Modifying the R390A Power Supply to Solid-State by Chuck Rippel

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Modifying the R390A power supply to solid state is a controversial subject and one that has been thoroughly discussed on the R390A Reflector. There are legitimate pros and cons to be considered before performing the procedure. At the bottom of this page, I have included a discussion on managing the additional voltage resulting from the modification.

Pros:
Eliminate the two hard to find 26Z5W rectifier tubes
Significantly reduce the overall heat production of the receiver
Virtually eliminate a rectifier based failure in the power supply

Cons:
Increased the B+ voltage will additionally stress some aging coils and capacitors..... When turned on, full B+ will be applied to the receiver before the tubes can warm up and begin putting a load on it. This will cause the B+ to even higher until the cathodes warm and tube conduction begins.

Solid stating the power supply is a listed government Field Change. The original authorizing document can be found on this WWW site by going to the Technical secton, R390A Field Changes. It is item #6. Here is the procedure I have developed. It is easy, reliable and easily reversable to 100% original. The R390A power supply is removable and located on the underside of the receiver. Unplug the receiver from power before attempting this procedure !

You will need: two 3A, 1KV diodes

Begin the removal process by unplugging the single connector then loosening the 6 green headed, captive screws that hold the power supply into the main chassis. There are 3 in the front which are easily seen but the 3 rear must be acessed through 3 holes in the tube deck. Lift the power supply straight up and out to a clear work space. Be careful, it is fairly heavy!
Making sure the tubes and shields are cool, remove the tube shields from V801 and V802, the 26Z5W rectifier tubes. In case you want to return the receiver to original, store these safely somewhere.

Turn the power supply upside down and note the bottoms of the tube sockets. It is here the diodes will be installed. Bend the leads of the diodes into a "U". Review the installation location below. You may want to trim mm or so off the leads so the diodes will clear the bottom of the tube socket. Do not remove so much that either of the diodes are nested in the socket pins. I like to have mine off the tube base so that they are in plain view for easy identification and removal. Install each, one per tube socket so the

cathode (banded end) is soldered to pin 3 of the tube socket and the anode, to pin 1. Do NOT reverse the polarity of the diodes; review your work before re-installing the power supply. Reinstall the power supply, secure the 6 green headed captive screws and plug the wiring harness connector back into the power supply.
Check the value of the main fuse. Verify that it is an AGC 3A fast blow fuse and change if necessary. For newer chassis so equipped, It also would hurt to also verify the values of the other 2 fuses, 1/8A and 1/4A respectively. This completes the procedure. First make sure the receiver has a proper ground then plug it in and power the R390A up. After warm up, it should work as before. Should it not, review you work and check for an open diode. Should you ever wish to return the receiver back to original. Simply remove the diodes and re-install the tubes and shields. I strongly suggest that if your receiver does NOT have IREC heat dissipating tube shields installed on the rectifier tubes, do so. These tubes run quite hot and are hard to replace when they fail. Their life can be enhanced with the black tube shields. Click here for additional information concerning IREC tube shields.

Voltage Management
The B+ voltages will be higher after making this change. This is further compounded by current higher A/C service voltages. As noted earlier, this will certainly put additional stress on aging components and can result in premature failures.

Before performing this mod, be certain that C-553, the .01ufd plate blocking capacitor for V-501 that isolates the mechanical filters from DC has been upgraded to a 600V Orangedrop. Also, C-549, the blocking capacitor for V-507A has been likewise changed to a .01ufd 600V Orangedrop. You will also want to have the 2 electrolytic filter capacitors, C-603 and C-606 rebuilt. Click here for additional information about filter capacitor rebuilding.

There are several methods to manage the additional voltage. I far prefer using a Variac. Not only can you reduce the B+ voltage but also the additional filament voltage caused by higher power company supply voltages. Note that the soild state modification will not affect filament voltage.

Connect the receive to a Variac pre-set to output 120V. Then remove a convenient tube and insert the leads of an accurate digital VOM set to read AC voltage to the sockets of where the tube filament leads plug in. Turn the receiver on and allow it to warm up for 30 minutes.

Adjust the output of the variac so the VTVM reads 6.30VAC of filament voltage.

Reinstall the tube and use the receiver.

Although a little more involved and not as accurate, a large filament transformer wired configured to "buck"the supply AC will also reduce the input voltage.

Inrush Current Protection by Jan Skirrow
from http://skirrow.org/Boatanchors/currentinrush.htm

The following series of posts to the BoatAnchors list consider the problem of protecting equipment from current and voltage transients that can occur when the power is first turned on. Unfortunately in the course of saving these and putting them together, the headers were lost, along with the names of some of the posters. Thus, I've generally omitted the identification of the poster. This also leaves me free to correct the spelling and delete the repetitive parts. But, if you recognize your stuff, and would like your name reattached, just ask! As always, these posts are offered without any guarantees!! Jan

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1. Inrush Current Protection
2. Socratic Exchange: Theory & PROTECTION
3. Voltage Spike Protection

The following series of posts to the BoatAnchors list consider the problem of protecting equipment from the transient high line current that can occur when the power is first turned on.

Unfortunately in the course of saving these and putting them together, the headers were lost, along with the names of some of the posters. Thus, I've generally omitted the identification of the poster. This also leaves me free to correct the spelling and delete the repetitive parts. But, if you recognize your stuff, and would like your name reattached, just ask! As always, these posts are offered without any guarantees!!

Inrush Current Protection

Post 1: Selecting an Inrush Current Limiter
Some time ago I discovered a neat little device that solves the inrush problem and, as a side benefit, reduces high line voltage. All this for a bit over $2! The device is an Inrush Current Limiter made by Keystone Carbon Co. The beasties look like ceramic disk capacitors with a black vitreous coat. The limiter is a **Positive Temperature Coefficient Thermistor** which is designed to handle current. When cold (room temp - 25C) they exhibit some resistance. As current passes through them and they warm up, this resistance drops by a factor of about 100. The limiters

are rated by current handling capability (1.1 to 16 Amps) and cold resistance (0.7 to 120 Ohms). Not all possible combinations of resistance and current are available but at last look there were about 20 different types.

You use the limiter by installing it in series with the line cord (preferably the hot lead) input to your BA. This can be done in a fashion that is totally esthetically pleasing (read “out of sight”) and completely reversible. IMPORTANT: Since the device is a resistor (and a HOT one at that) you must mount it away from heat sensitive components. I have mounted them under chassis without trouble but keep ‘em away from just about everything. Don’t attempt to heat sink it - that ruins the operation! Pick the right value by first measuring the steady state current of your BA. That is, after it is fully warmed up and all accessories are turned on. While you’re at it , also read your line voltage. Pick a unit that has a MAX steady state current of 120 - 130% greater than the current you measured and has the HIGHEST no-load or cold resistance.

Example: You measure 2.5 Amps (a moderately hungry BA!) and the line voltage is 123V. The KC008L is rated for 3.0 Amps with a cold resistance of 47 Ohms - a nice fit.

Benefits: A BA drawing 2.5 amps probably has a transformer with a primary DC resistance of about 3 Ohms. Inrush, at the peak of the AC sine wave, could be as high as 40 Amps but probably not less than about 20 Amps. With the limiter installed, the inrush will not exceed about 2.6 Amps at 123 line Volts. After the limiter warms up it will have about a .49 Ohm resistance (actually a bit higher because we’re not drawing the full 3 Amps.). This means that the line voltage across the transformer will be about 122 Volts (also a bit lower because of the higher resistance). This example came from real life and my actual results showed that the line voltage was reduced to 118 Volts (the BA was rated for 117) which means that the limiter was adding about 2 Ohms.

Negatives: If your area suffers from brownouts, the limiter will exaggerate the effect. If voltage drops, current drops. The limiter will cool a bit, its resistance will rise, and the voltage your BA sees will drop more than the line voltage. This is a very minor problem for me but I feel bound to mention it.

;Post 2: Experience with a 51S-1 Receiver;

In the past few years, a new kind of thermistors has become available for limiting start-up surge currents in electronic instruments. They differ from conventional thermistors in having a negative temperature coefficient (resistance decreases with increasing temperature), and this property gives them a useful self-regulating characteristic. Placed in the ac line of an instrument, they initially have a high resistance, which limits the inrush current through the instrument. Upon application of power, the current through the thermistor causes self-heating, which lowers the device's resistance. At some point the resistance stabilizes to a value that depends on the equilibrium temperature of the device. The equilibrium temperature is determined by the steady-state current drain of the instrument and the ambient air temperature surrounding the thermistor. Current-inrush thermistors are inexpensive and provide an effective way to protect power supply components in vacuum tube receivers, particularly those that use solid-state rectifiers. Note that you should not use current-inrush thermistors to protect transmitters or amplifiers; they are only suitable for instruments that draw a relatively constant current from the line. (See later post) Here are the details for protecting a typical boatanchor receiver, in this case a Collins 51S-1.

The steady-state current drain for my 51S-1 is about 0.8 Amps at 120VAC. To measure the inrush current, I temporarily removed the 1.5 ampere slow-blow fuse and jumpered a 1 ohm resistor across the fuse terminals. By measuring the voltage developed across the resistor with a scope, I determined the peak inrush current to be slightly more than 7 amperes! The equivalent load resistance presented by the 51S-1 at turn-on is thus (120 VAC/7 Amperes) = 17.1 ohms. As the filter capacitors charge and the tube filaments warm up, this load resistance increases to a steady-state value of (120 VAC/0.8 Amperes) = 150 ohms. A 7 ampere inrush current is very hard on the power switch, and isn't so great on the power transformer, rectifier diodes, and filter capacitors.

;The most suitable inrush thermistor I could find was Digikey ....; (1-800-DIGIKEY) part number KC014L-ND, at a price of $2.13. This thermistor is specified at 50 ohms resistance at room temperature (54 ohms measured), and dropping to 0.89 ohms at 1.1A load. I measured the resistance at 1.1 ohms at the current drain of the 51S-1. To install the thermistor, I clipped the wire to the fuse socket of the 51S-1 and relocated it to an unused lug on a nearby turret. I then soldered one lead of the thermistor (which physically resembles a small disk capacitor) to the same lug and the other to the recently vacated lug on the fuse socket. I used a bit of Teflon tubing on the leads, and kept the leads long so I could suspend the thermistor in free space away from other components. The thermistor dissipates about a watt of heat and runs rather hot.

After installing the thermistor, I replaced the fuse with a 1.5 Amp fast-blow type. I then remeasured the peak inrush current and found it now to be only about 1.8 Amperes, which is consistent with the theoretically expected value of 120 VAC/(54ohms+17ohms) =1.69Amperes. The peak inrush current is now only slightly greater than the steady-state current drain and should thus pose no problem for any of the power supply components. Note that this particular thermistor is appropriate for almost any boatanchor receiver that draws 75-150 Watts from the power line.

Concern is often voiced about a related turn-on problem (actually, a turn-OFF problem), namely the inductive voltage spike caused by the power transformer inductance when the power is switched off. This spike is reputed to cause sparking and welding of contacts in hard-to-replace power switches, particularly in rigs like the KWM-2 and S-line. I checked on this problem with my 51S-1, but measuring the peak voltage developed across the power switch when the rig was shut off. (My Fluke 87 DMM has a peak-reading feature which can capture voltage transients as short as 1 msec.) To my surprise, I found that the inductive voltage kick was only about 5 volts higher than the line voltage, and was no cause for alarm. I had thought about using an MOV surge suppressor across the switch contacts, but decided it wasn't necessary. This is not to say, of course, that the problem isn't greater in some other rigs, but 51S-1 owners need not worry.

;Post 3: Inrush Protection for Transmitters;

Comment:
>>Note that you should not use current-inrush thermistors to protect transmitters or amplifiers; they are only suitable for instruments that draw a relatively constant current.

Response:

Au contraire. Inrush current limiters work nicely in transmitters and transceivers and probably in amplifiers as well, although I've not tried that. The only stipulation is that the device must be selected to allow the maximum current needed by the transmitter. The resistance of the thermistor after the initial surge is very small, a fraction of an ohm, and less than the resistance provided by the typical AC mains. Consequently, its effect upon the load regulation of the transmitter is negligible. I used an inrush limiter a while back in an Eico 753/751 transceiver supply with excellent results. Prior to using the inrush current limiter, the power on surge produced an unnervingly loud KWUMMP! After installing the inrush current limiter, powering up the unit produced no audible effects at all. I don't happen to remember the voltage drop across the inrush limiter when just the receiver was operating, but I did measure it and found it be negligible; on the order of only a volt or two.

And Someone Else Added:

Of course, on larger transmitters one has to use thermistors on each element. Generally the current draw is too large to protect the entire transmitter.
The filaments transformers, the plate transformer, low voltage transformers should all be individually “thermistorized”.

In mine, I find a volt or two drop at the thermistors is just what the doctor ordered as the line is slightly high.

;Post 4: Mounting Caution;

Don’t solder them into your circuit unless you want trouble. They do get hot in operation and repeated heating and cooling of a solder joint will cause it to crystallize and eventually fail. This was a common failure in televisions with thermistors used in the degaussing circuits, and even with some of those cement-block power resistors on circuit boards.

Put in a small screw terminal strip to mount the ICL. Crimp terminal lugs on the ICL and then attach it to the strip with the screws. In the long run, this will save lots of grief and it also makes installing and insulating the ICL a snap.

;Voltage Spike Protection

Post 1: MOVs;
Turning off a rig can cause a big voltage spike across the transformer primary and the AC line. Usually it just burns out or welds your switch, as R-390A users often learn.

A back issue of The Collins Journal suggested getting 240-volt MOVs and wiring them across your primaries to absorb the transient. Note that if the MOV fails (shorted) it will suck lots of current, but you have a fuse in the line, right?

These will protect your switch, and apparently your transformers could use it too. I doubt the big toggle snappers in a Viking need it as much as the wimpy switches in an R-390A or KWM-2, but your transformers may last longer this way. And you’ll get protection from nasty things that come in through your power line, and your gear won’t put glitches back out there when you turn it off.

;Post 2: Selecting MOVs;

Query:
>> There have been a number of posts touting the use of varistors to protect against voltage surges. Question is: How to decide what specs when buying these little doo-dahs?

Answer:
My background is in Mechanical Engineering, so take what I am about to say with a grain of salt. When I have picked MOVs (metal oxide varistors) in the past, say to protect stuff on the AC line against spikes, there are two things I have been concerned about. First is the clamping voltage. These little do-dads work by turning from a non-conductor to a conductor at the clamping voltage. The other rating is the amount of current they can handle. Usually this is broken into two numbers, a surge number with a time (like 7000 amps for a microsecond) and a steady state value if I remember correctly. So when I picked one to make into a AC surge suppressor, I picked a clamping voltage of about 150 volts with the highest current capacity I could afford.

;Socratic Exchange: Theory & PROTECTION

Post 1: Theory;
On Fri, 23 Aug 1996, Jan Skirrow, VE7DJX, asked me some excellent questions about thermistors, varistors, and such. I hope he does not mind me posting his questions or my reply to the group. Thermistors are not often seen in boatanchors (or in a lot of modern semiconductor stuff for that matter). I know a little about them because of their use in temperature measurement and instrumentation.

>>First, I conclude that NTC thermistors would be placed in series with, for example, a transformer and would thus limit in-rush current because their resistance is inversely related to temperature, which would rapidly increase on start-up.

Exactly. They are particularly beneficial with power supplies having capacitor input filters.

Look at the special devices sold as Inrush Current Limiters, not conventional thermistors. Keystone is probably the most common NTC Inrush Limiter manufacturer.

The typical resistance ratios of common NTC thermistors (for other than Inrush Current Limiting operations) is generally between 5 to 10 for 0 C to

50 C temperature changes. Plugging these numbers into the typical resistance relationship

;R = Ro * exp(B/T) R and Ro in ohms, T in Kelvin;
gives a Beta in the approximate range of 2800 to 4000. Using a value of 3400 as an average gives an Ro value of 0.0011 ohms (the resistance at absolute zero). So at 50 C, the resistance should be around 41 ohms (and at 0 C, the resistance is 284 ohms and the ratio is: {ta-da...} 6.9).

In true Inrush Current Limiters, the Beta value is MUCH higher. If, for example, B is 10,000, the 0 to 50 C ratio is 290. This is such that a few ohms cold becomes very low resistance when hot. I don’t really know what the Beta number is for these devices but I might be able to estimate it from the specs knowing the dissipation of the hot device and estimating some heat transfer conditions. It is not necessary to know it for picking an Inrush Current Limiter for your operation. In any event, a typical Inrush Current Limiter might have the following specifications (actually those for a Keystone CL-110):

Resistance at 25 C: 10 ohms +/- 25%
Maximum Steady State Current: 3.2 amps

Approx. resistance @ maximum steady state current: 0.18 ohms

>>I assume your reference to older metal oxide devices doesn’t refer to metal oxide varistors - which seem to be a transient suppressor that functions by clamping the voltage across itself to some fixed level. NTC thermistors are generally made from oxides of manganese, nickel, cobalt, copper and iron. Metal oxide varistors for transient voltage suppression are generally variations on zinc oxides. Older thyristors were generally silicon carbide.

It is interesting that while quite different in operation, the thermistors and varistors obey similar exponential relationships. The simple thermistor relationship is shown above. The current through a varistor follows a similar one: ;I = Io * exp(a*V) I, Io in amps, V in volts;

If you look at more exact relationships with both temperature and voltage dependency included, the equations start looking VERY much alike. Basically a varistor draws very little current at low voltages, but as the voltage increases, the current increases very rapidly.

>>So these would be used by placing them across (for example) switch or relay contacts that switch an inductive load, and would prevent the voltage across the contacts from going too high due to transients, thus arcing and damaging the contacts.

That is one use, although in snubbing an inductive load, the presence of a diode in a DC circuit or a varistor is an AC circuit will slow down the response of the relay. You really need something that will absorb the energy stored in the magnetic field.

The more common use of a varistor is across the AC line as a transient suppressor. The voltage rating is chosen such that the device does not conduct much at normal voltages, but conducts heavily during a voltage transient.

>>So, comprehensive protection for, say an R-390A, would be an NTC thermistor in series with the power transformer and a varistor that clamped at something over normal line voltage (perhaps 150v rms?) across the troublesome main power switch.

Sort of! An Inrush Current Limiter in series with the transformer primary would reduce the current surge during turn-on. A varistor across the main power switch might help a LITTLE but what you really need here is a snubber network of a resistor in series with a small capacitor. Typical values might be 10 to 100 ohms in series with a 0.01 to 0.05 uF capacitor (rated at 1 KV minimum). A better approach would be to use a better switch!

A 130 volt varistor, like a V130LA20, would be a good choice to add after the power filter network across the line. It would protect against line voltage transients. However, it won't protect the filter here. You should probably use a proper transient protected multiple outlet strip to power the radio anyway. The best ones will have 3 varistors inside. One from line to neutral, and one each from line and neutral to ground.

Inrush Current Limiters and Transient Voltage Suppressors are quite inexpensive today. Small and unobtrusive, they can often be tucked inside your Boatanchor giving you some added protection.

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Post 2: Additional Comments;

>>I seem to remember horror stories about some so-called transient protected outlets that worked once, and then provided no protection as the varistors went south. All of my outlets are so protected, and I hope they all work! This is important too. In transient suppression, you want to have as much impedance between the source of the transient and the device you want to protect as you can get. Thus for best protection, a staged approach is a good one. At the service entrance to your house, you should have one of the lightning arrestor/transient suppressor blocks made for this purpose.

These cost $15 to $30 at a commercial electrical supply house. The only problem is that with installation at the service entrance, you usually have to pull your power meter. Between the service entrance and the wall outlet, your house wiring provides some distributed capacitance and inductance. A 3-MOV protector at the outlet is a good idea here. Checking them is a problem as there is no simple way to do this. If your circuit breaker or fuse blows upstream of the protector for no apparent reason or during a thunderstorm, you can probably assume the protector “went south” and needs to be replaced. Finally at your equipment, its line cord and RFI filters provide even more impedance. A transient protection MOV inside the rig provides the final stage of protection. It can be smaller in its ratings since the earlier protectors should have already taken most of the energy away from the transient. Nothing protects against a direct-hit of lightning though. But I would still rather have a few MOVs explode, and maybe a line-filter or two, than the entire rig to replace!

THE SELENIUM RECTIFIER REPLACEMENT

by David Medley"

A very common fault in the R-390 radio is failure of the selenium rectifier CR801. This is situated just under the power transformer on the power supply sub assembly. Symptoms are non operation of the antenna relay and the break-in system. To replace this is easy but there are a couple of wrinkles.I replace CR801 with a bridge rectifier obtainable from Radio Shack part number 276-1173. This has a mounting hole which bolts conveniently in the bracket which supported CR801. Click here and you will find a wiring diagram of the power supply.You will note there are five connections to CR801 whereas there are only four to the bridge. There are two wires connecting to pin 5. One connects to pin 1. Remove this and discard. The remaining wire is the positive DC lead. The wire connecting to pin 3 is the the negative DC lead. Pins 2 and 4 are AC in. Solder these leads to the appropriate terminals of the bridge.

MAIN POWER MICROSWTICH ASSEMBLY

Subject: Re: [R-390] On/Off
microswitch............changing/cleaning/repairing

Thanks to everyone who passed on encouraging words -- the deed is done and a bit of TLC with DeOxIt did the trick to make the switch start working normally again.

Some words of caution to anyone faced with this in the future: The Dial Lock mechanism is a pain in the petutie. I had to remove it to get the faceplate free (and I DID have to remove the faceplate to get access to what

I needed to do). I had to loosen the dial bushings for the AF module controls (BFO position is critical -- be careful not to move the shaft after removing the knob!) AND the bushings for the MHz and kHz dials in order to give myself enough 'leeway' to get the panel off.

You DON'T have to remove the two screws behind the dial plate (they hold a circuit board onto the faceplate and don't prevent you from removing the plate) and there are a couple of other faceplate screws that hold wires and not the plate -- I left those on to no ill effect. Once it is completely loose, the faceplate 'hinges down' rotating on the wire harness, and gives you access to things enough to get at the mode on/off switch.

As for the switch itself -- I did have to remove it (which was a bit nerve wracking) to get at it to clean things out, but other than briefly misplacing one of the washers it went rather easily. Go slowly and don't force anything and the disassembly/assembly process is easy enough with a small jewlers screwdriver.

NOW one last question -- what does the last unlabeled position of the switch do? The pins were crimped down so that the switch couldn't access that position in my set, but it looks suspiciously like it SHOULD do something....

Subject: R390A Main power switch

Yes, there was a discussion about the power switches. My 2ndnd R390A's switch stopped sticking after I used it for a while, but of course it could start sticking again at any time: anything that fixes itself, can unfix itself.

Shouldn't be too hard to get a replacement, but lots of work to get the old one out and install the new one, especially if the body size and shape and screw hole locations don't match. With a Bristol spline wrench you can actually flip down the front panel and make the job much easier.

My 2ndnd RX did come with the 3 covers. I will probably move them to my nicer, 1st unit. And maybe move the Collins nameplate over too: nah, that might be fraudulent (might be, since who knows who made the 1st one, whose nameplate is missing). 73, mike k w9nrd

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Subject: R390A Main power switch

>My R390A is'on' all the time - the microswitch mounted on the front panel
>function switch seems to be permanently closed. I seem to remember someone on BA saying that these switches freeze regularly, but can be

fixed.
Anyone have any idea how, or where I can get a replacement?

Hollow State News issue #32 contains an article entitled'R-390A Won't Turn Off (Again)?' by Dallas Lankford. The article describes how to fix the microswitch in the function switch. HSN #32 can be purchased for a check or money order payable to'Ralph Sanserino' for US$1.00 (USA, Canada, and Mexico) US$2.00 elsewhere.

Hollow State News
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P. O. Box 1831
Perris, CA 92572-1831, USA
Regards, Steve Byan Internet: steve@hi.com

Subject: R390A Main power switch

Yeah, I remember an article on this. You can take the Microswitch off of the rotary switch body, and then you can either replace it or take it apart and clean the contacts and maybe give the spring a little extra curl. I think you can probably get a new Microswitch from somebody like Allied or Newark; or you can look in surplus stores for a suitable replacement Microswitch.

Subject: R390A Main power switch

Years ago my 390A did this. I took a long wooden dowel about º inch in diameter. I placed one of the dowel on the switch and gently tapped the other end with a very small hammer. I had to repeat this process a couple of days later. Since then, no problems. I wonder if dirt doesn't get in there and make these things stick.

Subject: R390A Main power switch

I've heard of a lot of people having problems with this. I just looked at the schematic, and the switch is just there, in series with the power transformer primary. And people who have opened them up have talked about the contacts being pitted.

Back when I worked for Teletype it was pretty standard to connect a spark suppressor across switch contacts that make or break an inductive circuit. The thing we used was, as I recall, something like .05 mf capacitor in series with 1K resistor, or maybe .1 mf capacitor in series with 500 ohms. (There were at least two of them, depending on the power level involved.) So maybe there is a need for something like that here to protect the switch contacts.

Subject: R390A Power Switch Repair

My R390A is'on' all the time - the microswitch mounted on the front panel function switch seems to be permanently closed. I seem to remember someone on BA saying that these switches freeze regularly, but can be fixed. Anyone have any idea how, or where I can get a replacement? I just performed a switch repair operation on my 1955 Motorola R390A. It is not that hard. Should take about an hour, or maybe less if you are familiar with front panel removal of the R390A.

Here is how to do it:

1. Remove the front panel. This requires removal of a lot of screws. The main tuning knobs, ant alignment, BW, dial lock, and BFO knobs must be removed.

I may have missed one. The dial lock mechanism must be loosened and rotated so it disengages from the metal disk. Also remove the function knob and remove the nut and lockwasher holding the wafer switch assembly to the front panel. Use a piece of 2X4 to elevate the front of the radio, and the front panel assembly will lower to the bench without putting too much force on the cable harnesses.

2. Unsolder the two wires from the microswitch. I sure hope you had the radio unplugged ! Remove the 4 bolts, nuts, and washers from the microswitch. The microswitch is now easily removed.

3. Remove the cover from the microswitch. You will notice 2 rivet like things holding the cover on, however, they ain't rivets ! You can pry these 2 pin- like devices out if you get a sharp screwdriver underneath their heads. Don't lose em ! The cover can now be pried off.

4. Make a sketch of the workings of the microswitch to use later in reassembly. Note that the contacts are covered with oxidation, and the surfaces of the contacts are highly pitted and nasty looking. They are probably welded together, but can be easily separated. Note that this switch is normally OPEN. Remove the small beryllium copper strap spring that holds the contacts apart. Don't lose it ! You will now be able to pry the 2 pieces that contain the switch contacts from the switch body.

5. The contacts on my switch appeared to be silver. I took a flat Swiss file and filed the pitting away until the contacts were nice and smooth. The contacts were thick enough that I bet I could do this a couple more times without completely removing the contact. You might want to clean off the oxidation first so you can see the pitting.

6. Reassemble the switch and make sure the contacts mate flush together. If so, put the cover back on and punch the 2 pins back in place. You may want to spray some contact cleaner on the contacts just to make sure they are nice and clean.

7. Reassemble the microswitch to the function wafer switch assembly and resolder the 2 wires. Assemble the switch assembly to the front panel, and the front panel to the radio. You are done. This procedure should be required every 40 years based on my experience.

73 KF5N, Greg Raven, egr002@email.mot.com

Date: Sun, 12 Oct 1997 11:12:30 -0500
From: badger <badger@...>
Subject: [R-390] Replacing Capacitors

Regarding repacing the electrolytics in in the 390A, I have found a relatively inexpensive solution. Rather than try to find the original plugin cans, I found a couple of "empty" relay cases with octal plugs. There was enough room to mount the individual capacitors for C603 and C606 inside the cans (admittedly I had to LOOK for smaller caps that would fit) and the relay cases just plug in to the chassis where C603 and 606 would fit. Just my opinon that newer electrolytics are better than old stock, even new old stock.

Date: Mon, 10 Nov 1997 06:18:22 -0600
From: hinec@... (Cory Hine)
Subject: Re: [R-390] Oven concerns

Somewhere, long ago.... I read in one of the operations manuals, that the heaters were to be used in cold climate (below freezing) in unheated shelters. They would probably work well at the south pole..... otherwise, leave the heaters off. After 24 hours the thing is stable to within 1 or 2 cycles anyway. If you are running crypto, and need higher stability, you have other equipment that is designed to do that!!!!

From: "Chuck Rippel" <crippel@...>
Date: Thu Nov 20, 1997 9:44 am
Subject: Re: [R-390] Tube Startup shock questions.

You worry about filament inrush in big power tubes but in receiving tubes, there is not much worry. You could put in inrush supressor on the radio but I doubt it'd buy you much.

From: hinec@... (Cory Hine)

Date: Fri Nov 21, 1997 4:22 am
Subject: Re: [R-390] Tube Startup shock questions.

One of the solutions that I have found, and I use it on all my Collins equipment, is the inrush current limiter (ICL). These are available from various sources, and were originally designed to suppress the first three cycles of startup current on switching power supplies.... Probably a 4 amp ICL would cover the situation. The device is put in series with the 125VAC, and drops to an insignifigant resistance as it is turned on and heats up. Probably 10 ohms, or 100 if you really want to startup slow, will do the job. Keystone is one of the outfits that makes the things, and they are available in Allied and such distributers. $4.00 or $5.00... and they work!

From: paul.courson@... (An Unsigned Note)
Date: Fri Nov 21, 1997 5:01 am
Subject: [R-390] Stand-By Mode (cathode bombardment?)

Your note with your concerns about inrush current also suggests the possibility that you are turning your radio on and off a few times a day. If your receiving patterns are predictable and you know that you are going to be around on a given day, why not just leave it on? I do this on the weekends typically, but then, Sunday night, turn the radio off until next weekend.

Advantages include having everything warm and stable for when you have a few minutes to check out the bands. and, of course, just turning up the volume and being able to immediately monitor.

Caution -- it may *not* be wise to turn the radio to STANDBY when it's idle. More than one person has discouraged me from doing this, with one explanation being the effect of "cathode bombardment" on the tubes. I'm not convinced that's a significant factor which would affect tube life. At the same time, I don't see any reason to use STANDBY instead of fully "on," and leaving the RF GAIN cut back to quiet the room if I'm not there to listen.

Comments from the group on the issue are solicited and appreciated.

From: crippel@...
Date: Fri Nov 21, 1997 2:55 am
Subject: [R-390] Re: Stand-By Mode (cathode bombardment?)

Paul is right about using "standby" on the R390A or R390. One problem is that the B+ becomes unloaded and is allowed to "drift" upwards in value. The problem here is that combined with our higher line voltages, the B+ can rise enough to begin to compromise the maximum voltage ratings on some of the capacitors. If you have an R390A modified for soild state (a legitimate, listed factory/military modification) the overvoltage problem can be exaccerbated by that improvement. The best answer is to put the receiver on a variac and run it at 115VAC input. The most workable answer is to not use "standby." Instead, turn the volume and RF gain controls down and the beast will sit around as quiet as a church mouse.

From: Don Stepka <dts4@...>
Date: Fri Nov 21, 1997 8:52 am
Subject: Re: [R-390] Tube Startup shock questions.

You are correct that it is theoretically better to turn filaments up slowly. But in practice it doesn't seem necessary. I've replaced thousands of failed tubes and can count on one hand the receiving tubes with bad filaments. Tube designers knew that tube devices would be turned on and off, and designed accordingly. I'm inclined to recommend against the NTC thermistor surge limiters for vacuum tube equipment. They aren't slow enough to make any practical difference with tube filaments, and the added operating resistance "softens" the supply and may make the radio more prone to drift as the load varies. (This last is more a theoretical objection -- but if you don't get the benefit, why suffer even theoretical losses?) If you're really that concerned, put it on a variac and turn it up slowly. But the odds are insignificant that you will ever have a filament failure if you just use it as designed.

From: Dave Rickmers <rickets@...>
Date: Fri Nov 21, 1997 9:43 am
Subject: Re: [R-390] Re: Stand-By Mode

>If you have an R390A modified for soild state (a legitimate, listed
>factory/military modification) the overvoltage problem can be
>exaccerbated by that improvement. Chuck Rippel

If you do modify the power supply; don't overspec the diodes, and add a B+ fuse. Otherwise a internal short in a tube may cause a catastrophic failure of the wiring harness. 500 mA is a safe upper limit.

From: rerobins@... (Rick Robinson)
Date: Fri Nov 21, 1997 12:17 pm
Subject: Re: [R-390] Tube Startup shock questions.

This is a good point you've brought up. Last week someone posted a tube price list on boatanchors that showed 5AR4/GZ34 rectifiers going for nearly $50. I snickered at that until I was told that Mullard designed the GZ34 with slow warm-up filaments in order to give a long turn-on time and avoid problems with inrush current. Hence they are much easier on power supplies and are highly valued in the high end audio community.

This could be an audio urban-legend for all I know but it does sound reasonable and would contribute to the high price they are fetching. Does anyone know if 26Z5s are designed this way? With all the engineering that went into the R-390 series, you'd think this potential problem would have been addressed.

From: "Chuck Rippel" <crippel@...>
Date: Fri Nov 21, 1997 10:31 am
Subject: [R-390] Re: Stand-By Mode (cathode bombardment?)

Yes, there is a difference but this problem is not model specific. The problem typically causes failure of the B+ filter caps as they over voltage. R390, R390A or FT-1000 it makes no difference. If you run filter caps beyond 80% of their rated voltage, the life cycle drops markedly. I have found that in many cases, mfg's usually over rate the caps voltage rating by about 20%. I know that in the case of the "A," using "Standby" causes the HV to become unloaded and it drifts up. Yes, the OA2 clamps the additional HV on the circuits it filters but some of the damage is done long before it gets to the regulators. Namely, the filter caps.

From: Don Stepka <dts4@...>
Date: Sat Nov 22, 1997 10:20 am
Subject: Re: [R-390] Tube Startup shock questions.

>.............audio urban-legend for all I know..........................

It is. It's a solution to a non-problem today , unless the filter capacitor voltage ratings are extremely marginal. The British were quite fond (and justifiably so) of choke-input power supplies. In choke-input supplies, the capacitor voltage is much higher under no-load conditions than under load. In order not to require capacitors rated at, say, double their operating voltage, they specified slow warm-up rectifiers. Today, everybody uses capacitor-input filters, so the zero-current voltage is only higher because of the resistive drops in the transformer and rectifiers, which is much less than the choke-input zero-current rise. If a modern power supply won't tolerate its zero-current voltage indefinitely, the solution is proper capacitors, not a slow rectifier. Like most smaller rectifiers, the 5AR4 is a cathodic rectifier, not a filamentary rectifier. It has an oxide-coated cathode just like most receiving tubes. So, (1) its cathode warms up at about the same speed as other cathodic tubes, (2) its forward voltage drop is less (about 20-25V rather than the 40-50V of a 5U4 or similar), and (3) it is not as tolerant of abuse as a filamentary rectifier.

>Does anyone know if 26Z5s are designed this way?

They are, though not for this reason. Most receiving rectifiers (like the ubiquitous 6X4) are cathodic, because (1) it's the only way to get sufficiently high emissions into the limited space and (2) the greater abuse-tolerance of filamentary rectifiers is not thought necessary for receiving rectifiers.

Date: Sun, 15 Feb 1998 21:46:05 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat build up in the R-390A

Well Dennis, simply plugging in silicon rectifiers in place of the tubes will raise the B+ voltage. Guaranteed. The rectifiers will run much cooler but the rest of the tubes, the electrolytics and the power transformer probably run warmer. At least the high voltage winding. Not having the heater heat to load the transformer and to heat the transformer has to be a bit of benefit. Adding resistance or a filter choke to the rectifier circuit will lower the voltage and move the heat from the individual tubes to the resistors or the choke. Though the choke will drop the B+ more from inductance (relatively lossless) than from its inherent resistance, thus softening the current peaks which makes life a tiny bit easier on the HV transformer and the rectifiers (so long as you don't get an inductive kick problem to overly back bias the rectifiers when you turn the radio off).

I think silicon rectifiers with a choke are the best solution, silicon rectifiers with resistors are pretty good, silicon rectifiers without resistors are a poor idea, but the tubes will heat the world the most because of their voltage drop (which is transferred to the resistors when they are used with the silicon rectifiers) AND heater power.

There can be two resistors, one in series with each rectifier, or just one in the common output line. I don't know what the value would be, but pick it to drop the B+ the same as the original tubes. I did this same thing in a Tectronics scope about 25 years ago when replacing seleniums with silicon and it worked fine without loss of aged electrolytics.

On the other hand, the slow warm up of the rectifier tubes does mean that the rest of the tubes get hot about the same time and there's less of a voltage peak on the filter capacitors each time the radio is turned on. If the filter capacitors have aged to such a condition that their voltage withstand value is the normal operating voltage, changing from tubes to silicon rectifiers, even with resistors, could lead to the build up of excessive pressure within the electrolytics from excessive leakage current. Some might do a bit more than bulge their cases. Exploded electrolytics ARE a PAIN to clean up from inside a radio. But if the electrolytics are that sensitive to applied voltage, they are not working as well as they should anyway and should have been replaced already. And so long as the electrolytics can withstand the occasional applications of higher voltage it means their withstand voltage will stay higher than the operating voltage and they will have a lower leakage current at the normal operation voltage, which should give them longer life. 73, Jerry, K0CQ

Date: Tue, 17 Feb 1998 08:29:37 +1100
From: Morris Odell <morriso@vifp.monash.edu.au>
Subject: [R-390] Solid state rectifiers

Can I have the list's collective advise on these 'Solid State' replacements? Do I hear by this that they are not an 'improvement' and are counter productive to long life? Is this where our Glow Plugs are better than Sand State? Whoda thunk here in 1998? Gee there has been an awful lot of discussion of this subject in the few years I have been on the Boatanchors list and here too. In general it's true that silicon rectifiers impose a sudden high B+ before the tubes have had a chance to warm up. This is not really a problem for receiving type tubes - don't forget that in old radios with directly heated rectifiers the B+ comes up pretty high too because these tubes heat faster than the indirectly heated tubes in the rest of the receiver.

There are a couple of possible problems though:

1. The main concern is the surge rating of electrolytic capacitors. These have to be able to handle the full peak voltage of the power supply for 20 seconds or so. If a designer is certain this will never happen, then lower rated caps may have been used which might not be able to withstand the surge if silicon rectifiers are used. I don't think this is a problem with the electrolytic caps used in the R390A. It may also be a potential problem with some coupling or bypass caps only rated for 350 volts or so. These days 630 volt capacitors are still readily available for replacements in necessary.

2. The internal resistance of vacuum rectifiers is higher than that of silicon diodes so the power supply output voltage under load will be higher using silicon diodes. Any replacement procedure must include adequate series resistance to adjust for this. On the same subject, if a capacitor input filter is used, the peak diode current (and therefore transformer heating ->burnout) depends on the total value of rectifier anode circuit resistance. If silicon diodes are installed, the peak current may be quite high unless an adequate resistor is installed in series.

3. There has been a suggestion that the R390A function switch could be left on "standby" while the tubes warm up. This is not a real good idea as in this receiver there are still some circuits connected to the B+ on standby including (correct me if I'm wrong) the 0A2 regulator tube. There will be

increased B+ on standby even with hot tubes and this may overload other components icluding the 0A2. I don't use the standby position at all for this reason.

I was forced to think about all this early in my R390A owning experience as one of the 26Z5s developed an open heater very soon (a week) after I got the receiver. I replaced both rectifiers with silicon diodes and a common series resistor in the power tranformer centre tap of about 300 ohms 20 watts (this was 10 years ago - I'd have to look up my modification records to check the exact value). It hasn't missed a beat since.

Date: Sun, 15 Feb 1998 01:37:28 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat build up in the R-390A

<snip> I think the variac is OK to get the heaters down to rated voltage if the line voltage is high (though a bucking transformer would be less easily messed up by a wandering hand), but removing unnecessary dissipation from the series regulators (maybe that's in the 390) and the other tubes has to help longevity a bit. I can show that a choke would reduce total power consumption better than the resistors.

Date: Fri, 13 Feb 1998 12:14:19 -0500
From: "Will Schendel" <n8azw@concentric.net>
Subject: [R-390] Heat build up in the R-390A

My reason for the variac is to keep the filament voltages below the maximum value. If you look at some of the Eimac literature, reducing the filament voltage just a few tenths of a volt, will increase the life of the tube dramatically. While it certainly won't hurt anything, I think the Variac idea is unnecessary...the MilSpec 390 won't likely mind the 125 volt lines at all; this is definitely not a wimpy radio.

Date: Fri, 13 Feb 1998 16:33:52 -0500
From: "Will Schendel" <n8azw@concentric.net>
Subject: Re: [R-390] Heat build up in the R-390A

I stand corrected on my statement about filament voltages. Guess filament distortion due to high inrush current, and filament life have no bearing on plain jane receiving tubes. A simple incandesant lamp will last longer at a reduced voltage. There I go using that ham sense again..I'll leave this discussion to the engineers and post hole diggers. Thank you all for your replies, we have a great bunch here. I have learned a lot so far. Going back to the listening mode...

Date: Fri, 13 Feb 1998 13:35:30 -0800

From: "Mark Glusker" <glusk@mechcad3.engr.sgi.com>
Subject: Re: [R-390] R-392 Cooling?

I don't really know. But, of course, that doesn't keep me from making a couple wild guesses:

Guess #1 - It's an MTBF issue. Anything will run in a closed box for at least a little while. Perhaps the military was willing to accept a lesser MTBF to achieve the size and mobility of the R392. Certainly the 26 volt tubes are evidence that they were willing to compromise the design of the R390 somewhat.

Guess #2 - Maybe there really is a problem with the R392 and they knew it. I gather there are several case designs for the R392, including one with fins to aid the convective heat transfer from case to ambient air. I don't know which design came first (fins or no fins) but it's conceivable that they did recognize a problem and phased in the finned design to improve cooling. Of course, it's equally likely that they made the finned case first and changed over to the smooth case as a cost reduction because the fins weren't necessary. Mark Glusker, glusk@sgi.com

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Date: Fri, 13 Feb 1998 19:32:46 +0000
From: "Chuck Rippel" <crippel@exis.net>
Subject: Re: [R-390] Heat build up in the R-390A

NOS (New Old Stock) Electrolytics are bad electrolytics. I rebuild mine with new Mallory components. Check the bottoms of yours. If there is white power (dried electrolyte) around the base gasket and/or pins, the caps are bad. You can also check them on a cap checker like the HP or Sencore LC-101. The Sencore unit is capable of biasing them at 300V for measuring leakage.

Date: Fri, 13 Feb 1998 17:54:26 -0600
From: w5jv@juno.com
Subject: [R-390] Voltage, Heat build up, and Alignment in many NAVY R-390/As: A 2 cents worth.

Greetings to everyone working the heat problem, I used the R390 in various settings in the Navy both at sea and ashore during the Vietnam conflict. This was during 1966, 67, 68, 69 and as you would expect they were left on 24 hours per day. At sea the radio rooms were fed with the Mains through isolation transformers and available power stayed very close to 115V-117V as I remember. While most of us might not want to employ our own isolation xmfr or conditioning unit, I think keeping some control over our own AC source voltage is not such a bad idea. During the early 60's, many of us running ham stations used independent filament transformers to keep the tubes lit and only hit the mains when B+ was needed. Even then it was becoming popular to bring the mains up with a variac monitoring the AC voltage as you went.   If I'm not mistaken, keeping the filaments running reduced maintenance.   <snip>

Date: Mon, 16 Feb 1998 10:41:21 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat build up in the R-390A

John, I've not checked my books, but it wouldn't be like a Collins receiver it the standby switch merely unhooked the B+ or B- like a Hallicrafters... Most likely it biases the RF and IF stages to cutoff by lifting cathodes of those stages or applying a large negative bias to the AGC circuit. Of course, a time delay relay could be added to the solid state circuit to delay applying ALL B+ for ten seconds. I begin to think that while having B+ may not be the very best for the cold tubes, the high B+ before the tubes warm up may keep the electrolytics formed for the higher voltage so they leak less at the normal operating voltage. After long periods of operations, the oxide layer (that does ALL the work) in electrolytics gets thinner so it just stands the actually applied voltage. Which is why years ago they were only considered properly used within their design range. E.g. 450 volts electrolytics were for circuits ONLY above 350, and 350 for above 250 and so on and electrolytics were readily available for each voltage.

Date: Sat, 14 Feb 1998 20:59:44 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat build up in the R-390A

Doug, it would seem to me that adding some series resistance with the silicon diodes could maybe move heat from the tubes to the rectifier region. I was thinking that maybe if the filter circuit was capacitor input with a choke that reducing the input capacitor would help, but in checking the book I see its already pure choke input in the 390A but only a small capacitor in the 390. It would reduce the voltage from the silicon rectifiers more to use a choke instead of a resistor in either radio without adding as much heat as from a resistor. But it would be definitely bulkier. If I was to guess at a value, I'd guess 10 hy at 125 ma as suitable, but that's purely a guess. I doubt it would be as bulky as the original rectifier tubes.

Date: Sun, 15 Feb 1998 19:34:37 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat build up in the R-390A

Doug, there once were some chokes in the SRT-14 that were about 2" square by 4 or 5" tall. Those would just about fit over one of the unused rectifier sockets. I've almost designed the current regulator on this list. I'd use an LM317K or 337K, wired as a current regulator, set to 300 ma. But since the circuit is AC, I'd embed that regulator circuit in a diode bridge. E.g. brige + to + input of the regulator. Bridge - to - output of the regulator. Then one AC terminal to supply and the other AC terminal to the load. Having set the regulator for 300 ma at DC, because of the finite transition times of the AC, the level would need to be raised to get the heating value of the current up to 300 ma. I'd use my B&K true RMS meter or my Kiethly (really true RMS, has a heating element followed by a thermocouple) true RMS meter to check the calibration. I did a rough graphical calculation a couple weeks ago and it seemed to indicate the peak current would need to be 350 ma. Then I was calculating roughly 700 ma for a 600 ma RMS circuit. Power dissipation would be the same as the ballast tube, so remote locating would be of benefit, even for the ballast which wouldn't be difficult, an old tube base, some wire and a socket out away from the radio...73, Jerry,

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Date: Sun, 15 Feb 1998 22:28:51 -0500 (EST)
From: Steve Stutman <sstut@world.std.com>
Subject: Re: [R-390] Heat build up in the R-390A

Another reason to shy away from silicon rectifiers is that B+ is almost instantaneous. When applied to "cold" tube with indirectly heated cathode, damage can occur. Tube rectifier must heat up as well, so B+ is delayed after AC comes on. Sure, the question is, whose filaments heat first, but it's a delay nevertheless. I posted this awhile back and received some disagreement, but proved this to myself in the '60s with my BC-779.

Date: Sun, 15 Feb 1998 21:46:05 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat build up in the R-390A

Well Dennis, simply plugging in silicon rectifiers in place of the tubes will raise the B+ voltage. Guaranteed. The rectifiers will run much cooler but the rest of the tubes, the electrolytics and the power transformer probably run warmer. At least the high voltage winding. Not having the heater heat to load the transformer and to heat the transformer has to be a bit of benefit. Adding resistance or a filter choke to the rectifier circuit will lower the voltage and move the heat from the individual tubes to the resistors or the choke. Though the choke will drop the B+ more from inductance (relatively lossless) than from its inherent resistance, thus softening the current peaks which makes life a tiny bit easier on the HV transformer and the rectifiers (so long as you don't get an inductive kick problem to overly back bias the rectifiers when you turn the radio off). I think **silicon rectifiers with a choke are the best solution,** silicon rectifiers with resistors are pretty good, silicon rectifiers without resistors are a poor idea, but the tubes will heat the world the most because of their voltage drop (which is transferred to the resistors when they are used with the silicon rectifiers) AND heater power. There can be two resistors, one in series with each rectifier, or just one in the common output line. I don't know what the value would be, but pick it to drop the B+ the same as the original tubes. I did this same thing in a tek scope about 25 years ago when replacing seleniums with silicon and it worked fine without loss of aged electrolytics. On the other hand, the slow warm up of the rectifier tubes does mean that the rest of the tubes get hot about the same time and there's less of a voltage peak on the filter capacitors each time the radio is turned on. If the filter capacitors have aged to such a condition that their voltage withstand value is the normal operating voltage, changing from tubes to silicon rectifiers, even with resistors, could lead to the build up of excessive pressure within the electrolytics from excessive leakage current. Some might do a bit more than bulge their cases. Exploded electrolytics ARE a PAIN to clean up from inside a radio. But if the electrolytics are that sensitive to applied voltage, they are not working as well as they should anyway and should have been replaced already. And so long as the electrolytics can withstand the occasional applications of higher voltage it means their withstand voltage will stay higher than the operating voltage and they will have a lower leakage current at the normal operation voltage, which should give them longer life.

Date: Wed, 29 Apr 1998 18:08:56 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: [R-390] sockets

New subscriber. Have R-390-A S/N 2066 Electronic Assistance Corp. Got it from the Army at Griffis AFB auction. It had two bad triple caps and I couldn't find any new replacements. Cut out the sockets? AAHG!! Nooo!! I used the **octal bases from 120 volt ice-cube relays.** Just remove the guts and cover, then solder in the new caps vertically. It looks neat and I didn't have to butcher the otherwise good radio. But I don't have the experience or equipment to evaluate the effects of this setup as far as noise or interference on other systems in the radio. AS far as I can tell the radio works fine, very smooth mechanicals.

Date: Mon, 14 Sep 1998 11:49:17 -0400
From: Paul Bigelow <pbigelow@us.ibm.com>
Subject: [R-390] Replacing multisectional

Has anybody come up with a cosmetically pleasing method to replace the plug-in multi-sectional filter caps? My original 3-section was shorted. I had an octal plug and mounted 3 capacitors via that method but it sure doesn't look right - or even good. I wouldn't mind cutting open the original can and re-stuffing it but I do not think anyone makes capacitors of the necessary voltage small enough to fit inside - I've been measuring too and have even considered tearing off the plastic coating on the axials just to gain that extra .5mm. I have heard about using old octal relay housings but all the ones I can find do not have large enough housings to hold the capacitors. There certainly does not seem to be any place underneath the chassis. Maybe for the Fowler run the government made a billion of these things and all are sitting in a warehouse drying out.

Date: Sun, 15 Feb 1998 22:29:06 -0800
From: John R Bookout K7JB <k7jb@ptld.uswest.net>
Subject: Re: [R-390] Heat build up in the R-390A

Another reason to shy away from silicon rectifiers is that B+ is almost I am wondering if the concern about B+ being applied before tubes have a chance to reach operating temperature could be minimized by placing the FUNCTION switch into STAND BY. What I am assuming here is that in the STAND BY mode B+ is removed from the tubes. If this is the case then one has to only remember that when turning the R-390A on, park the FUNCTION switch in STAND BY, then wait for the tubes to warm up, then go to AGC, MGC or CAL. Since I don't have schematics to verify this perhaps someone else might. Thanks John K7JB

Date: Sun, 15 Feb 1998 18:45:16 -0500
From: "Grant Youngman" <nq5t@gte.net>
Subject: [R-390] Re: Heat build up in the R-390A

If you go back to an early issue of ER (#20) , Bill Kleronomos provided a very nice design for a filament current regulator for an SP600 -- but I would think it would translate nicely. It was based on an LM317 set up to provide 300ma as a current regulator -- with sufficient data to use in other circumstances as well.

From: "Dennis M. Fox" <foxd@mail.grady.public.lib.ga.us>
Subject: Re: [R-390] Heat build up in the R-390A

>One thing that did raise the ambient temp of an R390A was the "Solid State" mod for the power supply, adding silicon diodes to replace the ever failing rectifier tubes. It DID save the rect tubes, but also raised the plate voltage on the rest of the reciever about 20 volts (the drop across each rectifier tube no longer in the circuit), increasing heat dissapation in all of the tubes, causing more heat related failures! Have fun and enjoy one of the world's finest receivers!

Can I have the list's collective advise on these 'Solid State' replacements?

Do I hear by this that they are not an 'improvement' and are counter productive to long life? Is this where our Glow Plugs are better than Sand State?

Date: Sun, 15 Feb 1998 22:41:52 +0000
From: "Chuck Rippel" <crippel@exis.net>
Subject: Re: [R-390] Re: Heat build up in the R-390A

I tried that very idea. The LM-317 is being driven close to the edge such that the filament current caused by a cold start drove the device into current limiting.

Date: Sun, 15 Feb 1998 22:04:51 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Re: Heat build up in the R-390A

You mean it was thermally limited or which? Current limiting is the whole idea of the circuit. An LM317K is good for 1.5 amps, though the power dissipation with cold filaments may cause it to shut down. It could very well be that some of the power dissipation should be moved to a series resistor to remove heat from the LM317... The 317 shouldn't be current limiting more than limiting the current to 300 ma. At power on its likely going to be dropping 20 volts so the power dissipation can be a limit, if its not supplied with an adequate heat sink. The chip is self protecting based on chip temperature. If the 317 is configured as a voltage regulator, then the turn on current for the tubes likely will put it into current limit and drastically drop the voltage on the tubes, probably never letting them heat. But as a voltage regulator, the softening of turn on for the tube heaters that may well be the major benefit of the ballast is prevented, and made worse by the voltage regulation.

Date: Mon, 14 Sep 1998 17:33:55 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Replacing multisectional

If it's of any help, I put the caps on the octal relay base in a vertical configuration and put a tie wrap around the whole package. I thought it looked OK especially with the top cover on the radio. Someone found caps small enough that he could get the relay cover back on, seems as if those same caps would fit inside the original can, done carefully. Chuck Rippel rebuilds the original caps, and that's as good as it can possibly look.

Date: Fri, 18 Sep 1998 09:00:53 -0500
From: Laird Tom N <LairdTomN@jdcorp.deere.com>
Subject: [R-390] FW: Electrolytic replacements

I have had a hum in my 390A, and pondered getting EXPENSIVE replacements for the plug-in caps, or chancing NOS that may or may not work. Went to Javanco(Nashville, TN 615-244-4444; www.javanco.com) yesterday and found by accident **empty relay cases with octal bases on them** --I then proceeded over to the capacitor isle and found some 47 mfd caps that fit just fine in the cases, even stuck with 47 to replace the 30's. Three caps will fit in the cases, though it is a tight fit. Soldered the capacitors inside the cases, pulled the old caps out, plugged the new caps in. Seemed much too> easy-- they plug right in!!!! Replaced both C-603 and 606 for less than $10 and with NEW 47mfd @ 350VDC caps in each. No soldering, hacking, rending of sheet metal, etc.

> Much less ripple now on the power supply, no heating of the new caps, nothing out of the ordinary, not that there should be..... And it fixed the slight hum that I could hear with headphones.

Date: Mon, 28 Sep 1998 09:38:13 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Low +150 reg. line

That ohmmeter test requiring the electrolytic to hold a charge is a tougher one than MOST new electrolytics will pass. Factory specs tend to allow significant leakage current. There is a dropping resistor from the high voltage to the 150 volt rail. After confirming its value, the voltage drop with show the current, simple ohm's law. At 135 volts the VR tube won't be drawing any current. There will be differences in voltage from the transformers being from different makers with different turns ratios and depending on the age of the tubes and whether they've been replaced by silicon rectifiers. And even more from different makes of meter reacting differently to pulsating DC. Leaky coupling capacitors in the audio will lead to excess current consumption by the audio output tubes.

Date: Thu, 12 Nov 1998 02:37:43 -0000
From: "Chuck Rippel" <crippel@exis.net>
Subject: [R-390] R390A Voltage Data

We have discussed the soild state v/s tube rectifier choice many times here. There are pros and cons for each approach. I adressed that in the New R390A Video. Here is some data I ran while making that recording:

Input Voltage: 120VAC (set by Variac)
Measuring plate voltage at pin 5 of V-502

Tube rectifier supply: 212VDC
Solid state rectifier supply: 223VDC

Even though the filament voltage is not affected by the type of rectifiers installed, I measured it to establish a baseline: 6.24VAC

In this case, a solid state supply increased the RF/IF B+ 11VDC.

Going another route, we measured the input voltage value
necessary to the rated 6.3V: 121.5VAC

My Navy manual says that the B+ value on pin 5, V502 should be 192V.
We measured the input voltage until we measured the above spec.

Tube rectifiers: 107.6VAC
Solid State rectifiers: 100.3VAC

The 107v figure might support that the transfomers were designed for 110V input, a norm during the design period and the radio was designed to operate on 110V. However, the performance of the receiver noticeably degraded on 110V. This was cause was shared in by the critical filament voltages dropping below 6V and the lower HV values. There are the numbers, use you own judgement whether you wish to convert to solid state rectifiers.

Date: Thu, 08 Oct 1998 18:07:47 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: [R-390] LIMBO! How Low Can You Go?

I had read that some of the computer rated tubes were designed along these lines. I've done this a lot with the old TV2 and TV7 by lowering the voltage one step. A lot of the old CRT testers had a function like this too.

Even the old 1956 TM on the R390A mentioned not to leave it on Standby for long periods. It seems that I remember reading somewhere that either the plate voltage ot the regulated 150V output increases to levels aproaching the voltage limits of some of the capacitors when the receiver is placed in Standby mode, too. And that if the 26Z5W's have been replaced with SS recitifiers, the voltages will exceed the working voltage of a bunch of the capacitors in the Standby mode. ;-(

I played with powering one with external power supplies a few years back. You don't appreciate how compact the original PS in the R390A is until you have about two or three times the bulk of the receiver in PS'd sitting next to it. :-)

Another interesting note on tubes is about the old mecury vapor rectifiers like the #83 used in a mess of tube testers. When first placing one of these tubes in service or using one that hasn't been used in a while, the life of the tube will be greatly increased by letting it warm up for twenty minutes or so before applying B+. If I remember right, if the B+ is applied before the mecury vapor dropletes has "boiled" off of the heater or plates, it'll break down the mecury and fuse the remnants of it to these surfaces, and creating "dead" areas as far as emmision or conductivity goes. As expensive as the #83's are now.....

Date: Fri, 09 Oct 1998 16:04:23 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] LIMBO! How Low Can You Go?

Yep, usually Amperite delay relays. I think that it's either 30 or 45 seconds in my Tek 547. I've picked up a few extra relays of this type and plan to modify one of the extra R390A power supplies I have when I get a chance. I'll add two SS rectifiers, an adjustable dropping resistor and a delay relay. Got the parts, even a metal plate to replace one of the 26Z5W sockets to mount the resistor too. Just haven't had the time. ;-(

It's been years since I've played with any of the earlier 500 series scopes but I seem to remember that Tek used indirectly heated cathode rectifiers in some, 5AR4's if I remember right, before they went to the thermal delay relay.

>What is the advantage of what Collins did with this receiver. Actually, why even bother with standby if it causes tube damage. I have an idea, Collins put the switch there for a reason.

Might have been a design requirement required by the military. I'm curious about this too.

>Page 79 of my RCA Tube Manual of 1966 says that lower filament voltage will cause limited cathode emission and reduce tube life. It also states that
high cathode voltage will cause rapid evaporation of cathode material and shorten life. Interesting stuff.

Yep, I've seen slowly accumulating tube manuals and older tube text books for decades. Good reading. :-)

Date: Thu, 15 Oct 1998 10:43:32 +0200
From: "Alex Kosman" <CERAKAK@techunix.technion.ac.il>
Subject: [R-390] power supply

What do you think about replacing the two 26Z5 with some silicon rectifiers like 1N4007 or even 1N5408 with some resistor in series and maybe even with a delay circuit (555+relay) in order to connect the HV when the tubes are warm. It will save 2x26x0.3=3D15.6 Watt !!! if you look at filament and oven circuits schematic diagram, you will see that the rectifiers filaments are grounded, a very bad idea !!! the isolation between cathode and filament is generally poor and for this reason in many systems the rectifier filaments had a special floating winding, but not in the R390A. HIGH DANGER

Date: Thu, 22 Oct 1998 09:03:38 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat and the C603/6

Electrolytic capacitor life is affected a great deal by heat. The electrolyte is reactive enough that the highest quality capacitors (computer grade) have a shelf life of only two years with no voltage applied. They may work for decades if used regularly.

NOS electrolytic capacitors in my opinion are JUNK. Suitable only for cosmetic restorations. Sometimes they can be reformed by applying a slowly rising DC voltage to recreate the oxide on the aluminum foil that the electrolyte ate sitting on the shelf. I've not have good luck with my reforming tries and didn't appreciate the shredded foil and crepe paper filled with electrolyte that I had to dig out of the project when the "reformed" capacitor exploded. I may be overly picky but by reading date codes and insisting on NEW capacitors only, I've not had to clean the guts of an electrolytic from anything of mine lately.

Heat causes chemical actions to be faster, sometimes doubling for each 10 degree C rise in temperature. Heat also causes higher pressure in the cans causing venting of electrolyte. The electrolyte is one plate of the capacitor. Once there's no electrolyte (the radio is rotting) and the capacitance is greatly reduced.

Heat is definitely an enemy of the electrolytic capacitor. Removing heat won't make the capacitor last forever, but it should at least lengthen the expected life of electrolytic capacitors.

Date: Thu, 22 Oct 1998 16:55:50 -0400 (EDT)
From: Steve Stutman <sstut@world.std.com>
Subject: Re: [R-390] Heat and the C603/6

Disagree. While electrolytics are somewhat like beer; the best is the freshest; I have used NOS electrolytics from early 70's with excellent results. Especially those made by Sprague, Mallory and Marconi. Usually reform on bench supply for maybe a couple of hours. I suggest that not all vendors create equally and that basically there are the good and the bad, not to mention the others. Maybe even the COLLINS company sometimes shopped for "bargains". Don't think that age should be used as a singular critical factor, because that makes a lot of things suspect.

Date: Thu, 22 Oct 1998 15:57:28 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Heat and the C603/6

When we shipped 9-250 KW (Collins model 821A-1) transmitters to VOA in 1966 and they were going to store them, Sprague specifically refused to guarantee the capacitors beyond two years from their date code unless we removed each from their circuits and applied rated voltage for a period of time to reform each one at least every couple years. And these were their highest quality computer grade capacitors where they claimed the aluminum was most pure. NOS capacitors tend to not be cared for that well. I take it Steve that you've never had to clean the mess out of a radio. I have and because of that I refuse to take that chance with old electrolytics again. (besides the potential for hearing damage at the time of the explosion...).

Date: Thu, 22 Oct 1998 19:34:59 -0400
From: Will Schendel <n8azw@concentric.net>
Subject: Re: [R-390] Heat and the C603/6

Electrolytics are always suspect. They are expendable items, especially in HV power supply applications. If in doubt, change them out. Jerry is right, they can make a real mess.

Date: Sun, 01 Nov 1998 19:42:53 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: [R-390] R390A Power Supply Ripple?

I was a little bored today and decided to "play" with the EAC that I just finished going thru a few weeks ago. I noticed that with the antenna inputs terminated, and the RF gain cranked down, and local audio gain cranked all of the way up, I could hear a faint hum. I lugged the Tektronix over and terminated and checked the local and line audio outputs. There's a 60 Hz ripple there on the order of about a .1 volt with the audio at max across a 600 ohm resistor. I've never checked this on an R390A before, it seems excessive. Next, I checked the diode load and found about .01 volt of 60 Hz ripple. And a bunch more ripple on the regulated and unregulated B+ voltages. I pulled the two plug in caps and tested them for value. They were within 10%, some sections high, some low. The power factor was no worse than 4% or so on any of the five sections. Not too shabby for caps built in 1956. Just for the hell of it, I looked up the part numbers for 33 and 47 mf 350V Sprague electrolytic caps and will order the correct number of each tomorrow to install in the receiver for a comparison. I pulled the two 26Z5W's and supplied the B+ to the receiver from an HP 0-500V regulated power supply. No more ripple, that I could see on the scope, anywhere. Cranking the audio wide open, no more hum. You can hardly tell that the thing is turned on. I reconnected an antenna and played with it a while. With the regulated B+ across the board, the receiver felt totally different when surfing. It's hard to describe but it "feels" like a different radio when either adjusting volume, RF gain, etc. It seems "quieter" when tuned to dead spots in the spectrum or weak stations. Just for kicks, monitor the B+ of your receiver with a scope while tuned to a local broadcast station with the volume turned up about half way. Then vary the RF and AF gain. Hey, don't worry about it, what's a few 15% B+ voltage swings among friends, huh?

At any rate, I'm curious about a few things: One, have any of you experimented with powering an R390A from a regulated external PS? Your findings/results? Two, what's the normal ripple for an R390A in the regulated and unregulated B+ supplies? At the diode load? At the local audio output?

Date: Wed, 18 Feb 1998 09:01:59 +1100
From: Morris Odell <morriso@vifp.monash.edu.au>
Subject: Re: [R-390] Solid state rectifiers

> I had the same idea re protecting the rectifiers, and placed series resistors not in the common >xformer lead, but between each secondary and the ss device: a pair of 140 ohm 25 watt heart->sinked resistors: not only do they run barely warm, but my B+ dropped on the IF-RF line from >265VDC to a more reasonable 225VDC in AGC mode, well within the specs called for in the >manual. My reasoning was the same as yours, to even out and limit the current flowing thru >the ss devices... with an added benefit of reducing the higher B+ to spec levels. By the way, >my receiver draws 200mA in AGC mode.

Yes, that's another good solution to the problem. Of course it doesn't matter electrically where the resistors are but putting them in the anode lead means you need two resistors and they are at a high potential above earth. I have some old tube gear which used one twin diode per side with the plates parallelled and in those designs they used small equalizing resistors to make sure the load was shared equally. I have done this a few times and have found that the value of the resistor can be quite critical especially in gear that uses VR tubes. You have to use a value that allows the tubes to stay lit under minimum B+ full load conditions and this can result in higher low load B+. It's a reminder that the tube rectifiers are not just resistive but have a constant voltage drop component that is higher than the 0.7 volts of a silicon diode.

Date: Tue, 7 Jul 1998 00:41:03 -0400 (Eastern Daylight Time)
From: Norman Ryan <nryan@acpub.duke.edu>
Subject: [R-390] Solid State Diodes or 26Z5 Rectifier Tubes

This was an official field change. Check out Chuck Rippel's web site and you will see it was called for on shipboard R390A's. Someone may tell just why it was called for. Personally, I'd be in favor of not making the modification if 26Z5W's are still in the set as long as one is willing to hunt for the tubes and pay for them. (Prices are increasing as they get more scarce, unfortunately.) If you are faced with diodes one way or another, using a variac would ease the sudden introduction of B+ on start-up.

Date: Tue, 07 Jul 1998 14:47:54 +1000
From: Morris Odell <morriso@vifp.monash.edu.au>
Subject: Re: [R-390] Solid State Diodes or 26Z5 Rectifier Tubes

There was an official mod that replaced the rectifier tubes with diodes without adding a ballast resistor to compensate for the reduced voltage drop. I don't know if the power transformer was altered to suit but I suspect not. When I was forced to do this to my R-390A because of a failed 26Z5 heater, I added a 200 ohm 20 watt resistor in series with the transformer centre tap. It's worked well for the last 10 years. I don't know what the original reason for the mod was.

Date: Tue, 7 Jul 1998 14:37:38 -0400
From: "Chuck Rippel" <crippel@exis.net>
Subject: Re: [R-390] Solid State Diodes or 26Z5 Rectifier Tubes

> Many R390s you come across these days do not have the 26Z5's, having instead solid state diodes.

Probably 60% of the military units have been upgraded. That is Field Change #6 which can be found on the R390A WWW site.

> Was this an official mod? If so, what was the problem or was the mod for reduction of heat?

Most likely yes plus future availability of the 26Z5W tubes. The only mfg I have ever seen is Tung-Sol and I suspect the military may not have been comfortable with a sole-source on that part. Not to stir debate on the already overtraveled subject of tubes v/s solid state rectifiers.......... I prefer using solid-state with the caveat of dealing with the increased B+. In my case, once I rebuild the filter caps and replace C-553 and C-549, the risk of additional overvoltage based problems occuring does not lie in capacitor failures. It is the coils that short: especially the cans in the IF and T-208. They start leaking and get noisy. Put the radio on a variac or put a filament transformer line configured to buck the A/C input and enjoy the improved reliability of solid state.

Date: Wed, 08 Jul 1998 00:20:59 +0000
From: Dave Rickmers <rickets@earthlink.net>
Subject: Re: [R-390] Solid State Diodes or 26Z5 Rectifier Tubes

Use a B+ fuse. Use the smallest diodes that will work without popping.dr

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Date: Wed, 08 Jul 1998 09:25:00 -0700
From: dma@islandnet.com
Subject: Re: [R-390] Solid State Diodes or 26Z5 Rectifier Tubes

The Navy units I have all have this mod done. But each also has a 220 ohm, 10 watt resistor added in series with L601 on the audio deck to drop the B+ to more or less the value it would be with the 26Z5s. There was nothing on the exterior of the audio deck to indicate that this mod had been made, so as modules get switched around, it's probably a good idea to make sure your audio deck and power supply 'match.' This resistor sure does increase the heat inside the audio chassis, so I'm not sure how much was gained, overall, by eliminating the 26Z5 heat.

Date: Wed, 08 Jul 1998 14:17:08 -0700
From: dma@islandnet.com
Subject: Re: [R-390] Solid State Diodes or 26Z5 Rectifier Tubes

>Where is the 220 Ohm 10 W resistor physically located. On top of the chassis I would hope!

Nope - that would be too sensible :>).

Date: 8 Jul 1998 16:14:05 U
From: "Richard McClung" <richard_mcclung@tcibr.com>
Subject: Re: [R-390] Solid State Diodes or 26Z5

I personally use Dale, Model RH-25, wirewound, MIL-R-18546, type RE aluminum housed, chassis mounts, 225 ohms 5%, max WV 550. In the past I used two 100 ohm 25watt sand filled resistors soldered on the bottom of the rectifier sockets. One in series with each diode. I find that the Dale's actually run cooler and everything is happier..........Putting a little pidgeon poop (silicon heat compound) on it before screwing it down helps conduct the heat.

Date: Thu, 9 Jul 1998 12:36:58 -0400
From: "Chuck Rippel" <crippel@exis.net>
Subject: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

>The Navy units I have all have this mod done. But each also has a 220 ohm, 10 >watt resistor added in series with L601 on the audio deck to drop

the B+ to >more or less the value it would be with the 26Z5s.

I have never seen that one. I have seen the resistor added to the power supply near the tube sockets though. I was chasing a bizzare problem where the PTO or BFO would "pull" when the audio was turned up. It was interesting, to a sensitive ear, the receiver would actually FM under strong signal conditions. It turned out that someone had installed a pair of resistors to drop the voltage and compensate for the solid state diodes without thinking it out first. The problem is that might be a solution appropriate for a power supply under a static load but not a dynamic one. Thus, I would recommend that no resistors be added to fudge the B+ down. If you must drop it, do it correctly. Bite the bullet and use a variac or transformer wired to buck the line voltage.

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Date: Thu, 09 Jul 1998 11:03:00 -0700
From: Joe Reda <joer@reda.com>
Subject: Fwd: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

>Thus, I would recommend that no resistors be added to fudge the B+ down. If you must drop it, do it correctly. Bite the bullet and use a variac or transformer wired to buck the line voltage.

I don't understand something though (or maybe I need a few more cups 'coffee . If you used, say, a variac to drop the line voltage, wouldn't you also be dropping the voltage applied to the filaments of the tubes, thereby reducing performance?? And would someone refresh my poor memory, how do you wire a filament transformer to buck the line voltage, again?

Date: Thu, 9 Jul 1998 17:21:03 -0400
From: "Chuck Rippel" <crippel@exis.net>
Subject: Re: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

> Better yet, why not string of enough solid state diodes together ....

It would, however be a large mass of diodes. At 0.6v drop across each, it'd take about 40 diodes to compensate for the additional voltage. As they say, your mileage may vary based on local supply voltage. Back to the Variac or Buck/Boost xformer...........

Date: Thu, 9 Jul 1998 15:23:16 -0700
From: "JerryL" <glockett@lightspeed.net>
Subject: Re: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

How about a little circuit that would incorporate a zener or something similiar. Looks like there is more than enough voltage/current to work with?

Date: Thu, 09 Jul 1998 18:23:01 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

Whether there's a resistor, a gang of silicon diodes, or a zener diode there's still the same power to be dissipated. A gang of diodes or a zener diode would give better regulation for varying load than the resistor. If the heater voltage is correct with normal line voltage applied and one doesn't want to distribute that excess power supply heat throughout the radio, the DC voltage can be dropped by adding a small transformer in series with the rectifier. Or most likely more simply by adding more input filter choke. That transformer must be center tapped and connected with its ends to the separated full wave rectifier cathodes. The DC load that used to connect to the rectifier cathodes goes on the center tap. The primary has to be phased to lower the output voltage, not to raise it. There's two possiblities, equally likely unless you try to predict the result. Then likely it will be wrong. I did this about 20 years ago to slightly raise the output voltage of the second computer I built. It ran continuously for 19 years with only 40 hours down time. It was retired because of a change of data format, not from hardware failure. Is there damage from higher B+ voltage? I hear grumbles about wimpy audio output power. Higher B+ should allow for a bit more audio output power. Higher plate voltage on gain stages (rf, if and mixer) should increase maximum signal handling capability (really a problem in the R-392 at 28 volts) without significantly changing noise. Might even slightly decrease stage noise because of slightly higher stage gain. The variac or bucking primary transformer also works, but may reduce heater voltage (to rated?).

Date: Thu, 9 Jul 1998 21:03:22 -0400
From: "R. L. Blaney" <wb8mhe@bright.net>
Subject: Fw: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

Joe, first off, when those 'ole boatanchors were first designed, the average power line standards were in the neighborhood of 115-117 volts AC. Now, to compensate for much higher electrical loads, the utilities have raised the line voltage to 125-128 volts AC, rather than rebuild transmission lines to carry the heavier currents. So, lowering the input voltage would only bring the heater, bias and B+ DC voltages to nearer their original design ratings. Now, **to connect a transformer as a buck** or boost **transformer**, connect the secondary in series with the primary, and connect these series-connected windings in series with the hot side of the AC power going to the radio. Connecting the two windings in "series-aiding" will raise the voltage, while connecting in "series-opposing" will lower the voltage. Hope this helps.

Date: Thu, 9 Jul 1998 22:41:56 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

On Thu, 9 Jul 1998, Chuck Rippel wrote: if you used, say, a variac to drop the line voltage, wouldn't you also be dropping the voltage applied to the filaments of the tubes, thereby reducing performance?? Actually, when you drop the B+ to spec, you would also be dropping the filament voltage to spec also. The voltage error applied to the primary of the HV transformer the same as that applied to the filament transformer.

Well, using the variac to drop the AC line down to 105-110 would correct for the input line being too high, and thus would put the correct voltage on the filaments, but wouldn't we still have too high a B+ because of the much lower voltage drop in the diodes compared to the 26Z5's?

Date: Fri, 10 Jul 1998 15:24:16 PDT
From: Gary Gitzen <garyg@cup.hp.com>
Subject: Re: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

John Kolb wrote: >OK, break out the power Zeners :)

I'll go one step better. I'm seriously considering adding an outboard solid state series regulator for the B+. The heat is outside of the chassis. The 1/8A fuse holder looks like a great place to break into the circuit. Extra credit if you modify your spare audio amp assy to allow regulating all voltages and eliminating the 0A2. For the, er, retentive among us (me!) bonus points for a B+ delay and a true "standby" B+ shutoff.

Date: Fri, 10 Jul 1998 22:59:02 +0100
From: "Robert Montgomery" <RMonty3@worldnet.att.net>
Subject: Re: [R-390] Re: Solid State Diodes or 26Z5 Rectifier Tubes

You guys tickle me. We are not dealing with xistors here where 20 or 40 volts would cause a bit of a problem. Vacuum tubes can take it. I have had my 390a for 10 + Years and one of the first mods I put on it was to get rid of the 26Z5 rectifiers and go solid state just as the government mod had suggested. The 390 is still working in good order and very happy with its operation. Three bad tubes in 10 years is not so bad. One of them being the ballast tube just after receiving the radio. I can afford it. No resistors added, no variac, just turn it on and use it. Used very heavy in winter months but occasional use in the summer months. Bob Montgomery

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Date: Sat, 12 Sep 1998 07:44:37 -0400
From: "Chuck Rippel" <crippel@exis.net>
Subject: [R-390] Re: 26Z5W/Solid State Issues

I will solid-state a receiver on request. Its very easy and I am posting the entire instructions on the WWW Site for those interested. Look in the "New Additions" section. I will post it this morning. Changing the 26Z5W rectifiers, V801 and V802 to solid state is an approved, listed, military mod. You will see the original document listed in the original information I have posted on the WWW Site under Technical, R390A Field Changes, field change #6. Yes, you save a lot of heat. However, you should know that the B+ is elevated just a bit. Strangely, I have never taken the time to measure the differences. There are potential for failures in the stage coupling (99% of this is accomplished via inductors v/s capacitors). If C-553 has not been changed (yours, of course has) doing that and also changing C-549 would be prudent.

I know I keep beating the drum about getting C-603 and C-606 filter caps rebuilt but with solid-stating, its a must. The extra voltage would be the death knell for these old filter caps. About 6 months ago, I wasted nearly 2 days chasing down an intermittent frying in an IF deck. I was convinced that it was a cap of IF can shorting. The failure was neither. One of the sections in filter cap C-606 was finally giving way causing the noise.

Date: Mon, 26 Oct 1998 11:57:38 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] How Low Can You Go? (filament voltage)

Well, I finally checked several tube manuals. They just said 6.3 volts, no range given for 6BA6 type tubes, but the engineering tube manual said 6.3 volts +/- 10% for 5749, 5654 and 5814A (which is close to 12AU7 but different heater current). There's some tubes in the 667n range with ratings of 6.3 +/- 20% for mobile radio service, but none there to fit any R390 sockets.

Finally I found some comments in the Radiotron Tube Designer's Handbook (a gem on receiver and consumer electronics design, bible of tube audiophiles) which I've owned for at least 40 years. It says (page 77): "The equipment should be designed to operate the filament or heater of each valve type at rated normal value for full-load operating condition under average voltage-supply conditions. Variations from this normal value due to voltage-supply fluctuation or other causes, should not exceed +/- 5 per cent. unless otherwise specified by the valve manufacturer. "Under the 'British Standard Code of Practice' B.S.1106, 1943 (Ref. 49) and the British Radio Valve Manufacturers' Association's publication 'Radio Valve Practice,' August, 1948 (Ref. 48), recommended British practice is that in general it is not permissible that the heater voltage should vary more than 7 percent. from the rated value. "It is a matter of experience, however, that the heaters and filaments of most modern receiving valve oxide coated cathode and filament types may be operated at voltages whose maximum fluctuation do not exceed +/- 10 percent. from their rated value, without serious effect on life or marked reduction in performance, provided that the maximum ratings of the other electrodes are not exceeded. In cases where the heater of filament voltage variations exceed, or are likely to exceed, +/- 10 percent., then maximum ratings should be reduced and recommendations obtained from the valve manufacturer as to the maximum ratings permissible under the particular conditions."

In days of yore, the problem with setting the heater voltage to the edge of such a tolerance was that the common meter had only maybe 3% accuracy if really good, 5% was more common. I'm not fully convinced that the 3-3/4 digit ordinary DMM does AC significantly more accurately. Many are actually peak to peak reading calibrated in RMS, which is very dependent on waveform purity. I have a couple B&K 2815 that use analog computation techniques to allow for variations in waveform, which are a little better, but that technique probably isn't better than a couple percent. I have an analog meter in my test rack, that actually runs an amplifier to heat a resistor and the meter is a thermocouple reading the temperature of that resistor. THAT's TRUE RMS! If the aged capacitors in the amplifier haven't altered its gain and frequency response. Since the turns ratio in the power transformer feeding the tube heaters almost certainly isn't exactly what's needed to get precisely 6.3 volts at the other end of the heater wiring because you can't wind fractional turns on a transformer core and the wire size chosen affects the resistive drop in the winding, the only place to check heater voltage is at the tube socket with the most wire between it and the power transformer. Then maybe with the heater voltage reduced to precisely 5.670 volts, the ultimate test for that set of tubes is to see how much the performance has fallen. The phenomena is one based on a charge cloud. The oxide coated cathode is limited in peak emission, but with an adequate temperature it can shove out electrons to make a charged cloud of electrons and that charged cloud of electrons can supply the peaks. When that charged cloud is depleted by a plate current peak and more electrons are extracted from the oxide surface there's physical damage.

Date: Mon, 26 Oct 1998 17:53:27 -0500
From: Will Schendel <n8azw@concentric.net>
Subject: RE: [R-390] Heat and the C603/6

I didn't think my comment about all electrolytics being suspect would raise so much hair... You are more than welcome to keep those old caps in your equipment for as long as you like Cal. I wouldn't dream of trying to convince you otherwise. Myself and others feel that fresh electrolytics are cheap insurance, and the peace of mind that a potential problem has been eliminated goes along with it. The electrolytic is a marginal cap at best,

and no amount of electronic experience is going to bring a bad cap back to life. You can re-form it until the cows come home. The choice is up to the owner of the equipment... Are the caps older than you would like to think? In the case of the R-390A, 30 to 40 years. Is the equipment worthy of spending a few bucks on it? The R-390A is worthy of time, effort and money to help it function as well as it did when it was new.

Date: Mon, 26 Oct 1998 20:23:58 -0500
From: Will Schendel <n8azw@concentric.net>
Subject: RE: [R-390] Heat and the C603/6

I was referring to old caps, which are in effect, bad caps. You must understand what an electrolytic capacitor is, and that it does not last forever. It will eventually go bad.

I live by that bit of wisdom, but there is such a thing as preventive maintenance. Just because you have found a few electrolytics that lasted beyond their normal life expectancy, I wouldn't make a rule out of that. You have your opinion of electrolytics Cal, and I have mine. I didn't intend to get into an argument over electrolytic caps, just to comment that they should be looked after. In my opinion, these caps have no defense even when new. They are unpredictable time bombs. Oil filled is best, but not always practical. Im still referring to HV power supplies.

Date: Mon, 26 Oct 1998 20:32:14 -0500
From: "Joe Schreiber" <jschreiber@netcarrier.com>
Subject: RE: [R-390] Heat and the C603/6

Have you ever heard of preventative maintenance? Would you step on a 40 year old elevator without it? Fly on a 40 year old airplane? Drive a 40 year old car?

The failure of a radio is somewhat less hazardous, but components will wear out, causing the radio to fail, often taking other components with it. For example, I had a filter choke on an SP600 burn out, probably due to excessive current caused by leaky caps. Let me tell you, it took quite a while to find a replacement. In this case, "I didn't fix it until it was broke".... and paid the price.

Date: Mon, 26 Oct 1998 19:51:55 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: RE: [R-390] Heat and the C603/6

I'm running a pair of 1956 caps in an original 1955 Collins contract audio deck that I went thru and an burning in before I throw it in the pile for my old Collins that I'm resurecting. I reformed them over a period of a couple of days, then ran them a little above rated voltage on a regulated PS for a week or so and checked the leakage and power factor before I put them back into service. I've been using these two caps, off and on, since 1975.

They haven't failed yet. ;-) Actually, for the caps used in the R390A's, the early ones with the light tan silicon looking seal between the metal can and the octal base seem to be the most reliable of the dozens and dozens of caps that I've played with. The later ones from the mid 1960's use a black rubber seal that cracks and allows either leaking/drying out.

The 1967/68 vintage ones seem to be the worst. The cans corrode thru. ;-(I've run these 1950's caps at 100 volts over the rated voltage for over a week at a time. The power factor is as good as a new one. The only R390A cap failures that I've ever had were caps made in the mid 1960's.

Date: Mon, 26 Oct 1998 22:51:27 -0500 (Eastern Standard Time)
From: Norman Ryan <nryan@acpub.duke.edu>
Subject: Re: [R-390] How Low Can You Go?

Many thanks for that terrific post. I find running the receiver at 105 volts doesn't appear to degrade performance perceptibly and suspect that's "as low as one can go." LOCAL GAIN is usually set to 2.5 due to a decently efficient speaker and is amply audible in the next room. Overall the receiver "feels" content and happy, to put it unscientifically. Most likely the tubes are maintaining proper charge cloud effect.

Lower temperatures also benefit electrolytic filter caps and other components. I've got IERC type tube shields in the set including extra tall ones (type 6027B) where they fit which, due to their extra mass and flue effect, dissipate and convect away more heat.

If all goes well, my '67 EAC almost surely will perform well into its sixtieth year and beyond. In real life, my job involves conservation of historic and irreplaceable components and the RX's regimen reflects the thinking connected with that work.

Date: Mon, 28 Dec 1998 10:26:33 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: Variac

Looking for an American made Variac is probably somewhat safer depending on how its been abused. I'd try surplus stores like Fair Radio, Gateway Electronics (in St. Louis), and some with Internet pages in San Diego. For American made you want General Radio Variac or Superior Powerstat. <snip>

Date: Thu, 07 Jan 1999 19:59:33 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: RE: [R-390] Electrolytics

<snip> >I've noticed that a lot of the plastics and rubbers used in 1960s electronics haven't stood up. I have R-390A can electrolytics from Collins decks (and that have a 1956 date on them) that have perfect seals, but ones from the early 1960s that are hard and cracked. Someone who knows something about these materials can probably explain what happened.

The mid/late 1950's R390A filters that I've examined were all made by Sprague and had a light tan silicon rubber seal. I've never seen one of these crack and leak like the black seals. In addition, those silicon sealed ones were the only ones that I've seen that had a round "blow out" vent hole in the octal base located about where the #8 pin would be. I still have a couple of pair of them that test at about 6 to 8% power factor. Not too shabby for a 40+ year old electrolytic cap. I've never seen one of the Sprague R390A caps dated any later than about 1958. Most of the ones with the black seals that I've seen were made by either Pyramid or General Instruments and have cracks of various degrees in the seal. These capacitors had a "blow out" safety plug in the center of the octal plug. I've got a bunch of these from the 1960's. Generally, they test about the same as the earlier caps. The earliest ones I have are 1960 and the latest are 1968. All have cracks forming. I've tossed some that leaked.

All of the spares that I have had a little squirt of Armor All rubbed into the seals with a q-tip. I figured that it couldn't hurt. Periodically, I cook all of my spare caps on either one of the RC bridges or one of the HV power supplies. Cheap insurance.

Date: Tue, 19 Jan 1999 15:57:09 -0500
From: "Roy S. Morgan" <roy.morgan@nist.gov>
Subject: RE: [R-390] Line Voltage

You REALLY need to put a bucking transformer in your line. Your tube life is being reduced to maybe 20 percent of what it should be. (No, I did not do the math to estimate that number, it is a SWAG - silly wild answer guess.) Actually, 127 volts is about 10 percent above the 115 volts the R-390 is designed for, which is not tooo bad. But why treat your toobes badly?

DO NOT DELAY! A bucking transformer will not add any noise to your system.
Here is how to use one:
- ---------------------------------
HIVOLTS, or Don't Fry Your old Radio on modern line voltages!
Here's the trick to use a filament transformer to reduce modern too-high

line voltage to lower (110 or 115) line voltage for old radio equipment. Most receivers don't take more than a couple of amps, and 2-amp transformers are easy to find. (If it runs hot, it's too small.)

```
               Filament Transformer
                     -----
            black  | *   |
           - --------------   |
                    )|||     black
 Line         )||(   -------
 Cord     PRI )||( 12v|
                    )||(   |
                    )|| -----       Output
           - --------------    *
           white   |          white
            ------------------


-  ------------------------------
green              green
```

 * Switch the 12 volt leads if output is higher than line!

Choose filament transformer for the voltage needed to reduce the line voltage to the desired amount, and current rating to equal the needed load current or higher. The transformer's primary is connected to the power line. The transformer's secondary is connected in series with the power being sent to the outlet point. If it's connected right, the voltage out will be 12 volts LESS than the voltage in. (If it's backwards, the voltage out will be 12 volts MORE than the voltage in.) If you're worried that the filament transformer is rated at 115 volts,
not 125, you can connect the transformer primary to the output, not the input. (It'll work just fine, and this would increase the output voltage slightly.) If you wanted to, you could mount the transformer inside the receiver as a permanent part of the radio. Attach the primary wires to the primary wires from the main power transformer. (If you do this, make sure that you have the polarity thing sorted out before you run the receiver on it. 125 PLUS 12 is too much!)

Date: Tue, 26 Jan 1999 23:00:54 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] 240 variac - conclusion

Well actually there is something that makes it 240 instead of 120. More turns on the core. A transformer is generally designed so that at rated voltage the core is approaching saturation. Iron is a very nonlinear magnetic material. When the core is driven into saturation, the inductance falls and the current then rises dramatically part of each cycle. To apply a higher voltage for the same portion of saturation it takes more turns. A transformer or variac made for 240 volts will have twice the turns of one made for 120. Turns for a particular core cross section are precisely proportional to applied voltage. The the voltage transformation ratios are always very close to proportional to the number of turns.

If the winding has a tap at the center, you could apply 120 volts there and have an output going from zero to 260 volts probably. Though then you would be operating the core approaching saturation and there would be more core losses. Leaving it as it is, it will run colder at light loads and work very well.

The reason for operating a transformer core near saturation is purely economic. The closer to saturation, the less iron and the less copper is required to build it. The trade off is lowered efficiency. The transformer manufacturer isn't paying for wasted energy over a lifetime of 40 years, he's paying for copper and iron, hence he'll tend to make it with the least amount of materials for greater profit. The 240 volt variac operated with 120 applied will save a few watts and if energized a lot that can mount up to a buck or two a year. Multiply that potential energy savings by a dozen wall warts, X-10 boxes and clocks each continuously wasting 3 or 4 watts and it adds up a lot over the 8760 hours in a year (not leap year)!

Date: Wed, 3 Feb 1999 21:54:43 -0800
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] Slightly off topic Electrolytic question

Having answered some people's questions on electrolytics (some in R-390's) and thinking about it awhile I've made the following observations.

1. Electrolytics as used in tube gear has a definite aging problem, they get old, dry out, lose capacity, turn leaky or short out.....

2. Electrolytics in SS gear also fail, but seemingly far less often. Of course much SS gear is newer but I don't think that is the total answer. Question for thought....
   A. Is it due to lower temps?
   B. Lower Voltages?
   C. Better quality in the (sometimes slightly) newer equipment?
3. I have had many various transceivers over the past few years, here is a summary of a few of them....
   A. Two Hygain 3750's SS with tube finals, Japanese built...
   B. Drake "C" line twins Tube type USA built...
   C. Kenwood TS-520SE SS with tube finals, Japanese...
   D. Atlas 210 SS USA Built....
   E. Two Yaesu FT-101E's, SS with Tube Finals....

F. Galaxy V, Tube type USA built....
G. Drake TR-7 (newly acquired), SS, USA built...
H. Ten Tec Century 21, SS, USA built...

4. All the American Tube gear needed Filter Capacitors in the high voltage sections, due to dry/ leaky caps..
5. None of the SS equipment (or SS low voltage supplies in the hybrids) have needed filters .
6. Only one of the Japanese "Hybrids" had a failure in the HV Electrolytics, one of the Caps in the TS-520 puked it's guts (oil) out but still measures good on Capacity, Leakage and Power factor. Japanese HV electrolytics seem to hold up moderately well.

7. Just some food for thought, this is not an opinion of the "relative" merit of various radios. I do not want to get into that argument !!!!

Date: Thu, 4 Feb 1999 08:28:54 -0500 (EST)
From: "P. J. Rovero" <provero@connix.com>
Subject: Re: [R-390] Slightly off topic Electrolytic question

I see as many, if not more, electrolytics failing in solid state gear as in tube gear. Quite spectacular failures at times, too. Smoke, spewing electrlyte, and loud bangs.

Date: Thu, 04 Feb 1999 07:49:38 -0700
From: "Eustaquio, Cal J" <cal.j.eustaquio@lmco.com>
Subject: [R-390] electrolytics

Just wanted to say that after reading the litany of equipment you had, it brought to mind some of the TV servicing jobs I dealt with while working at a local electronics repair facility. Most of the TV's that I dealt with that had electrolytic failures were about 5-15 years old. The electrolytics I replaced were mostly small cans used in coupling and bypass work. You'd figure that the manufacturers would "get it right" after all these years in business and experience but maybe this isn't the case. In addition to heat, age, duty cycle, I guess one has to factor in some degree of "chinzyness" on the part of the manufacturers to install lower cost components into mass produced TV's. Could the same philosophy pervade ham equipment? In a sense, yes. We have the el nasty "capacitor negra bonita" haunting us. Ditto with those "brown sausages of death". But you pose a good question to the group. 73. Cal, N6KYR.

Date: 04 Feb 99 06:57:46 -0700
From: "Richard McClung" <richard_mcclung@tcibr.com>
Subject: Re: [R-390] Slightly off topic Electrolytic question

Tantalums are the most violent and spectacular to explode. Also will burn you good if you get hit with those hot little particles......

Date: Thu, 04 Feb 1999 11:10:11 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Slightly off topic Electrolytic question

Actually I've found that of the small miniature electrolytics sometimes come from the factory, half failed. Most capacitor testers don't do power factor in their ranges, but I've modified mine so it does and many lines fail my incoming power factor inspection. Much of the power factor is true series resistance plus leakage accompanied by loss of value. Fortunately most solid state circuits are more forgiving about value and leakage than high impedance vacuum tube circuits. Most are expecting the electrolytic to be within a factor of two on value.

High operating temperature is not unique to tube gear. The switching supply in my FT-736 had three bad small electrolytics that kept it from operating.

The least expensive small electrolytics are nowhere near the quality of high voltage electrolytics.

I think that semi-vintage solid state gear needs to have ALL the miniature electrolytics replaced, just like all the black beauties need replacing.

Date: Thu, 4 Feb 1999 12:13:42 EST
From: SBJohnston@aol.com
Subject: Re: [R-390] Electrolytic caps

>I see as many, if not more, electrolytics failing in solid state gear as in tube gear. Quite >spectacular failures at times, too. Smoke, spewing electrlyte, and loud bangs.

Yes, I agree. The common cause I've seen has been heat. Put an electrolytic cap near a source of heat and you can expect trouble sooner than later. I especially see electrolytic failures in solid-state gear when the caps are mounted near heat sinks. And you know the sources of heat in tube gear... On a related note, I've been interested to learn recently about the appropriate uses for regular electrolytics versus Non-Polar and Bi-polar types. If I've got it straight, regular polarized electrolytcs should be used for steady-polarity DC only. (in spite of the fact that I often see them as audio coupling caps). Non-polars (NP) are for circuits where DC sometimes reverses polarity, and Bi-Polars (BP) are for fast-reversing DC or AC (audio, etc) situations. If I understand correctly, Non-Polars are much like two polars in parallel backwards, but Bi-polars are something different. I tried some experiments, and sure enough, it made a difference.

My info comes from various catalogs - not to much detail. Anyone know any online sources of info on these variations on the electrolytic theme? Maybe in the audiophile world?

Date: Thu, 04 Feb 1999 13:14:19 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Electrolytic caps

Electrolytics used as audio coupling capacitors have a bias voltage applied, else they lead to distortion. Generally from a positive collector to a less positive base. Non Polars and bipolars are made of two DC electrolytics in SERIES never in parallel and when one side is back biased it acts like a poor diode to let the forward biased side to the capacitor work. With enough heat dissipation built in, non polar electrolytics are used for motor start capacitors, but for intermittant service only. The Radiotron Designer's handbook should have a treatise on electrolytics. I have a book in my collection that's on capacitors and it has a chapter or two on electrolytics.

Date: Thu, 4 Feb 1999 15:13:13 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Electrolytic caps

> Anyone know any online sources of info on these variations on the electrolytic theme?

Fine post. Try <www.faradnet.com>. Not saying you'll find the answer, but there's a whole lot of capacitor info there. Chances are good you will find it.

Date: Tue, 23 Feb 1999 17:23:01 -0600
From: Tom Norris <badger@telalink.net>
Subject: [R-390] Re: C603/606 replacements

One thing I have done for replacements of these caps is find an empty octal relay case. These can be had from Digi-Key, I think, and a few other places. Buy some modern, much smaller caps of the appropriate values. Solder in. Put box together. Plug in. This is pretty much what Jan has for sale, and I would recommend his over my method, since his cases are metal, and would probably stand the test of time a bit better than my cheapie plastic cased thingies. (And his prices are very good too, well worth it and then some.)

Date: Tue, 23 Feb 1999 18:10:22 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] mechanical noise

A side effect of high line voltage is transformer noise. A transformer designed closely for 110 volts operating at 129 volts may tend to hum. Though the 50 Hz design should give a little more head room than that. Maybe your line voltage is more than 130 volts and using a bucking transformer would allow the transformer to operate quietor and cooler.

Date: Tue, 23 Feb 1999 21:08:57 -0500
From: Will Schendel <n8azw@megsinet.net>
Subject: Re: [R-390] Re: C603/606 replacements

>....empty octal relay case. ....much smaller caps of the appropriate values. Solder in. ......

Did the same thing here Tom, got the idea from the list, may have been you... Had a few octal "ice cube" relays from the junk pile at work, before I owned a R-390A. If I would have known, could have had more. Gutted them out and wired in new Sprague caps from Mouser:

P/N 75-515D350V33 Sprague 85 Deg Radial Alum Electrolytic 350V 33MF
P/N 75-515D350V47 Sprague 85 Deg Radial Alum Electrolytic 350V 47MF

Not real pretty, but new lytics are always a good thing... Gotta say, Jan's cap assemblies are very nice looking.

Date: Mon, 8 Mar 1999 20:18:25 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Capacitors

Your caution sounds commendable. These receivers are veterans and will fade away like the proverbial old soldiers. To defer that unhappy day, we should take extra steps to prolong their useful life. A good way to start an R-390* each time is to use a Variac. Slowly crank it up to the nominal voltage (no higher than 115 Volts) over a minute long period. If you have a Variac that cranks up to 135 Volts or more, reconfigure its connections to the lower voltage option so as to prevent inadvertently setting the Variac too high. With a meter, measure the voltage under load and mark the Variac dial where your meter reads 115 Volts and use that as your nominal setting. You can run the receiver at 105 Volts, but don't operate it lower as the tube cathodes won't emit right and will deteriorate over time. <snip>

Date: Wed, 31 Mar 1999 10:08:29 -0600
From: "A. B. Bonds" <ab@vuse.vanderbilt.edu>

Subject: [R-390] Power diode mod resistor

Dug into the Capehart blue striper last night. It has the diode mod in the power supply, also has in the audio module a 220 ohm 5w mounted between pin 2 of the 45 uf cap socket (just used as a tie point for the line from the connector) and the first power choke. Consistent with the other web wisdom I have received.

Date: Wed, 31 Mar 1999 12:48:13 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Power diode mod resistor

So, if you installed a modified power supply, which had the dropping resistor in it, then you'd have TWO in the B+ line right?   And lowered B+? And an extra few watts of power being dissipated? Hmm.... Sounds like a split mod which depends on keeping the two modules in the same radio..

Date: Wed, 31 Mar 1999 15:00:36 -0800 (PST)
From: Kenneth Crips <kk7cm@rocketmail.com>
Subject: [R-390] wondering

This is just a thought, and I don't have the technical knowledge to take it much farther. In the years to come it is going to get harder and harder to keep tube type radios running not so much because of unavailability of tubes but the inability to replace the high voltage electrolytic capacitors, I am thinking mostly about the Cap's in the power supplies. Is there another method of filtering the output of the power supply that doesn't use large capacitors. I was thinking of an electronic device perhaps something that would fit on a board which would, in the case of the 390, plug into the socket where the filter cap was. This device would only be used when there is no way of obtaining good electrolytics.

Date: Wed, 31 Mar 1999 18:44:10 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] wondering

Its hard to get the energy storage function of the filter capacitor any other way. A regulator type of thing can clean off ripple, but only by lowering the output voltage to below the bottom of the ripple. A large capacitor can store energy from the peaks and raise the bottom of the ripple voltage. Something in the form of a switching supply operating with inverse characteristics of the high power factor supply might work at filling in the ripple dips from lower supply voltages. It would be easier to come up with a three phase power source and a three phase full wave rectifier that had only a few percent ripple without a filter compared to the 100% ripple of the single phase power supply. But creating a polyphase power supply from

a single phase source takes either rotating machinery or a gang of capacitors. There is quite a lot of power electronics (motor drives top the list) and off line switching supplies that require 450 volt capacitors so I don't think electrolytics will disappear very soon. All these high power factor power supplies first store energy at 380 volts in electrolytics. Then go through a switching supply to get the required output, whether motor control, computer voltages, or fluorescent light ballasts. So I think the capacitors will be around quite a while.

Date: Tue, 13 Apr 1999 15:02:28 -0400
From: "John F. Bunting" <w4net@alltel.net>
Subject: [R-390] Some Case Histories

<snip> I noticed that on occasions that the dial lamps flickered. Nothing else on that outlet flickered. Before taking it out of the case, I used a line splitter and a clamp ampmeter to watch for changes in line current. I sure got them, but they were from the thermostat in HR202. Until then, I had always figured that the Ovens Off switch really meant what it said. However as you know, it does not control HR202. I did see some flickering of the ampmeter when the lamps flickered. I traded power supplies between the R-1247 and the R390A. Still had the flickering lamps in the R390A. Using clip leads, I monitored various things in the primary power chain. I even changed F101 and later monitored across it with a voltmeter. I finally put the clip leads across the microswitch (They never fail, do they?) operated by S102. The rest is history. Replaced the microswitch and positioned it for more positive switching action. <snip>

Date: Thu, 06 May 1999 13:55:22 -0500
From: "A. B. Bonds" <ab@vuse.vanderbilt.edu>
Subject: [R-390] An interesting variation--the diode mod

Got a replacement (Amelco) power supply for my Capehart 390A from Fair yesterday. The original hummed (mechanically) to the point of annoyance. The Amelco is in very clean shape, and had the sand state diode mod, but in a form that I had not seen before. Usually one gets a pair of top hat diodes soldered under the tube sockets, with the shield bases squished or filled with some kinda goo (RTV?) so that you can't also put in a tube. This one had a couple of black epoxy cylinders about half an inch in diameter and 3/4" long, with 9 pins on the bottom, plugged into the tube sockets. The only markings on these was ED5902, with ED1-7919 below it. It's pretty obvious what they are, but anyone know where they came from?

Date: Thu, 06 May 1999 22:07:54 -0400
From: Barry Hauser <barry@hausernet.com>

Subject: Re: [R-390] An interesting variation--the diode mod

They used to sell a whole selection of solid state rectifier replacements with tube bases. There were several manufacturers. One trade name was "Solidtube" as I recall. I have in front of me as I write an "S-5U4" Silicon Tube Replacement, with, as you'd expect, an octal base. Actually, it's made out of an octal tube base and filled with potting compound or plastic. The instruction sheet says it was made by Calrad. I believe these were private labeled also, so you might find the same thing in a Radio Shack package or Philmore or something.

That ED prefix on yours sounds familiar, like it was an abbreviation of the manufacturer's name, but I can't remember now. ("Electronic Devices?") Typically these were carded hanging on pegboard behind the parts counter. Hidden behind the item in the blister was a piece of paper with the instructions that would caution that it was necessary to add a dropping resistor -- so much for the plug 'n play.

All that's in there are the two silicon rectifiers. These were usually cross-referenced on the box or blister pack with an assortment of tubes they were supposed to replace. Generally they listed nearly every rectifier tube with the same type of base and basing pinout. Sometimes they called the unit by the most popular tube, as in my case. The first ED number is probably the model. The second one may be a date code and, if so would be the 19th week of 1979. ED-1 may signify the factory/supplier source. Not sure how many people smoked their TV's with these when they skipped the other steps. Many, like mine were left unused after the scare on the little piece of paper. Tradition was then to go out and buy the darn tube.

Usually carried a disclaimer/warning about the warmup thing too.
Mileage will vary stuff.

If this was done right, you should find the rest of the usual mod in there somewhere. The "solid tubes" had nothing special in them. Just a convenient way of plugging in the SS rectifiers.

Date: Thu, 06 May 1999 21:37:37 +0000
From: Thomas Marcotte <marcotte@iamerica.net>
Subject: Re: [R-390] An interesting variation--the diode mod

I had one of those diodes you describe lock up on me, popping the fuse. Dead short.

It is gone now, replaced by a toob.

Date: Tue, 25 May 1999 10:37:40 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] FAQ Page Updates

This thread brings up another interesting detail in getting power to the rigs properly: The power terminals on the rear of the R-390A are marked "A" and "B." Check that "A" gets the neutral (white) wire as it is continuous to the transformer whereas "B" is interrupted at the switch. Three wire grounded line cords are a must.

Date: Tue, 25 May 1999 12:59:33 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] FAQ Page Updates

And see that the lead from the "B" terminal goes FIRST to the fuse.. THEN to the switch.. this protects against shorts in the harness between the fuse and the switch.

Date: Sun, 30 May 1999 15:50:03 -0700
From: "Robert M. Dunn" <dunnr@ix.netcom.com>
Subject: [R-390] Apologies and R-390A Power Swictch Question

Apologies if you have seen this before and/or for any problems a previous version of this message caused. I was just informed by a list member that I have been sending out e-mail in HTML format and that causes problems for the reflector. Thanks to Steve Harrison for pointing this out and I have now fixed the mailer to only send out plain text.

Has anyone found a source or substitute for the R-390A's microswitch that switches the power on/off? It is mounted to the function switch on the backside of the front panel and is actuated by a cam on the function switch. The entire function switch is labeled S102 in the parts list, there is not a separate number for the microswitch. My microswitch is very close to the end of its useful life. I successfully got it off and opened up after the contracts fused closed and the radio wouldn't turn off. When I had it open I burnished the contacts and reassembled it. Now it is making an arcing noise when I power up and it cannot be long at this rate before it burns up.

Date: Mon, 31 May 1999 10:16:06 +1000
From: Morris Odell <morriso@vifp.monash.edu.au>
Subject: [Fwd: [R-390] Apologies and R-390A Power Switch Question]

> Has anyone found a source or substitute for the R-390A's microswitch
that

> switches the power on/off?

<snip> There has been a lot written about this over the years. The microswitch has a tendency to fail in the closed position making it impossible to turn off the radio. Some peope have found it possible to disassemble and repair but eventually it will wear out. Exact replacements are unavailable. When I had this problem a few years ago I replaced the micro with a roughly similar sized one which I found as a stadard size in an electrical merchant's catalogue. The switch only cost a couple of dollars and had a metal lever action which could be bent to suit the application. I removed the front panel and disassembled the old switch mounting. I used the old mounting plate as a template to make a new mounting plate to suit the replacement switch. There wasn't much difference as it turned out but it required a bit of adjustment to get it to work properly. I reconnected the leads and put it all together and it's worked fine ever since. Make sure the replacement switch has a suitably conservative rating. Here in Oz with 240 volt mains I used a 5 amp microswitch.

Date: Mon, 31 May 1999 09:55:48 -0700
From: dma@islandnet.com
Subject: Re: [R-390] Apologies and R-390A Power Swictch Question

You're likely going to have to replace the switch, and Morris Odell's approach is probably better than buying a replacement switch from Fair Radio - assuming they have any left, they may be near then end of their lives too.

I find it interesting that these things fuse shut. I suppose I thought the arc on opening would - over time - build up enough material to bridge the contacts. Yet when I repaired one of mine, the fused contacts showed some arc damage, but other than being fused together, they were fine. When they were separated, the moving contact sprung right back, leaving a nice wide gap.

I thought at the time that the arc on opening was definitely damaging the contacts. But I became convinced it was the surge on closing that welded the damaged (and thus more susceptible) contacts together.

I've thus installed current inrush limiters on the R-390As that I've rebuilt. I've had no further problem with the original microswitch that I repaired. Maybe these two things are connected. Who can be sure? At the time I thought it might be useful to put an arc suppressor on the switch to protect against the contact opening problem, but have yet to do it as I've not had another failure (knock wood!).

Date: Mon, 31 May 1999 22:48:57 -0400 (EDT)

From: Norman Ryan <nryan@duke.edu>
Subject: [R-390] Re: R-390A Power Switch Question

Jan's solution to the power switch problem is apt and chances are one can rescue a stuck Microswitch by taking it apart carefully and smoothing the contacts. There's a written piece together with sketches by Dallas Lankford in Hollow State News that covers this in detail.

Trouble is it's a pain in the neck to get the switch out and there is no new replacement for a totalled switch other than taking a used one from another R-390A.

One workaround is to leave the power switch on all the time and power up with a Variac. Run the set at no more than 115 Volts, the nominal voltage, but consider running it at just under 110 Volts. The set is designed to run at voltages ten percent above or below that. Variac settings at the lower range extend tube and component life, something one should consider in light of our finite and dwindling supply of tubes and parts.

It will also extend the time between recapping and re-resistoring. Such work takes a huge amount of time to do carefully and is a worthwhile challenge. Still, I'm not sure I'd want to do it all over again on the same rig!

Nominal line voltages have increased since these receivers were designed and built. The lime voltage here runs around 124 - 125 Volts. My Variac procedure is to crank it gradually to seventy volts and wait for audio to come up, then gradually raise voltage to the desired level (107 Volts). Takes only a minute or so. The B+ settles gently over the filter caps and tube filaments heat up evenly. In the rare instance I have to slam full power into vintage BA gear, my stomach tightens up during warm-up!

Date: Thu, 03 Jun 1999 12:08:32 -0700
From: dma@islandnet.com
Subject: [R-390] Re: Power Switch Question

Well, I won't even try and match your colorful metaphors etc., but I agree with the essence of what you've said. The R-390A is a very conservatively designed radio. Note that it is rated for a line frequency as low as 48 Hz. There is a lot of iron in that transformer, it is potted and I expect will be around long after any of us are.

The issue of whether or not line voltages have "crept up" over the years has been argued endlessly on the Boatanchors mailing list. While line voltages do vary from place to place and time to time, the consensus is that nothing has changed. How and when the voltage is measured and how accurate the measuring device is (digital meters - for example - give a false sense of accuracy!) are all important. I dug out my old Pender and Del Mar Electrical Engineers handbook, first published in 1914 and regularly reprinted ever since, which gives the standard household line voltages as 120/240. My hazy memories of power engineering suggests that conservative design practice means design for somewhat below standard line voltages because what you get may well be lower than "standard" and a lot of electrical gear is very unhappy with low voltage, but is Ok with somewhat elevated voltage. Ever see how long a power saw motor lasts at the end of a 200 foot #18 extension cord? Or an air conditioner during a brownout?

Now, a couple of caveats.

The microswitch is a notorious weak point in the R-390A design. A current in-rush limiter helps protect it. Further, our favorite vacuum tubes will - within a few short years - be very hard to find. Thus it is also useful to reduce the thermal bang that happens to them when voltage is applied and their cold resistance results in major overcurrent. (Why do filaments usually burnout at turn-on? Same with light bulbs!) The in-rush limiter helps here.

This radio was not designed for silicon rectifiers. So replacing the 26Z5s requires care. The vacuum tubes bring the B+ up much more slowly than silicon diodes, and the voltage drop across the tube rectifiers is higher. The in-rush limiter deals with the rapid B+ rise, and the resistor mod discussed on the list previously solves the other problem.

The electrolytics on the AF deck are also of concern. But - if they show no signs of damage to the rubber seals, have been reformed carefully, have not been left sitting for months since last use, and have a power factor that is low - they too will likely outlast any of us. I just started reforming a pair of caps from a Collins deck yesterday. They are dated 1955, have the usual signs of age on the case, but otherwise are perfect. They are reforming nicely, and the power factor is low. So they'll probably be Ok.

So, turn it on - use it. Dare I say - revel in it! Follow the manual warning about extended use of "standby." Why not just turn the volume down! Ventilate it. A blower is a good investment. Use black IERC tube shields - or as the manual suggests, no shields at all except on a couple of critical tubes.

While I'm not concerned about operating these radios at a slightly reduced line voltage (the in-rush limiter results in a few volts drop at steady state - which is probably enough), you will alter the operation of every vacuum tube in the set, except those that benefit from the 0A2. Changing the line voltage changes the operating point of your tubes and may well result in performance changes - especially if some of your critical tubes are marginal and you have a bunch of out of spec resistors. If everything is to factory spec, small line voltage changes shouldn't result in noticeable performance changes.

Recall that the original design - the R390 - had a regulated power supply to ensure constant operating conditions. This was dispensed with in the R-390A design, probably because someone decided that line voltage was constant enough that regulation wasn't essential. Also, the fact that a well-tuned R-390A gives performance stats a factor of ten or better than factory spec provides a lot of room for performance degradation before it is not up to its role in life!

If you see much change by varying the line voltage up or down by 5 or even 10 volts, start checking component values, and/or swapping tubes.

One real benefit of using a variac (with a meter) on the bench and in the shack is to ensure that the day to day operating voltage is the same as was used when the set was aligned. Some of the best gear ever built called for alignment to be done with the equipment on a variac set to a specified voltage.

One last point! When I worked in a research lab we used huge electronic regulators on our ac supplies to ensure a constant voltage to the equipment (one piece of which was a 75A4 - but that's another story!). A variac will NOT regulate voltage - merely change the output with respect to the input. At my QTH, the line voltage changes quite significantly over a 24 hour period, and when the big industrial loads at the mill in the next cove switch on or off, there are big transients, and changes in line voltage. All a variac without a meter would do here is to ensure that the rcvr input voltage wandered in lockstep with the line.

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from EIB-895.pdf

POWER SUPPLY FUNZIES by Dave Medley

After restoring a Motorola R-390 a few months back I ran into a very perplexing problem with the power supply. The symptom was no DC output although the expected voltages were present at the 26Z5W pins. After a lot of fruitless checking, where everything tested OK, I finally discovered that the HV center tap on the power transformer(pin 6)was not grounded as per the manual diagrams. Further investigation showed a new wire connected from this pin to pin 14 on P118. Further tracing of wiring showed this to be connected to the DC fuse which I normally don't bother to install. Putting a fuse in this restored the power supply to normal operation.

I then found the B+ fuse had been shorted out at the fuseholder. I assumed this to be some mod to transfer the fusing from the hot side to the ground side of the system. Why I have no idea. I forgot about it and went on to other things. I even forgot to make a note of it. Today I fired up another R-390 which I have just restored and ran into precicely the same fault. Only problem was I had forgotten the fix. How Dumb can I be. Anyway after about 20 mins head scratching the light went on and I replaced the DC fuse. Now all is well. Even the voltage regulator works!! I record this now in case anyone else runs into the same problem.

Date: Mon, 29 Mar 1999 00:28:33 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] R-390A fuse holder queries

Holes for F102 and F103 also are missing, right? Otherwise, you just misplaced your fuseholders. :-) All seriousness aside, earlier versions of the R-390A have just one fuseholder, F101. Don't know which contract added F102 and F103. My earliest, a '62 Amelco has all three.
It's possible to add the two fuseholders if you're willing to add more wiring to the harness, but looks like there is more to it than meets the eye. F102 looks straightforward with just one wire coming off each terminal; however, F103 has one wire going to the top connection and four coming off the lower connection.

Color codes follow with a guess as to wire gauge and where they go:

F101 White with orange trace, #18, one wire to each terminal.

F102 One white with red trace, #18, to upper terminal from P111-5.
One white with orange trace, #18, to lower terminal from P119-5.

F103 One white with red trace, #18, to upper terminal from P119-2.
Two white with red trace, #22, and
two white with red and green trace, #22, all to lower terminal.

From what the schematic shows, F103 lower terminal wires come from P108K, P109A, P110A, and S102 rear, pin 1. So you would have to undo quite a bit of harnessing to get it right.

Date: Sun, 04 Jul 1999 20:02:32 +0000
From: Thomas Marcotte <marcotte@iamerica.net>
Subject: Re: [R-390] Fuse mod info?

IMHO, I think the fuse mod was done for the following reason. The main fuse is a 3A. The thinking was that it would take a catastrophy in the B+ circuits before the 3A would blow, and then the horse already got out of the barn, the damage was done. However, with the very low amp B+ fuses added in, it would take only a relatively minor (compared to 3A) increase in B+ current to pop a B+ fuse and prevent the damage, a current that would have not necessarily popped the 3A. The 3A is good for the main and filament, but it does not give peace of mind for the B+ necessarily. I added an internal B+ to my old Collins (also to my BC-348 with that dynamotor-thingy).

Date: Sun, 04 Jul 1999 21:49:13 -0700
From: "Gene G. Beckwith" <jtone@sssnet.com>
Subject: Re: [R-390] Fuse mod info?

Have been working on an R-390A for a friend that appears to have some kind of standard mods... one of them is to change 3amp to 2amp...there is a small 'dymo' type label on back panel indicating this fuse is changed to the 2amp level...

Not sure if this is an official mod, but its been discussed here on the list recently... plus I found a real world machine that seems to have adopted it...

Date: Mon, 5 Jul 1999 01:59:32 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Fuse mod info?

In the R-390A you can use a 2 Amp. fuse in F101 instead of a 3 Amp. if the ovens switch is turned off. This is not a Fort Monmouth mod but an official R-390 reflector mod. :-) Which reminds me...
Everybody, your attention please: Reach behind your rig and turn the ovens switch off NOW.

Date: Mon, 05 Jul 1999 09:53:18 -0800
From: Cal Eustaquio <n6kyr@value.net>
Subject: Re: [R-390] Fuse mod info?

Oddly enough, my Capehart has that same type dymo label. I'm wondering if this was a field change put into some Navy units (mine is such because of the diode load pin jack in front). Hmmm...in addition to the factory add on of the new fuses, I wonder why the "degradation" in fuse amperage? Cal.

Date: Mon, 05 Jul 1999 11:10:07 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Fuse mod info?

I don't thinks its a degradation in fuse rating, just getting the fuse rating closer to the current drawn so the fuse can be more effective. Likely there's also a change of fuse type from fast blow to slow blow to better accommodate transformer core and filter capacitor charging surges at initial power on, while providing better protection to the transformer from overload brought on by leaky filter and coupling capacitors.

E.G. a 3 amp fuse adequately protects the wires to the transformer and in the line cord, but doesn't do much for protecting the transformer. A 2 amp slow blow (Buss MDL) will do both better and may have been a slightly later development than the first editions of the receiver.

Date: Mon, 5 Jul 1999 10:57:33 -0700
From: "Rob Dunn" <dunnr@ix.netcom.com>
Subject: Re: [R-390] Fuse mod info?

From the NAVSHIPS 0967-063-2010; Technical Manual; Operation, Maintenance and Installation Instructions with Parts List; Radio Receiver R-390A/URR; 15 April 1970; page 1-8; para 1.5.2 (Production Changes); Table 1-9; note d:

"B+ Fuses. Receivers bearing Order No. 14-Phila-56, serial numbers 2683 and above, and Order No. 14385-Phila-85 have two additional fuses for B+ protection. Fuse 102 is located in the B+ line between pin 5 of plug P111 and pin 5 of plug P119. Fuse F103 is located in the B+ line leading from pin 2 of plug P119."

Looking at the poor schematic in the manual copy it looks like F103 is a 1/8 amp fuse protecting the RF-IF B+ circuits and is inserted at the RF-IF B+ output from the audio chassis. F102 is a 1/4 amp fuse that is series directly with the outputs of the 26zw5 rectifier tubes and protects all the B+. F102 is inserted between the power supply chassis and the audio chassis.

From the same manual; page 2-12; table 2-3; "List of Overload Protection Devices" the F102 and F103 are listed as 1/4 and 1/8 amp 250 v fuses. F101 for 115v operation is listed as 3 amp with OVENS Switch ON and 2 amps with OVENS Switch OFF so this is a Navy approved mod as well as a "official R-390 reflector mod. :-)".

For 230v operation the values of F101 are 1 1/2 amps and 1 amp depending on position of the ovens switch. As expected F102 and F103 fuses are the same as for 115 v operation. That's about all I can find but personally I would like to have the fuses as they protect the B+ power supply circuits, something that may well be burned up with just a 3A primary fuse.

Date: Mon, 5 Jul 1999 14:05:09 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Fuse mod info?

Does your Capehart have just the one fuseholder? If so, it's understandable one would want to fuse it as close as possible to the least value practicable given what could happen if the B+ overloaded or shorted.

As you know, switching off the ovens will bring current consumption down to where a 2 A. fuse in F101 is sufficient. Turning off the ovens increases component life as well. The oven circuit is intended for operation under extreme and rapid changes in ambient temperature conditions and where maximum frequency stability is desired.

A blown B+ fuse is an attention getter. Upsizing that is really asking for it and no tech with any sense should do it although he might fudge (wrongly) on the main fuse. Tom explains it best (see below).

Date: Mon, 05 Jul 1999 11:04:19 -0700
From: dma@islandnet.com
Subject: Re: [R-390] Fuse mod info?

As everyone knows - the early units used a single fuse. I have a couple of Motorola chassis with singles. Later units used three. But I also have a Motorola chassis with two - which appear to be F101 and F102.

F103 seems to have been a later addition. F102, of course, is the main protection in the B+ line before the filter section. F103 is in the RF/IF B+ line - i.e. to everything except the AF B+ and the VR feeding the osc. F102 is specced at 1/4 amp, but F103 at 1/8amp - which seems very marginal given that it is supplying all of the RF/IF tubes. In fact, in the radios I've got, this fuse is always 1/4 amp as well - without the approval of anyone, it appears. I've tried using a 1/8 amp unit, but it usually blows. I can understand the F102 mod. It would provide better protection to the transformer and rectifiers in the event of a B+ short. As it comes before the chokes and filter caps, there is the possibility that this was a trouble spot - especially the caps. The addition of F103 after the filters is a real puzzle, especially if the fuse actually used was also 1/4 amp. Seems like a belt and suspenders kind of mod. The only thing I can see is that there was a problem with B+ shorts somewhere in the RF/IF line that was damaging the power supply chokes (which are after F102) before F102 blew. Perhaps it was simpler (and cheaper) to add the extra 1/8 amp fuse then to redesign the B+filters. Still strikes me as odd though, especially if 1/8 amp didn't work out. OTOH, it's possible that the 1/8 amp fuse worked on new radios. As the resistors tend to drift down in value with age, B+ current would probably creep up somewhat as the operating point of the tubes changed - possibly enough to make the 1/8 amp marginal. Jan Skirrow, VE7DJX

Date: Mon, 05 Jul 1999 11:08:25 -0700
From: dma@islandnet.com
Subject: Re: [R-390] Fuse mod info?

Should have said ... In Table 2-3 of the 1970 Navy Manual this option is indicated.
But only if the oven switch is off. Otherwise, the 3 amp fuse is required.

Date: Mon, 5 Jul 1999 12:17:01 -0700
From: "Craig McCartney" <craigmc@pacbell.net>
Subject: RE: [R-390] Fuse mod info?

Two of my radios, a Collins and a Motorola have the single fuse holder. When I did the solid-state power supply to them I mounted a fuse holder on the power supply chassis (in place of one of the 26Z5W sockets) and wired it in series with the B+ leaving that chassis. I think that is a lot neater than dangling fuse holders or, worse yet, trying to drill new holes in the rear panel and modify the harness.

Date: Mon, 05 Jul 1999 15:49:11 -0700
From: dma@islandnet.com
Subject: Re: [R-390] Fuse mod info?

In my long post about this I made some comment about possibly some resistors dropping in value with age and heat. As Norman Ryan pointed out in an e-mail in return, they're are supposed to go up! I always thought this was so, but I've found several resistors that have gone the other way.

But on reflection I don't think this is the reason for F103 being marginal at 1/8 amp. It could be due to high line voltage or making the silicon rectifier mod without installing the dropping resistor.

Has anyone measured the B+ current thru F103??? I have a single fuser on the bench right now, or I'd measure it.

Date: Tue, 06 Jul 1999 12:38:05 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] Fuse mod info?

Actually, It might have been an "ARMY MOD". <grin> It's listed on page 12 of the January 1956 edition of TM 11-856A where they tell you to use a 2 amp fuse for 115 volt operation without the ovens and a 1.5 amp fuse when running the receiver off of 230 volts with no ovens. :-)

Date: Tue, 06 Jul 1999 10:55:42 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] Fuse mod info?

Yep. Over the years, I've had some pretty spectacular meltdowns in my old Collins "single fuse". The IF deck was usually the one to melt down. I've had a couple on the RF deck too. It'd fry lots of stuff real crispy before the fuse would blow.

>I added an internal B+ to my old Collins

Good idea. I've been tossing that idea around but hven't figured out how I'm going to do it yet. I've got a couple of matching NOS fuse holders for the R390A that I'd thought about installing but I hate to drill the rear panel and I don't have the proper "D" punch to do it right. I've scribed them and filed them to shape before but I'm getting lazy in my old age. I may use a couple of inline insulated ones mounted inside of the receiver.

>(also to my BC-348 with that dynamotor-thingy).

The last 348 that I owned was as a teenager. I can still remember that damn dynamotor whine that mine had. I never could get it to run as quiet as it should. A buddy of mine had one that was as quiet as a tomb.

Date: Wed, 07 Jul 1999 18:21:20 -0700
From: "Gene G. Beckwith" <jtone@sssnet.com>
Subject: Re: [R-390] Fuse mod info?

The rcvr with the 2 amp fuse is marked near the spare fuse holder on the back panel...it is a tiny dymo type label that is cut down to just the size of the numeral... no other info...and the machine has no spare fuse in the holder as it was brought to me by for some tlc by another list member...its not a Navy version, at least based on the presence of the diode pin jack on front panel...this unit has none...the dymo appears aged, so its doubtful that it was added recently based on list info...the guy who brought it too me did not make the change, but pointed out the label based on info here on the list...

Date: Wed, 07 Jul 1999 23:29:54 -0700
From: "Gene G. Beckwith" <jtone@sssnet.com>
Subject: Re: [R-390] Fuse mod info?

Regarding mounting fuses in BA's ... have been doing such a technique for all the xmtrs and rcvrs I rework if fusing isn't adequate...mostly in the case of xmtrs...am putting minimum value fuses in the HV lines just after rectifiers to help protect from cap shorts and other nasty events down stream...also using step starts on all rebuilds...esp xmtrs...have considered a simple relay step start system with fuses, of course for the R-390x's ... but haven't had time to build one yet...so, using Variacs for all start ups at the bench and planning same for operating position starts of the '390's.

In the case of mounting fuses...I am using small single fuse blocks, usually quite available at the 'fests' or in a desperate move to avoid delays at the bench, Radio Shack has them in bubble packs...I use small ceramic stand-offs, usually mounted on a stray/existing 8/32 bolt extending through chassis in the general area...use long bolt if needed, and put the fuse block on top of the stand off, and route wiring accordingly considering HV level...so far this has proved an excellent technique...totally reversible, no special extra holes...can be mounted nearly any place you can route HV lines to the fuse block, is cheap, and best of all it works to save stuff when you have a major glitch to ground down stream....of course minimize fuse current rating per recent list discussions...run close to the minimum limit for max protection...

Hope this helps...its a non-surgical technique that runs in circuits from 100 volts more or less, to near 2800 volts or whatever in my T-368'3 and "Chippewa" linear...(bigger stand offs)...

Date: Thu, 08 Jul 1999 11:22:46 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Fuse mod info?

WARNING!!!

The normal 250 volt fuses will act as an arc after failure in a 2800 volt circuit and will provide practically NO protection.

High voltage fuses used to be made and are about 6 inches long, were filled with arc-quenching material in some cases, and cannot be bought now.

Do NOT depend on common fuses to adequately protect high voltage circuits.

Date: Thu, 08 Jul 1999 21:02:46 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Fuse mod info?

Modern diodes tend more often to fail shorted than open. Real carbon composition resistors make better fuses, but film types including IRC pseudo composition resistors don't. Most small high voltage fuses are made for semiconductor protection and use silver wires. That's what makes them expensive and fast. 600 volt rated fuses ought to be reasonably available in the 13/32" diameter sizes. Looking in most catalogs other than fuse manufacturers won't show them because distributors don't think there's a market for them and so don't bother to show them. Which then proves they don't sell.

In the WESCO supply catalog the least expensive I find in 600 volt fuses is the BBS, listing at $4.51 each, 2.97 in lots of 10.

Date: Fri, 30 Jul 1999 17:39:50 EDT
From: DAVEINBHAM@aol.com
Subject: Re: [R-390] My Senco Up/Down note

I doubt lowering the line voltage would cause the radio to be quiter. It is likely to be the transformer. Most radios will be noticably quiter when run through an isolation transformer. Whatever crud is in the AC at the wall will be somewhat reduced by going through a transformer.

Date: Thu, 26 Aug 1999 12:20:19 -0800
From: "Larry Shorthill" <r41656@email.sps.mot.com>
Subject: [R-390] Why use a tube when Solid State will do!

26Z5, OA2, 3TF7 replacement

I know this topic is way over done, but I've had some thoughts that I would like to share with the list.

I am not one who wants to change the wiring or drill holes in my radios to accommodate willy nilly changes. I know that there are ballast tubes, rectifier tubes, and OA2's out there still. But there are many, many pros and cons to putting solid state in place of tubes in several of the sockets (or under the sockets, or....) and I personally think the cons can be reasonably overcome. I especially like the challenge of doing these sort of retrofits without compromising performance, reliability, longevity, or integrity of the original electrical or mechanical design. In other words, no holes, no rewiring, and completely returnable to stock without any effort.

Anyway, I think I have some pretty valid ideas on "converting" these radios to put solid state in place of the rectifiers, the ballast tube, and the OA2. Caveat: except for the filament heater power in the rectifiers, no other direct power reductions take place. Lowering of overall B+ value will indirectly remove some excess power that would otherwise occur throughout the receiver. B+ will be applied quickly but for small tubes, this is not known to be a real problem.

These ideas would work in a stock, completely unmodified RX and would allow the instant removal of these replacement SS tubes with their original counterparts.

First, let me start with the rectifiers. These can be replaced by a suitable SS diode with attendant increase in B+ ... a well known problem (maybe not problem, but an issue). One solution puts a 220 ohm power resistor under the audio chassis in a well documented location. Problem one is too much heat already in the audio chassis, problem two is that there are some among us (audiophile and careful listeners like Chuck Rippel) who have actually heard some examples of this mod FM'ing the PTO at high audio levels due to the dynamic impedance of the B+ system being increased. Problem three is that it requires a modification to two different modules (power supply and audio) that from then on must go together as a pair and be so documented. Solution: Use power zeners (say 20 volt zeners) in series with the rectifiers to lower the dynamic impedance. Problem, finding cheap power zeners and properly heatsinking them. Solution, use a low wattage zener and an appropriate cheap bipolar power transistor instead of the power zener--much cheaper and easier to find low wattage zeners. You can buy a zener assortment and "tune" the B+ to exactly what you want.

OK, so now we can put a cheap, power dissipating, low impedance voltage dropper in series with the silicon rectifier and make this thing work with good B+ values and good B+ regulation (no FM'ing for Chuck). Packaging this solution in a proper manner is next. A plug in installation that drops right into the rectifier sockets is appropriate and requires no mechanical modifications. If you ever get flush in 26ZW5's you can drop them right back in place and never miss a beat....

Well, I like a good cigar now and then and there are some off the shelf cigars that are in aluminum tubes that are about the right diameter. One such tube is from the Bering Imperial cigar (not a great cigar, but a nice Al tube!). This tube will serve as the outer sheath for the power "rectifier" device(s). The innards of this rectifier consist of a piece of copper pipe--actually a repair sheath for 1/2 inch copper pipe. This repair sheath is available at Home Depot, etc. in 12 inch lengths. It is 5/8 ID and just fits inside the Al Cigar Tube with enough clearance to allow for good insulation The copper pipe is the heat sink for the power transistor and allows a lot more thermal mass for it. Cut the copper pipe to about 2+ inches in length and insert a 5/8 x 2 inch wide strip of copper sheet (like flashing material) inside this pipe. The cross section will look like a capital Theta. Solder the stip into the pipe, drill an appropriate access hole radially in the Cu pipe and perpendicular to the plane of the soldered in strip and drill a smaller hole in line with that one into the copper strip (say a number 6 screw clearance hole) to mount a TO-220 power transistor.

Outside the copper pipe, do the following: connect a 1N4007 cathode to the collector lead of the TO-220 (assuming an NPN, say of the TIP-30 family). Connect the cathode end of the low wattage zener to the collector lead and then solder these two diodes to the collector lead. Now take the anode of the zener to the base of the TO-220, and solder it. Finally, and just for safety (one 1N4007 doesn't have enough stand off voltage for safety margin in this application), use another 1N4007 and connect and solder its anode to the emitter of the TO-220. The cathode of this second 1N4007 is the cathode of the overall "rectifier" and the anode of the first 1N4007 is the anode of the rectifier.

Use appropriate heat shrink to keep things from shorting against each other and the copper pipe, and insert this into the pipe, mounting the TO-220 onto the copper strip with a #6 screw and Keps nut. (I think the #6 fits the hole of the TO-220 packages--I'm still working out the details). Use heat sink grease for best thermal transfer. The cathode and anode leads should be all that are sticking out of the pipe if this is done properly (sorry I can't put a drawing up yet). These connect to the appropriate lugs on an upside down tube socket that has been turned down enough to just fit into the cigar tube. Into the tube socket insert pins of the correct diameter wire (I use pins removed from a surplus connector that I bought for this application--wire may be good enough) and solder these to the socket lugs. The copper pipe now is covered with heat shrink (2 layers) and the outer Al tube is put over that and glued in place at the socket (Hi temp RTV will work). Cut the cigar tube to a proper length before you glue it--it should be just a bit longer than the copper tube and socket combo. For best heatsinking, the whole thing can be potted inside with clear epoxy. This isn't the best for thermal transfer, but it will keep things from moving around and is better than air gaps. Make sure you test the rectifier before you pot or glue it. All the insulation is to keep B+ off the Al Tube so make sure you do a good job of insulating. Don't forget to insulate the top end of the copper tube to keep it from contacting the Al tube.

You can paint the outer surface of the Al tube with Krylon ultra flat black (thanks for the info on this paint, Jerry) to help with the dissipation of this rectifier. Two of these will now do as the rectifier substitutes. Fine tune the zener value if you want before you pot the thing up.

Now for the ballast! Dr. Jerry has commented on his circuit for a ballast on this list before. He uses a power LM317 inside a bridge rectifier as a current source. The details are available from him or may be in FAQ somewhere, but he has gone to a lot of work making a current regulator that puts out the proper RMS value of AC current for the filaments of the two 6BA6s. I know that by using seriesed 12BA6s, this whole ballast thing becomes relatively moot. However, there may be some valid reasons for keeping the ballast regulator in the radio, and the 12BA6 modification needs to be documented and remembered, lest someone changes out the 12BA6s with 6BA6s and toasts some tubes.

The SS ballast circuit itself can be built into a copper pipe heat sink as described above. Keep in mind that this unit must dissipate about 3.5 watts of power. This is a bit much for copper pipe described above, so make the thing as long as possible for maximum dissipation capability. I am still working out the details of this and it may need some improvement for additional heat sinking. The small components used may be put on a small circuit board and inserted with the LM317 into the copper. Heat shrink some tube over the circuit board first to keep things tidy.

Finally, I have a circuit that will take the place of the OA2. A high voltage power zener will not work in this application because it does not have the low dynamic impedance needed for proper regulation. An OA2 is quite a bit better at these voltages. My circuit is based on a power N-channel MOSFet, a TL431B, 4 or 5 resisitors and a couple of disk caps. I am still debugging it, but it should also fit into one of the copper tube heat sinks and package up just like the rectifiers and the ballast. It will need to dissipate between 1.5 and 2 watts. Insulation is also a must because of the 150 volt level on the top of this thing (the copper tube is attached to the drain and is at 150V).

So, with 3 power/regulator functions to be converted over to solid state, I think I have eliminated a couple of potentially costly problem areas in these receivers. The solid state equivalents work with lower dynamic impedances (better regulation), higher reliability, and lower cost. These plugins should last the rest of the life of these receivers. Except for the filament power of the rectifiers, they still dissipate as much as the tubes they are replacing. Still, I think it is a worthwhile retrofit, especially considering that the original radio has been left untouched and in the case of the 220 ohm dropping resistor, it is even un-modified if you remove that resistor and put the audio module back to original condition.

Keep in mind that this is a concept work in progress and some of the details are still in process. I welcome suggestions and comments. After I have the whole bunch debugged, I'll post my results. I may try to get some photos scanned for inclusion on a web page. Keep em glowing where they need to!!!

Date: Thu, 26 Aug 1999 18:18:36 -0800
From: "Larry Shorthill" <r41656@email.sps.mot.com>
Subject: Re: [R-390] Why use a tube when Solid State will do!

Boy, John, this is all good stuff. I know exactly what you are saying in this reply and I can't counter anything you have said. We are all motivated by slightly different things and my motivations are slightly different than yours so I'll address my motivations as I go through your response. Thanks for all your insight and a light on your motivations. Again, this is all good stuff!

No problem here. I don't intend to hack on anything. I like the design just the way it is, too. No modifications--in fact, I'm restoring the mod the Navy did when they solid stated the PS under the socket and I'm replacing those crimped over monsters with NOS 9 pinners. I'm also taking out those 220 ohm audio deck heaters that are in some (but not all) of audio decks on the solid stated units that I have. Again, I'm not modifying the radio, I'm building a better rectifier (I think!). Along the way I'm learning about the system called an R390A.

Agreed--just slightly different points of view on what constitutes "fully representative". I'll keep my original ballasts, any rectifiers I can find (none of my radios has the original tubes still in them) and a couple of OA2s, but I'll use them with the solid state versions of these, just so I don't have to use up the originals. They'll drop right back in place if or when I ever want to. Total agreement here. With SMT technology as the prevalent state of the art approach in our sand state rigs, we can't work on them, we can't understand what goes on inside of them very easily and we sure can't get readily available replacement parts for them. Too much custom stuff. I sure like working on three legged transistor stuff and all the tube stuff I can find. But my work and my hobbies just don't overlap anymore. This makes me want to go and solve the world's electronic problems--even if none exist. In a way the solid stating of a few power devices in the R390A is an example of this. I don't take this process too seriously (I'm not a fanatic about doing something like this, that is), but I like the idea of overcoming some of the prior objections to solid state approaches. Some of the approaches that have been taken in the past didn't go far enough in solving the problems created by solid state solutions. The 220 ohm dropping resistor is a prime example of this. For sure, the B+ can be brought back down to a proper nominal level, but the cost in regulation of adding all that impedance causes other problems, and the location where most of the 220 ohm resistors was installed was mechanically good, but themally really bad. A better solution is to put the radio back the way it was and do all of the voltage management in a plug-in package that rectifies, drops voltage like a tube recitifer, and adds no appreciable dynamic impedance to screw up the overall regulation. Make it robust enough to stand up to the rigors of high voltage, temperature and mechanical stresses and it should last for the life of the radio. Keep a set of 26z5w's around for the times you want to show the radio to the kids and other interested parties.

Ultraminiaturization has killed the hobby electronics industry and has kept all of our kids from building up their first real rigs. The obsolecence of a lot of components has also occured since there is no longer any demand for them. Try finding 1 and 2 watt carbon comps out there. It's real hard to do.

Yeah, I knew when I wrote this that Nolan would probably go back to his comments on how ballast tubes live forever, etc., etc. (I wonder if anyone has a video of Nolan puking--that's a thought!). For some the quest for NOS parts is the game. For others, refurbishing, rebuilding, or redesigning is the game. In my case, I don't like to see a used part thrown away if it can be rebuilt better than before (like using the shell of the Al electrolytics as the foundation of rebuilding with modern caps, etc.). In the case of solid state substitutes, it isn't a real redesign of the radio (something that I would have a problem swallowing) but an implementation of a device that is form, fit and function as close as possible to the original. Again, no mods to the radio are allowed in my scenario. Yeah, there are tubes out there--a lot of them. But the problem is that I would rather go looking for 6DC6s and a few others as needed and not have to even think about the rectifiers (notoriously unreliable) and the ballast (OK, so if you don't ever move the radio and shake the ballast real hard, it should live a long time). It's time I can spend listening, refurbishing, or with my wife!

Line transients can be handled other ways. ESD isn't a problem with reasonable care. EMP, well, if EMP gets to be a problem, tubes will be the last of our worries.

Date: Fri, 27 Aug 1999 10:18:56 -0800
From: "Larry Shorthill" <r41656@email.sps.mot.com>
Subject: Re: [R-390] Why use a tube when Solid State will do!

Completely solid stating an R390/A would be a tough proposisition, considering the lack of availability of double gate MOSFETs today. I don't think it would be an effort worth trying. However, using the mechanical front end and crystal mixing scheme and maybe overall architecture would be OK. It would entail a complete redesign to get the most out of what would be left over after you took out the tubes. Nolan--I'm not advocating this, so don't get the stake ready for the next burn!

As for moving the heat around, as you commented, yes,my approach doesn't remove the heat (except for the filaments on the rectifier tubes), but that was a choice I made when I decided to not modify the radio and just replace with form fit and function equivalent circuits that plug in. I truly believe that heat is not our friend in these radios, and if the original designers had access to some of the regulator and power devices we now have, they may have done their original design of these circuits a little differently. That not being the case, we can remove heat by using 12BA6s and no ballasts (a pretty good solution, really), a simple SS diode rectifier with no dropping resistor (distributes the heat to other areas of the box) or better, a simple SS diode rectifier and dropping inductor (your solution), and replacement of the OA2 shunt regulator with a simple series pass regulator (about 2 watts worth of saving). All totalled, about 12 watts or 10% of what the box uses now. But the down side of this is that the addition of the inductor means a mechanical change, the 12BA6s need to be documented for future users and a series pass regulator would require some additional systems evaluation, just to make sure.

My approach doesn't require documentation -- just remove the solid state plug ins and put the original tubes back in, and it does save about 3 watts--not great but then 10% isn't a great savings either.

The OA2 replacement using a TL431 isn't completely debugged. I'll share my circuit with you off the reflector to see if you have some comments on it.

Thanks for your comments--especially about the inductor. I like that approach, but where to mount the thing is an issue.

From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Fuses for a HP410B

The smaller the fuse rating, the more exotic the fuse wire to be predictable. .001 amp fuses use platinum and so despite the fact the wire is short and thin, are very pricey.

Have you tried Hosfelt (800-524-6464) Digi-Key (800-digi-key) www.digikey.com or Mouser (800-346-6873) www.mouser.com?

Be aware that some off shore automotive fuse makers have no idea whatthey are making and their "fuses" may as well be bussbars for matching Buss or Littlefuse characteristics. E.g. cheap fuses may lead to expensive damage from their failure to operate properly.

If the fuses are for protecting metering circuits, they need to be FAST, if for power supply they probably need to be slow blow to allow charging the filter capacitors.   73, Jerry, K0CQ

Date: Mon, 18 Oct 1999 11:11 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] Fuses for a HP410B

If you are going to blow fuses in a VTVM, I do not think you want to do it slowly. Do not get real hung up on the value. Use a 1 Amp until you can find the better value. Is your dead fuse a slo blow, (has a spring inside or says so on the end caps?) The slo blows just take a larger power on surge. You have to exceed their value for about 1 second. Any real problem will trash a 1 amp fuse before real damage is done in a tube instrument. It cost money to put that low demand inventory on the shelf for instant gratification. Are you going to support your home town economy or buy slave labor wage price parts on the Internet from international sources? Its not the cost of the fuse. Its the cost to buy it, ship it, put it on a shelf, and pay some one to hang around the parts counter until you want it that is driving the price at your local parts source.

Date: Fri, 5 Nov 1999 20:03:45 EST
From: Tnjent98@aol.com
Subject: [R-390] solid state rectifiers

With the solid state rectifiers in the power supply of the 390a, what would be the best way to return the B+ voltage to its nominal range? is the 220ohm 20watt dropping resistor it?..anything else? thanks

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Date: Fri, 05 Nov 1999 18:16:43 -0600
From: "Larry Shorthill" <r41656@email.sps.mot.com>
Subject: Re: [R-390] solid state rectifiers

Chuck Rippel noted on one of his receivers that with the 220 ohm dropping resistor, or at least resistance in the B+ circuit, that heavy audio would pull B+, modulating one of the oscillators and causing an FM effect. Therefore, he doesn't use the 220 ohm solution. There is another way to use solid state devices and to drop the voltage (but still dissipate the extra heat, unfortunately) by putting a "zener" of about 20 volts in the B+ to drop the voltage down, but without causing the FMing effect noted by Chuck. This "zener" will dissipate about 4 watts or so, so it needs to be pretty husky. My preference is to put one in each diode leg, so you share the dissipation a little better. I also am not a fan of power zeners, so I use a small 3/4 watt zener with cathode from the collector of a power NPN and the anode feeding into the base of the NPN. The emitter becomes the effective anode, while the cathode is the junction of the real cathode and the collector. NPNs are cheap, and big, and zeners are expensive. You get better dynamic impedance for overall better performance in the B+ circuit. Just make sure you heat sink those transistors. Do it in the power supply module and not in the audio module--that one gets hot enough as it is. That's the other downside of the 220 ohm mod--it's cleanest installation is done under the chassis of the audio module where it just adds to the cooking that takes place there already.

Date: Fri, 05 Nov 1999 20:55:46 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] solid state rectifiers

The 220 ohm resistor is the accepted technique. Moves the heat dissipation from the rectifier tube plates to inside the chassis, but saves the heater power from the rectifier tubes. 73, Jerry, K0CQ

Date: Sat, 06 Nov 1999 08:23:27 -0600
From: "Paul Staupe" <ptstaupe@comdisco.com>
Subject: Re: [R-390] solid state rectifiers

After all is said and done, don't you think that the best solution is to remove the solid state devices and re-install the 26Z5W's? I would think that the "instant-on" of solid state B+ would have a stressful effect on the components and perhaps even shorten tube life.....

Date: Sat, 06 Nov 1999 10:04:45 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] solid state rectifiers

I think, for all practicality, it depends on the available supply of 26Z5W. Its far better to have a receiver hearing with the imperfections of the solid state B+ than to have it dead for lack of rectifiers, thus shortening the life of the owner for lack of news and entertainment.

Most of the capacitive components do have some voltage rating in excess of their normal operating voltage so the high voltage at power up isn't a factor unless one is trying to utilize electrolytics with original issue date codes, then one is toying with having to clean their guts out of the radio no matter which rectifiers. There isn't a whole lot of difference in the start up B+ voltage and the standby B+ so in standby mode those same components are stressed the same way.

And the silicon diodes with resistor mod was factory and military approved long ago,...... so it is "authentic" to the radios.

Date: Sat, 6 Nov 1999 11:19:35 -0500
From: "Ronald Reams" <wa4mjf@worldnet.att.net>

Subject: Re: [R-390] solid state rectifiers

I've always heard that putting the 390-A in standby was a sure way to shorten it's life. You seem to indicate otherwise. Is this new research?

Date: Sat, 06 Nov 1999 10:21:39 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] solid state rectifiers

I have no research to indicate one way or the other, just that the radio came with a stand by mode, and that mode would be necessary for being used with a transmitter and that the wear on the radio would be no different while tubes were heating with the solid state mod than being put into standby as required for tranmitting from the same shack on voice with a local microphone.

Date: Sat, 06 Nov 1999 08:46:44 -0800
From: Leigh <bipi@worldnet.att.net>
Subject: Re: [R-390] solid state rectifiers

I always power up my boatanchors using a variac so start-up is no problem (even though I still use tube rectifiers). But it would remedy the instant on issues with solid state replacement (can also keep the line voltage where ya need it). Good luck.

Date: Sat, 6 Nov 1999 12:56:44 -0500
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] solid state rectifiers

I just reach over and run the RF gain to 0. With the TR relay changing ant to transmitter, no problem.

Date: Sat, 13 Nov 1999 11:07:43 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] more solid state rectifiers...

Choke input filters are not often used with semiconductor rectifiers because an abruptly falling load can cause a high voltage inductive kick from the filter choke. An input filter capacitor absorbs that. Or a diode in parallel with the choke (cathode to the input side) can keep that inductive kick to something reasonable just like it does for a relay coil. Some Collins transmitters used a double anode selenium zener diode transient protector across such input chokes. Otherwise a solid state rectifier with choke input should give a decent supply voltage with lower power dissipation.

Date: Mon, 6 Dec 1999 17:07:29 -0800 (PST)

From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] New Electrolytics Under Frame

Oh now, it doesn't look that bad!! I put mine vertically on octal plugs, they can be easily removed and there is NO hacking of the radio. Besides, they're on the bottom of the radio.

Then there's the relay case method where you find caps that will fit into the case of a relay with an octal base, this actually looks pretty good.

Date: Tue, 7 Dec 1999 01:11:16 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: Re: [R-390] New Electrolytics Under Frame

I did this to a R-390A that I re-furbed well over a year ago. I was concerned about reliability, so I ordered premium "Hi Temp" caps from Mouser (It gets very hot under that chassis). They fit well under the chassis, I used some small standoffs from a junked R-390A IF section which mounted well with existing screws, so the entire thing looked "Factory" except for the empty sockets. I "donated" one of the slightly leaky caps to a friend to get his R-390A up & running (it was missing). It worked with only a little hum.

Date: Mon, 6 Dec 1999 20:57:27 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] New Electrolytics Under Frame

I cut the cans on my filter caps with a dremel tool and put new caps inside the existing cans. Looks original. I took pictures as I did this. Yes, it does take some time and patience, but I didn't really want to stick the caps under the audio deck. You can see how and where to cut them and get a feel for what's inside on my webpage. Follow the Collins R-390A link to the restoration section. Lots of pictures. Walter Wilson

http://www.knology.net/~wewilson <<< my website is here

Date: Mon, 06 Dec 1999 20:47:54 -0600
From: "Jerry G. Kincade" <w5kp@swbell.net>
Subject: [R-390] Re: [Hammarlund] NOS Elelctrolytics from RF Parts.

I rebuilt the cap on my JX-14 using three new electrolytics. Not that hard, at least not after you get the potting compound out of the old case! Looks stock, works new. I repotted it with epoxy potting compound when completed. My new (to me) sorta-mint JX-17 had all discs everywhere from the factory. Sure was happy to see that, after going through some of the BBOD/GLOD replacement drill on the JX-14. I still have the RF deck to do on the JX-14 :-(at which time I will replace some of the leaf contacts also.

Date: Mon, 06 Dec 1999 20:56:09 -0600
From: "Jerry G. Kincade" <w5kp@swbell.net>
Subject: Re: [R-390] Re-forming capacitors

Yep, I do the same with my Sprague TO-5. Works fine. This particular TO-5 will go up to 730V, but never ran into a cap yet that I needed that for! Monitoring the voltage with a good meter is essential. My voltmeter on the TO-5 reads about 20% lower than the actual being applied. Found that out the hard way. Anyway, a good cap analyzer is worth it's weight in 3TF7's.

Date: Tue, 7 Dec 1999 00:47:26 -0500
From: "Gary E. Kaufman" <gkaufman@bu.edu>
Subject: RE: [R-390] Re-forming capacitors

There's a nice piece about reforming caps at:

http://www.angela.com/catalog/how-to/about_caps.html

The Eico 950B also works nicely for reforming caps and is common and inexpensive.

Date: Tue, 7 Dec 1999 06:00:33 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] New Electrolytics Under Frame

It only took about 15 minutes each. The paper capacitor section slides right out, but all that tar looking stuff had to be scraped out. I gave it a shot of parts cleaner and used a screwdriver. I know it's crude. Maybe I've been reading too many of Nolan's articles ;^)

The only trick is to measure the cans and order the short version of the capacitors. This is especially true for the 47 uF ones. I went through the manual at Mouser until I found some small enough. I chose the Samsung 350V ones, their part # 630-STX350V47 (ending V33 for the 33uF ones).

The hardest part was attaching the caps to the plug. I had to grind the contacts flat on a grinding wheel, mount them in a vise, and drill a small hole. I then choose brass screws (easy to solder to), and clipped the brass screws to length after seating them (see pictures on website). I'm hoping that the brass does not have any galvanic corrossion problems with the other metal (don't think it will), but I couldn't solder to the existing metal contacts.

Date: Tue, 7 Dec 1999 06:02:09 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] New Electrolytics Under Frame

I found the site this morning at http://www.skirrow.org/Boatanchors/
Follow the links to Articles/Inrush Current Limiters

Date: Mon, 13 Dec 1999 18:55:55 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: [R-390] Dud tube bases

You know, those octal based tubes? Well the bases twist off easily, they could be used to replace the filter caps in the R-390's in a pinch. Just solder in some appropriate caps and plug them in.

Date: Mon, 13 Dec 1999 19:41:37 -0800
From: Dan <hankarn@pacbell.net>
Subject: Re: [R-390] Dud tube bases

I was lucky to find 12 of the caps and I did use an octal base and it works great. True plug n play. Looks good goes good. Hank

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Date: Thu, 16 Dec 1999 11:49:46 +0200
From: <yrjo.hamalainen@thk.fi>
Subject: [R-390] Filament voltage only 5,7 VAC ? **LOW HEATER VOLTAGE**

I am a bit concerned since the filament voltage in my r-390a is only 5.7 VAC measured at tube bases. Mains AC input is nominal 230 VAC. But could it be because of 50 Hz we have instead of 60 Hz ? Drop to 5,7 V means that filament heating power actually is decreased by 20 % from nominal ! On the AC transformer of my R-390a filament output is stamped as 6,1 VAC/8A, on the other hand the Army manual I have states that at tube bases you should have it as 6,3 VAC.

If I remember correct these series of tubes are specified for 10% filament voltage deviation, then 5,7 VAC would be just hardly within this limit. I understood that low filament voltage causes also shortened tube life as mentioned also in this ng.

Date: Thu, 16 Dec 1999 10:47:36 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Filament voltage only 5,7 VAC ?

Low heater voltage doesn't cause shortened tube life by itself, just that as the tube ages (and at lower voltage it may age a bit slower) the emission started out lower from the reduced heat and so gets to the low limit of usefulness with less percentage reduction. Some tube testers include a predicted life test and running the tube with reduced heater voltage is the basis of the test. A tube with emission getting marginal at low heater voltage will still work at normal heater voltage for a while.

I'd say that if your meter is within 5% and the tube is at the lower edge of 10% (then it could be 5 to 15% low) and the radio performs well, keep it that way. AC meters are not often known for being extra precise. Even meters made strictly for AC can be off. Be careful on the low voltage range that you read the special low voltage AC scale. That has to be different from the higher voltage ranges because of diode drop in the meter rectifier. Other than raising line voltage, there is nothing you can do to the radio to raise the heater voltage unless you simply find that one bad solder connection in the heater circuit and fix it and maybe apply Deoxit to the heater pins in all the connectors. You might do a survey of the receiver from transformer pins to most of the tube pins to see if they are all low or just some modules (which would indicate a heavy load in some modules, or that poor connection).

Date: Fri, 17 Dec 1999 01:03:16 -0500
From: km1h@juno.com
Subject: Re: [R-390] Filament voltage only 5,7 VAC ?

> Low heater voltage doesn't cause shortened tube life by itself, just..................

That statement is true only when the tube is run within the specification range it was designed for Jerry. Be it +/- 5 % of a nominal voltage or whatever. However when that tube is run below its specs the cathode temperature will fall to a point that will hasten cathode contamination and rapid degradation of the tube. Likewise overvoltage will shorten life by boiling off the cathode coating via an above normal electron flow. In the case above the 5.7V is 10% below nominal wheras the typical 6.3V tube is rated at +/- 5%.. I cant speak for typical receiving type tubes but the accepted norm in oxide coated cathode transmitting tubes is to run the filament at 0 to 2.5% of nominal voltage for maximum life. This covers tubes from the 2E26 size to multi killowatt plate dissipation ratings. In the case that the line voltage is abnormally low or the design is such that the filament wiring has excessive resistance/voltage drop there is an option. That is to series connect another xfmr in the proper phase to the existing filament winding. Yep, there is a gotcha here, you cant usually find a xfmr that will only boost the voltage 1 or 2 volts or less. However for the truly desperate situation it is quite simple to modify most any open frame type filament xfmr. In those extreme situations it may be a good idea to consider converting to DC filaments. A voltage doubler circuit, a Zener or a more sophisticated regulator is easily and cheaply accomplished today as compared to when a boatanchor was new.

> in some modules, or that poor connection).

All excellent info Jerry, it is suprising how much a dirty or weak contact can affect performance....even at DC or 60Hz.

Date: Fri, 17 Dec 1999 11:11:50 -0600
From: David Wendt <dwendt@electrocam.com>
Subject: [R-390] AC DC and tube filaments

I have one of those ponderous questions for the group about tubes and filaments and their type of power. This is been something I have been wondering about for some time and since there has been such deep discussion about the half wave more than half power topic this seemed not too far off base. Tubes are normally rated for use with AC power since this is easiest to provide with a transformer. There are applications that do use DC at the same level as the AC RMS voltage. (To keep on topic.. the R-392 for instance.) I had always thought that powering a tube with DC would be potentially quieter since the chance of coupling any AC signal into the circuit would not exist. There does not seem to be many that actually do this though. Even in the world of super hi-fi I don't think this is done where they can worry about too much oxygen in the copper wire to create noise. So why is it not done? Are there real advantages to using AC power to the filaments of a tube over DC?

Even further of contemplation is my RT-834/GRC106A which is a very nice solid state transceiver version of the R1051 receiver, that has tubes in the receiver's RF amplifier. Current lore seems to attribute the tubes to fear of EMP problems in military action. The rig is entirely powered by 24 VDC but internally it has a very nice little module to turn that DC into 6.3 V AC for the tube filaments. Any idea what may have been in the designers mind for this?

Date: Fri, 17 Dec 1999 12:28:48 -0600
From: "A. B. Bonds" <ab@vuse.vanderbilt.edu>
Subject: Re: [R-390] AC DC and tube filaments

It was done by Fisher (in the 80-C) and McIntosh in most of their tube-based preamplifiers, at least in the high-gain early stages.

Date: Fri, 17 Dec 1999 14:39:27 EST
From: PABigelow@aol.com
Subject: Re: [R-390] AC DC and tube filaments

I guess the R-392 would be a pertinent example of a completely DC operated tube communications receiver.

Date: Fri, 17 Dec 1999 14:59:49 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] AC DC and tube filaments

It is done. Especially in two applications:

1) In phonograph pickup and microphone pre-amplifier stages where the signal levels are at the millivolt level, and especially in moving coil cartidge preamps where the signals may well be in the nano-volt levels.

2) Where directly heated tubes are used in the power output stages, and especially in single ended designs. Some tubes such as the ancient type 45 and the 2A3 use 2.5 volt filaments. These are less prone to hum with AC power than similar tubes using 6 volt filaments.

Are there real advantages to using AC power to the filaments of a tube overDC?

Yes. Economy, simplicity of design, reliabiltiy are some reasons.

... Current lore seems to attribute the tubes to fear of EMP problems in military action. Another possible reason is that at the time the design was done, there were no solid state devices available that could match the gain, resistance to overload and cross modulation, and noise figure of the tube selected. In some Watkins Johnson receivers, the tube is a planar frame grid triode meant for UHF use.

Date: Fri, 17 Dec 1999 15:49:38 -0500
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] AC DC and tube filaments

The Harmon Kardon A-500 amp I have also uses DC for the filaments/heaters. Once once a very clean, quiet amp - needs recapping and some new 7355's. Can't imagine why DC wasn't used more than it was for communications receivers.

Date: Fri, 17 Dec 1999 15:07:48 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] AC DC and tube filaments

Getting tubes that would work on AC so they could be run from the power line instead of batteries was such an advance that no radio designer wanted to go backwards. Until fairly recent times (silicon and germanium), the low voltage rectifiers (selenium and copper oxide) were relatively inefficient and had a tendency to fail slowly gently lowering the load voltage. And large electrolytics were expensive or not available to get the DC truly clean.

> I had always thought that powering a tube with DC would be potentially quieter since the chance of coupling any AC signal into the circuit would not exist. There does not seem to be many that actually do this though. Even in the world of super hi-fi I don't think this is done where they can worry about too much oxygen in the copper wire to create noise. So why is it not done? Are there real advantages to using AC power to the filaments of a tube over DC?

Filaments and heaters react differently. DC on a filament means the grid/cathode bias is different at different ends of the filament (that's producing the electrons). This complicates linear operation of the tube. Low voltage AC on the filament averages the operating conditions better. A heater cathode tube shouldn't care whether the heater supply is AC or DC for bias, but there's always capacitance and leakage between the heater and the cathode. Sometimes it seemed like heater cathode leakage was the most predominant failure mode of tubes.

> Even further of contemplation is my RT-834/GRC106A which is a very nice.....

All reports indicate that solid state radios connected to antennas will be fried if there is ever an atmospheric nuclear explosion within several hundred miles because of the Electromagnetic pulse created by that explosion. The same reports indicate tubes will not be affected. I don't know if this report has taken the modern high dynamic range silicon semiconductor into account or is based on the far more fragile germanium RF transistors.

> The rig is entirely powered by 24 VDC but internally it has a very nice little module to turn that DC into 6.3 V AC for > the tube filaments. Any idea what may have been in the designers mind for this?

Getting 6.3 volts from 24 volts DC efficiently means creating AC so a transformer can be used. Then its more efficient and reliable (fewer parts) to apply the AC to the tube heaters than to add a rectifier, filter, and maybe regulator.

Date: Fri, 17 Dec 1999 16:25:58 -0500
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] AC DC and tube filaments

DC is wonderful for filaments but AC is the easiest and cheapest. We're talking tube-era equipment here, before the availability of efficient and inexpensive silicon rectifiers.

It would be *potentially* quieter but the question to ask is would it make any real improvement in your application? For example, if your hum level was already 60 dB down from some arbitrary reference level, would knocking it down another 20 dB (or whatever) make an audible difference for your application? Even after total elimination of filament hum you still have B+
ripple, residual circuit noise, and microphonics to deal with. There are other ways to reduce filament power hum. The most common technique to reduce hum is to float the AC filament power from ground and use twisted pair for the filament wiring in order to reduce its crosstalk into signal wiring, and to keep AC filament current from flowing through the chassis and hence the ground returns of the other circuitry. Then you ground the center-tap of the filament transformer winding, or provide an equivalent return by using a low value pot connected across the filament line with its wiper grounded which makes it a "hum balance control". I was initially surprised to find out that the R-39x radios did not use balanced filament power but there was probably no requirement for a super low hum level in a military communications receiver. Single-ended filament power wiring makes for a simpler cable harness, and automatically keeps all the filaments at a low impedance to ground which may also help the isolation between IF/RF stages. Also, most of the gain in the radio is performed at the RF/IF frequencies. By the time you get to the detector stage you have volts of audio available so low levels of filament hum are not an issue. I did meet one hifi guy who was very proud of his homebrew DC filament supply with a microvolt of ripple (claimed) that he built for his big 211 amp. However, I think it was more a labor of love than a necessity. Is it the RF or IF? I'm not familiar with that radio, but remote cut-off pentodes are hard to beat for low frequency AGC, which may have led to some of the hybrid tube/ss designs out there in radios of that time period.

Date: Fri, 17 Dec 1999 17:45:53 -0500
From: dave metz <metzd@cfw.com>
Subject: Re: [R-390] AC DC and R725's

Just remember that the R725 (alias R390A with a R390 non mechanical IF deck) uses another transformer to power the IF deck and they also rectify the filaments for the PTO and BFO. This configuration was used in DF work in a bank of at least a dozen receivers. Evidently, in extreme cases, there is a difference. 'Course that makes the case that the Signal Corp wizo's felt the
R390A's were awful and they needed a revision to the existing hardware. The mechanical filters created a phase change that would be a problem but

rectifying the filaments? Boy would that be an interesting story as to how the R725/TRD15 came into being.

Date: Fri, 17 Dec 1999 15:07:23 -0600
From: "Larry Shorthill" <r41656@email.sps.mot.com>
Subject: Re: [R-390] AC DC and tube filaments

I seem to remember from my distant past reading in a GE or RCA tube engineering note that AC was preferable to the life of the filament or heater over DC because of a thinning effect that would occur on one end of the tungsten wire under DC operation. This effect would not occur with low frequency AC. In fact, at the time I even thought of a DC filament power supply that would periodically at a very low frequency switch polarities applied to the filament pins -- a DPDT relay operating at about 1 switch over every few seconds would be about right. No ripple from AC, very tameable switchover glitching, and no loss of heater effect in the short time it takes for the relay to switchover. That was in my 7025 tube preamp designing days. Never did get around to implementing it. Is anyone else aware of such an engineering note?

Date: Fri, 17 Dec 1999 18:49:01 -0500
From: "Gary E. Kaufman" <gkaufman@bu.edu>
Subject: RE: [R-390] AC DC and tube filaments

Actually most hi-fi equipment (except for rather low end stuff) used DC on the preamp tubes, especially in the phono section. I just repaired a Fisher integrated amplifier which did this in a rather cute way - the output tubes are cathode biased. The 42 volts across the cathode resistor was used to provide DC for 4 12AX7's in series. It made for a really interesting (and dramatic) failure mode when one of the 12AX7's developed a heater-cathode short!

Date: Fri, 17 Dec 1999 20:02:18 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] AC DC and tube filaments

I'd think this DC filament erosion would be far greater with a filament than a heater because the filament temperature has to be so much higher without the oxide electron emitting surface.

And the time constant of this potential damage would be thousands of hours, so unless your amplifier was on continuously, reversing the polarity each time it was powered would more than be adequate. Probably some sort of hardware random polarity switch would do well. Perhaps something based on the polarity of the AC when the line switch closed. Or something that reversed the polarity every few hundred hours.

Date: Fri, 17 Dec 1999 19:38:32 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] AC DC and tube filaments

>I seem to remember from my distant past reading in a GE or RCA tube... AC better than DC..

Correct. If I remember right, rather than a general "thinning", it causes what looks like pits in the filament conductor. I don't remember if it was at the positive or negative end of the conductor. I've read it somewhere, but do not remember the source.

Date: Fri, 17 Dec 1999 21:58:58 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] AC DC and tube filaments

Always have been intrigued by the issue of AC vs. DC filament power. In the R-390* I can understand how running audio stage tube filaments on DC might make the audio quieter, assuming the B+ is up to snuff. If a set were aligned, peaked, supplied with strong tubes, connected to a good antenna, etc., and generally coaxed into giving its all sensitivity-wise, would smoothly regulated DC filament power in any of the other stages (RF, IF, et al.) improve the R-390*'s ability to dig signals out of the mud?

Date: Fri, 17 Dec 1999 23:33:28 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] AC DC and tube filaments

Thanks for a really nice answer. Hope you don't mind me sharing it with the r-390 group.

On Fri, 17 Dec 1999, Dr. Gerald N. Johnson, P.E. wrote:

> I kind of doubt DC would help much in sensitivity. It probably helped
> the DF receiver by regulating heaters more to control gain more closely.
> Maybe over time it reduced slight hum modulation as tubes aged. I don't
> think the difference could be detected with really good tubes, because
> low leakage from heater to cathode is a part of a really good tube.
>
> Then it might depend on how the dc was developed. If through rectifiers
> not properly bypassed and shielded, they might add more noise than the
> heater to cathode leakage coupled. Might be necessary to use batteries
> (primary or secondary) chosen for low noise at the tube load to improve
> on ordinary AC. We think of batteries being low noise but they are not
> NO noise. There can be noise from chemical action, things like gas

> bubbles on plates temporarily reducing the plate area and so causing
> noise modulation. This effect is probably ten times stronger than the
> effect of excess oxygen in speaker conductors, maybe 100 times
> stronger... But FAR below most antenna noise levels.
>
> 73, Jerry, K0CQ

Date: Sat, 18 Dec 1999 18:45:03 -0500
From: km1h@juno.com
Subject: Re: [R-390] AC DC and tube filaments

I raised the AC-DC issue a few weeks ago and pretty much got "told off" by a few experts. However others offered great insight. Been doing a lot of reading since and have this to offer:

Directly heated filaments should be run on AC if rated AC/DC for maximum life. Voltage is still critical and roughly - 2.5% of nominal rating (that is Minus 2.5%) gives the best life. Today this is a critical issue with amplifier tubes such as the 811A/572B series, 3-500Z/4-400A and similar. I would "assume" that boatanchor RX tubes have similar requirements. Remember that the voltage is RMS so many cheapo digital meters are way off. I use an old Simpson meter designed for the application and it has multiple scales in the 3 to 50V max range. At the risk of starting another ad-nauseum discussion I would say that a good Simpson 260, Tripplett 630 or similar meter will work good enough. I have an old HP-3400A true RMS meter with a 1999 cal sticker as a comparison reference but the old bakelite Simpson/Tripplett meters are a lot more portable. For critical audio applications DC does work best. This is no suprise since old references suggest battery power!

Indirectly heated tubes should always be run within +/- 5% of nominal. Overvoltage and undervoltage will both shorten operational life. Indirectly heated tubes may be run on DC with no measurable deterioation. In those applications, particularly audio and instrumentation , DC is the way to go when stability, low noise and repeatibility is important. Sources of info are RCA RX and TX tube manuals, GE, Amperex, Eimac, ITT, Penta Labs and several other references.

Date: Sun, 19 Dec 1999 11:30:30 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] B+ and tube filaments

The last capacitor in the power supply nearly always serves as the bypass capacitor for the audio section feeds and if there's too much impedance between it and the audio section you get interaction, usually seen as motorboating. Could easily happen at frequencies not heard by ear and then lead to unexplained distortion (or excess attention or refusal to enter the room by the family pets). May early transistor radios tried to cut corners by not bypassing the battery, but its well proven that as a dry cell ages, the impedance goes up, and a good electrolytic across the battery is a good way to get several times the battery life. With the shack full of storage batteries as the B+ source the leads could be long enough to supply motorboating impedance at 50 KHz or so.

Date: Sun, 19 Dec 1999 21:31:12 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] R-390A Filter caps......

I know the usual procedure to replace the filter caps in a '390A is to either rebuild the old cans with new "innards" (preferred method) or "hide" new type smaller caps under the chassis possibly leaving the cans in for "appearances" or possibly (scandelous) doing it ugly style above the audio chassis. I'm wondering if anybody has tried another possible alternative and if it works mechanically. That is, remove the cans and their sockets, mount Phenolic FP capacitor mounting plates in place of the socket and install New FP Capacitors. I know it would be fine electrically.... (Negative of all caps is at chassis potential aren't they, schematic is not at hand right now) Reason I ask is now that the SP-600 is basically functional, I should be getting another R-390A later this spring and I KNOW it will need filters, I put this particular set into "basic working order" for the guy which is all he wanted and now I'll be buying it. It will need a complete re-cap. If the FP cans would work I think I'd like to go that route as easier than stuffing them under the audio chassis and they should run "cooler".

Date: Sun, 19 Dec 1999 17:42:27 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390A Filter caps......

Here are some considerations on the options and a possible idea: When considering NOS FP cans the concern is shelf life. Even though they reform OK, there's a chance of failure, I suppose. (Opinions? Experiences?)

AES has some values of new manufacture FP's. They're assembled in Mexico. I bought one for an HQ-180, but one section will have to be subbed with a Sprague Atom under the chassis. As I recall, one can is a triple section 30 Mfd and the other is a dual 45 Mfd. They offer a triple 40 at 525 volts. Dunno if that's acceptable for at least the 30 Mfd, and possibly the 45. They cost $28.95 apiece. Ouch. Rule of thumb used to be you could replace with a value up to 50% higher, usually not advisable to go lower or not more than 10% lower. Of course, "thumbs" are known to get bashed with hammers. Ouch #2.

Any thoughts on using these values? Kind of pricey for NPNP (not plug 'n play). Can you trust NOS FP's? Anybody else have new manufacture FP cans?
If you can find an FP, another approach is to make up an adapter. The new FP I got was somewhat shorter than the old one, so there might be some room. You'd need the FP socket and a plug that would fit the cap sockets on the deck. It's been a while since I looked at them. Aren't they like octal sockets, only with 4 pins? Is it possible to adapt an octal socket for these by clipping extra pins? Of course, when you think about it, Chuck Rippel's $80 rebuild-for-the-pair seems like a pretty good deal, although they may be wait-listed. I hate the smell of that old potting compound. There was also the plugin relay housing approach of Jan Skirrow. But I think he ran out of them. (Are you out there Jan?) That was pretty neat, although I missed out. Finally, if an octal or other plug base can be adapted, the next idea is to use a length of aluminum tubing to make up the container. Is there a conduit of the right diameter? Maybe some existing throw away container. The only thing I can think of at the moment are those mini aerosols. Don't know how you'd open those safely. There's probably some kind of aluminum flotsam that we normally trash. Maybe even some kind of plumbing item would work. This is the point at which I usually migrate to the giant hardware store with a 6 inch ruler, measuring all sorts of things and making the guy watching me on the CCTV very edgy. (Excessive handling of mdse.)

Date: Sun, 19 Dec 1999 21:33:03 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] R-390A Filter caps......

Check the diameter and the mountings carefully. There's two sizes of octal socket holes and mounting hole spacings, and three or four sizes of FP capacitors and mounting plates. Get the mounting plates first or check the holes and check the mounting plates first. Such things USED to be dimensioned in the Sprague catalogs.

FWIW, I bought one of AES's 3X40 at 525WVDC and before installing it in my 75A4, I thought I'd better check its forming and see what leakage current it
has. The bottom line is that it's OK.

I started it out at 30 volts or so and ratcheted it up to 500 volts over a couple of minute period. The initial leakage current at each voltage step started out at a couple of mils then settled down quickly to under 50 microamps. This for all three sections. So at least mine is a good cap. This particular one is the Aero-M FP type mfg. in Mexico in 7-99. $28.95 isn't cheap, but I saw the same cap advertised by a noted plains state surplus dealer for about $37. Hmmm, maybe import duties are more expensive out there in Native American territory.   Tom, W4PG

Date: Mon, 20 Dec 1999 07:31:11 -0600
From: "Jerry G. Kincade" <w5kp@swbell.net>
Subject: Re: [R-390] R-390A Filter caps......

Barry, I was able to find metal octal bases at my local surplus emporium, but never found a suitable "can" to fit them. Tried antenna tubing, plastic pipe/conduit, etc. etc. Still looking. I was the lucky guy who (I think) got the last couple of Jan Skirrow replacements, they look and work great in my '67 EAC, but still don't look "stock", which doesn't keep me awake nights. I opened, recapped and repotted the main triple filter in one of my SP-600's, wasn't that hard and worked fine, but took considerable time. I'd be surprised if Chuck is making much, if anything, on doing these, considering the time factor. Hardest part for me was cutting it open without messing up the very thin, soft aluminum crimped base. These things are about the same metal thickness as a beer can. I used fast-set epoxy potting compound instead of the removeable soft stuff, so if this one ever quits, it's a throwaway for sure!

Date: Mon, 20 Dec 1999 10:28:31 -0500
From: "Gary E. Kaufman" <gkaufman@bu.edu>
Subject: RE: [R-390] R-390A Filter caps......

If you go to all of the trouble of swapping the sockets, consider the LCR line of caps. They are primarily intended for the guitar market, but are a very good quality cap, and quite inexpensive. It is a dual capacitor in a blue jacket, which is intended for clamp mounting. While I haven't tried, it looks like it will mount to the socket holes without modification. The 50/50uf@500v part is all of $9 including the clamp. They make an assortment of values including 32/32uf, 50/50uf and 100/100uf.

http://www.angela.com/catalog/capacitors/LCR.html

Date: Mon, 20 Dec 1999 10:43:35 -0600
From: "A. B. Bonds" <ab@vuse.vanderbilt.edu>
Subject: RE: [R-390] R-390A Filter caps......

"Rebuilding" the old caps that come on the 390A is not that hard, save one detail.

The crimp is easily undone with a small screwdriver and needlenose pliers. The metal is quite soft and is bedded onto a rubber sealing gasket. The assembly pops out pretty readily--no potting compound to mess with. The big HOWEVER is that the internal conductors are aluminum and are crimped into the pins on the base. Only a modest idea how to make a new connect. I yank the existing conductors out and redrill the aluminum sleeves large enough to take the lead from the new capacitor. Slip it in and recrimp. Solder definitely doesn't work. I worry a bit about the crimp, but the new caps are sealed and all, so perhaps corrosion will not be a problem. The case then slips back on and is easily crimped back.

Any other suggestions? How do the pros do it?
(Incidentally, that's why I love my 390. All the filters are bathtubs....)

Date: Mon, 20 Dec 1999 14:30:11 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] R-390A Filter caps......

> I yank the existing conductors out and redrill the aluminum ....

I've remounted new capacitors in the existing cans by drilling the hole in a similar fashion, and then screwing a brass screw in the hole. Then I cut off the top of the brass screw, wrap the conductor around the screw stub, and solder the conductor to the brass. You can see an example at:
http://www.knology.net/~wewilson/images/FilterCap_2x47.jpg

Date: Mon, 20 Dec 1999 21:41:01 -0500
From: John <jbharvie@erols.com>
Subject: Re: [R-390] R-390A Filter caps......

Had to jump in on this one for pictures of how one 390er did the capacitor routine see http://members.delphi.com/jbharvie/index.html The capacitor plug pins are brass, from the drill the center with a small blind hole, counter sink, insert tinned bus wire, solder, make loop at the end. Works great!! (excuse the advertisements)

Date: Sun, 2 Jan 2000 15:48:43 -0500
From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] ATTN: BA Owners! You might want to archive this

If you have had an R390A receiver restored by me, you already have "option 3" at the bottom of this note already installed. For those who may have other vintage equipment in use or have an R390A which has not yet had a 3 wire cord properly retrofitted, take heed. I found this yesterday and discovered I had a hot chassis on my 32V-3 for about 4 months ! In a R390A, the fused side of the input network (under the removable rear cover) is the terminal on the far right. However, I have found some have been swapped around by careless and unknowing individuals and yes, even "professional restorers." Read this and adapt it to your R390A by removing the 3A power fuse and using a common ohm meter, determine which of the terminals on the rear power input filter is wired to the receivers 3A fuse block. That will be the terminal which should be connected to the side of the AC plug which inserts into the "hot" side of your wall receptacle as explained below.

- -----

In troubleshooting my 32V-3, a condition occurred which bears repeating as a warning to other owners of Vintage Equipment. However, I am not an electrician so check your local situation andcodes before proceeding at your own risk. My 32V-3 was blowing HV power fuses due to an internal short. In the circuit, there is a 115V lamp HV indicator lamp across the primary of the HV transformer and its outside case was just touching a near sub-chassis. When the A/C line was plugged in one way, A/C was on the outer lamp socket case. The station was protected from a potential deadly hot chassis condition and/or fire by the station ground. The 120VAC simply went to station ground and took the fuse. With the plug reversed in wall socket, the neutral side of line was on the lamp socket thus, no A/C short occurred.

It was an easy fix to a potentially dangerous situation.

Like a lot of vintage equipment, a "stock" 32V-3 has a non-polarized, 2 wire A/C line plug. It has a pair of fuses on only one side of the A/C line. A 3A protects the LV transformer and the circuits it serves and a 5A protects the HV transformer and its circuits. In looking at the "V-3" print, I noted that a condition could easily exist where the radio would not be protected by any fusing at all! One side of the A/C input is found on terminal 21 (actually, a feed-thru capacitor) on the rear panel or the transmitter. The other side of terminal #21 is connected to the 3 and 5A fuses and from there, to the transformers. The return to the wall plug is through terminal #22. If a failure condition in the 32V-3 causes a short across actual A/C line, the fuse(s) will open and protect the equipment as normal. Were a fault to occur, such as a transformer failure where the primary shorts to the equipment chassis, causing the A/C to be returned VIA the station ground, it is possible that the transmitters power fuse(s) would not open. The only overload "protection" would be VIA the circuit breaker in the panel. A good bit of damage may occur before a 20A breaker would open v/s a 3A fuse! Whether your equipment were protected by its fuse would depend on which way the plug were inserted into the wall outlet. When looking at a 2 or 3 wire A/C outlet wired under the current code, the narrower of the vertical sockets in the receptacle is the hot side of the A/C line. Referring to the 32V-3 print, note that as long as its A/C plug was inserted such that rear terminal 21 were connected to the hot side of the A/C line, the equipment fuses would open in the event of a failure to chassis ground. If the A/C plug was reversed such that terminal 21 were connected to neutral, the fuses may not fail and any protection would then be provided by the circuit breaker in your main panel. The current path would be through terminal #22 (unfused in the 32V-3) through the short to return through station ground. It is possible that this condition can also happen in other equipment (regardless of make/model) which has only one side of the A/C line fused and is equipped with a 2 wire, non-polarized A/Cplug. There are 3 "fixes" which come to mind. Two are simple and one, not quite so simple. All involve identifying the hot side the A/C line and making sure that when the equipment is plugged in, the hot side of the A/C line feeds it through the equipments internal fuse(s). Since the original line cord was in good shape and I wanted to keep my 32V-3 "stock," here is the fix which I applied to my radio: Remember that the 32V-3 power cord is completely removable where it enters the rear chassis. If your power cord is not easily removed, there are steps in the procedure below to accommodate that design.

A- Identify the fused rear panel input terminal by removing the power fuse and using an ohm meter, see which terminal the fuse block is connected to. Mark that terminal and go to step "B," below.

- - If the A/C line cord on the piece of equipment you are checking is not removable, use the procedure above but note and mark the blade of the A/C wall plug which you determine is connected to the fuse. Proceed to step "C."

B- Using some red paint, mark one of the two blades of the actual power plug with a red band, up near where the blade actually enters the moulded plastic plug. This does area not tend to contact anything in the receptacle and should not wear off while also staying out of sight when the equipment is plugged in. Again, using the ohm meter, identify which wire at the radio end is connected to the blade you marked. Connect that wire to the terminal you previously identified as the one which is fused.

C- The A/C plug should be inserted into the wall such that the red banded end is in the hot (narrower) receptacle slot. This way, the hot side of the line must go through the power fuse.

The second fix deviates from "stock" and involves adding additional protection VIA the installation of a 3 wire cord to accommodate a grounded power plug. The procedure is the same as above save for connecting the ground wire in the new cord to the radio chassis. Computer cords, found for around $1 at hamfests work wonderfully for this purpose. Just cut off and strip the end which would normally insert into the computer.

The third option is to add a second fuse or set of fuses within the equipment to the "as stock," unfused side of the A/C line in conjunction with the 3-wire cord installation above. As this involves possibly drilling or punching out the chassis to fit a fuse socket(s), some prior thought should be given this option. Depending on the situation, the installer would most likely want to replicate the electrical "position" of the new fuse(s) with that of the existing fuse. That is, most likely the fuse should be located before the primary of the transformer. Just install the new, additional fuse on the now unfused side of the A/C line.

Again, research your situation and check your local building codes before proceeding at your own risk. If there is the slightest question, consider hiring a licensed electrician to help.
- --------------------------------------
Chuck Rippel - WA4HHG

Date: Sun, 02 Jan 2000 15:51:07 -0600
From: Tom Norris <badger@telalink.net>
Subject: [R-390] Re: Chuck's safety hints, my comments and additions.

[This is in response to Chuck Rippel's comments posted earlier regarding a safety hazard he discovered with his Collins 32V3. The radio did not have a polarized AC cord, and a potentially deadly situation could have occurred. The suggested solutions were to make sure the high/hot side of the AC line is the side that is fused, and the the equipment is GROUNDED. I did not quote his post, though I should have. Those of you on the BA and R-390 lists should have read it anyway. :-) Those who did not should contact him at crippel@erols.com if you if you need the earlier posting.]

Always check your input fusing. I work in an Air Force PMEL (Cal Lab) and doctrine REQUIRES this to be done on each piece of test gear EVERY time it comes into the lab. Any gear with an AC cord and a fuse must be checked regardless of how many times it has been in and checked before. Overkill, but I suppose the AF figured us and the user should best be safe than sorry. If a piece of gear comes in and does not pass the test, it must be modified so the fuse is in the high side of the AC line. What is amazing is that many pieces of multi K$ gear come in NEW for acceptance testing and are found to be neutral fused! (I am not counting items that are switchable from 115-220 that may have both AC lines fused) Most of this stuff is high precision test equipment for jet and rocket engine performance tests, not just a toaster over, so one would figure the manufacturor would know better but not always.

A BA related note : MOST all the Wavetek signal and function generators we have had had to be modified so the high side would be fused, so be on the lookout if you pick up any surplus or used Wavetek test gear for your test bench. The same failures that can happen to your radio gear can also happen to your test gear. Just think if the internal short that Chuck uses as an example had happened to your signal generator. The moment your grabbed that BNC connector and hooked to the generator you might get thrown across the room or at least bitten by the AC, but if not, the moment the BNC cable with its shell at 115 volts contacted the grounded piece of radio gear BLAMMO!* ALWAYS check ALL your AC powered gear for proper grounding and fusing.

Radios such as the R-390/390A/389/391 should always be grounded because of the AC input filter has caps on each line to ground, and can give you a good
jolt if touching an ungrounded radio and a grounded cable for example. The
little AN/GRR-5 set is even worse -- it does not have the input filter the R-390 has but it does have a .1MFD cap to ground on each leg of the line. It WILL bite if not grounded. Not a bad idea to make sure all your radios are grounded.

Sets such as the S-38 and SW-54 and other transformerless AC powered sets
should always be equipped with a polarized plug as well. Mine are modified to have the chassis connected directly to neutral and the hot switched through the power switch so that *at no time* is the chassis ever at hot potential.** It ain't stock, but it a bit safer than a non-polarized "crap shoot" plug. And don't even get me started on those death-wish double-fused-non-polarized cords that some gear uses... heehee.

Thanks again for the reminder Chuck, one can NEVER spend too much time on ensuring ones equipment is safe to use. Tom KA4RKT

*Official Technical Term

** This is assuming the house wiring is actually correct. <snip>

Date: Wed, 12 Jan 2000 12:46:03 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Line voltage monitor on the cheap

MOV's won't affect that inrush current peak. It comes from the core being saturated solidly and remembering it was saturated when it was turned off. The inrush would be limited by turning the variac down before turning the power to the radio off. Bringing it up slowly then won't matter because by turning the variac down the core will be essentially demagnetized. A series negative temperature coefficient thermistor would make for a soft start, something from a transformer operated TV maybe though you might need several in parallel to carry the current for a Viking 500. These would be large diameter disk types.

Date: Wed, 12 Jan 2000 14:42:06 -0600
From: "John P. Watkins" <jwatkin9@idt.net>

Subject: Re: [R-390] Line voltage monitor on the cheap

Hi All, I went ahead and got some inrush limiters after reading about them on Jan Skirrow's website. Lots of good info there on the limiters and I believe MOVs. It takes about 8 sec's for the voltage to really get to the 115 volt point on my R-390A with it in. I also put three MOVs across the hot, neutral and Green ground. I am not sure if tubes need them, but I don't want my xformer going south. John WD5ENU

Date: Wed, 12 Jan 2000 21:40:29 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: Re: [R-390] Line voltage monitor on the cheap

I would think twice about doing that, for two reasons.

1. Most modern tv's are never "turned off", the power supply from the 110vac mains is always on and the set is frequently switched by turning a pass transistor or relay off/on.

2. The "degaussing" circuit relies on a heavy turn on surge to degauss the picture tube, the current through the degauss coil slowly decreasing to zero. In fact, you are probably hearing either the "degauss coil" or the High Voltage charging up the capacitance of the picture tube.

3. To do this will probably void the warrenty on your expensive Sony TV.

I work in a tv shop, I do the audio repairs but occasionally get my fingers in one of the one eyed monsters.

Date: Wed, 12 Jan 2000 15:13:26 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Line voltage monitor on the cheap

A consideration based on picky-ness:

MOV's degrade after each spike they encounter, reducing them to a short, with the resulting possibility of causing a fire.

Should we be putting a fuse in line with them? Maybe an indicating fuse to show that there is no longer any protection from spikes.

Date: Wed, 12 Jan 2000 20:41:59 -0600
From: "John P. Watkins" <jwatkin9@idt.net>
Subject: Re: [R-390] Line voltage monitor on the cheap

Hi Joe, I installed the MOVs after the fuse. If they short (Normal failure mode after firing) they will also take out the fuse. That should be noticeable enough I think. Someone else said to only install one MOV from the hot side to ground. That's not how they normally do it in any of the quality surge suppressers and also in the Triplett catalog. They have all three legs MOVed, hot to neutral, hot to ground and neutral to ground. That supposes that you have a proper system to start with. John WD5ENU

Date: Wed, 12 Jan 2000 22:42:40
From: Glenn Little <glittle@awod.com>
Subject: Re: [R-390] Line voltage monitor on the cheap

As I remember from a UL document, MOVs require a way to disconnect them from the line to prevent fires. The failure mode of a MOV is definitely a short, hopefully followed a short time later by an open as they explode from the destruction of the device. The company that I work for makes remote site monitoring equipment. One of the things that we can monitor is tower lights. The lights are connected to the monitor circuit through a surge suppressor made of SADs and MOVs. When the antenna (the tower light wiring) receives enough energy from a close lightning strike, I can tell you first hand that there is not a whole lot left of the MOVs and SADs.

To address the indicating fuse holder. THere are two issues here. The MOV should suppress the energy and short. The fuse should blow, placing the indicator in series with the damaged MOV. The light will now probably **explode** from the surge. Issue two is the **shock hazard** presented by the indicating fuse holder. With the fuse blown or missing the supply voltage is available through the indicator. This provides a shock hazard as well as a phantom path to power up the circuit. While in the US Navy, there were field changes to remove all indicating fuse holders from our electronic equipment due to the shock hazard.

Indicating fuse holders come in at least three colors. Clear is a neon lamp for voltages above 90 volts to some upper safe limit. Red is for 5 volts and has an incandesant lamp. Yellow is for 24-32 volts and also has an incandesant lamp.

Date: Thu, 13 Jan 2000 09:33:32 -0500
From: Glenn Little <glittle@awod.com>
Subject: Re: [R-390] Line voltage monitor on the cheap

See comments below on how LEDs work on the suppressors. On at least one consumer suppresor, the suppressor is fused to disconnect the MOVs from the line when the MOVs fail. On the MOV side of the fuse is an LED that is accross the AC line with its rectification and current limiting resistor. This LED indicates that the surge suppressor is good. Actually that the fuse is still intact. When the fuse opens removing the MOVs from the line, the LED goes out. This indicates that there is no protection.

The ground indicator is controlled by a transistor. All the MOVs come back to a common connection that is tied to the ground terminal. The base of a transistor is also tied to this point. If the ground connection is good, the transistor is biased off with the LED across the collector/emitter. This allows current to flow through the ground OK indicator LED. If, however, the ground connection is not there the transistor is biased on, shorting the LED. And there is no light with no current.

Date: Thu, 13 Jan 2000 09:51:32 -0600
From: "John P. Watkins" <jwatkin9@idt.net>
Subject: Re: [R-390] Line voltage monitor on the cheap

Hi All, From my understanding of the way that the MOV works, the short (failure mode after clipping spike of over voltage) is supposed to blow the fuse or the breaker and remove the power. The MOV is then replaced and the circuit put back into service. Acts like the old crowbar circuit with an SCR to blow the fuse on the supply. The indicator lights are a bit of fluff except possibly the ground indicator. That one is important if hooked up properly. I have an inexpensive Ground Fault/Neutral/Hot indicator plug that I use to check my duplex sockets. I was amazed at what I found the first time around the house (now corrected of course). As I mentioned, I am not really sure if I need the MOVs on the R-390A, but I sure do like the ICLs. John WD5ENU

Date: Thu, 13 Jan 2000 17:46:42 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Line voltage monitor on the cheap

With all this discussion of wiring MOV's, why not do what I do -- use a reasonably high quality 3-MOV surge suppressor power strip? You can run a few rx's off of one. They usually come with a "suppression" LED as well as a circuit breaker. Some have filtering -- usually just a ceramic cap. I also use these in combination with a variac. Variac goes into the "mains". Outlet strip goes into the variac. Another touch -- RS sells an "AC Line Voltage Monitor" -- I think the cat. number is 22-104 and in fact they may be on sale now for 2 bucks of -- $7-8. They plug in like a wall wart and have "bandspread" scale of 96-130 volts. I plug 'em into the outlet strip to set the the variac and keep an eye on things. The target voltage (115) is just a bit to the right of the center of the scale, so it makes it easy to eyeball -- like a dashboard gauge. Of course, it makes sense to check these against a known good multimeter.

Date: Thu, 13 Jan 2000 22:17:28 -0500

From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] re: Filter Caps

This is absolutely right ! Those 67 General Insturment filter caps are nearly 100% bad. They are the single reason I learned how to rebuild all the R390A filter caps.

> Of all the items produced by General Instruments, the worst thing.............

Date: Fri, 14 Jan 2000 13:42:50 -0500
From: "Ed Tanton" <n4xy@att.net>
Subject: RE: [R-390] Power supply resistors and other changes

The thing to do Roger, when changing from either Selenium or tube rectifiers, to SS diodes, is to measure the DC output voltage and current WITH THE TUBE/SELENIUM IN PLACE. Then it becomes a matter of returning the voltage to that value. Since you can measure the NEW voltage also, all you have to do then is use the previously measured current along with Ohms Law to calculate the necessary resistor. You also will be able to calculate the power requirement for it. Sure saves a LOT of guessing. Sometimes it isn't an EXACT thing: when I removed the 1/2 wave selenium rectifier in a B&W 380-B T/R SW, it took several (3) tries-but at least I had a good starting point, and wound up within 2 or 3 volts (over... I had a choice-as I recall-of either 10V under or 3 volts over, using standard values.) Good enough for me.

I personally leave all my tube rectifiers in place-except for seleniums. THEY ought to be changed due to their potential for poisonous gas emissions (selenium disulfide?) upon failure. (And whether it's REALLY a DANGER or not: what a stink!)

Date: Fri, 14 Jan 2000 13:52:39 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Power supply resistors and other changes

I think the normal value for one common resistor is 200 ohms. Spreading the heat amongst four resistors will only make them run colder if the surface area of the accumulation is larger than that of the single resistor you'd otherwise use.

> Considering the change in B+ from tubers to diodes, how far is the grid bias
> being pushed off the expected operating value on each tube? Then what is
> this doing to the receivers sensitivity?

If anything greater voltage and a slightly greater plate current should make the tube gains a little greater. So the receiver should be a hair more sensitive though it may be a couple hairs more noisy.

> I have my BFO and PTO wired to 6.3 volt filament from the 6AK6 on the
> end of the IF deck. Is this extra current draw over loading that 6.3
> transformer winding and giving me low filament voltage.

Probably will lower the 6.3 slightly. If you are running 120 or higher line volts its still well above 6.3.

> Last week some one suggested that a 12 or 15 volt 9 pin tube with a 0.3 amp filament current could be uses as a ballast tube. I like that idea. Then at least I would have a load back on the 24 volt winding and maybe less radiated hum from those wires in the chassis that are now just laying there with unused power on then. Why is not that a 60Hz transmitter and antenna system under my If deck?

It is an 60 Hz antenna, but with a length of 1/5,000,000 wave fed by a low impedance its a really BAD antenna. There's more 60 Hz effect from the magnetic field when the wire is loaded.

> There is a lot of talk about rebuilding caps. Did I luck into locating some replacement plug in caps for my R390/a? In the audio deck I have a 3 section one and a 2 section one. I think the 2 part one was 45uf at 350v. I found a 56uf at 400v same size can. I found a part 20uf 400v for the 30uf 350v can. Hay after moding the ballast tube, doing diode modes, swapping the antenna wires to work around the twin ax connector, and now looking for a good SSB detector mod, who am I to hold out for exact looks.

Old electrolytics are always old electrolytics and never as good, though lovingly reformed, as new caps.

> Does anyone make a 9 pin plug that would serve as a tube base. Then we could use those to build up mods that just plug in. Will I need to do my own PC boards? Little round circles with a set of holes that match the tube pin pattern.

Vector Electronics used to make miniature tube based plugs. I don't know if they still do. You can make one from a miniature tube socket. Stick #18 wire into the sockets and solder it into place. Copperweld wire is best but copper works.

Date: Fri, 14 Jan 2000 19:55:20 EST
From: DCrespy@aol.com
Subject: [R-390] Power supply resistors and other changes

>What value resistor should I be adding to get the B+ back in line?

NONE (a lot of people will not agree with me..)! The government modified A LOT of these with no ballast resistor. They even have a plug in solid state replacement for the 26Z5's, used without a dropping resistor (I have two radios with these, right off the pallet). You will hear about a Navy technician exchange newsletter mod (quasi official) to add a resistor in the AF deck, and you'll hear about a 200 ohm resistor. The 200 ohm resistor is a carry over from the octal rectifier (bigger voltage drop than the 26Z5's) days. Chuck Rippel's web site has the DATA: I have confirmed his numbers, you don't need it.. Check it out :
http://www.avslvb.com/R390A/index.html

>I have my BFO and PTO wired to 6.3 volt filament from the 6AK6 on the end of >the IF deck. Is this extra current draw over loading that 6.3 transformer >winding and giving me low filament voltage. Last week some one suggested >that a 12 or 15 volt 9 pin tube with a 0.3 amp filament current could be uses as a >ballast tube. I like that Idea.

I do too! In fact, I plan to wire all of my IF decks (3) to accept the 12BH7 as well as a 3TF7. However, you have UNloaded (total load) the transformer with your mod. because you no longer have to heat up the ballast!

Date: Fri, 14 Jan 2000 22:21:46 EST
From: DCrespy@aol.com
Subject: [R-390] Power supply resistors and other changes

I sent you to Chuck's web site for data on the voltage increase for solid state diodes. only to discover (when I went there to see the StJC photos) that the data was not there. Scrambling for credibility.... ;-) in my own notes, I found my printed copy of Chuck's post to the list from 12 November 1998:

>At 120VAC in: Voltage at Plate of V-502: 212 VDC before/ 223 VDC after

That's only 11 volts or about 5%. In my experience, by way of comparison, octal base tube rectifiers (5U4, 5R4, 5Y3) usually give increases on the order of 15% or 30 to 35 volts on 250 volts.

Date: Fri, 14 Jan 2000 21:41:45 -0600
From: "Joel Myers" <joelmy@worldnet.att.net>
Subject: Re: [R-390] Solid State Power supply in(non A) R-390

The filaments opened in my 26Z5W tubes in my R-390/URR . After pricing new 26Z5W tubes the thought of solid stating the power supply ala the method used in the R-390A/URR seems very appealing to me. Has any one done this to the" non A "? It looks plausible but I have not read about any one doing it to a "non A". Any comments on pitfalls or reasons pro or con the the conversion are welcome.

Date: Fri, 14 Jan 2000 21:52:49 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Metal Film Resistors

I wouldn't consider a switching regulator in a receiver unless I could stuff it into a box welded shut with double walls and very good feed through capacitors. But I have had some 78xx series regulators oscillate when the leads on the input were not bypassed AT the regulator. To that end, I hand a 0.1 monolithic between the input and ground leads between the PC board and the IC package. Shorter than short leads! Then I generally don't have them oscillate. 20 to 35 MHz of tantalum across the output does help sometimes.

Date: Mon, 17 Jan 2000 09:39 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: [R-390] Solid State Power supply in(non A) R-390

A 26Z5 is a 26Z5, A solid state replacement is OK in the R390's. I ask last week about the change in voltage this caused. Consensus is its 11 volts for the 26Z5's (<3.6% change). I ask about finding a 9 pin connector so I could build the mod up as a plug in. One of the fellows told me to get a 9 pin tube socket and some #18 wire for pins. Chop the metal frame off the socket. Sand the plastic down round so it will fit into the existing tube socket. Use wire to make up a set of pins and solder those into the new connector. Add the diodes as needed for 26Z5's I have some plastic pipe I am going to use as a form over the diodes to make up the "bottle".

One pro reason is the cost of 26Z5's.
One pro reason is the reduced filament load for the 26Z5's
One pro reason is the less tubes to test on every PM
One pro reason is the less heat under the chassis

Date: Tue, 18 Jan 2000 20:27:08 -0500
From: "Mike Taylor" <mtaylor@freeway.net>
Subject: [R-390] GFI Problems

I am sure this has been covered before but I can't find it. Recently moved the radios to a new location and all three of the 390 A's and non A flip the GFI off when brought on line. These were all rebuilt by Rick Mish and I have had no other problems. If plugged into a non GFI line all goes well.

What do you think. I think this was discussed once before. If anyone has some thoughts you can let me know off list if you wish.   Mike Taylor

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Date: Wed, 19 Jan 2000 11:59:32 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] GFI Problems

Below is my reply to Mike including some facts, and following that is my OPINION on each of the suggested solutions.

>The bottom line is this: the line filter of the R-390 series of radios
>contains capacitors from both line and neutral to ground which are large
>enough to pass ac currents higher than the trip limit of GFI devices. The
>radio is not at fault. The capacitors are NOT "leaking". The GFI things
>are operating properly.

>The answer is:
> 1) remove the line filter.
> 2) run your radios on a circuit that is NOT protected by a GFI device
> 3) run your radio on an isolation transformer.

Opinions on the suggested "answers"

1) Removing the filter will allow signals from transmitters, line noise, and local broadcast station signals into the radio. This is not likely to cause much trouble. The filters original purpose was to prevent both external signals from entering the radio and to prevent signals form the radio from getting out.   IF you replace the existing line filter with a suitable IEC filtered line cord connector there will very likely be no trouble of any kind, including tripping of GFI devices. The original condition of the radio will be violated. Your radio will be safer and will work just the same as otherwise. This is a reasonable solution, provided you do a GOOD job of installing the new line cord connector. Purists can save the original line filter for retrofit by a later owner.

2) Run on a non-GFI-protected circuit. Assuming that the ground circuits to the outlets are sound and work right, it should lead to no problems. To do this, you may have to circumvent electrical installations in your home/shop/garage. This may violate electrical codes in your area. I cannot pass along any generalities about electrical codes except that they vary with the location, and the age of the home.

3) Isolation transformer. This is a reasonable approach, providing that you don't also run other equipment on the same transformer that leads to trouble. For instance, AC/DC radios that actually have the chassis connected to one side of the line, or have leaky or shorted bypass

capacitors in them, can led to very dangerous situations.

4) (new) Remove the bypass caps from the line filter.. This is not a good idea. The line filter is a sealed unit and is potted according to some reports. I have never taken one apart, but I assume you would have to unsolder the case, unpot teh innards, and rewire the thing, then reassemble it all. Failed caps inside there HAVE occurred. We are better off making a plate to replace the original filter and fitting a properly grounded, filtered IEC line cord connector.

5) (new) Remove the line filter and install a three-wire line cord with do-it-yourself rf bypass caps. If you do this, arrange your bypass caps as follows: one cap from line to neutral (from white to black in American color-coded cords) and one from neutral (white) to chassis. Use caps rated for bypass use. These are available from suppliers new. You know you are getting caps rated for such service if you read the catalog carefully and pay about $5 to $8 EACH for them. Caps that cost 60 cents are not it, despite any high voltage rating you may pick. <snip>

Date: Wed, 19 Jan 2000 17:24 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: [R-390] Power supplies and 9 pin socket adapters.

I was forwarded a posting from Jim, N2EIY about the non-A 390 power supply not containing a reply address for Joel, N0GHY. Although I haven't run into a problem obtaining rectifier tubes for the R-390, I have a workable suggestion. Each tube can be non-surgically replaced with a silicon diode quite easily. I would use a 1Kv @ 1A diode or better for each tube. 9 pin plugs with covers can be gotten from RF Parts for $1.45 ea, 6 lot and up for 0.95 ea. (catalog 99-5A Pg. 43) No surge limiting resistors are needed, these are already in the power supply. BTW, RFP has a minimum order of $25 so you may want to call a friend who needs something and pad the order.

Date: Tue, 15 Feb 2000 11:20:44 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] 3 Fuseholders for R-390

A very good idea. I've had some interesting meltdowns in the old single fuse Collins in the past. ;-)

>My questions are listed below. (I'm full of em). My last '56 Motorola had all three fuseholders, apparently done at the factory.

There was a production change. I don't have the SN break handy. It's in the *-35 and the Navy manuals but not in the 1956 manual. Hmmm, I think that it is in one of the changes for the 1956 manual though. They describe the wiring changes made to incorporate the two extra fuse holders.

>1.Is this a difficult mod to do since obviously the wiring harness
>probably does not have the required wires already installed.

I'm planning to add the two B+ fuses to the Collins if I ever finish the refurb. ;-(I'll probably just install a couple of chassis mount fuse holders inside the radio. Odds are that if a fuse blows, you'll be pulling the covers off of the radio anyway. I don't have a D punch, either.

>2. Does anybody know what "mod number" the 3 fuse holders was, and possibly know which manual (either Army or Navy) describes the mod in enough detail that I can do as close to a "correct" job as possible ?

It was listed as a production change. I don't think I've ever seen an actual MWO for it. I have seen some that were probably done at the depot level. Neat job with labels and even the spare fuse clips.

Date: Tue, 15 Feb 2000 11:25 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: [R-390] More 3 Fuseholders for R-390

From 68-75 I worked on a lot of the R390/As that only had one fuse. We had no field change to upgrade the older receivers. We just left them as they were. We were doing a good semi every six months on them and were not expecting them to go up in smoke while in use. We had bad power in Nam and Korea. Those extra fuses were just one more to change out after a power surge. The lights would blink and we would go to the parts room and grab a box of each fuse size. Then we would go walk the bays. We would just write one 2404 against the site. Power outage, replaced fuses. We had to list the size and quantity to get the stock replenished. We were not going to install and new problems.

Date: Tue, 29 Feb 2000 07:23:05 -0600
From: pbigelow@us.ibm.com
Subject: [R-390] Solid State rectifiers

My EAC, when purchased, contained 9-pin plug in solid state rectifiers. I notice that on pin 3 of V801 the voltage measures about 265 volts rather than 240. My line voltage is about 119 volts. Consequently, I'm reading about 20-25 volts higher on the plates of various tubes in the switched B+ line. Other than shorted tube life and shorts, would there be an adverse effect on performance?

Date: Tue, 29 Feb 2000 08:55:42 +0600

From: "Ben Hall" <kd5byb@wt.net>
Subject: Re: [R-390] Solid State rectifiers

While I'm no expert on R-390A's, I'm fairly well versed in the design of military and spaceflight electronics, so I'll toss in my few cents:

For military and spaceflight, you design your equipment so that the primary power supply voltage can fluctuate a certain amount without causing problems in the operation of the equipment. My recently delivered treadmill for flight in the space station (Russian Service Module, actually) runs off of 28 volts, yet is certified to operate at a range of 24 to 32 volts. Military equipment is the same way - there is a certain amount of line voltage variation that the R-390A's were designed to meet. 265 volts is 10.4% high. If the primary line voltage were to be 10% high (assuming 110 vac is nominal,), I'd expect to see about 264 volts on the B+ line assuming the line to B+ transfer function is linear. So, design-wise, I'd bet it is okay. 10% isn't a lot of variation.

I've read a lot of stories of the military replacing 26Z5 with silicon without dropping resistors, so it must have been acceptable practice. However! What would I do (and have done)? I like having the 26Z5's in there - these sets are old, their caps and wiring insulation may be degraded, etc... So, it may be best for the set to install tube rectifiers or dropping resistors to get that B+ back down.

Date: Tue, 29 Feb 2000 10:12:19 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Solid State rectifiers

There shouldn't be any adverse effect on performance, but component life will suffer. Best thing to do is to put in a voltage dropping resistor (220 Ohm wirewound @ 10W??) to get the B+ back down. There may be something on it at Al's FAQ page.

The plug-in caps are rated for the higher voltages, but since they are old they're at risk of sudden failure with messy results. Tubes also don't like to have B+ thrust on them before their filaments warm up first. With solid-state rectifiers it comes up instantaneously.

Consider going back to tube rectifiers if your budget can handle it. They cost anywhere from $6.00 each on up to $10.00. Get them while you can.

A Variac is a nice accessory also. It allows you to gradually warm up the set and to regulate line voltage to the radio. I crank mine up to about ninety volts and wait for the audio, then move it up to 110 volts. Only takes twenty or so seconds. The R-390* is rated at 115 volts nominal, but

works fine on 110. Don't go lower as the tubes actually suffer over time as a result.

Date: Tue, 29 Feb 2000 08:22 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: Re[2]: [R-390] Solid State rectifiers

Back in the last century when R390 were designed, the engineers knew sand state was coming and provided a feature on the R390's to adapt to the coming change. This is the stand by switch. Back in the old days after a power failure the first step was a rush to flip every power switch off. Once power was back on every R390 was turned on in two steps. Stand by-(pause)-AGC. We were taught in school to use that stand by position. It is there to be used. It does just what we need it lets us warm up the filament before we apply B+.

Date: Tue, 29 Feb 2000 23:56:12 -0500
From: km1h@juno.com
Subject: Re: [R-390] Balanced Input

A good AC line filter may also help. Not a simple one as you find in scrap computers tho. I found a scrapped heavy duty unit built for 20A @ 240VAC that works like you wouldnt believe when I run it on 120V. AC line hash that used to run a steady S-3 to 5 on 160M, even on the Beverages, is now completely gone. Noise is almost like water, it will always seek its own level and drive you nuts trying to keep it out.

Date: Wed, 1 Mar 2000 01:40:53 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: Re[2]: [R-390] Solid State rectifiers

Good point. However, I don't use the on/off switch at all since the microswitch is very old and replacements are hard to find. As you probably know, the contacts can fuse together or the fuses can blow from repeated inrush of line current. Instead I just leave the set on, but power up or down with the Variac. I feel this prolongs the set's life better than any other method plus I can adjust the line voltage to suit. There was discussion of inrush current limiters a while back. That too is an option. See Jan Skirrow's website for more info on this: http://www.skirrow.org
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Date: Wed, 1 Mar 2000 02:47:47 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: [R-390] Replacement for 26Z5W?

Just discovered an interesting web page that suggests using the 12BW4 tube instead of the 26Z5W. Apparently the 12BW4 is cheaper to obtain;

however, some wiring modification is necessary to adapt this tube to the R-390* power supply.

See: http://www.xmission.com/~cwest/Reference/12BW4Mod.pdf

Date: Wed, 1 Mar 2000 20:51:06 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] AC Power Line filtering.

I think this is applicatble to the R-390 list as my R-390A gets it's power from this circuit. (Like the guy trying to sell a Mercedes with a 2 meter rig on the "ham" swap nets). Last week I wired my "Radio Bench" with 11 duplex outlets, 9 of which are controlled with a heavy duty Wall Switch mounted in one of the boxes. 2 Outlets have power at all times for Clocks, battery charger etc. This circuit gets its "power" from a 15 Amp circuit breaker which so far as I can tell is only used for the kitchen ceiling light. (no frige, garbage desposal etc on it) My question is this. I have a Stanley Heavy duty "wire in" 250 volt "Noise suppresser that I would like to put in the supply lead to these outlets, along with 3 MOV's (Neutral & Hot to ground and across Neutral/Hot). I need to identify the "inputs/Outputs" on the filter. It consists of two heavy duty coils, one in each of the Neutral/Hot legs. On one end it has a pair of capacitors from the Neutral and Hot legs to "Ground". Ground feeds straight through the unit. I intend to put it in a metal "duplex box". I "presume" the side of the filter with the capacitors is the "output"? I also "presume" that I want to put the MOV's at the "Output" or LOAD side of the filter? Also, I have a very good station ground (for the locale) consisting of 5 ground rods. Do I want to tie the filter to this ground or should I tie it to the "green wire" ground. Station ground strip is about 3 feet from where the filter will be located.

Date: Wed, 01 Mar 2000 17:07:19 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] AC Power Line filtering.

I prefer the MOV on the line side of the filter because peak voltages are greater there (integrated to a lower peak voltage by the low pass filter) and so the MOV's are more effective.

Date: Wed, 1 Mar 2000 20:08:24 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] AC Power Line filtering.

And since MOV's do fail after a number of hits, you wouldn't want it to take out the filter if it fails shorted.

Date: Thu, 2 Mar 2000 00:55:19 -0500

From: km1h@juno.com
Subject: Re: [R-390] AC Power Line filtering.

Are these caps external or just shown on a schematic? Many simple filters are a Pi type with caps on both ends and are reversible. The large commercial filters I have here are all marked IN or OUT even when the external terminals are identical. I havent a clue what is inside but performance appears to be by the pound. Several of almost identical dimensions do not perform the same and there is a considerable weight difference between them. I picked the best 4 and use them in several places around the ham station and work area.

>I also "presume" that I want to put the MOV's at the "Output" or
> LOAD side of the filter?

I'll probably get some flack from this one but I install MOV's at the panel breakers. Had some inside an outlet strip that damn near set the plastic enclosure on fire from a lightning hit out on the AC pole.

Date: Thu, 02 Mar 2000 06:48:49
From: Glenn Little <glittle@awod.com>
Subject: Re: [R-390] AC Power Line filtering.

This is an "L" filter. The capacitors are on the output. If the capacitors were on the input and the filter were subjected to a high level signal at the freq that it is designed to filter out, the capacitors would soon destroy themselves due to high current through them. Almost found this out the hard way. I was selecting a filter to get a 50Kw AM broadcast station out of a piece of equipment mount within 50 feet of the tower. Was going to use a pi filter until a filter maker showed me the error in my ways and the very short life of the input capacitor.

The fuse protected MOVs need to be mounted on the INPUT side of the filter to keep from destroying the inductive component of the filter during a MOV clamp situation.

>I'll probably get some flack from this one but I install MOV's at the panel breakers.

All surge suppression is done in stages. What you now have is stage one suppression. To get the best from the MOVs, you also need to mount a 10 to 20 Joule device near the protected equipment. This will suppress the surge at the equipment. The house wiring is a very efficient antenna that picks up inpules from nearby lightning events quite well. This will reduce the probability of damage to the equipment. The panel mounted devices should be in the oudre to 250 Joule devices or better. To make the installation better yet, install fuse protected MOVs on your inductive loads. Your house is fed with 220 that is split into two legs of 110. If an inductive load is on the opposite leg from the protected equipment, when the inductive load stops, a spike is placed on the line that is felt on the other led as a sag. You cannot do much on that leg for the sag that occurs on the inductive leg as the equipment starts.

>Had some inside an outlet strip that damn near set the plastic enclosure
>on fire from a lightning hit out on the AC pole.

This id the reason that a UL1449 rated device will have a fuseable device in series with the MOV. The better ones have a "microtemp" device held to MOV with glass fiber tape. This is to remove the MOV from the circuit before the temperature fise of the MOV during a clamp situation reaches the combustion temperature of the surrounding material. <snip>

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Date: Thu, 02 Mar 2000 10:55:05 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] AC Power Line filtering.

I think that you can only have too many MOV's when they begin to fail and overheat. Before that, the more MOV on the circuit the better the clipping. Its good to have big ones at the main panel, then at the input of the line noise filter at the computer and the radio. The filter does not absorb fast transients, it just does a mathematical integration on the impulse and passes it on with lowered peak voltage, but containing the same energy.

That's why the MOV on the load side of the filter is much less effective. I've tested that with an impulse generator in one computer maker in Davenport Iowa at least 15 years ago. The reset circuit was particularly sensitive to noise getting past the MOV and filter. With the right combination of MOV (on the line side) and filter, the computer would ignore transients on the line that would blow holes in the transformer insulation and arc to the core without the MOV and filter. Many of the 7200 volt lightning protectors are made of MOV. At least one here has ended up spread all over the yard after it couldn't take the direct hit. 73, Jerry, K0CQ

Date: Thu, 02 Mar 2000 14:55:52 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] AC Power Line filtering.

Wire a fuse in series. I don't know that fuses are yet a part of the MOV. Maybe something like a 25 amp 250 volt MDL with wire leads.

Date: Thu, 2 Mar 2000 20:00:33 -0800 (PST)

From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] AC Power Line filtering.

The fuse should be in series with the incoming line, rather than just in series with the MOV. If the MOV fails shorted and blows the fuse, it's better that whatever is plugged into the circuit stop working, so you can find the open fuse and replace the MOV's. If the fuse is only in series with the MOV's, you won't know it's blown and the MOV protection is gone.

Date: Thu, 6 Apr 2000 20:01:26 EDT
From: Llgpt@aol.com
Subject: [R-390] Confessions of a sinner

I MUST confess................For years I have used 1,000 volt (kv) 3 amp diodes in place of 26Z5W rectifier tubes. Heaven forbid!!!!!!!! But I am also guilty of using a replacementfor the 3TF7 Ballast Tube. Guys, get a life, I have NEVER experienced a " Shorter " tube life than when using 26Z5W's as rectifier tubes. Heavens, I have heard voltages in excess of 280 Volts quoted. Yeah right!!!!! How about 253 Volts. Hey, we have to expect to expect higher voltages, when the nominal household voltage is in excess of 110 or 115 volts. (Mine is 118) And, now that we live in homes that have CONTROLLED temperatures, the 3TF7 also isn't needed. I use a 12BH7 with the number 2 & 4 pins and the 5&7 pins tied together. Guess what....NO DIFFERENCE!!!!!!!!!! So much for Rocket Science.

Date: Fri, 7 Apr 2000 01:19:55 -0400
From: km1h@juno.com
Subject: Re: [R-390] Pwr diodes

The 1N5408 is my favorite rectifier diode. In a 390A guess what, no voltages are over any component spec and I have 122VAC at the box. After running 96 hrs continuous the complete rcvr had no hot spots and I've only replaced 7 caps total to start with in a 1955 Collins. Except for the 8mF electrolytic on the audio deck (10 mF works fine) all other caps used are disc ceramic. Absolutely no reason to use Orange Drops or any other higher priced alternative. We aint talking about hi-fi radio here.

I read the same quotes Les...I've found 255-260 or so and thats it. But I have an accurate VTVM.....

Why waste a good tube? A pair of 51 Ohm 2W carbons in parallel give me 12.3VAC RMS and the leads fit perfectly into the socket pins. No need to pull the deck, exposed leads to measure from, etc....a technicians dream . If you don't have carbons go to Mouser and get a pair of 3 or 5W MOX resistors. They have smaller gauge leads so you have to twist together and then stuff in the socket. Just remember to count socket pins from the correct direction; if in doubt use a voltmeter to find the 25-26V input and mark that as pin 2.

Date: Wed, 12 Apr 2000 00:35:05 -0400
From: km1h@juno.com
Subject: Re: [R-390] C553 adventure

For those without Variacs or not wanting such a beast in their living room check out www.harbach.com Allen offers a step start PC board that is just the ticket to inrush current. Altho designed for Heath linear amplifiers it is 100% adaptable to any 120 or 240VAC application. Its real small, real cheap, and will fit inside just about any BA. In a 390xx I wonder if inrush current is even a problem? Depends a lot on the xfmr and the wiring. Be interesting to actually measure it.

Date: Thu, 13 Apr 2000 12:20:40 -0400
From: "Charles A. Taylor" <calltaylor@prodigy.net>
Subject: Re: [R-390] RE: In-Rush Current and R-390A's

>Just let me know who your electric company is so I can buy some stock.

Carolina Power & Light (CPL). Superb quality power at the outlet ...115 VAC+/- 0.5 V at the transformer, but the stock dividends aren't that hot.

>IMO the 390A is no more prone to on -off failure than any other quality
>radio such as a 75A4, S-Line, etc.

Tube radios do suffer the effects of current inrush into the filaments/heaters. We've probably all heard cases of radios that were left on for years and played without failure. Buddy at the workplace enlisted in the Navy from Memphis and got out after 16 years. His g-mother had an old RCA or some- such that she left on. It was on when he left for bootcamp, and was still on when he came back to live in Memphis. The tubes were still lift, it still played. The tubes' transconductances weren't too hot, though. Point is, ballasts are expensive and some tubes, too. Some aren't manufactured anymore. Balanced against $0.06/7 per kilowatthour, it's not a hard decision to make. I usually operate my R-390A on my days off (Saturday and Sunday only one weekend a month). Variac it up on the evening of my last work- day, and leave it energized until the morning of my workday. The variac-in' and leavin' DOES in fact make all the difference in tube life. I've fiddle/fooled/fixed/played with R-390As since Navy tech school years, and saw a bunch of them continuously energized aboard ship and shore stations. They stay live a long time if not turned on and off frequently. Same here...mine hasn't need a new tube or filter electrolytic in many, many days.

Date: Thu, 13 Apr 2000 13:12:25 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] RE: In-Rush Current and R-390A's

<Economic Analysis Mode ON>

Current AES price for a 3TF7is $36.45.
Assume one ballast tube failure due to on/off cycling.
Assume no other tube or component wear.
Estimate R-390A power consumption at 150 watts (ovens off).
$36.45 worth of power at $0.07 per kilowatthour is 520 kilowatt hours.
520 kilowatt hours at 150 watts is 3471 hours.
3471 hours is 144 days or about 6 months.

Conclusion: If ballast tube failures occur less often than every 6 months due to on/off
cycling, you should spend your money on tubes not on electricity.

</Economic Analysis Mode OFF>

Date: Fri, 14 Apr 2000 18:41:00 -0400
From: km1h@juno.com
Subject: Re: [R-390] RE: In-Rush Current and R-390A's

Good info Jerry but didn't that relate to a single secondary xfmr? How about sticking to the 390A? What about a (lets do something real here) 390A xfmr with both the original rectifier tubes and then a pair of 1N5408's. (1kv @ 3A) Would not the SS version in particular place enough of a momentary load on the full 390A secondary so as to limit the filament inrush? As you suggested it is time for others to get off of gound zero and contribute instead of becoming couch potatoes.

Date: Fri, 14 Apr 2000
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>

The voltage drop of the secondary winding would be the predominant factor in the voltage drop in a multiple winding transformer because since the primary has to handle more power, its larger. The only load the SS rectifier would supply would be for a very few cycles charging the filter capacitors. That would add some voltage drop in the primary that would probably be detectable in the filament winding. I think the time constant of the tube heater would a significantly longer than the filter capacitor charging. That might be modified by the filter chokes. The filter chokes would limit the peak capacitor charging current but lengthen the time to charge the filter capacitors. Without a filter choke, the peak capacitor charging current could be limited only by the transformer impedance. A choke input filter will limit the peak current to something like twice the load current under steady state conditions. the peak heater current is going to be more like ten times the steady state heater current.

I based the 7 volts open circuit on a multiple secondary transformer. It is a variable that depends on the design constraints of the transformer, the quality of the core, and the available volume, which is reflected in the operating temperature. Allowable operating temperature is dependent on desired transformer efficiency and voltage regulation and generally controlled by the insulating materials used in the transformer. Where insulating materials (paper and wire insulation) are capable of higher temperatures with acceptable damage a transformer can be made smaller, at the cost of lower efficiency and poorer voltage regulation. Where the load is known and constant (as in a receiver's tube heaters), voltage regulation isn't much of a problem. Size is a constant incentive to make the size small and thus the temperature rise great. Until the design trade offs get down to the precise number of whole turns of wire there is no RIGHT answer to a transformer. There are constant trade offs.

I studied the design documents for a line of fluorescent lamp ballasts one time. I found changes in the stack height and the number of turns that seemed to be essentially random variations up and down. I concluded that they were actually in response to costs of copper and laminations. If the engineer was able to shave a penny a ballast by changing the iron or copper content and keep the ballast within the UL temperature rise limits, he paid for his salary every time when the production line was producing 10 million ballasts each year. Heck in the mid 60's he probably only made $7500 a year. He only had to save 0.075 cent a ballast each year to pay his salary. Four times that to pay overhead too.

Likely each production run of receivers has a different transformer design so that the precise effects of transformer impedance on tube heater inrush (which is dependent on line voltage and frequency also) can't necessarily be predicted by measurement of one sample. If there were more than one transformer vendor in a production run, there might be differences in transformer impedance depending on the design philosophy of the transformer vendor's designer. The specifications typically did not specify transformer impedance, just maximum size, loaded voltages, and maximum temperature rise. If there's a design already in their files that's adaptable, the added copper for a conservative design may easily be less expensive than new tooling and several days of engineering time. 73, Jerry, K0CQ

Date: Sat, 15 Apr 2000 02:02:36 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] Silicon for HQ-180

I'm sure R-390 afficianados will also understand, I also posted here due to the vast resources available. Hope not to start another long "off topic" thread. (though the R-390A has no Octal tubes the R-390 does) No, this isn't advocating "Cosmetic Surgery". Should have my HQ-180C Sunday. One thing I intend to do is replace the 'Lytics in it. I don't trust old radios with old filters. While I'm at it I intend to make a "plug in" silicon rectifier module to plug in the 5U4 socket (Blasphemy?), primarily to lower internal temps some. I have a couple old 5U4 tubes, one is very questionable (many filament particles in it) and will make the ultimate sacrifice of it's base towards this project. (I've done this before). To insure a nice high PRV I will probably put two diodes in series in each leg since diode forward drop isn't a problem.

QUESTION: What is a good material to "pot" this thing with./ I thought of buying some 5 minute epoxy for the job, but not sure of it's insulating qualities. Whatever I use needs to be readily available in the average small /medium size town.

Date: Wed, 19 Apr 2000 08:07:50 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Black Ukumpucky (revisited)

Bingo! I didn't even have to heat the cans. Just screwed the lag screw and pulled it out. A little scraping/wiping with mineral spirits to remove the tar and my cap cans are now ukumpucky free. As luck would have it, though, as I was drilling out the wire in the LAST pin, my drill decided to go quite a bit deeper than the other pins and immediately snapped off flush with the top of the pin. I can not get the bit out. So, is there a source for octal plugs anywhere? I plan to make kind of a hybrid unit. I worked too hard on the cans to not use them at this point. I pulled a larger octal tube I have and it is almost a perfect match for the ID of the can. If this tube wasn't a good one, I would trash it and use it. I think one used to be able to buy the plugs, but I don't know where they would be available anymore. Anyone know where I might find some?

Date: Wed, 19 Apr 2000 07:57:32 -0700 (PDT)
From: Tom Marcotte <courir26@yahoo.com>
Subject: [R-390] Electrolytics Under AF Deck

Since I can't keep the thing original unless someone finds new electrolytics, I simply install the five caps under the AF deck. Works great. No unpuckity or whatever that mess it. I keep the nice shiney old stock electrolytics in a box in case General Dreedle wants to do an inspection.

Date: Wed, 19 Apr 2000 11:25:41 -0500

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Electrolytics Under AF Deck

That would be great, but where did you find room under the deck? Mine won't fit, at least near the sockets. Did you put them somewhere else under the chassis?

Date: Wed, 19 Apr 2000 12:28:27 -0400 (EDT)
From: "Paul H. Anderson" <pha@pdq.com>
Subject: Re: [R-390] Electrolytics Under AF Deck

Anyone have suggestions for exact type and seller for electrolytics that actually fit? I went to a local place, but the cans were too big to fit under the deck. I'd like to replace all of them in three AF decks I'm working on. I do know enough to use insulating tubing (or heat shrink) on leads that get too long.

Date: Wed, 19 Apr 2000 09:40:49 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: RE: [R-390] Electrolytics Under AF Deck

Buy an octal relay in the plastic case with a flat plastic base toss the guts, solder in the caps, trim to fit the can or just plug them in without the can. That way you can change it later if you find some of the right caps. Mine's been that way for ten years!! Sometimes you can find them with a square steel can that the caps will fit in, then they look like they belong there.

Date: Wed, 19 Apr 2000 11:25:01 -0700 (PDT)
From: Tom Marcotte <courir26@yahoo.com>
Subject: RE: [R-390] Electrolytics Under AF Deck

I think I had to relocate one of them a bit down the chassis.

Date: Wed, 19 Apr 2000 11:34:27 -0700 (PDT)
From: Tom Marcotte <courir26@yahoo.com>
Subject: [R-390] Caps under AF, how to

First my opinion on caps above the chassis. I think they are butt-ugly (I didn't say they WERE butt ugly, just my opinion) that is why I chose to go underneath. I respect other methods as well. Tech America catalog has a good choice of electrolytics.

Mouser or the other may also have some, but TA (or is it radioshack.com now?) is convenient to use so I went to their catalog with the pretty pictures. I don't have a photo of the finished product, but as I recall, I located only one cap in a remote location with hookup wire, and the remaining four were wired in right to the bottom of the socket.

It is close, but can be done. I used a tie-wrap to secure the remoted one and its associated hookup wire. No smoke or other surprises. It works great.
73 Tom

Date: Wed, 19 Apr 2000 22:15:57 -0400
From: dave or debbie metz <metzd@cfw.com>
Subject: RE: [R-390] Electrolytics Under AF Deck

I would offer an additional suggestion. After doing the above, go purchase a 1 1/2" chrome drain pipe (Straight). Cut if off about 2.5 " long with a tubing cutter, slip it over the 2 or three caps, and then fill it full of clear silicone bathtub sealant. If I could only find a metal cap, it would hardly be noticed as different from the original.

Date: Thu, 20 Apr 2000 00:18:04 -0400
From: Glenn Little <glittle@awod.com>
Subject: RE: [R-390] Electrolytics Under AF Deck

Do NOT use regular Silicone RTV or bathtub sealant. These cure by releasing Acetic Acid. If you remember your chemistry, you will remember that acid attacks most metals (aluminum, copper and solder come to mind). This was a problem with early potting of VCOs in a kit. A suitable sealant is available at your auto parts store as a sealant that is safe for oxygen sensors. This sealant cures by releasing alcohol and is not harmful to metals.

Date: Thu, 20 Apr 2000 01:32:30 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: RE: [R-390] Electrolytics Under AF Deck

<snip> What about electrical conduit? Do they make matching endcap hardware >for that stuff?

I made some up a year or so ago using bases from dud octal tubes and plastic conduit nipples. The nipples had the exact diameter to allow a good interference fit for the octal tube bases when pressed in. You have to remove the hex studs that secured the original capacitors and using a burr and a Dremel tool cut a couple of grooves to clear the heads of the screws that hold the octal socket to the audio module chassis.

Date: Thu, 20 Apr 2000 12:00:54 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Electrolytics Under AF Deck

Might be arcane, but it works. Look in the dime store at stainless steel and thin aluminum pots, pans, and bowls. All covered with spinning marks. Maybe from the hinterlands of India or China. Besides I don't have a wood lathe. The small size and precision desired implies a metal lathe to me. That I have. I'd still be more inclined to look for the relay case at M. P. Jones and Associates or Hosfelt. Though any old octal plug with the capacitors wired to it and held together with baling twine or nylon straps would function everywhere except in the back of a radio van riding on a deuce and a half.

Date: Thu, 20 Apr 2000 20:31:27 EDT
From: WC4G@aol.com
Subject: Re: [R-390] Electrolytics Under AF Deck

I used this method posted on the reflector about a year ago by Eric Furness
Mouser part numbers 140-XAL350V33 and 140-XAL-350V47 (caps)
Jameco part number 155096 (octal relay cases)

The relay cases are keyed incorrectly to fit the orientation of the sockets on the AF deck. I simply whittled the key down and wired it accordingly. After this was done I marked the keyway between "new" pins 1 & 8, kinda like you do when the keyway gets busted off a rectifier tube in your 516F-2.. I made three sets for about 20 bucks.

Date: Thu, 20 Apr 2000 18:47:29 -0700
From: Shadow <shadow@gilroy.com>
Subject: Re: [R-390] Electrolytics // 8 Pin Sockets & Cases

I have been reading the mail about replacement cases for replacing plug in electrolytics. This may help you. I have used the cases made by Vector that have a 8 pin socket and are reticular in shape with built in standoff . They are a aluminum case and look just like they belong in a 1950 to 1970 radios. Also If you can find the Mercury Wetted Relays that have a 8 Pin socket. They are in a Chrome Case the look like a the size of the 6V6 and some ate the size of a 6L6. I have used them before to build plug in filters for audio amps and receivers..

Date: Sun, 30 Apr 2000 13:18:20 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] THE R-390 COOKBOOK - Warning

The 6082 heaters contribute 30 watts of heat that has no benefit (other than making the tube operate). There's 52 watts of plate dissipation capability available. According to my R-390 manual there's 23 watts plate dissipation. Its certain that running lower line voltage will reduce the power dissipated in the 6082. Both heater and plate, but especially plate.

Without going to a switching regulator (which can make noise we don't want to hear), we can't remove the plate dissipation power from the regulators by going to solid state. But the heater power alone is worth removing, nearly a sixth of the total receiver power use. The raw power supply puts out 141 watts of heater power and 49 watts of unregulated DC. I have a power supply regulator scratched out on paper with components chosen. Its not been tested. Uses a couple IRF820 MOSFETS, one working hard on current, one working hard on voltage. It uses three ordinary zener diodes to protect gates and a TL431AIZ that provides the reference and a lot of gain. There's four resistors and one disc ceramic capacitor. Two of the resistors need to be 1% for long term stability, the other two are not critical. Heatsinking will be the most bother.

Date: Mon, 1 May 2000 23:42:23 EDT
From: DAVEINBHAM@aol.com
Subject: [R-390] RE. Electrolytic Capacitors

Sorry if we seem to be miss communicating. What I did was to pry the aluminum can bottom from the header of the filter capacitors. When I got the new capicators installed, I put the aluminum can back in it's original position and bent the bottom edge right back where it came from. The aluminum looks a little the worst from wear as it has now been bent 3 times--- once at the capacitor factory, and twice by me. It does, however, seem to be holding up well. Someone commented about using a cutoff wheel on a Dremel tool to remove the can and then epoxying the whole thing back together. To me, that sucks because epoxy does not adhere well to aluminum. Again, I wish to emphasize that digging out the capacitors from their cans is a Yuckky, grotty job to be avoided if at all possible. If you absolutely, positively just gotta do it anyway, I got the capacitors in the recap kit to do it. Just specify when you order or you get the ones to go under the chassis because I can't imagine anyone in their right mind digging the crap outa those electrolytic cans. I did it once just to prove to me I could do it. Don't plan to do it to my 4 other R-390's. Regards, Dave

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Date: Tue, 2 May 2000 08:14:01 US/Eastern
From: mdenison@blazenet.net
Subject: Re: [R-390] RE. Electrolytic Capacitors

I just did the 30-30-30 cap a couple of days ago. I'm waiting on the 47mfd caps now to do the other one. I used a Dremel cut off wheel to remove the housing, cut carefully at the top flange.

I used a hair dryer to heat the can after cutting it and the old caps/tar pulled out quite easily, leaving an empty can with no residue. I then cut the old caps off at the posts. After drilling small holes in the posts and screwing in some very small brass wood screws, I soldered the caps to the brass wood screws (the posts are aluminum and, as such, are unsolderable). I rechecked the screws and they remained tight. I used a q-tip with the cotton cut off to apply some quick setting clear epoxy to the base. The cover attached solidly and I'm unable to pull it off with moderate force. Mort

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Date: Sat, 13 May 2000 12:54:38 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] Rectifier tubes

Every 26Z5W that I've ever seen was made by Tung-Sol. It's hard to imagine that the Govt didn't require a second source for that tube number. come to think of it though, there was only one supplier for the 3TF7 too. Anyone ever see a 26Z5 made by anyone else?

>The last I heard was that the 26Z5 was $50 from Fair Radio.

Damn! They got real scarce back in the early and mid 1980's but the prices were only a fraction of that. I just checked the AES web site and they're selling them for $7.60. Better, but...

>They told me that they are doing diode mods on all power supplies now on the radios going out. My primary source just sold me his last 2 NIB and 2 used ones. I have 3 spare NIBs on hand now.

I think that the major advantage to using the 26Z5W's rather than the SS rectifiers and resistor mod is the slowed application of B+ when powering the set up. Hopefully most of you are running your receivers off of variacs. This might help to negate this advantage. Myself, I run it 24/7. Once the B+ is "on" it stays that way. For me, SS rectifiers with the dropping resistor would probably be ideal but I'm kind of a traditionalist. I still have vivid memories of some spectacular capacitor failures a decade ago that I attribute to SS rectifiers in my old Collins R390A. That was back in the "pre-dropping resistor" days. Anyone ever thought of a "half diode mod" where only one tube was replaced with a SS rectifier? <grin> I've had pretty good luck with the pair of 26Z5W's in the EAC. Today makes 19 months since I powered the beast up after I went thru it. I put a new pair of 26Z5W's in it at that time. That's about 13,680 hours and they're still going. That's the best service I've ever gotten from that tube number by a long shot. I'm sitting here listening to WWL on it as I type this. About the only "cheat" I did this time was to install some NOS extra long (must be close to 3") IERC tube shields on them. I've got one like that on the 3TF7 too along with the IERC heat conductive strips for the base of the tube socket.

>Not exactly ready "for the duration", eh Nolan?

You would not receive a passing grade in my tube hoarding class. <grin> Actually, you got me to thinking so I just checked and I only have twenty of them myself. I'll have to give myself a "B" on that one. ;-)   nolan

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Date: Sat, 13 May 2000 13:09:40 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Rectifier tubes

One silicon diode and one vacuum rectifier would tend to be a poor choice. Though the vacuum rectifier life would greatly extended, the ripple would be at least 20 volts at 60 Hz, half the frequency the filter was designed for leading to greater ripple current in the input filter capacitor (and thus greater heating), and probably 60 Hz hum from the audio stages. Remember there's some 20 volts drop in the 26Z5 and only about a volt in the silicon diode. Silicon diode and dropping resistor chosen (with an oscilloscope) to remove the 60Hz ripple component, might work except that the drop of the vacuum diode is not quite the same as resistive drop, e.g. not exactly proportional to current. There's some minimum drop, that might be simulated with a series zener diode, then a slop that might be reasonably simulated with an appropriate resistor. I'd suggest two silicon diodes replacing both tubes is FAR SIMPLER than trying to match one silicon diode to one tube.

Date: Sat, 13 May 2000 21:35:06 EDT
From: Kenneth A Crips <w7itc@juno.com>
Subject: Re: [R-390] wondering

RE: At turn on the filament is pretty much a dead short....not unlike the mental powers of your old fart buddies ,< G>

I began to think this after what Jerry was saying about the variability of resistance in a bulb filament, and it increases as the filament heats up. I am sure glad I have this forum to ask, I'll say it again this is the best mail group for accurate technical data.

Wow $50 bucks a piece for a 26Z5W, crazy. I know this has been beaten to death but at 50 bucks each rebuilding the power supply for a tube which is easy to get is in order, with all the small rectifiers tubes out there I can't believe there isn't one that can't be adapted. regardless of the heater voltage.

Date: Sat, 13 May 2000 21:13:35 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] wondering

Pair of 12AX4GTB, 12AY3B, 12BE3, 12CT3, 25CT3. The last two fit the 26Z5 socket, the last one would require the least changes, but might need some wires moved around the socket to prevent shorting voltages through internal connections. The data book says certain pins should not be used as tie points.

These are TV damper tubes and because of their high voltage ratings may have a little more voltage drop than the 26Z5, but these have adequate current ratings. There are other diodes that would be lacking in current capabilities. There might be others that RCA didn't admit existed. Other than the 'AX4, I don't think I've ever seen any of these, but then I tried to ignore series string TV sets because every time I didn't I got bit or hurt some other way.

I've know shops and work benches that included a 500 watt 120 volt lamp in series with the power leads to any device, TV, radio, tool or whatever being tested under power. If the load current was proper, under a couple amps the lamp ran fairly cold and the device received nearly enough line voltage to work normally. If there was a power supply problem the area was well illuminated, but not obscured by smoke.

The large lamps (and a lot of small short lived lamps) change resistance about 15 times from cold to hot. So a 500 watt 120 volt lamp would have a resistance of 28.8 ohms hot and 1.92 ohms cold. A 327 is 700 ohms hot, 46-2/3 ohms cold. A 56 ohm 1 watt resistor in series had a definite beneficial effect on lamp life by lowering operating voltage and limiting the turn on surge current.

According to lamp handbooks and catalogs, changing a lamp supply voltage by 5% changes the life by a factor of two and the light output by 10%. More voltage results in more light (until the life gets shorter than the test period) but shorter life.

Tube heaters operate at a significantly lower temperature so don't change resistance as much. I've not tested them and not read anything about the values.

A couple silicon diodes should make the power supply run cooler by eliminating most of the rectifier drop and heater power while increasing dissipation in the rest of the radio. A thin dime for a pair of 1N4007 or couple quarter for a pair of 1N5408 seems cost effective. Heater power savings alone may pay for a pair of 1N4007 in under 100 hours of operation.

73, Jerry, K0CQ

Date: Sat, 13 May 2000 23:30:51 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] wondering--26Z5W mod

Dexter Francis, N0YLJ has a nice page on converting the 26Z5W rectifiers to
12BW4's for the 390. Should be applicable to the 390A as well.

http://www.xmission.com/~cwest/Reference/12BW4Mod.pdf

Date: Wed, 17 May 2000 11:20:26 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: [R-390] 26Z5

AES is out of the tube. $7.60 seemed like such a gud price that I was gonna get some.

Date: Wed, 17 May 2000 11:03:16 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] 26Z5

Y'know, it appears that as much as I hate to see it, the supply is drying up. I suppose I could get them if I really wanted to pay the piper, but some things just aren't worth it. Can someone tell me the correct mod to make this solid state? I chunked some 1000PIV RatShack diodes in their place and it works, but this should be leaving the voltage too high. I understand there should be a series dropping resistor, but is there anything else I should include. With only one diode, I don't need any equalizing resistors, but anything else? I'm considering making some plug-in replacements on a PC board. Perhaps others on the list might want some. If so, I'll plan to make more. Wonder if I should include a little lamp just so they'll still glow...?

Date: Wed, 17 May 2000 10:54:01 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] 26Z5

A 24V 200 ma lamp would provide both voltage drop and glow. Equalizing resistors should not be used with modern rectifiers. The rectifiers now have controlled avalanche at over voltage and so control the reverse voltages better than the resistors which can't hack 1KV. Between midnight and dawn I worked out a MOSFET regulator for the 390 along side on for rebuilding a 12 volt supply I brought home last night from the county EOC with all the pass transistors burned open or shorted. Since the circuits are similar I might add the R-390 resistors to my parts order today and try that regulator on the bench some day sooner than later. I can't remove the plate power dissipated on the 6082, but can remove the heater power, the power in the 5651 and the 6AH6 replacing the reference and control tubes with a TL431AIZ which costs about 30 cents from Mouser. The circuit would also work as a preregulator for the 390A though a resistor beats it for simplicity!

Date: Wed, 17 May 2000 19:15:25 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] 26Z5

A switcher would save energy. I'm not convinced it would be easy to make quiet enough for a super sensitive receiver. I've suspected the switcher in my Yaesu FT736 effects receive capabilities though it might be hidden by synthesizer noise. I use an external high efficiency linear supply for quietness. It might be useful to drive a switcher from the calibrator so its frequency is predictable and the bandwidth minimized. I built a low frequency switcher in 1978 that ran 24 hours a day until 1998 without failure, so I know a reliable supply can be built. But that one wasn't noise free. But it allowed backing up a S-100 bus computer and keeping it operating with only one battery.

A large choke input filter would save a lot of energy in the R390 if the voltage regulator didn't need the head room and a solid state regulator wouldn't need the head room that the 6082 require. Since the choke input filter lowers peak rectifier currents and spreads them out over a longer time period, the power transformer runs cooler. It could be plugged in the rectifier sockets with the 1N4007s.

Date: Wed, 17 May 2000 21:35:27 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: [R-390] Re: Switching regulator with numbers.

The power switched in the switcher can be considered as 23 watts, the amount dropped in the linear regulator or the output power of 36 watts. Either case is a potential signal of +13 to +14 dBW. +44 dBm. and that has to be kept from the antenna and antenna input which can hear down to - -135 dBm or maybe -140 dBm. 188 dB of shielding and filtering is truly difficult to accomplish. Trying to keep leakage from a 0 dBm oscillator requires at least double shielding with only one connection between the shields, the coax output connector with power inside the inner shield. Might need triple shields for +44 dBm. Very far from trivial.

What it may require is something in an amplitude controlled sinewave converter to minimize harmonics. Or rewinding the plate transformer to supply just a few volts above the required regulated voltage. There are

MOSFET regulator circuits that regulate down to .02 volts drop across the regulator. A linear regulator with such low drop is tolerably efficient, probably more than a switching regulator. Might be that an auxiliary transformer could be wired in phase opposition to the existing transformer to reduce the effective AC on the rectifiers. I've done that to boost or drop the DC a little on occasion. The regulator circuit I've sketched for the 390 requires about 10 volts drop minimum. Which means it would dissipate 2 watts while regulating 36 watts for an efficiency of nearly 95%. A lot of switchers don't do that well. If I can make circuit changes in the power supply circuit, I can reduce the required voltage drop in the regulator. But I have to put the MOSFET in the negative side of the power supply to keep the transistor cost low. With that connection I can regulate down to well under one volt drop in the regulator. Which leads to very high linear regulator efficiency.

Might drop the AC to about 230 volts per plate, then use a choke input filter to get maybe 195 volts filtered, then regulate. Would have to adjust the voltage to minimize the regulator dissipation while leaving it room to regulate for changes. The bucking transformer and choke input filter would improve the receiver power factor which would make it a nicer load on invertors and small generators.

I've made a 13.8 volt supply for my shack using such techniques, there I also used Schottky rectifiers for minimum drop, and it runs 85% efficiency with a linear regulator at 20 amps load. Its not compact but it is quiet. Its been on-line continuously for about 3.5 years now without failure.

Date: Thu, 18 May 2000 11:32:27 -0400
From: km1h@juno.com
Subject: Re: [R-390] 26Z5

For what its worth, there is no real reason add a resistor since the voltage increase is minimal and well within original capacitor voltage ratings. It might hasten the demise of already faulty caps; but they are like an accident waiting to happen anyway. Remember that the radio was not always run on a nice steady USA 110V mains. Foreign and portable power varied considerably; I measured 135-140V at several embassies and the like back in the 60's. Add the xfmr heating of 50Hz mains and there were still no out of the ordinary failures.

Date: Thu, 18 May 2000 10:59:36 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

120 Hz ripple comes from filter capacitors not doing their job, though 20 mv may be acceptable. Are you sure your scope is stable on DC with that

much offset to see 50 mv motion? I'd think that amount of motion is within the ratings of the VR tube.

Date: Thu, 18 May 2000 13:32:10 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: RE: [R-390] Regulated 150V question

True, there is a hum balance control on the R-390 (non A), but none on the R-390A. Dunno what the spec is for minimum allowable variation in the 150 VDC B+, but 50 mV seems minor. Only other thing that comes to mind is a tired OA2. If you get around to replacing it, try and find an OA2WA, the more rugged version.

Date: Thu, 18 May 2000 12:01:35 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

Reverse polarity is not good for electrolytics. They can become more leaky that way. Ripple can come from them developing extra series resistance. Hum balance was a feature of the regulator in the plain 390. I don't think its in the 390A. It looks like the regulator in the 390 functions as an electronic filter also. Shine a light on the VR tube. It may change the voltage also. Check for rotten solder connections around the regulated voltage dropping resistor. It likely runs hot and makes solder joints fail more rapidly. How are you sure that the slow (1 second) variations in voltage are not the scope?

Date: Thu, 18 May 2000 13:05:41 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Regulated 150V question

I don't know about that. That's kind of why I asked the question. Perhaps I'm doing something that is not "according to Hoyle." Just because I can stick a scope probe there and look at DC at that value doesn't necessarily mean I'm performing a valid test.

I plan to pull the VR tube and look at it then. That should be a simple enough test to see if it's the problem. Oh boy...another expensive tube. At least they're more common than some of the others in the set.

Date: Thu, 18 May 2000 13:10:02 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Regulated 150V question

I'll have to check, but I think I looked at this on the non-regulated B+ and I didn't see this phenomenon. If it's not there on one Hi voltage and not on another, I think that discounts the scope, right?

Date: Thu, 18 May 2000 12:28:17 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

If there's no similar variation on the unregulated B+ then I'd suspect the VR tube. I have designed a solid state replacement, but I've not tried it. Probably needs a TL431AIZ and a couple hundred volt couple amp MOSFET and some resistors. VR tubes are known to oscillate in their old age. The rate depends on the amount of capacitance across them. They are little more than a large neon lamp with variations in electrode size for better power dissipation and variation in gas mixture to adjust the voltage. Its clear I fat fingered the call. Call it influence of a tornado on the ground within 50 miles.

Date: Fri, 19 May 2000 21:54:07 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

I tested a 150 volt zener for regulating the oscillator in a RCA mobile that I was going to use for 432 MHz CW once. I found the VR tube gave better stability than the zener diode because the VR tube had a flatter slope. The knee of the large high voltage zener diode is very soft. The zener will last longer but the high voltage zener is not a better regulator than a good VR tube.

I have sketched out a circuit using my favorite TL431 and a 200 volt couple amp power MOSFET, but I've not tested it yet. It should regulate from currents below 1 ma up to nearly 100 ma, a much wider range than the normal VR tubes. All the circuits I've used the TL431 have had nearly perfect voltage regulation far better than any zener diode. In my circuit most of the power dissipation is in the MOSFET. Getting to 100 ma requires using the 8 pin dip package. The TO-92 package that I bought from Mouser for 30 cents is only good for 50 ma.

Date: Sat, 20 May 2000 03:21:39 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

The slopes of the low voltage zeners add when you stack them to give an overall slope at least as large as the high voltage zener and which is larger than the slope of the VR tube. Just happen to see a Motorola rectifier and zener diode data book in a pile from having answered this same question last year. Ah, pulling the book from the pile didn't make the pile fall, yet.

A 1N4744A, 15 volts 1 watt zener tested at a 17 ma current has a slope of 16 ohms, 700 ohms max at .25 ma. Stack 10 for 150 volts and that's a slope of 160 ohms at 17 ma, 7K at .25 ma. So if the diode current was doubled from 17 to 34 ma the voltage would change .017 * 160 = 2.72 volts. According to a curve here, it appears that if the current went down from 17 to 5 ma (minimum for regulation in the VR tube) the zener impedance would rise from 16 ohms per diode to about 20 or 200 all told. That 12 ma change in current might result in a 2.4 volt change in total drop.

A 1N3011 150 volt 5 watt zener shows a slope of 175 ohms at 17 ma. and 1500 ohms at 1 ma.

My RCA tube book says the regulation for an 0A2 for current swings from 5 to 30 ma. is 2 volts average which is a "zener" impedance of 114 ohms, 6 volts at end of life. And that the average voltage during that lifetime is 151 volts it can range from 140 to 168 for an individual tube as the tube ages.

And interesting comment here, its permissible for the 0A2 current at radio start up to exceed 30 ma. up to 75 ma. for ten seconds. But the tube voltage may require up to 20 minutes of steady operating within the 30 ma. current limit for the voltage drop to return to normal. So a test circuit must be careful to limit the initial current to keep from achieving a misleading voltage drop.

Date: Sat, 20 May 2000 16:15:11 -0400
From: km1h@juno.com
Subject: Re: [R-390] Regulated 150V question

"Dr. Gerald N. Johnson" writes: I tested ..... I found the VR tube
> gave better stability than the zener diode because the VR tube had a
> flatter slope. ....

However , advancements in Zener technology appear to have improved that. I refer to Ian, G3SEK's comments in the magazines and VHF lists over the past several years. His highly structured tests list the VR tube at the bottom of the list as far as stability, life and impedence. In a BA, using a 2 or 3 zener string to reach the desired voltage should not create any problems.Current offerings do not have the parasitic problems of the past either.

> I have sketched out a circuit ....All the circuits I've used the TL431 have had nearly perfect voltage regulation far better than any zener diode. ....

In a 390 or any other BA we are not concerned with absolute perfect regulation. Equal to or better than the VR tube is more than sufficient.... Zeners are cheap and available....its a one time swap, however a VR tube can go bonkers at any time .

Date: Sat, 20 May 2000 18:43:47 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

I do sometimes disagree with Ian, G3SEK about shunt regulators and he's aware of where we differ. His latest screen regulator circuit does use the TL431. 73, Jerry, K0CQ

Date: Sat, 20 May 2000 18:43:24 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

I like the programmable zener, TL431 family. It has square knee. Maybe my collection of zener diodes is too old, but I wasn't ever favorably impressed with their knees and finding a maker with a technical department is hard these days. Most of the diode makers have bought old production lines and processes, so I don't expect them to be different than my old data books. A lot of the characteristics aren't so dependent on process as on a mixture of avalanche phenomena to set the voltage.

Date: Sat, 20 May 2000 18:43:45 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

I've commented in another post about zener diode technology. Zeners are surely better than no regulation or a bad VR tube, but my last experiments showed the VR tube gave better frequency stability in that particular application. I've not yet tried my MOSFET and TL431 VR tube replacement circuit.

Date: Tue, 23 May 2000 10:54:44 -0400
From: km1h@juno.com
Subject: Re: [R-390] Regulated 150V question

...... the VR tube gave better frequency stability in that particular application...........

Interesting, I found the opposite, particularly with a varying load suchas a TX tube screen grid. One problem with zeners that is often overlooked is stability over temperature. Several published circuits tend to stress saving a few pennies and specify devices that are run close to their maximum dissipation. In a 390 application a conservatively rated zener will supply all the stability required and provide a long life. OTOH, a VR tube will deterioate and can change the regulating voltage point , current handling ability, or develop a parasitic oscillation that can do very strange things when coupled back into the B+ line of the radio. A fancy SS regulator sounds nice but may be a bit overkill considering the application.

Date: Tue, 23 May 2000 10:59:16 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Regulated 150V question

In my experience, the more conservative one operates a zener's current, the poorer the regulation. It is true that the aging modes of a VR tube include changing voltage drop (with a time constant of years, not seconds) and changing stable current limits. The low current regions of a good VR tube display negative resistance. Age can increase the upper current limit of that negative resistance region. Then oscillations abound. For shunt regulator applications from 2.5 to 35 volts and currents from less than 1 ma. up to 100 ma., the TL431 in the 8 pin DIP package has a square knee and very good regulation. There is enough gain in the chip that it will oscillate with certain ranges of shunt capacitance. I find it can be slowed by connecting a capacitor from output to input. When I add a power MOSFET to the loop as in the steam turbine voltage regulator I've found that I can get better stability by making the TL431 operate at higher output currents, e.g. lowering the loop gain. The TL431 in the TO-92 package is only good for 50 ma. By adding a power MOSFET to the output circuit, most any high voltage can be regulated, though shunt regulation is rarely energy efficient. One place shunt regulation is essential is the screen of a tetrode where screen current may go negative. The beauty of the solid state series regulator in the R-390 is that there is the potential to save at least 40 watts power dissipation, more if the rectifiers are silicon, just in heater power alone. Changing the power supply filter from a simple capacitor to a choke input filter to lower the unregulated voltage and reduce the ripple on the unregulated voltage saves more heat dissipation which can show up on the utility meter several times if there's air conditioning in the radio room. And should lead to better receiver longevity from lower temperature operation. The choke input filter along with silicon diodes should help cool the R-390A also. Converting the shunt regulator to a solid state series regulator should also save some energy. That would require removing the dropping resistor to the VR-tube and using a MOSFET circuit much like that for the R-390 solid state regulator, though the current requirements are smaller and the power saved may not be great.

Date: Wed, 14 Jun 2000 10:11:09 -0400
From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] RE: Ballast Tube Musings

Well done. I am finding there are no 2 filament voltages "regulated" by the 3TF7 coming up the same. The one I tested is no doubt was the extreme side of high at 15.2 VAC.

> What about the effect of a heat dissipating shield on the 3TF7 ballast
> tube? What happens in a cooler running ballast tube? Bet you all know the answer.

Those of you have seen the 2nd R390A video know that we discussed the solid state v/s tube diodes voltage issue fairly extensively and demonstrated only an (11?) volt difference in favor of the solid state rectifiers. That said, the points made on regulated voltages in the R390A for the 2 tubes which are so configured leads to another point of discussion.

>How does one calculate the base voltage by which to determine any
>deviation?

I chose to use the 6.3 VAC filament voltage. It is fairly critical that it be 6.3VAC. Less and the tube emission may be low, drastically higher and the tube life is diminished. In the video, the filament voltages for the tubes were all "low" at about (6.1 VAC?) despite a "high" service input voltage. I forget the exact number but memory suggests that 123 VAC was the number. Using a VARIAC to lower that "deadly" number to 115 VAC resulted in lower than nominal filament voltages, reduced emission and lower overall gain. Those so equipped, try that experiment. I think the conclusion will be that the receivers being conected to a service line of up to 125 VAC is simply a non-issue; don't waste your money on a VARIAC to drop the service voltage feeding your R390A. I am already firmly in the camp of "it is a non-issue" concerning the solid state diodes used in place of the 26Z5W's.

Date: Thu, 15 Jun 2000 08:46:43 -0500
From: "David Wendt" <dwendt@electrocam.com>
Subject: Re: [R-390] RE: Ballast Tube Musings

I got a replacement power supply from Fair last year. I think it was marked as made by Teledyne which I think made a number of replacement modules. The filament voltage printed on the transformer is 6.1 volts, not the standard 6.3 volts. I had thought it might be a misprint. This almost makes me suspect it might not have been. Has anyone else noticed this?

Date: Thu, 15 Jun 2000 11:25:29 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] RE: Ballast Tube Musings

............f is 6.1 volts, not the standard 6.3 volts. ...

Not necessarily a misprint. All the transformers I've seen are marked 6.1V.

Date: Thu, 15 Jun 2000 19:03:05 -0400
From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] Filament Voltages

I wonder why? All the tubes have 6.3V filament specs. Could it be that the designers were accommodating higher service voltages?

Date: Thu, 15 Jun 2000 19:26:40 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Filament Voltages

Probably so, as 115 volts wasn't any longer the norm.

Date: Fri, 16 Jun 2000 00:13:47 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: [R-390] R-390 nonA CR801 replacement

Anyone know the recommended replacement for the selenium (?) rectifier used for supplying DC to the antenna relay coil in the R-390 nonA? Would the Radio Shack full wave bridge rectifier, PN 276-1173, 4 A. 400 PIV work?

Date: Fri, 16 Jun 2000 01:35:11 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] R-390 nonA CR801 replacement

That part works very well, I just used one to replace the fried CR801 that was in a 391 power supply (same thing). It bolts right to the frame where the old rectifier was mounted which I think is a copper oxide type. After installation I got about 9.8 VDC to the ant relay coil. My guess is that the coil was rated for 6 volt operation but I haven't seen a mod where anyone has bothered to install a dropping resistor since during normal operation the coil isn't energized.

Date: Fri, 16 Jun 2000 06:37:30 -0400
From: "P. Rovero & Family" <provero@connix.com>
Subject: Re: [R-390] R-390 nonA CR801 replacement

The original is actually a copper oxide rectifier. The R-S bridge is a safe replacement.

Date: Fri, 16 Jun 2000 09:27:36 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] R-390 nonA CR801 replacement

Since silicon diodes have a lot smaller voltage drop than the original copper oxide rectifier, it might be important to add some series resistance to keep the relay voltage down to rating.

Date: Fri, 16 Jun 2000 11:52:19 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] R-390 nonA CR801 replacement

Thanks for the many helpful answers to the R-390 CR801 replacement question.

Survey sez: The Radio Shack part #276-1173, 4 A @ 400 PIV, full wave bridge rectifier or an equivalent will work fine. Voltage drop across a silicon device is less than across an original copper oxide rectifier found in R-390's, thus a voltage dropping resistor might be in order.

Will experiment with the latter and share findings. Apparently Dave Medley's website (where the Radio Shack as source idea came from) is still up. Didn't have success locating it last night.

Date: Mon, 19 Jun 2000 09:37:25 -0500 (CDT)
From: Dave Merrill <r390a@enteract.com>
Subject: Re: [R-390] Filament Voltages

I found this interesting piece on rec.guitar.amps where they have a similar interest in preserving tube life. Perhaps this is a reason for the 6.1V filament voltage in the R-39x power supply?

Date: Sun, 18 Jun 2000 21:25:50 -0400
From: Maven Peal <maven@peal.net>
Newsgroups: alt.guitar.amps
Subject: Re: Use of Variacs

I agree with Danny that the abuse that power tubes receive in a guitar amp in the form of extremely high plate and screen voltages and dissipations far outweighs any heater voltage problems. However, I see no reason to abuse the heater if you don't have to ...

As for anecdotal evidence on tube life vs. heater voltage, I have some from an article in Glass Audio, 1989 - Volume 1, Number 2. The article is entitled 'Extending Tube Life' by Charles King. The article quotes some statements from GE, Audio Dimensions, Audio Research (stereo tube amp companies) and 'Audio Cyclopedia.' Mr. King then went on to actually measure tube life with heater voltages of 6.3V, 7.56V and 5.04V (+/- 20% or 140VAC and 93.6VAC). All of the references agree that higher than rated heater voltages are to be absolutely avoided.

Mr. King's own experiments found that 80% of the tubes run at 7.56V failed after 5000 hours while 25% of the tubes run at 6.3V had failed. Interestingly, none of the tubes run at 5.04V had failed after 5000 hours. Additionally, Audio Research used to under run their heaters for longevity, but then stopped due to 'sonic degradation.' GE states that "There is a certain critical voltage below which the tubes do not operate properly, and that operation between that point and the rated heater voltage increases tube life."

All of the above statements refer to preamp tubes. Personally, I would assume that the same general idea would hold true for power tubes except that their 'Critical voltage below which they do not operate properly' would be higher than for a preamp tube.

Given that the standard wall voltage appears to be 125V these days, it would seem that any amp that doesn't have a regulated heater supply (or is being under run with a Variac) is abusing its tube heaters unnecessarily. Conversely, under running the heaters is going to cause some amount of 'sonic degradation.'

David Zimmerman
Maven Peal Instruments, Inc.
www.mavenpeal.com

Date: Mon, 19 Jun 2000 09:44:26 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Filament Voltages

AT WWV they get up to 100,000 hours on tubes by running them at reduced power on the plate and then they lowered the heater and filament voltages to just above the point of loss of emission. Like GE noted, there is a minimum voltage that causes cathode damage.

Date: Mon, 19 Jun 2000 14:29:34 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Filament Voltages

We can assume that the tubes you refer to are Thoriated Tungsten directly heated transmitting tubes (such at the 4-400 and the like we would expect to find in the TMC GPT-1K and -10K transmitters used there). These should not to be confused with indirectly heated receiving tubes.

Date: Wed, 21 Jun 2000 09:35:39 +0600
From: "Ben Hall" <kd5byb@wt.net>
Subject: Re: [R-390] Filament Voltages

Well, I haven't tried inrush limiters in place of ballast tubes, but I have installed them in a lot of my hollow-state gear with good sucess. I use one by Keystone Carbon, bought thru Mouser Electronics. (I beleive it is a CL90) You want one with adequate current rating for your application, with the highest initial resistance you can get. When placed in my R-725, when I hit the power switch, the limiter dropped about 50 volts AC, then ramped up to dropping about 5-6 volts AC when fully warmed in about 15 seconds. Definitely takes out the turn on "twangggg" that some transformers make. Cannot comment on increased tube life as I've done no scientific testing on that, but it cannot hurt...

Date: Wed, 21 Jun 2000 18:08:20 -0700
From: "Gene G. Beckwith" <jtone@sssnet.com>
Subject: Re: [R-390] Filament Voltages

In addition to the current limiter technique, many of us have/are using Variacs for soft starts...Am sure this has all been said before, but just in case you missed it...its another approach...

Btw, searching the fest for Variacs large enough to handle my DX100's and Viking Valients...the transformer 'twange' in my Vallient II is so loud, I've shut it down until I find a Variac with enough current capacity to handle it....if none show up this season, planning to build an outboard step start, that drops out a series resistor in the AC line...have done that with great success in a recently re-habed Heath "Warrior" linear (that's the own with 4 811's) I have it designed for about three seconds of warm up time for the fillaments before full line voltage is applied... (uses a 50 watt wire wound in series with AC line that is shorted out with dc relay).

If any one needs details, most recent ARRL handbooks show several examples ...

Date: Wed, 21 Jun 2000 19:36:53 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Filament Voltages

Actually, I think the **series resistor, whether step start or thermistor, does more to limit turn on surges** than cranking up a variac... And the thermistor type as used in large tubed TV sets used to be not hard to find.

Date: Wed, 21 Jun 2000 21:56:10 -0700
From: "Wayne Rothermich" <rother@impulse.net>
Subject: Re: [R-390] Filament Voltages

May I offer a somewhat different perspective on tube life and inrush current?

In the waning days of tube-type radios and TVs, I worked summers for a local repair shop. Over a span of several years I must have replaced thousands of defective tubes. The odd thing is that very few of these failed tubes had open filaments. Almost all of them failed due to low cathode emisson, and most of the rest had what the tube tester called a "short". My experience with Tek 500 series vacuum tube scopes has been similar.

The few open filaments that I saw were mostly in radios that had all the filaments connected in series. Because the resistance of the filaments increases with temperature, a tube that warms up faster than the rest (in a series string) can have more than its rated voltage across its filament until the rest warm up. It could be that this is what caused these particular filament burnouts. I believe some tube types specifically designed for series filament operation had controlled warmup times in order to minimize this problem.

If the major cause of tube failure is indeed deterioration of the oxide cathode, and not filament burnout, I wonder if the filament startup surge is really affecting tube life to any significant degree. (Admittedly, the R-390A does have a series string of two tubes, but these are also in series with the 3TF7, which acts as a current regulator. This regulation should minimize the effect of any warmup time differences between the two tubes. All the rest of the filaments in the R-390A are wired in parallel groups.)

The thoriated tungsten filaments in transmitting tubes are different, and the surge may well shorten the life of these tubes. Pilot lamps certainly play by different rules. These observations only apply to oxide-coated, indirectly heated cathodes in small receiving tubes. To borrow a great line from one of our sages, for other kinds of filaments, "your mileage may vary".

Inrush current may be hard on filter capacitors and rectifier diodes, but my experience suggests that it's not a leading cause of the depletion of the world supply of NOS 6BA6s. Has anyone seen a significant proportion of tube failures in parallel filament radio receivers due to filament burnout?

Date: Thu, 22 Jun 2000 08:16:12 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Filament Voltages

Above a certain filament rating Eimac and other makers REQUIRE current limiting to their filament. Typically to about 3 times operating current. If they operate white hot (like a lamp) the normal surge with a perfect transformer would be 15 times normal current.

Date: Mon, 10 Jul 2000 11:09:53 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] electrolytics

In my experience, once an electrolytic has faulted from applied voltage greater than its current aged capabilities, it won't recover by reforming. Its toast and any attempts will lead to it blowing out the seals and filling the equipment with shredded foil and conductive crepe paper and goo. That's why I quit trying to recover old electrolytics. A few such cleaning jobs are not worth the cost of new electrolytics.

If I was on a deserted island and had to reform electrolytics, I'd monitor the current. If it didn't steadily decrease with a constant applied low voltage I'd get suspicious that I was going to have a bit of hum on my signal from not using the electrolytics. The worst case is when there are spikes in the current at low applied voltage. That tells me that the capacitor is breaking down and making carbon spots on the aluminum foil that are NEVER going to form aluminum oxide. That capacitor is going to be useless forever. No amount of external electrical influences are going to make it good. So I'd put up with hum (if I had AC to run a radio) or a little audio regeneration from lack of power supply filtration and I'd put out my hum modulated SOS. Part 97 says in an emergency that I can use any means of communications at my disposal and I take that to include breaking the rules on purity of signal as well as operating frequency within the ham bands. Better to have hum than to have blown the rectifier from the exploding electrolytic that shorted the whole radio.

Date: Mon, 10 Jul 2000 13:58:04 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] US Air Force Test Oscillator

I'll say they do.. Here is my advice: Electrolytic Capacitor Reforming/Testing

1) study the schematic to see if there is any DC drain on the B+ supply (such as voltage dividers or VR tubes). Unhook/remove them if any are present.

2) apply re-forming current to the B+ system from a variable power supply through a 50K or 100K resistor. (The variac is useful to provide the

variable supply if solid state rectifiers or separate plate and rectifier filament supply are present. The radios own B+ supply CAN be used if you put in solid state rectifiers AND insert the needed series resistance.)

3) monitor the supply voltage and the capacitor voltage(s). Compute or measure the charging current.

4) increase the supply voltage to keep charging current modest (say 5 to 10 ma per capacitor)

5) when the capacitor voltage stabilizes at an appropriate leakage current you know the health of the cap. This may take many hours. Do not be in a hurry. I use one to 5 ma as final leakage current. If the final cap voltage is above the operating voltage, and above the turn-on surge voltage, all is well. A capacitor whose leakage voltage has lowered due to age and deterioration will draw lots of current above that voltage and will not continue to re-form.

Multi-section caps can be re-formed through the isolating resistors commonly found in multi-stage filter setups with out unhooking them. Be mindful if the later sections of such filters have lower working voltage rating. The best way is to unhook one end of any electrolytic from the rest of the circuit, then re-form it individually. This also allows for testing of loss factor or series resistance if you are able to do that. Some folks say that re-formed voltage, leakage current and series resistance must be measured before a cap can be properly judged. The problem with the "bring it up gently on a variac" approach is that a cap section can get to its limit and begin to draw lots of current and you will not know it. The rectifier or worse yet the high voltage winding on the transformer can be damaged and you will not know until the thing smokes or quits altogether. Another possibility is that the capacitor sits there getting hotter and hotter and finally blows up in your face, covering the insides of your radio with sticky, corrosive goo (known as "Umkumpucky"). Have you tried to find a replacement transformer for a Hallicrafters HT-32 lately?? Or a 1939 receiver? Peter Dahl will make one for you for about one hundred and fifty dollars plus shipping. The place for your variac is in your adjustable B+ power supply. The place for a current meter is NOT in the AC line to your radio but in the DC supply feeding the electrolytic you are reforming.

Date: Tue, 01 Aug 2000 15:19:41 -0400
From: Bob Login <jlogin@mindspring.com>
Subject: [R-390] Run tubes at higher fil. voltage?

Hi All...What are the consequences of using lower voltage filament tubes in higher voltage filament circuits? I would think shorter life but better

characteristics?

Date: Tue, 1 Aug 2000 13:11:12 -0700 (PDT)
From: Tom Marcotte <courir26@yahoo.com>
Subject: Re: [R-390] Run tubes at higher fil. voltage?

Or you can calculate a dropping resistor knowing the filament current, and add that resistor in the circuit to get you back to proper voltage. I think the higher voltage will be a reliability headache. How much higher are we talking about? Your mileage may vary.

Date: Tue, 01 Aug 2000 16:12:56 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Run tubes at higher fil. voltage?

Definitely shorter life, perhaps hours instead of years, maybe only minutes. Better characteristics, probably not. There would likely be more cathode emission for a short while, but unless the tube is over the hill, cathode emission isn't a limiting factor to tube operation.

The much hotter cathode would spray cathode material and would heat the control grid a lot hotter leading to grid emission and loss of control of the grid voltage in high impedance circuits. That's not a positive benefit. Loss of AGC and distortion often are the results of grid emission.

Greater plate current when the grid emission lowers the grid bias also leads to high plate operating temperature which leads to a great temperature difference between the glass and the wires through the glass leading to more differential expansion and more propensity to crack, then air leaks in and the tube gets gassy which changes its characteristics for the worse.

All in all, I'd say the idea of running high heater voltage is about as good as picking tubes up off my barn floor after the raccoons have tired playing with them. Most are disassembled from hitting the concrete.

Date: Wed, 02 Aug 2000 12:43:05 -0400
From: Bob Login <jlogin@mindspring.com>
Subject: [R-390] Run tubes at higher fil. voltage?

Thanks to all who replied. The consensus is that its a bad idea as far as the life of the tube is concerned and the characteristics of the tube might be worse because of the higher heat generated. With that said I tried a 12BA6 in place of one of the 26A6 in my R392 and so far I have a working good sounding rx. I'm waiting for 26A6 tubes to arrive however but wanted to see if the rx worked. Besides I have a load of odd voltage tubes lying around that a friend said I might as well use for target practice, well maybe they can be used in a pinch?

Date: Mon, 21 Aug 2000 09:08:20 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R-390A worse nightmare - followup

1 amp is plenty 400 volts PIV is inadequate. 1 KV is better. In a full wave rectifier the diode sees twice the peak AC voltage, or twice the DC, if it is a capacitor input filter not loaded too heavily.

There's about 200 ma total load so each resistor sees 100 ma. .1 * .1 * 10 = 0.1 watt. 1/2 watt or 1 watt is reasonable. 10 ohms is on the low side to accomplish any compensation for the vacuum rectifier drop. 200 would be closer, but the power dissipation is much greater.

Date: Mon, 21 Aug 2000 17:52:23 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nightmare)

IEC stands for International Electrical Code or some such thing (the correct name is likely in French.) The connector I mean is the one found on all computers and monitors and such equipment nowadays. The common three-wire grounded plug computer power cords plug into them. The chassis connectors come in a wide variety of forms, features and ratings. Many are rated at 3 or 5 amps. these are fine.. A few are rated at 10 or 15 amps and are not needed for our receivers. You can find these connectors at hamfests and at most parts supply companies. You can extract them from defunct computers and printers, although these are normally meant for mounting on PC boards and not for solid mounting in a hole with nuts and bolts.

Some have built in RFI (radio frequency interference) filters. These connectors are usually bigger than the non-filter ones. They have modern capacitors and inductors in them. The current passed by the capacitors is MUCH lower than the current passed by the line filter capacitors in the R-390 receivers, and I would expect that they will not trip GFI devices (though I have tested this with the ones I have).

The problem with the R-390 line filters is that they were made with large value bypass capacitors. I think that the R-390 non-A filter has more capacitors in it than the -A version. In any case the capacitor from line to chassis allows enough current to flow into the safety ground line that the ground fault interrupter detects it and disconnects your power. If you operate your radio withOUT a proper chassis ground, the chassis will be at about half the line voltage above ground.. that is about 60 volts. This is enough to give you a strong tingle. The capacitors are acting as a voltage divider from the line hot to the line neutral. This normally happens not because the capacitors are "leaking" due to low insulation resistance or fbecause they have failed. They are simply acting as a capacitive voltage divider and placing the chassis at half the line voltage.

One solution is to have a non-protected outlet in your shack, but that defeats the purpose of the GFI protection, and in some locations may, repeat *may*, be against the electrical code.

Another solution is to remove the line filter from the radio, make a plate to take its place and install an IEC line cord connector, preferably one with RFI protection.

Another solution, is to bypass or remove the line filter and connect the power cord to the set with no connector and no line filter. In this case, IF you want to have rf bypassing, connect the bypass caps you provide, one from line (black) to neutral (white) and one from neutral to chassis. This is NOT the way most old radios were built, but is safer and just as effective. A short of the first cap will blow your circuit breaker. A failure of the second one will go unnoticed but will create no danger. It may trip a GFI device, however, depending on the currents in the neutral wire an the actual resistance of the ground return connections in your house.

Yet another solution is to use an isolation transformer, or a Sola-type constant voltage regulation transformer. These both have isolated secondaries. NOTE: almost ALL "Variac" devices do NOT provide any isolation.

I use computer line cords for my boatanchors by removing the female, equipment-end connector. Note that the color coding in European line cords is not black - white - green. Be wide awake if you run into one of these. The one with the green color is the safety ground, but do take time to carefully sort out the other two. Under no circumstances should you ever use a fused line cord plug. It can kill you in a variety of ways. The Johnson company put them on Rangers, Valiants, and other equipment. I just got a Heath VHF-1 6- and 2-Meter transmitter with one on it. That will be the first thing to go when I start returning it to serviceable condition.

Some time ago I wrote an imaginative but quite serious description of the many ways fused line cords can make a widow out of your wife. I want to re-write that thing and put in back into circulation, but that will have to wait for another day.

Date: Mon, 21 Aug 2000 16:18:27 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nightmare)

I dislike using the filter with the IEC connector in any application because it prevents connecting MOVs on the line side of the filter where they are far more effective. The low pass action of the filter drastically reduces the peak voltage of impulses but broadens its time period to conserve energy and that makes a MOV on the radio or computer side of the filter relatively ineffective because the MOV is strictly voltage actuated.

Date: Tue, 22 Aug 2000 03:13:38 -0400
From: twleiper@juno.com
Subject: Re: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nightmare)

That's why I just wire the the MOV's into the receptacles in my shack...

Date: Tue, 22 Aug 2000 02:06:16 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nightmare)

That's fine for use in your shack, but what about when you take a trip or do a demonstration? The MOVs are not with the radio or computer.

Date: Tue, 22 Aug 2000 10:10:02 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nightmare)

I have both the expertise and the experience reinforced by testing with impulse generators. I am certain that MOV on the line side of the EMI filter are more effective. In a test at the Archives computer company, MOV on the line side of the EMI filter would keep transients from affecting computer operation and those same amplitude and energy impulses would blow holes in the power transformer insulation without the MOV. We could hear the sparks. So I've been there, tried that and that's my conclusion.

Date: Tue, 22 Aug 2000 11:57:09 -0500
From: "David Wendt" <dwendt@electrocam.com>
Subject: Re: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nightmare)

> That's why I just wire the the MOV's into the receptacles in my shack...

When MOV's die the valiant death it is a catastrophic event of fire and brimstone. Usually what ever they have died in, gets moved to a non-offensive area rather quickly to avoid the stink. They also can cover the inside of a confined area with a lovely soot. You may have noticed on some devices built to European standards that the MOV's have heat shrink over them. This is to help control the "blast effects". If you have the pleasure of loosing any of them this way you will probably think again about the wisdom of putting them into the shack receptacles.

Date: Tue, 22 Aug 2000 13:00:59 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: Replacement Rectifier WARNING, (Was [R-390] R-390A worse nigh tmare)

So THAT'S explains the heat shrink. I'm in the process of taking the filter portion out of an old PC power supply and am going to use it as an external filter for the R390A in place of the FL101. I noticed the tubing around a lot of the components and wondered why it was there.

Date: Wed, 06 Sep 2000 14:15:00 -0700
From: Robert Tetrault <tetrault@teleport.com>
Subject: Re: [R-390] It's "Rubinstein" Not "Rubenstein"

Not having a non-A, I can't help directly, but my guess is that the tube regulators aren't as good anymore compared to what linear solid state regulators are capable of. A moot point that I'll monologue about later. For one thing, loop gain translates directly into load/line regulation. If a given power supply regulates to a tighter voltage for a given step change at the input or load change at the output, then its control feedback loop has greater loop gain. The op amps at the heart of SS regulators are capable of loop gains (depending on frequency) of greater than ten million, sometimes much greater. Tubes were used in op amps, but tube op amps were not in power supply regulators; they required about six glass envelopes.... And their frequency response was dismal. It is conceivable that a 608X type regulator, referenced by a 0A2 type could have a loop gain of several thousand (dependent factors being the dynamic impedance of the 0A2 (how well IT provides a stable reference in the face of changing line voltage that would change the voltage drop across their current limiting series resistor) and 608X transconductance) which would be largely defined by the biasing and feedback network around the 608X. In other words, your parameter of 150.1 Volts would probably be reasonable for line changes. My thinking tells me that the 390A or non-A tube regulator is perfectly good for the application (a tube receiver) WITHIN certain limits:

1) the 0A2 reference is a very good source of noise (it is a gas arc with controlled current giving a fairly stable reference voltage) and this noise (possibly RC filtered to some degree and then certainly filtered to some degree by the control loop filter) is applied to critical tubes like the PTO, crystal oscillators and early gain stages in the RF and IF chain. Hence, the noise may degrade the noise figure and the phase noise characteristics of the entire receiver. Solid state references are capable of much lower noise than thought possible in the tube era and a thoughtful power regulator design can apply that low noise to the regulated voltage. Modern frequency synthesizers are largely control loop exercises that (in the best cases) attempt to impose that low noise characteristic of the regulated voltage on the frequency being generated. The problem being in all cases that the frequency characteristics of the noise often extend far beyond the capabilities of the loop filter in either the synthesizer or the regulator.

2) the rate of change (transient response or simple frequency response) of the regulators is adequate for the application: CW data rate at worst argues for transient response of the B+ regulators to be maximum up to a kilohertz or so. Now here I'll bore you with some more trivia: The transient response of a regulator or other type of control loop is primarily a function of the frequency response of the control loop low pass filter (anything other than a low pass filter will oscillate) and the gain of the loop at that frequency. Better transient response requires more gain at higher frequencies within the control loop. As you can imagine, control loops with gain sound alarmingly like oscillators... So it can be fiendishly difficult to get good regulation with good transient response. But some do. Kepco makes, IMHO, the very best lab supplies with regulation as tight as .001% for all load and line changes (that is, 10 parts per million(!)), say, 10 microVolts change per 1 Volt of output voltage. A 150 Volt regulator would then vary by no more than 1.5 milliVolts, = 150.0015 Volts for all changes. 150.05 Volts should be achievable by any SS regulator. Hence, your 150.1 parameter is arguably too loose.

3) A tradeoff always exists with the allowable input variations over the range of environmental factors and what the space and complexity allows for a power supply. A simple LC filter before the regulator is usually all that is allowed, and a regulator MUST have adequate excess voltage to throw away across the regulator device at the lowest line voltage or the regulator will dropout and not regulate. The existing SS units need only 3 Volts max, while a tube needs as much as 20 Volts differential. Multiply that by the current drain and you see quickly what is thrown away in the form of heat, and what the advantage is of SS on this item. Heat is a killer that can be mitigated, but always takes his dues. Minimize the impact, shift to SS in the diodes and the regulator and you save a lot.

So.... So.... So, again, IMHO, the relative merit of tubes/SS is now weighted heavily in favor of SS. Something I'll pursue in the fullness of time with my own non-A. Jerry (K0CQ) might have considerable observations on this topic, since I've read of his comments on regulators. Incidentally, the latest ARRL Handbooks have an excellent power supply section that covers all this gibberish in far greater detail, and is largely written by Bill Sabin of Collins' fame. Hard to gainsay him anyway, wherever he hails from; he knows of what he speaks. Also, the noise characteristics of oscillators and how it affects the rest of a receiver's signal chain is well covered in these later books. Finally, I am an EE also, analog by career, twenty five years in low noise design and power supplies. I first saw a 390A when I was 14 and have lusted after them ever since. Soon I'll have one for my fiftieth birthday. I'm still wondering when I'll ever really grow up...

Date: Mon, 9 Oct 2000 23:05:36 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] R-390A simple questions

> 1) FL101 is gone. How critical is this line filter ? Enough that I should
> bother to build/find another one ?

FL101 is not critical. If you're restoring a set, it's nice to have a unit from a parted out receiver rather than homebrewing a new one.

> 2) Power is "ON" as soon as the machine is plugged-in whether the Function >switch is in the OFF position or not. Going from StandBy to OFF audibly >activates/deactivates the antenna relays. Was the Function Switch noted for >failures with respect to switching the AC ? I'm trying to figure why
> the power was hard wired in.

AC power switch is a microswitch attached to the FUNCTION control and apparently is missing from your rig. They fail frequently -- usually the contacts fuse. They can be opened up and their contacts burnished. I always leave mine on and cut power elsewhere. (In my case, at the Variac which is what I use to power up gently-- a different issue.)

> 3) The 26Z5's have been replaced with crummy little diodes (they'll be
> replaced with 1N5408's). The anode of each diode shows around 270 volts
> and the B+ measures 300 volts - a "little" higher than spec. Has anyone
> that's ever replaced the 26Z5's with diodes ever also added 220 ohms in
> series with each diode to simulate the IR drop across the original 26Z5's
> ?? This would restore the B+ to approximately the original value. The
> tube manual says the IR drop is 22 volts at 100 ma per tube. The added "R"
> would also help damp the surge at initial power-on.

You've got a good handle on this issue. It's a very good idea to add a voltage dropping resistor to the diodes to bring the IR drop down to spec. You might have an ex-Navy set-- this was a common field change and is described in the NAVSHIPS manual.

> 4) L603 (little 4H choke on the AF B+ supply line) has been replaced with a
> resistor. The choke apparently met an early demise and the resistor value
> is close to series R of the original choke. Despite the kludge, the audio
> sounds fine - no discernable hum. Regardless I wouldn't mind replacing the
> thing. Are parts like this available out there (stop laughing before you
> reply please).

Fair Radio (Lima, OH) might have this part as well as a line filter. They're extremely helpful.

> 5) The Zero of the Carrier level meter changes up and down when I switch
> AGC settings or from AGC to MGC. Doesn't seem to matter where I set R523, I can't find a spot where the Zero stays put. I'll guess that this is an
> indication that some of the components in the bridge circuit have changed
> value over the years. Am I on the right track ? Or is this an indication
> of something else ?

R523 is a bit of a pest to set correctly. I use a ten-turn pot which is so simple to set, it's fun to tweak. See Chuck Rippel's website for more on this and other helpful hints.   Welcome to the world of the R-390*!

Date: Tue, 10 Oct 2000 08:18:34 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R-390A simple questions

As for item 1, mine was broken when I got it. I got a replacement (thanks again Cal) and it was in better condition. There's a problem with these, however. There's enough leakage in these older filters to give you a pretty nice voltage on the chassis. Furthermore, if you plan to use the radio on a GroundFaultInterrupt circuit, it will more than likely trip the breaker.

I sawed off a filter flush with the mounting plate and mounted it on the backplate to get the original look from the back and connected the wires from the pins on the inside of the filter. I'm going to use a new line filter to feed the radio where it will plug in. These newer filters have very low leakage and are commonly available. I got mine from Mouser for a little over $5.00. They also make these that take a three-wire cable (like the ones that connect power to a home PC) that you might just be able to devise a bracket and mount it directly to the backplane. I liked the original screw-on power connectors so I didn't do that.

As for item 2, I had the same problem. The microswitch that controls this is kinda backwards from what I expected. It is a normally-on switch - it is depressed when off and un-depressed when in the "ON" positions (perhaps some Prozac is needed?).

It turned out the little plunger was simply stuck in the "down" position after so many years of being off. I was able to exercise it a bit by pushing it a bit farther down with a small instrument and after a few times, it started coming back up just fine and I have On/Off functionality again.

Check it before ordering a replacement. You might be as lucky.

Date: Fri, 20 Oct 2000 23:07:51 -0400
From: twleiper@juno.com
Subject: [R-390] Re: Over Voltage Protection for Older Equipment.

An interesting post on BA Swap and my addition...

On Fri, 20 Oct 2000 10:35:55 +0000 k6uuz@juno.com writes:
> Those of you who have read my posts will recognize me as an advocate
> of reducing the power line voltage for older equipment. In my opinion,
> no tube-type radio or test equipment should be plugged into the wall
> outlet. The voltage at the time of manufacture was 110 to 117 VAC and
> running it at today's 122 VAC can overload it causing premature failure
of > power transformers, tubes, etc. For instance, a radio designed for 115
VAC operation and pulling 1.5 amperes consumes a power of 172.5 VA
> (watts.) The same radio operating at 122 VAC pulls 194.3 VA (watts.)
An
> overload of 12.6 percent. I have been running all my tube-type radios
and test equipment on a voltage reducer for two years and have not had a
> failure.
>
> In order to extend the life of these fine old radios and make life
> easier for their owners, I have put together a cheap, simple but effective
> voltage reducer. It is in a 4" X 4" X 3" metal electrical junction box
> with two outlets; one for 110 VAC @ 3 amperes (330 VA) and one for
> 116 VAC @ 3 amperes (348 VA). It operates on the principle of a
> series-bucking voltage, using a filament transformer. The voltage to
> the radio is reduced by the amount of filament voltage added in series,
> but opposing in phase, thereby subtracting from the line voltage rather

> than adding to it. This has several advantages over using a resistor to
> drop the voltage: (A) It is more efficient. no power is wasted heating
up a resistor...21.8 watts in the example above. (B) Better voltage
> regulation as the voltage drop is due to the voltage developed by the
> transformer, which is nearly a constant, not the drop across a resistor
> which varies with the load. (C) It doesn't get hot like a resistor does.
> (D) It can be used for different loads without having to change the
value of a resistor.
>
> Anyone interested can write me for more information, A free
> schematic, drawings, a parts list and step-by-step assembly
> instructions will be sent by return e-mail.
>
> I am not doing this to make money, but for those who don't want to
> run around gathering up the parts and pieces, I offer a kit of all the
> parts plus the instructions for $29.95 plus $7.95 S&H.
>
> And for those who are time-challanged, I offer a built and tested
> unit for $39.95 plus $7.95 S&H.
>
> Anyone wanting to forward this information to other reflectors has
> my permission.
>
> Ed Richards

A very sensible idea. You can also browse around your local scrap yard and find numerous buck/boost 12V transformers pretty cheap and able to handle several KVA. The inside covers usually show how to connect the windings to buck or boost. For my local conditions, these take me to an average of 110V. This should be especially important to those of you who may occasionally use poorly regulated exciter style generators which usually have high open circuit and low-load voltages. One trick I learned while restoring a CV-591 was the Navy mod for solid state rectifier diodes. At the same time they removed the 5R4 and put in the diodes, they ran the now-unused 5V filament winding in series buck with the primary winding to (presumably) drop the HV down a bit. It caused the unit to run significantly cooler and nailed the voltages at book value. I have since done this same mod to several other pieces of equipment with good results. I have not noticed any increase in operating temperature of the transformers due to increased eddy current to offset the reduced, filament current...and got dizzy trying to figure out if such should occur, but, at least in this case, reality is sufficient regardless the theory. Tom Leiper

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Date: Tue, 31 Oct 2000 21:55:19 -0500
From: "Randall C. Stout" <rcs1@sprintmail.com>
Subject: [R-390] 26Z5W replacement mod

The Stewart Warner tagged R-390A I just picked up had the 26Z5Ws replaced with small black plugs marked ED5902, EDI-7834. I seem to recall talk of these before, and assume they are just incapsulated diodes. I haven't fired up the rig yet, but am wondering if I should expect the same elevated voltages out of these as the straight diode conversions?

Date: Tue, 31 Oct 2000 19:20:24 -0800
From: Ed Zeranski <ezeran@concentric.net>
Subject: Re: [R-390] 26Z5W replacement mod

I've had two SW R390As from the 1959 contract for several years, both having the Navy diode mod for the rectifiers. I run them at 115VAC line w/variac and they seem OK

Date: Mon, 13 Nov 2000 13:37:12 -0500
From: brumac@juno.com
Subject: [R-390] R 390A Fuses, What To Do?

I lugged home a early R 390A this past summer, (funny how they attach themselves to your arms) that is probably an old Collins or Motorola with a silkscreened panel and only one fuse on the back panel. The earliest dated component is 1955. My quandry is should I install the 2 additional B+ fuses under the chassis or modify the rear panel and install them there? The chassis is not pretty, panels bent, corners rounded, and probably sat in a dirty environment for a while and will need a good cosmetic redo. FYI, it worked at plug in, (up slowly on a variac) and agc is running at -5.5 v on local stations. So should I bastardize an oldie by punching 2 holes for fuse holders or hide them underneath? It will get an engraved panel anyway!

Date: Mon, 13 Nov 2000 14:31:04 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R 390A Fuses, What To Do?

Install them in the rear panel. Do a good job of it. Then listen with confidence that your radio is protected and with pride in a job well done.

Date: Mon, 13 Nov 2000 18:51:26 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] R 390A Fuses, What To Do?

I have worked for 45 years without the fuses. There was never a field change to add them. New models had them to help isolate problems. Why do this to an old receiver. Just leave it as is. ppppp will do more to keep the receiver running than running it til the fuse blows.

Date: Mon, 13 Nov 2000 22:17:35 -0500
From: Glenn Little <glittle@awod.com>
Subject: RE: [R-390] R 390A Fuses, What To Do?

Greenlee makes a chassis punch in the shape and size that you need. Have not looked at their prices lately, however, I suspect taht it would be in the $50.00 range. The only other punch that I am aware of is a Roper hand punch. They will make the "D" punch for you. The punch and die will cost around $100.00 for the jr punch. You would probably need one for the larger punch. This would probably cost more. Also you will need the handle for the punch and die set, more expense. Probably the best thing to do is to see if a local sheet metal shop can punch the holes for you or drill them round.

Date: Mon, 13 Nov 2000 22:27:55 -0500
From: Glenn Little <glittle@awod.com>
Subject: Re: [R-390] Motorola details

The extra fuse was added with a field change if I remember correctly. This field change probably was done at the depot level. The MCSC Albany probably means Marine Corps Supply Center Albany, Ga. This was (is?) a depot level repair faculity for the Marine Corps. The numbers/letters scribed below the MCSC Albany label may be the instruction number that authorized the modification for the Marines.

Date: Mon, 13 Nov 2000 23:33:48 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R 390A Fuses, What To Do?

Greenlee makes a D hole punch. Otherwise its punch or drill 1/2" round and file it out to a D hole with a small half round file.

Date: Tue, 14 Nov 2000 04:27:14 -0800 (PST)
From: Tom Marcotte <courir26@yahoo.com>
Subject: RE: [R-390] R 390A Fuses, What To Do?

I installed my fuses on the inside of the radio.

Date: Tue, 14 Nov 2000 12:28:12 -0000
From: "Michael P. Olbrisch" <kd9kc@elp.rr.com>
Subject: RE: [R-390] R 390A Fuses, What To Do?

That punch is expensive!!!! So much so in fact that the boss would rather pay us $25/hr to hand cut the hole rather than buy us the punch. Our boss is a real D--K... even his mother named him Richard!!!

Date: Tue, 14 Nov 2000 07:26:42 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] R 390A Fuses, What To Do?

>I has worked fo r45 years with out the fuses.

I'd guess that they might still be a few houses out there wired with knob and tube wiring too, but I wouldn't want to sleep in one. <grin>

>There was never a field change to add them.

I've never seen or heard of one either.

>New models had them to help isolate problems.

They did more than isolate problems. The limited damage when a cap failed. Been there, done that many times. ;-(

>Why do this to an old receiver. Just leave it as is.

It takes a long time for the single AC primary fuse to blow if a component shorts in the B+ circuit. In the meantime, lots of magic smoke escapes from the radio and resistors, chokes, switches, etc. get char broiled. The fuses are well worth adding. Ditto for checking that the AC line fuse is a 2 amp fuse rather than the marked value of 3 amps. The 3 amp fuse is way excessive when not using the ovens. I think I have a 1.5 amp in my EAC. Also, I do not use slow blow fuses for the two B+ fuses. If something fails, the faster those fuses blow, the less damage to the receiver.

Date: Tue, 14 Nov 2000 10:20:46 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R 390A Fuses, What To Do?

I have a TO that talks about them being added at a certain contract, but its not quite a field change.

Date: Tue, 14 Nov 2000 21:32:34 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: RE: [R-390] R 390A Fuses, What To Do?

A sharp scribe, some layout dye, a center punch and small hammer, a drill, some needle files, and a steady hand. I've done a number of them. I cheat a bit though. I made a template out of an old piece of a chassis that had one in it.

Date: Wed, 15 Nov 2000 15:34:34 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] non A Power supply

>I am working on a r390 (non a). The power supply is running around 300v.
>This problem I am sure has been discussed before, but some clues as to
>what the problem is by someone that has been through this before would
>be very helpful in trouble shooting .

Plug all modules in especially the PTO. Ensure the ballast tube is working and that the PTO and dc regulator tube on the audio deck are getting filament current. Check resistor values in the regulator circuit, and also the hum-improving capacitor in there for leakage (although leakage there will lower the output voltage.) Problem: the DC amplifier tube in the regulator circuit operates on the ballast-regulated filament line.. if the PTO is unplugged, it gets no filament and the regulator goes to full raw dc output.

Date: Wed, 15 Nov 2000 15:50:19 edt
From: k4zku@juno.com
Subject: [R-390] R390 (non a)

Thanks to all that replied about the power supply problem. As I had 300v on the 180v regulated line. The problems turned out to be, parts out of tolerance mainly resistors in the regulator circuit. changed them and the caps also. Yes , I did not have all the modules plugged in so some of the filaments were not lit. Last a 6082 is bad , does anyone have one for sale? Now on to the next problem, The r390 receives signals from 8MC up. Dead on lower frequencies and even in the BC band. Any suggestions on this? What to look for?

Date: Mon, 11 Dec 2000 15:26:17 -0500
From: "Peter Lower" <pslower@sympatico.ca>
Subject: [R-390] Power Cord

Any suggestions on how to connect a three wire/three prong power cord to the 390-A? I get a nice buzz when holding on to the antenna connector.

Date: Mon, 11 Dec 2000 16:02:21 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Power Cord

I would make sure the hot lead is connected to the terminal on the filter that is connected to the fuse ("A" I think, but not sure about that) then simply connect the ground to a convenient place on the frame (I used one that holds the AC cover in place)   A word of caution, though: with that much leakage, you probably cannot use a GFI outlet. I don't use an original filter, but plan to use a modern 3-wire filter that doesn't leak as much. I gutted a filter so I could have the original screw terminals, and will filter the power before it enters the radio.

Date: Mon, 11 Dec 2000 18:50:51 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Power Cord

My R390/A has two studes into the line filter and two more studs on the chassis that is supose to have a cover over the open studs on the line filter. There are also a couple 6 x 32 bolts near buy that hold the mid deck to the rear panel. Place a loop terminal on the green wire and clamp it under any of the 6 x 32 bolts or over one of the cover studs before you place the cover on and drive the nuts down tight. Add a star washer if one is at hand.

The order of the hot black and return white to the filter should be with the hot black wire going to the fuse side of the filter. Check that with an OHM meter. One side of the filter goes to the fuse and the other side goes up to the switch. do not assume the ins and out match. Do not assume the current wiring is correct. Get ye old meter and test. Pick up a good 6 foot three wire cord at the hardware. You want a good molded plug on it. Use a good extention cord. Yes the R390 is under 3 amps, but you are after mass in the ground conductor here. (Don't you read what Jerry writes?) Pick up some crimp on terminals while you are there. Chop the female end off the cord and cut the out jacket off so you can spread the lead around as needed. Maybe leave the green one a bit long and get the black and white up short. I like to have the strain on the black on. Then when it breaks the ground is still attached. If you protective cover is missing ! ! Select a proper tin can and make up a new one. A U shape cover works. Kind of long top to bottom. about as wide as you can get between the studs and still get nuts on the studs. Deep enough so it will clear the filter terminals. I do not have a strain relief on my cord. I thought the original covers had a cable clamp built into them. If you got one use it.   Roger KC6TRU.

Date: Wed, 13 Dec 2000 09:26:04 -0500
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] r390a power transformer potting problem

If you ever have your R390a power transformer go bad, don't be in a rush to trash it. I've had two separate instances of the potting material forming a carbon track to ground at the feed-through porcelain bushing on the end of the high voltage winding. The repair is simple enough , chisel around the solder holding the bottom plate. With a soldering gun , melt out a small area around the bushing. Drill out the old solder-tab rod , run hookup wire through the hole. Solder back the connection , fill the void with coax seal. It is a good idea to repair both ends of the high voltage winding, as I neglected the other side, a year later it failed .

Date: Wed, 13 Dec 2000 20:02:28 -0500
From: Dennis McLaughlin <dennism2@ix.netcom.com>
Subject: RE: [R-390] r390a power transformer potting problem

I had a transformer fail in the same way. The red rubber bushing holding the porcelain bushing broke down and become conductive. The porcelain bushing just goes through the metal case about a 1/16". The red rubber bushing holds the porcelain bushing in the metal case. The rubber also goes behind the porcelain and contacts the conductor going through the porcelain inside the case. The rubber breaks down and shorts the high voltage winding to ground. From the outside it looks like only the porcelain insulates the high voltage conductor.

Date: Fri, 15 Dec 2000 20:09:35 -0600
From: "Richard Biddle" <theprof@texoma.net>
Subject: [R-390] R-390A Line Filter Repair

I opened a line filter up last year in an attempt to repair. They are full of black uckumpucky,some caps and coils. Heat gunk cleaned it out, but I gave up after the replacement came in from Fair Radio:) As for me, I use a good ground, a line isolation transformer, and a Variac (with slow ramp power up) to run the hollow state receivers to prevent the "tingles" and tripping the GFI.

Date: Fri, 29 Dec 2000 21:54:27 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: [R-390] R-390A Newbie Questions

I'm the proud owner of a SW R390A. But it's going to be a long winter with this one. Help needed!   First, when I plug it in, it trips the ground fault interrupter in the garage, indicating some leakage from AC lines to ground. I suspect the AC input line filter. Any replacements available?   So I disconnect the ground (don't ask) and fire her up anyway. Lamps come on, filaments come on, the carrier level meter looks like it wants to do something and the 3A main fuse blows.

Using a variac, I then crank it up slowly and at about 85 VAC input, the 26Z5 rectifiers spark and flash and the fuse blows again. I remove the rectifier tubes and crank it all the way to 115VAC with no problem.

I am getting 570 VAC from the power transformer secondary. I put the rectifiers back in and I disconnect the AF module connectors to isolate the rectifiers from the chokes and filter caps, and by themselves they still flash and the fuse blows. The seller claimed the radio worked before shipment, Are these rectifier tubes problematic or damaged by shipping vibration? Where can replacements be found? As soon as I get past this I'm sure there will be more. Thanks.

Date: Sat, 30 Dec 2000 01:03:26 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: Re: [R-390] R-390A Newbie Questions

OK thanks to all for your responses to my R390 problem. So tripping the GFI is normal, everyone says, so I will get an isolation transformer. On the B+ problem I was having (blowing the fuse, 26Z5 arcing), I have temporarily replaced the tube rectifiers with diodes and am getting IF noise now! So the 26Z5's were indeed defective...I will probably install the field mod for solid state supply. But I still have no live signals. And I have no filament on the BFO and PTO tubes....and of course, therefore, the ballast tube is bad too (3TF7). Darn expensive too. Anybody have a spare ballast they want to sell for a reasonable price, or know of a worthwhile alternative?

Date: Sat, 30 Dec 2000 08:32:53 -0500
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] R-390A Newbie Questions

.... reverse the Live and Neutral leads to the set, it might help. DON'T CHANGE THE EARTH LEAD!!!!!

Might be that GFI standards are different in your country -- do you have 120 or 230 V mains? Seems that everyone I recall who has posted on this in the US has had that problem. Another solution was to disconnect the line filter cap or replace them with something else, though the word was that most of these would trip a GFI. Another solution was to run off a circuit without a GFI. Also, more important, for safety reasons, the power switch and fuse should break the hot/live lead, not the neutral. If Jim simply swaps the power cord leads on the rear panel, this would put the switch and line fuse on the neutral - not safe, they say.

Date: Sat, 30 Dec 2000 10:40:08 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R-390A Newbie Questions

The bypass capacitors in the line filter, even if not leaky (and there's nothing about their age to say they aren't leaky like the rest of the paper capacitors in the radio), will draw enough current to ground to trip the GFCI. You can run a special circuit without GFCI and ground the radio securely and have equivalent safety, providing the ground is maintained. Or you can replace the line filter with one from a computer power supply that is designed with smaller capacitors and better inductors to be more effective.

There are multiple solutions for the ballast.

3TF7's do exist.

I've created a circuit that replaces the 3TF7 with a diode bridge and a LM317 as a current regulator.

One of the R-390(a) restorers sells a plug in module that replaces the 3TF7, I suspect with a diode rectifier and a LM7812 voltage regulator. I don't think the transformer appreciates the unbalanced direct current component of the load.

A resistor, such as a 12BH7, in place of the ballast works. So for no one has detected poorer stability as the result of the lack of regulation.

The diode mode has been debated that it doesn't really apply 12.6 volts RMS to the tubes.

A jumper and replacing the 6BA6 by a pair of 12BA6 (very common in the later 4 and 5 tube AC/DC radios) works. Means the tube socket labels need to be amended for the future.

The best I can figure, ballast tubes were an absolute necessity in the receivers of the era prior to the R-390 where the tunable oscillator was at HF, up to 32 MHz and band switched. That made the potential military customers expect a ballast in the R-390 even though it had virtually no effect. I suspect the military buyers would have rejected the R-390 without the ballast. The one engineering report that we have says the ballast was included "just in case" it might help. I can send you my circuit, I have it in various forms, including text with .GIF, .PS and .DXF.

Date: Sat, 30 Dec 2000 23:06:12 -0600
From: "Jon & Valerie Oldenburg"
<jonandvalerieoldenburg@worldnet.att.net>
Subject: Re: [R-390] R-390A Newbie Questions

Reminds me of an incident 8 months ago. My 51 Collins R390/URR has always lacked power to the lamps. Lost reception one evening, so I switched it off and started checking things out. I soon found out I had more than one problem, the micro-switch was stuck "on" and I got a nice ZAPP!

Date: Sun, 31 Dec 2000 12:06:53 +0200
From: "Paul Galpin" <galpinp@sabc.co.za>
Subject: RE: [R-390] R-390A Newbie Questions

Did this raise a hornet's nest!

1. The diode method does work correctly. The heating effect is proportional to the area under the curve of the sine-wave. One half of the sine-wave is missing, therefore it goes down 50%, but the amplitude is double, so it goes back up to 100%. Unlike light bulbs, the heater element has plenty of thermal lag to overcome the effect of the missing half-cycles. Since one of our correspondents has been using it for 20 years, I think the case is proved. The uneven load on the transformer is small compared to the overall load. This is a non-linear circuit, so doing silly things like putting in a big C will really screw things up. You can only measure the effective voltage with a TRUE RMS meter, which does not assume that all AC is a sine wave. Most AC/DC meters make that assumption.

The 3FT7 ballast is a fairly crude device (iron wire in hydrogen atmosphere, I believe), but hi-tech for its day. Sorry, I had forgotten that 110 volt countries really do suffer from regulation problems, here in Africa we are 220 Volt (+- about 5 volt), with an earth trip at 20 - 30 mA. If you really want ultimate stability, replace the (missing?) 3FT7 with a solid state regulator, and never mind about historical correctness.

So the options appear to be:

1. Solid state regulator: best stability, not historically accurate, heat depends on
design.......
2. 3FT7 ballast: good stability. historically accurate, dissipates about 4 Watts
3. Resistor: OK stability (mains dependent), dissipates about 4 Watts
4. Diode: OK stability (mains dependent), dissipates very little
5. Short circuit, use 12BA6s: OK stability (mains dependent), no extra
dissipation

The set is designed to have a hot 4W device in this position, so that is not really a problem, but I think that the 12BA6 is the most elegant answer if your mains regulation is reasonable. <snip>

Date: Sun, 31 Dec 2000 23:03:58 -0600
From: Dallas Lankford <dallas@bayou.com>
Subject: [R-390] Inrush Current Limiters

For those who don't want to leave their R-390As on 7/24/..., and who don't want to bring their R-390As up to operating voltage with a variac every time they turn it on, an inrush current limiter may be just the thing. Mouser has them, and calls them Current Limiters in their index. The correct one for an R-390A is the CL-80 (Mouser 527-CL80), rated at 47 ohms (cold resistance) and 3 amps (continuous duty), for $2.17 each. You could use the CL-90, rated at 120 ohms and 2 amps, if you are certain the ovens will never be turned on. They are easy to install. Merely remove the wire from the power line filter FL101 to the 3 amp fuse F101 and install the CL-80 in place of it.

Date: Mon, 1 Jan 2001 08:58:31 EST
From: Llgpt@aol.com
Subject: Re: [R-390] R-390A Newbie Questions

I use the 1N5408 diodes, put 1kv ceramic disks across them and a current inrush limiter. Chuck's module has a soft start feature in it, takes the 390A just under 1 minute to audio. I've checked B+ and its 241V, so it works for me.

Date: Mon, 01 Jan 2001 08:15:58 -0600
From: Dallas Lankford <dallas@bayou.com>
Subject: Re: [R-390] Inrush Current Limiters

I have CL-80s in mine (in case I forget and decide to turn on the ovens for some dumb reason or another), and my good friend, who I call Mr. R-390A because he has overhauled 100 + of them, uses CL-90s like you do. Good point about the current limiters dropping the line voltage. That is also helpful in improving the MTBF of our favorite receiver. I forgot to mention it. Thank you for the nice words about my 25D overhaul notes. Although I "upgraded" to HP-8640Bs, I still have my 3 overhauled 25Ds, and it is the 25Ds that I generally use (despite the hum modulation that worsens as you go up in frequency above, say, 5 MHz).

Date: Wed, 10 Jan 2001 23:01:49 -0500
From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] Inrush Current Limiters

Even though I'm rapidly getting my whole station up to speed with Variac slow start lines, I'm adding Inrush current limiters to all R-390X rebuilds as part of the standard referb menu.

These little gems run pretty hot, by design, so just a reminder to those who haven't used them, mount them so they stand away from other wiring down there under the chassis...with idea to allow as much air circulation as possible...it's an easy and inexpensive modification/up-grade.

Also adding high voltage in rush protection to some of my older linears. Latest in progress slow start project is to do my Viking 500 with an 18 amp Variac...plan to look at measuring 4-400 filament line and bring out for metering...

Note the T-368 is set up this way and allows for filament voltage adjust with built in panel meter...its just good operating practice for our increasingly scarce replacement components.

Date: Thu, 11 Jan 2001 09:38:20 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

<Soapbox mode ON> I was tempted. I almost re-posted my diatribe against variacs. But I restrained myself. If youse guys want apply ONE HUNDRED FIFTY FIVE volts to your radios, go right ahead. I have enough R-390A's here and I won't buy the ones you blow up for parts. If you wanna be stupid and put your radios in extreme danger, go ahead. PS: If anyone wants some good thinking and sensible advice on use of variacs, let me know.

Date: Thu, 11 Jan 2001 06:52:04 -0800
From: "Rob Dunn" <dunnr@ix.netcom.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

I hear your concerns about overvolting (find that verb in your dictionary) your R-390's with a variac but every variac I have seen can be wired so it doesn't put out more that is put in. It is just a matter of what terminals of the variac are selected. In the end this is just a variable tap autotransformer and used with the correct terminals there shouldn't be any risk to the radio.

Date: Thu, 11 Jan 2001 11:53:42 -0500
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

Anyway, I agree. Most of my "pre-enclosed" variacs have a range switch, usually labeled "0-120" and "0-140" which select the tap. Now that top end is nominally correct assuming 115 volts in, I think, so if your line voltage is starting at 125, the ranges are not exactly as advertised and we must cite the mantra YMMV. However, as a safety and to make it easier to set on 115, I always leave these switched to the low range.

Most raw variacs have the extra, low range taps whether or not the case has the switch -- if they're in a case. These are at approx. 10 and 2 o'clock on the windings. When "low gear" is engaged, ONLY ONE of these is used, not both for the AC input. I believe it's the opposite end of the variac coil that is common for the other side of the AC line and one output. The other output side is off the rotor.

I always turn the variacs down to zero before turnon and then bring them up slowly, but not all that slow -- a few seconds. There was a thread some time ago where it seemed to be resolved that a really slow run-up wasn't really helpful with hollow state rectification as nothing really happens with the rectifiers until about 90 volts and they turn on all at once. (I suppose the inrush current limiters are the right solution for that.) Someone even suggested (maybe two or more) temporarily subbing solid state rectifiers when awakening a "sleeping giant" after many years of slumber.

I always use a meter with the variacs. The ones with the built in meters are handy. I have a Staco "AC Power Supply" that consists of a 5 amp variac, voltmeter and ammeter. But most premounted variacs don't have meters, so also have a bunch of RS AC Voltage Monitors, which are handy. These are little meters with AC plugs on the back. Although small and cheap ($10), the range is restricted to 96 to 130 volts, which makes it easy to "tune" 115. You can plug a power strip (or surge protector with filtering, maybe) into the variac and plug one of these and the radio into the strip. The meter is on page 229 of the 2001 catalog, #22-107. (Note to Joe Foley: O'course sez "Made in China", but what isn't? Probably made by Chinese Capitalists who carry little green books on day trading. Come to think of it, that's scarier isn't it?)

Date: Thu, 11 Jan 2001 13:46:34 -0500
From: "Ray Vasek, W2EC" <w2ec@attglobal.net>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

We seem to agree on most things, but your concern with variacs is only valid if you wire the variac so that it can provide a boost. All the variacs I have here can be wired several ways. I have one right here in front of me. On this one, terminals 1, 2 and 3 are the input, terminal 4 is the variable tap/output. Terminal 1 is common. Terminal 2 accounts for appx 90 percent of the total windings and Terminal 3 is the end of the winding. Terminal 4 is the variable tap. Now if someone applies the primary voltage (say 115 volts) to terminals 1 and 2, then, yes, measuring the voltage between terminals 1 and 4, with the tap turned all the way to the far end of the transformer beyond terminal 2, a greater voltage than the primary will be seen. On mine here on the bench, with an input of 115vac (I'm blessed with a power company that provides me a constant 115 volts, measured by several different analog and Fluke DMMs so I'm fairly confident that its true), this variac shows a maximum of 135 vac at full spread, too much for our radios of course.

However, to prevent your concern, it is just a matter of wiring up the primary so it is across terminals 1 and 3, which means that no matter where I turn the variable tap, it cannot exceed the primary input voltage, as both the primary and the tap are at the same point on the autotransformer. Configured this way, mine shows a maximum of 115vac, exactly the same as the primary input.

The point is that, properly wired, there is no reason to not use a variac. Yes, it can be misused, but that doesn't justify the position you are taking, that they should never be used. It would be far more helpful to explain how to use one, rather than say never use one.

Used properly, a variac is very suitable for adjusting the input voltage, plus it allows precise voltage settings, unlike the concept of using a bucking transformer where your voltage selections are limited to a few different ranges.

Date: Thu, 11 Jan 2001 16:09:39 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

I agree with that, but I believe that there are variac owners who:
- did not wire the thing themselves
- do not realize that it can produce such overvoltage
- have variacs that were manufactured for 117 volt power source and are connected to produce overvoltage
- may not ALWAYS be careful in using it.

>All the variacs I have here can be wired several ways.

This is exactly one element in the potential problem. Most disasters, such as aviation accidents and death by electrocution, happen because of a combination of two or more factors, each of which contributes to the problem.. In many cases of disaster, if any one of the factors had NOT been present, no trouble would have occurred. The fact that variacs can be wired in many ways is just such a factor.

> I have one right here in front of me. On this one, terminals 1, 2 and 3 are the input,
>terminal 4 is the variable tap/output.

Your description of your variac is good, and will help folks understand why they can develop over voltages. If I remember correctly, General Radio Variacs (TM) had five terminals. This was to allow for:
- either overvoltge or nominal line output
- permit panel mounting, where the common connection needs to be made

to the other end of the winding in order for the voltage to increase with clockwise rotation of the knob.
- inclusion of an incandescent pilot lamp across the low voltage tap

... On mine here on the bench, with an input of 115vac (I'm blessed with a power company that provides me a constant 115 volts, You are lucky, and this is the second major factor in developing the dangerous overvoltage. From what you tell us, I estimate your variac could produce 146 volts from a 124 volt line. Many of us have nominal line voltages of 122 to 125 volts.

However, to prevent your concern, it is just a matter of wiring up the primary so it is across terminals 1 and 3,..Configured this way, mine shows a maximum of 115vac,

Indeed. This is a very safe and reasonable thing to do. If folks want to "bring it up on a variac slowly", then this is exactly what they should do.

> The point is that, properly wired, there is no reason to not use a variac.

Well, perhaps. I do not have good answers to the following questions:

1) Is it detrimental to run tubes with cathode current limited by cathode emission, as happens with low filament voltages?
2) What occurs to the rectifier tubes during slow warm up?
3) What would be the effects of running the radio on very low voltages, say 85 or 90 volts, for extended periods of time

>Yes, it can be misused, but that doesn't justify the position
>you are taking, that they should never be used.

The position I am taking is that it's far less likely that a radio will be damaged if we do not use them routinely.

> It would be far more helpful to explain how to use one, rather than say never use one.

Thank you for helping to explain the proper use.

>Used properly, a variac is very suitable for adjusting the input voltage, plus it allows precise voltage settings,

I believe that precise setting of the supply voltage is not needed and that the following results of using a bucking transformer are more important:
1) You cannot supply dangerous overvoltage to the radio, accidentally or otherwise. 2) The line voltage can be lowered to reduce heat and stress on tubes and components.

For the record, here is my "diatribe" on variacs: VARIACS, Just say NO!

Your variac CAN produce up to ONE HUNDRED AND FIFTY TWO* volts out, IF:

- it is not re-wired to accept modern line voltages * * and
- it is wired for overvoltage operation, and
- you JUST HAPPEN to turn it all the way up.

*(this is assuming that your variac is set up for 115 volts input and 140 volts output.)

Do you want that to happen? Even for a minute? I don't think so. The SP-600 power transformer has a 125 volt input tap. Use it. Most other radios do not have such a tap. You can set up a voltage bucking transformer to run your boatanchor safely at its rated voltage. See the following link for details: <http://www.r-390a.net/faq-HiVolt.htm>

Sola or similar constant voltage regulation transformers can be had with 115 volt output, and they are self -current-limiting. They are noisy, hot and inefficient, but do have many advantages. It may be the case that some of those set up for 120 volts output can have a few turns removed from the output winding to lower the output voltage, although the Sola transformers I have seen are varnished thoroughly. You may also be able to ADD a few turns in the opposite direction to lower the output voltage - a built in bucking winding.

If you really want to take the risk of applying overvoltage with your variac but want its dial to read correctly (that is, tell you the awful truth when you smell smoke from your radio), read on:

* * Briefly, to correct your Variac so that the dial reads correctly for modern line voltages, do these steps CAREFULLY:

1) Measure your nominal house current line voltage.
2) Move the input tap of your Variac to the winding the wiper rests upon when the dial is set to indicate that voltage. Now your dial will read correctly most of the time.

Careful use of an Exacto knife will loosen the one winding you need. Then lift it enough to strip the enamel and solder the input tap. Use a piece of insulating tubing under the lifted section, and apply some coil dope finger nail polish, or varnish to hold it all in place. If the original input tap is made on the inner side of the windings, just tape it off and make a new tap on the outer side of the winding.

One Superior Electric variable transformer I have has a center-off switch for 0-115 and 0-135 volts. The dial plate shows 0 to 100 percent. THAT one is dangerous for sure. It produces nearly 150 volts output on the "0-135" switch position.

While you are at this, check that there is a fuse in the OUTPUT of the variac, not just the input, install a three-wire cord AND outlet if it doesn't have these.

Of course, the thing will still produce overvoltage, so a better method is to move the input connection to the end of the winding and locate a new dial plate or recalibrate the original one. Some variacs had two-sided dial plates with the different calibrations. Be careful, because some two-sided plates are meant to be used for panel mounting or case mounting, where the dial is either fixed on the panel, or is mounted on the knob and rotates with it.

Good luck, and long live your radios.

Date: Thu, 11 Jan 2001 15:30:10 -0600
From: "J. G. Kincade" <w5kp@swbell.net>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

Gotta say, Roy, that all my variacs here except one (7 total) are set up so that you can't get out more than you put in, even if you crank them to the stops. The one I do have set up to put out 140V if I want is the one on my test bench, because sometimes I want to run it a few volts high when checking transformers.

Variacs are no more dangerous to equipment than guns are to people, assuming both are carefully set up and used by people who know what they are doing. I do agree that folks shouldn't bring one home from the hamfest and plug it up to their treasured boatanchors without checking the tap settings and output voltages, and they are best used metered at all times.

Date: Thu, 11 Jan 2001 16:58:29 -0500
From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

I must be missing something...??? scratch, scratch, hummmm...lets see now...?? System I'm using is to start with aprox 120 to 121 volts line, measured with a friends "Fluke" and bootsrapped to my cheapo dvm...I have looked at my several Variacs and none have been able to give a boost to the feared 155 volts as wired - pure hamfest rescure jobs -

Maybe I've been lucky, but they must be wired to avoid that kind of boost. Just now, I'm cleaning and painting an 18 amp GE that's still on the bench.

Will take a look at the possibility of being set up for boost...this one is headed for another heavy AM transmitter, not R-390X's. Regardless, I have checked max output of all of my Variac measured with AC volt meter...two with expanded scales, also checked against the above Fluke.

Next I ramp up the voltage ""slowwwlllllyyyy..." while sipping something cool (or hot) depending on the temperature in the operating area at the time...usually about 30 to 45 seconds...until the monitoring meter comes up to 115 vac indicated... What's neat is that with the expanded scale meter...one can watch the voltage variation on the mains...so your nominal 115 volts of indicated "juice" to the R-390X's is a bit of a moving target...scarry stuff for purists... So far, not a problem of running over voltage to the receivers or my xmtrs with this system....i.e., if one believes the meters and is actually operating one's equipment and paying attention...(always a good idea)... especially when one gets to the 3kv stuff and multi-hundred watt toys!

Date: Thu, 11 Jan 2001 17:19:55 -0500
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

Glad you mentioned that Jerry -- my diatribe follows:

Don't ever just plug in an old variac, particularly when you don't know where it's been.

Open it up and check the track where the wiper tracks. If it's blackened, loaded with carbon, first clean it up. I found the best thing is a SOFT pencil eraser. Keep cleaning the eraser on some paper or cloth and don't try to shine it up too much. The exposed copper usually has a thin brass plating which you don't want to rub off. If just a few turns are shorted with wiper fallout, the variac/autotransformer can burn up even with no load. Use an old toothbrush (no paste) to clean out between the windings. Don't ask me how I know this or what happened the one time I didn't open one up and check it (cough, cough, choke). (I posted on this ad nauseum about a year or two ago.) Don't go by outside appearances. People like to play wth the big knob on these and/or sometimes they were used for poor man's light shows, working the knob rapidly. That's what causes. most of the problem.

Also check the wiper brush. I think these should straddle no more than 2 windings at a time. The overlap is intentional to avoid intermittents as you adjust. However, most of the wipers are tapered, so if they're really worn badly, they could short more than 2, which isn't a good thing.

Never trust the dial plate rightside up or upside down. Always use a voltmeter if you're interested in setting the thing right. Many "canned" variacs are not fused right and other older ones weren't set up for grounded outlets. You can use adapters, but connect the ground through the frame. Oh -- another thing. Autotransformer designs vary. On some of them the whole metal rotor is HOT!. I believe this was to discourage tampering by the Darwinian method.

Variacs are not isolation transformers. One side is common with the supply (s/b neutral). Some big deluxe AC supplies may have both a variac and an isolation transformer, but these are @RARE@, and probably very @HEAVY@ for their amperage.

There are probably other checks to make -- so suggest away. e.g., If some turns are blackened already (all around the doughnut through the core) the thing is bad. Not to be confused with the black potting compound many have going all around the trace end and maybe an inch up the cylinder part. These things also depend on insulating washers and some use fiber or other non-conducting shafts, etc.

Date: Thu, 11 Jan 2001 18:05:27 -0500
From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

Guess it's Variac time on the List... Is there a source for new wipers? Or is it possible to 'fabricate' new ones from some motor brushes or some other source? Advice about not just bringing home a 40 pound hunk of funny looking transformer with a "steering wheel" is well taken....get it open and do some real serious visual inspection and cleaning befor putting power to it... How about starting with another variac to test the newcomer before putting full voltage on it?

Date: Thu, 11 Jan 2001 18:15:19 -0500
From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

I just cut some ""fish paper"" washers to re-shim the drive shaft on a recent rebuild...thats the heavy fiber paper used for xformer windings...required about three layers to take the play out of the shaft to minimize chance for the wiper potentially floating off the windings...looks like someone tired to do a fix on this poor old critter and couldn't get it back together...carbon wiper is 'ok' but if there was a new one around, I'd replace it...

Date: Thu, 11 Jan 2001 18:08:22 EST
From: Llgpt@aol.com
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

We have a steady 124 volts here on the Gulf of Mexico. I have a current inrush limiter in conjunction with Chuck Rippels solid state ballast replacement module. Chuck's module has a soft start feature built in also. When last checked (about 1-1/2 weeks ago), the B+ was 241 volts (forgot to mention I also have 100v 3 amp solid state diodes in place of the 26Z5W's) The manual calls for 240 volts.

Pretty close I'd say. When checking filament voltage on V-505 from pin 3 to ground, it is 6.2 volts. Of course, Chuck's module takes care of this. What am I missing???? I suppose we could get a rocket scientist to run an equation and tell me that my tubes will last 3.2 hours less than the guy who is running a variac. heck, I have over 300 tubes on hand, and I'm 57 years old. I can make it without buying anymore I think.

Date: Thu, 11 Jan 2001 18:20:45 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: [R-390] Variacs for Softstarts

Recently built a surplus Variac into a rackmount panel and fitted it with all the bells and whistles. I use it to softstart the R-390A of the day.

It consists of the Variac wired so it puts out no more voltage than it receives, an elapsed time indicator (just for fun), analog voltmeter, on/off switch, duplex receptacle, indicator lamp, and fuseholder. Lessee, anything else? Ah yes, a pair of rack handles. :-) Does this thing ever look cool! Knowing that analog voltmeters can be off calibration, I checked mine against a good DMM and set the zero adjust so that the analog meter reads 115 VAC correctly and ignored the needle being off zero with the power off. This assures that the voltage going into the receiver is what I want it to be. With the Variac set at its lowest setting, I switch on the Variac. (R-390A's on/off switch stays on.) I run the voltage gradually up to 90 VAC (takes five seconds), then wait a few more seconds until the audio comes up. This indicates that B+ is flowing. Then I run the Variac up to just under 115 VAC. I don't go below 110 VAC so as to keep emission problems from cropping up over time. Procedure is reasonably quick and automatic after a while, like buckling on entering a car. The R-390A microswitch has a high-ish failure rate, thus I use the Variac's on/off switch. Works for me-- as if I don't have enough dials to twirl!

Date: Thu, 11 Jan 2001 18:30:10 EST
From: Llgpt@aol.com
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

>I also have 1kv 3 amp solid state diodes in place of the 26Z5W's

Oooops !!! Should have typed 1,000v 3 amp diodes.

Date: Thu, 11 Jan 2001 17:12:10 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] We Don't Need No Stinkin' Ballast Tubes

> Also check the wiper brush.........

Right! And the wiper should be seated on a tit in its holder. This forces it to rock in the direction its forced in while turning the knob. Why? So the wiper will wear in the same shape it was made in, a shallow point. This wiper should center to make contact with only one or two turns when the knob is released. Sometimes they are sticky and don't move right. Oh yeah, the size of the wiper is dependent on the size of the windings, too. Make sure it's the right sized wiper, could have been replaced.

Date: Fri, 12 Jan 2001 10:26:24 -0500
From: "AI2Q Alex" <ai2q@ispchannel.com>
Subject: RE: [R-390] Variacs for Softstarts

Just a quick note: with my R-390A's Variac, I do indeed use a an AC panel meter on its cabinet. But, I also have wired-in a spring loaded double-throw toggle switch. In the spring position it puts the meter across the incoming ac line and I can read the line raw voltage. I typically do that before turning on the Variac. In the normal resting position the switch lets me read the output of the Variac. Works like a charm, keeping the ol' 1954 vintage R-390A happy.
BTW: I absolutely have the Variac wired to provide over-voltage. That way it can be used under any and all conditions.

Date: Fri, 12 Jan 2001 11:29:17 -0500
From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] Variacs for Softstarts

Not rack handles too!! Me too...and I painted it red as are all my antenna patch and power control panels... I like the part about goiing to 90 volts and then moving on as audio comes up... btw, Me too on letting the variac be the on-off switch...I've done that same technique for others of my heavy weight gang to avoid the lifting and working in cramped compartments with the switches go bad.... Yep, we must be some where near the same frequency, wave lenght or whatever when it comes to soft starts...

ps...elapsed time indicator....now why didn't I think of that...but with the current panel, there's no more room....'cause I put me on one of them "amp meters"....8>) this for the Viking 500...but maybe for the '390's....back to the design room....

Date: Fri, 12 Jan 2001 12:20:43 -0500

From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] Variacs for Softstarts

Gosh, now I've got to go and add another switch to my new panel...I really like the spring loaded switch to allow line monitor at start up idea....I do this anyways in other locations in my station, but to have it as a feature on my heavy duty starter is kinda neat. Oh well, where's the drill and hope I don't scratch my new paint job...

BTW, I have found a technique for "mounting" large panel meters without doing the hole...using a "sort of" surface mounting technique that I stumbled into.... At the bigger hardware stores, one can find very neat gray colored boxes that are meant for outdoor wiring junction boxes...they have mounting tabs on the outside that allows them to be screwed, bolted to a flat surface. The cove plates are plastic too and mount to the boxes with four husky screws and a rubber gasket/seal. They are ideal for mount the typical 3" round meters and there is one box big enough to do a 4 or 5 inch meter...(my junk box produced a beautiful neary 4.5" GE amp meter that fits perfectly)...and is soon to be pressed into service after years of living in its original box....

The idea is the plastic mounting plate cuts like butter in a small drill press with a hole cutter...""not"" the ones that look like a miniature soup can with a drill in the middle,

I'm using one of the hole cutters that has a radial arm and cutting tool as available at Sears...they are not too expensive and do a fantatastic job on these cove plates.

Once the hole is cut to size, mount the meter and position on the face of your panel, or other mounting surface...They look great 'scattered around the operatin position...a little bit like the spooks listening posts 8>).

Locate bolt holes and get it mounted...then drill some neat holes through bottom of the box and through the panel to provide leads to the meter...be sure to de-burr to avoid beating up the insulation on these real life volts/amp type wiring...

Sure beats trying to drill large holes in the panels, and allows usage of some of the older steel panels one finds from time to time a the fests...Also finding the plastic cover plates make great mounting technique for meters on panel that have holes already, but are too large for your existing junk box beauties ...same technique except add the cover plate and mounted meter over the existing hole..Mount the plates directly on the panel.....Looks great an is a very clean and simple process...

Finally the boxes come in two depths...check your meters for clearance so that the teminal bolts on back of meters have sufficient room to seat the cover plate...

Hope this helps someone to move ahead on a slow start projects that not only
work well, but looks good too....

Date: Fri, 12 Jan 2001 12:10:43 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Variacs for Softstarts

Did more or less the same thing. My panel has four single, contractor-grade, receptacles. Two of them are unfused outlets (think of them as just an extension cord). The third is a fused outlet and the fourth is fused with the VARIAC (the fuse in the output side). I have a 0-150VAC panel meter and a 0-5A AC panel meter that I can switch independently between outlets 3 and 4. This way, I can test the current draw of an item with fused receptacle #3 before I attempt to put it across the VARIAC. With the meter across #3 receptacle, I can monitor the "raw" line voltage.

The panel includes a big old toggle switch that completely disables everything in the panel. Overall, the panel is a very handy item to have as the outlet in the shop (read "utility room") is on the wrong wall for my setup. Only glitch is that switching the amp meter causes a slight hiccup in the connection to either outlet 3 or 4, but it's not too bad.

Naturally, everything is 3-wire and fed with a GFI recepticle. The utility room is on a concrete floor. AND the VARIAC is setup to give no more than the input voltage.

Date: Fri, 12 Jan 2001 21:36:52 +0000
From: Ron Hunsicker <ronhunsi@ptd.net>
Subject: [R-390] Inrush Current Limiters

Before you fool with these things you should read the technical description at the Thermometrics web site:
www.thermometrics.com/forms/appindex.htm and then, under "White Goods...", click on "CL".

What the Mouser catalog does not show is that each current limiter has a specific energy capacity defined, roughly, as P = 1/2CVV.

The CL-80 can handle 5000 microfarads at 120 volts. Thus P =
36,000,000

At 450 volts, C can be no more than 355 microfarads (1/2 X 355 X 450 X450 = 36,000,000).

Date: Sat, 13 Jan 2001 09:56:30 -0500
From: Gene Beckwith <jtone@sssnet.com>
Subject: Re: [R-390] Variacs for Softstarts

Once again, every time I think I getting close to getting something 'right' a new idea pops up...I too will replace the the feed recpticle with a GFI. Even have a new one in a box that I've been meaning to install...good intentions and the road to Hell....Thanks for the reminder...
I did get the new holes drilled yesterday and didn't scrtch the pain job....so will mount out going fuse and toggle to switch the volt meter from raw to out...don't have a spring job, but one will turn up in the coming 'fests'... Almost time to wire it up and put it in service...

Btw, regarding switching the current meter, maybe you have to adopt a cold
switching procedure and not do with load...probably real hard on the switch to do it hot...?

Wonder what type of switch ur using, and how much current you are dealing
with...In my case, expect to be dealing with maybe 5 amps or more (won't really know 'till I have this thing wired)...even when not transmitting...so any hot switching would be rough on the equipment...

Date: Mon, 15 Jan 2001 10:33:21 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Variacs for Softstarts

If you use a T rated switch, it can handle inrush up to 15 times rated current. That's a requirement for surviving the inrush of tungsten lamps. Tungsten lamps cold resistance is as mush as 15 times smaller than their hot resistance. Makes for a real inrush problem when switched.

Date: Mon, 15 Jan 2001 21:30:38 -0500
From: "Jim Miller" <jmille77@bellsouth.net>
Subject: [R-390] B+ Dropping Resistor, Paint, Etc.

Well the old SW R390A is playing real pretty now that I have the 2nd oscillator shaft aligned properly! I managed to find two 26Z5W rectifiers and plugged them in. All worked OK for a few minutes until the filament of one of them went out! So much for the tubes, the diodes are now in place under the power supply module. I also mounted a 220 ohm 15W+ dropping resistor under the 26Z5W tube sockets using two small standoffs screwed onto the ends of existing tube and connector mounting screws under the power supply deck. I decided to do this rather than put it in the AF module to keep the power supply moids all in one place: the power supply. Does anyone see a problem with this that I have overlooked? I positioned the resistor so that when the PS module is mounted in the frame the resistor would be in close proximity to the mainframe for heat dissipation. Have also ordered a CL80 inrush limiter to finish things off. Still no clue on the jump in residual carrier meter level when the BFO is turned on.... some have heard me discuss here. If I ever find that I will let all know. I'm now trying to match some touch up paint for the front panel at various paint stores. Any suggestions?

This is a good board, there don't seem to be many complaints about overly talkative threads like this. Thanks to all for their help on the MB connector etc. 73 Jim N4BE.

Date: Mon, 15 Jan 2001 21:37:14 EST
From: Llgpt@aol.com
Subject: Re: [R-390] B+ Dropping Resistor, Paint, Etc.

IUh Oh, pretty soon you will be branded as a witch......egads solid state diodes.<grin> Jim, I have used them for years, have also had a couple of p.s. modules with the same sort of set-up on the dropping resistor. Seems to work fine for me, 241 volts B+, supposed to be 240...close enuff for me!!!

Date: Tue, 16 Jan 2001 00:00:19 -0500
From: Thomas W Leiper <twleiper@juno.com>
Subject: Re: [R-390] SP-600

That's because they are for different primary voltages. So just rig up a rotary switch to "ramp up" through the taps, OR ... <snip>

Date: Tue, 16 Jan 2001 08:31:01 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] SP-600

NO, NO, NO>>>> If you apply 124 volts to the 95 volt tap on a transformer, you will be applying serious over voltage to the radio..The HIGHEST voltage tap on the transformer is for 125 volts. Use that one ONLY.

Date: Wed, 17 Jan 2001 21:00:12 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] different thread / question

I'm not an expert on magnetics by any means, but I seem to recall that filter chokes are built with an air gap to prevent the core from saturating from the DC through it. You wouldn't have such a gap using a transformer.

I think I would use a 120 ohm resistor of suitable power rating. It won't have the ripple fighting effect of a choke, but after all, few supplies used chokes, most used resistors. That will either hold you until you find a true choke or until you decide there's no hum so the resistor is fine. You might compensate for the resistor instead of choke by adding more C to the power supply.

Date: Thu, 18 Jan 2001 12:15:14 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] different thread / question

Filter chokes ARE built with an air gap so the unbalanced DC current doesn't saturate the core. Different air gaps give different results. A wide air gap makes for lower inductance but constant with varying current, a narrow air gap makes for a "swinging" choke where the inductance varies with load current. The swinging choke can lead to better regulation with varying loads.

A resistor won't cut ripple anywhere like a choke. And it's no test of a filter choke or capacitor (except for operating at excessive voltage) to test the power supply without load. Ripple is a function of load current. With no load current ripple will be practically zero because there's nothing to take charge from the capacitor when the rectifier is not filling it. And absent a lot of bleeder, the filter capacitors will charge to the peak of the AC voltage applied to the rectifier.

The power transformer applied as choke will work after a fashion. And probably always better than the resistor, but not as well as the choke originally did, because with no air gap the DC current will tend to saturate the core and significantly reduce the inductance. There's no magic connection of windings that will give you inductance and prevent core saturation.

These days, larger value filter capacitors are readily available, so one can often increase the value of the filter capacitor from that of the original 4 or 8 mf (fine with a couple filter chokes) to 30 or 40 mf and achieve the same filtering. Though without some current limiting element like the choke, the peak currents supplied by the rectifier tubes may exceed their capabilities. Then silicon rectifiers are a good change because they can often handle peak currents 10 or 20 times average while vacuum tubes are limited to 4 or 5 times average. Voltage regulation with changing load, limited peak limiting inductance/R and larger capacitors may not be as fine as the original scheme because at lighter loads there is more tendency for the large capacitors with smaller input Z to climb towards the peak voltage. The greater peak currents may lead to a warmer power transformer high voltage winding also.

Date: Thu, 18 Jan 2001 13:32:22 -0500
From: rbussier@lexmark.com
Subject: Re: [R-390] different thread / question

Excellent answer as usual, Dr. Jerry. I was wondering why the first element after the rectifier tube was only a 4 mfd cap. Next comes choke L1 and then L2 with 40 mfds on either side, The B+ then goes to the 591's tubes and also through a BIG resistor to feed the 0A2, which regulates the 150 VDC leg. Thanks for the advice, I have several offers on chokes and I plan to swap the 5Y3 for some diodes anyway so, I should be OK. Jerry, I guess you saw my original post where one of the filter caps had shorted and leaked. It was so bad, I had to replace the octal socket the dual section cap plugged into. It led to the demise of the original L2, and replacement L2 I replaced all the .1 and .01 caps below deck as well. The old waxy jobs looked bad, but surprisingly, were OK. The red molded ones were leaky and the only 'black beauty', leaked 375 v at a test voltage of 400 v.

Date: Sat, 20 Jan 2001 09:55:11 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] different thread / question (filter chokes)

It would not make sense to short the primary of the transformer as that would essentially short the winding being used as a choke leaving a very small leakage inductance and mostly wire resistance. Might as well use a resistor, it's more compact.

Date: Sat, 20 Jan 2001 11:49:26 -0500
From: Thomas W Leiper <twleiper@juno.com>
Subject: Re: [R-390] different thread / question

Oh. I assumed he was going to use the secondary winding for the choke and not the primary. The secondary would have greater resistance (certainly closer to the desired 120 ohm than the primary) and inductance, thus being be the logical choice. It also would presumably be better able to handle the voltage. That being assumed, would not shorting the other windings (not the secondary being used for choke) increase the inductive reactance of the whole transformer? I think it would because the shorted windings clearly would have some "flywheel effect" and, because it IS a transformer after all, their effect should be well coupled to the secondary. The other assumption is that he is using a plate transformer, IE it has a high voltage secondary. But you know what they say about assuming things...

Date: Sat, 20 Jan 2001 11:59:19 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] different thread / question

No! Shorting the primary drastically reduces the inductance seen at the secondary because its practically shorting the terminals of the secondary because the windings are very close coupled. I said before that leaves only the leakage inductance. The leakage inductance is typically a few percent of the winding inductance, often under 5%, rarely under 1%. One measures leakage inductance by shorting the opposite winding and measuring the impedance that remains. A significant portion of that impedance is winding resistance. Using the secondary as a choke is using primarily the magnetization inductance which is much larger than the leakage inductance. As I said before, shorting the primary, leaves mostly the winding resistance to act as choke, might as well use a resistor, its more compact.

Date: Sat, 20 Jan 2001 13:32:02 -0500
From: Thomas W Leiper <twleiper@juno.com>
Subject: Re: [R-390] different thread / question

I get it. I was thinking bass-ackwards about the effect of shorting the windings. You're right, shorting the primary in effect shorts the secondary for AC, thus no 'ductance.

Date: Wed, 7 Feb 2001 21:42:30 -0800
From: keith <khgrant@ix.netcom.com>
Subject: [R-390] Adding Fuseholders?

I have a an old Collins R390A (8719-P-55) that does not have the two extra fuses that later models have. I am interested in adding them but I'm a little unsure where to tap into the cables/connectors to make a clean job of it. Has anyone else performed this surgery? It looks like I will need to unlace most of the harness going from audio deck to the rear panel and add/remove wires. How hard is it to re-lace the harness neatly? Any words of encouragement?

You folks are a great group of people, in spite of your leather harness fetishes...!

Date: Wed, 07 Feb 2001 22:15:33 -0800
From: Craig McCartney <craigmc@pacbell.net>
Subject: RE: [R-390] Adding Fuseholders?

I have two receivers of the same vintage as yours. I have added a B+ fuse using the following method:

Both are modified for solid state rectifiers. I have removed one of the 9-pin sockets on the power supply formerly used for a 26Z5W. In the hole, I mounted a plate with a hole to fit a fuse holder. The holder is wired into the B+ line just before it leaves the power supply chassis. This puts it in the same place, electrically, as the B+ fuse on the later receivers so I fitted the same size fuse. You have to reach under the chassis (rcvr mounted in rack) to get to the fuse, so not quite so convenient. Since I have never blown one, not a problem, but still good insurance, IMHO.

I have not bothered to add the additional fuse for the RF only B+ line.

No holes in the rear chassis, no wiring harness changes. YMMV.

Date: Thu, 8 Feb 2001 14:44:41 -0500
From: "Paul Bigelow" <pbigelow@us.ibm.com>
Subject: RE: [R-390] FL-101 questions

Yep, they're leaky. Plugging in the receiver, removing all three fuses, disconnecting P111 and measuring from chassis ground to the cord ground was 62.5VAC at about 160ma with line voltage at 125VAC. Keep that thing grounded!

Date: Thu, 08 Feb 2001 14:01:42 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Air conditioned tube shield

The VR tube is drawing enough current so some dropping resistor takes the fall of 300 to 150 volts. The VR tube is from the +150 to ground. Any load on the +150 is current the VR tube doesn't have to carry. The VR tube heats the MOST when the power supply is unloaded because there's no load current and because the unregulated voltage is higher, the current through that dropping resistor is greater and the VR tube has to take it ALL. QUIT ABUSING your VR TUBE! Hook up the load!

Date: Thu, 8 Feb 2001 18:14:37 EST
From: G4GJL@aol.com
Subject: [R-390] Inrush limitation. Posted on behalf of Wolfgang DD8BD

Hi all, here my little contribution about my recent efforts :

Subject
- -------
Inserting a current inrush limiter into the R-390A/URR using the NTC S237 - a long story for a short procedure from a newbie for newbies

Remark
- ------
The used Siemens NTC S237 was found in the CONRAD ELECTRONIC catalogue as the most suiting type. There may be other and more suiting types available at other dealers for electronic parts.Also read Jan Skirrows et aliter articles on this subject at first. If you can help with some improvements please post a notice!

Parts:
- ------
- - NTC resistor e.g. Siemens type S237 [22 ohm at 25ÅáC / 4 amperes (crystal oven switched off)]
- - Teflon insulation from surplus wires
- - soldering tin

Tools:
- ------
- - suiting pliers for cutting and bending wires
- - soldering iron (I use a 25 watt soldering iron)
- - suiting screwdrivers for opening the lower deck
- - a pair of metallic tweezers
- - 1.5mm driller or nail with similar round shaft
- - desoldering device(s)
- - a hot cup of coffee

Instructions
- ------------
Where to insert the inrush current limiter:
The NTC resistor is inserted between the centred soldering ear of the fuse holder [F101] and the feed through of the line filter [FL101] . Normally in the unmodified condition these are connected by a wire.

Procedure
- ---------
Get the power supply plug out of the mains connexion.

At first you carry your R-390A on your work bench, turn it upside down and open the bottom cover to get access to the fuse holder and the line filter.

Put the 3 amp fuse out of the fuse holder.

You cut the wire off at the fuse holder and desolder to get the ear of the back and centred fuse holder connection open (this is the moveable contact what gets pressed out when inserting the fuse).

You cut the wire also at the feed through of the line filter, but let remain 1 to 1 1/2 cm of the wire at the soldering connection of the feed through. Now take a sharp little knife and a pair of tweezers. Hold the wire at the feed through with the pincette to save the sensible feed through at FL101 from any burden or mechanical drag by working on the wire. Cut off the insulation along the remaining piece of wire.

Try to twist this wire carefully a little bit if there is no solid inner conductor.

Now drink a sup of coffee.

Take some surplus Teflon insulated wire and pull out the inner wire. You need two pieces of this insulation suiting to the length of the NTC wires . Now slide the two wires of the NTC resistor each by one into the Teflon insulation so that there remains enough wire free from insulation for the soldering connections.

You take the 1,5mm drill and wrap about two to three turns of one of the wires of the NTC around it in order to get some little spiral or coil.

One wire (that without spiral) of the NTC is fed into the soldering ear of the fuse holder and wrapped as far you can. Now it gets soldered.

Take the spiralled wire of the NTC and insert carefully the now not insulated short wire from the feed through of the line filter so that few millimetres look out of the spiral at the remaining wire from the NTC . Bend or deflect this bit of wire to nearly 180 degrees so that the spiral won¥t glide off from the wire. You also may squeeze the connection. All this is done for the safety of these connections.

Fetch a suiting metallic pair of tweezers and put it between the housing of the line filter and the soldering eye (with the short remaining piece of wire) of the feed through to avoid heat what could stress the feed through and the soldering points.

Now solder this last connection. Bend the NTC wires to attain greatest distance of the NTC from all other parts around inside the receiver.

Put the bottom cover back to the receiver and screw it tight.

Remove the tools, straighten up your shack and take the cup back in the kitchen.

If you did not forget the pliers or the pair of tweezers inside the R-390A you should be ready and can switch on the gear reading the digital frequency readout reversed (unless you turn the receiver back in normal position, <grin>).

If you can¥t receive any signal you forgot to reinsert the 3amp fuse into the fuse holder,hihi!

My thanks to Jan Skirrow and other R-390 enthusiasts , whose interesting articles motivated me to use a "current inrush limiter" for the R-390A and other gear.

Date: Fri, 9 Feb 2001 12:42:24 -0500
From: "Paul Bigelow" <pbigelow@us.ibm.com>
Subject: [R-390] 125VAC / 270VDC

My line voltage is now 125VAC. From the SS rectifiers the voltage is 270VDC versus the 240VDC specified. Has anyone placed a voltage dropping resistor at this point in the circuit?

The AF Deck has one such a resistor (240VDC -> 203VDC) so I could either double the resistor and wattage rating or place another resistor of same value and rating in series, correct?

Date: Fri, 09 Feb 2001 13:22:32 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 125VAC / 270VDC

Adding a dropping resistor just moves the heat. Why not use a variac or bucking transformer to drop the AC, then the heater voltage will be more reasonable also, and the total heat will be reduced.

Date: Fri, 9 Feb 2001 11:40:03 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] 125VAC / 270VDC

There are 3 lines of thought on this.

Thread one do nothing and leave it as is The 0A3 may work a bit harder the heat gets spread around. It does not upset the receiver. (Works for me)

Thread two put a 5 watt resistor out side the tube socket on the power supply to get the heat more outside the receiver (but still under it) 10 to 50 ohms. YMMV

Thread three put a 5 watt resistor inside the power supply out of sight. This is still a lot cooler than those tube filaments you just replaced with the diode mod for the 25Z6's. 10 to 50 ohms. YMMV

Date: Fri, 09 Feb 2001 19:34:28 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] 125VAC / 270VDC

I have a follow-up question. The line voltage here in Montreal is 118/120VAC. The drop across the inrush current limiter is 2.3V. The DC voltage at F102 varies 251/255VDC, at F103 208VDC and at E607 152VDC. Tried a bucking transformer that originally had a 12VAC winding. I removed turns to get about 3VAC. The results were AC I/P 115/118VAC, 2.7 drop across the inrush limiter. The DC voltages were, F102 varies 241/243VDC, at F103 194VDC and at E607 149.6VDC.

My question is, In your opinion are the voltages with the bucking transformer satisfactory for good operation of the R-390 or would you just not bother.

Date: Fri, 09 Feb 2001 18:37:26 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 125VAC / 270VDC

If the line is 118 with 2.3 volts drop in the current limiter, I'd not bother with the bucking transformer.

Date: Fri, 09 Feb 2001 19:51:14 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] 125VAC / 270VDC

Thanks Jerry. Your response is appreciated. One more little nagging problem put to bed.

Date: Fri, 9 Feb 2001 21:53:13 -0800
From: keith <khgrant@ix.netcom.com>
Subject: RE: [R-390] Adding Fuseholders?

Thanks for the fuseholder tip. I still have the rectifier tubes in place in mine. I havn't decided if (or when) I'll convert mine to solid state diodes. I was thinking of drilling holes in the chassis to mount my fuse holders. Is there a particular reason that you didn't fuse the RF B+ line? Oh, I just looked at the schematic again and realized that the RF B+ supply comes off the first B+ fuse. Now why did they do that? Why have the 1/8 amp in series with the first one? Seems odd. Well, maybe I will stick with just the single fuse myself. Though I'd be interested in your logic.

Date: Sat, 10 Feb 2001 07:51:53 -0800

From: Craig McCartney <craigmc@pacbell.net>
Subject: RE: [R-390] Adding Fuseholders?

My opinion at the time was that the one B+ fuse does 90%+ of the job of protection. So much better than no B+ fusing at all. I just was not into hacking up the rear panel and messing with the harness. Couldn't figure out how to do it and still leave it looking kinda 'original'.

Date: Fri, 16 Feb 2001 10:53:41 -0800
From: Buzz <buzz@softcom.net>
Subject: [R-390] Capacitor failures

I took some pictures of electrolytic capacitors that failed so that you can have an idea of some things to look for when you are refurbishing a piece of equipment.   http://www.softcom.net/users/buzz/misc/caps.html

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Date: Fri, 16 Feb 2001 14:17:16 -0500
From: "Paul Bigelow" <pbigelow@us.ibm.com>
Subject: [R-390] Navy EIB-895 -- what is it?

Is the contents of EIB-895 available on the internet or does anyone know the detailed contents of that Navy modification?

Date: 16 Feb 01 12:58:20 -0800
From: "Richard McClung" <richard_mcclung@tcibr.com>
Subject: RE: [R-390] Navy EIB-895 -- what is it?

The quick and easy explanation:

Field Change #6, Changing the rectifier tubes to SS rectifiers caused an increase of 20 - 35 VDC of plate voltage.

EIB-895 describes the procedure of adding a resistor between terminal #5 of J619 and terminal #1 of L601.

If AC line voltage is consistently maintained at 115VAC use a 200 OHM 11- 14 WATT resistor (RW31V201/RW68V201)

If AC line voltage will vary up to 120 and 125 VAC use a 220 OHM 11 - 14WATT resistor (RW31221/RW58V221

Check DC plate voltages of V603 and V604, between pins 5 and 7, for 170 - 180 VDC.

CARRIER METER and IF GAIN adjustments may need to be performed.

Date: Fri, 16 Feb 2001 16:08:41 -0500
From: "Paul Bigelow" <pbigelow@us.ibm.com>
Subject: RE: [R-390] Navy EIB-895 -- what is it?

Thank you very much for the information. The Y2K manual shows the change but could not find anything more specific. Did EIB-895 indicate where to install this resistor?

Date: Fri, 16 Feb 2001 19:16:56 -0600
From: "J. G. Kincade" <w5kp@swbell.net>
Subject: Re: [R-390] Navy EIB-895 -- what is it?

Hi Paul, from a retired old Navy ET. EIB's (Electronics Information Bulletins) were put out on a regular basis to all Navy commands, and kept in big huge binders in each electronics maintenance shop, both ship and shore. They were official directives in nature, and contained both general "hints and kinks" type stuff and official Field Change info on Navy electronics equipment. If the mod needed no parts, then you were expected to take it for action and do it, and record it in the Field Change records. If it needed a parts kit, info to order same was provided. There was also an (annual, I think) index of all field changes put out for each type of common equipment. Early versions (50's, 60's) were put out by the Bureau of Ships (BUSHIPS), the electronics branch of which later broke out on it's own to become the Naval Electronics Systems Command, or NAVELEX. I do not know if there remains a central library of these things, but I would not be in the least surprised. A search of the web in the NAVELEX or NAVSHIPS area might uncover something, or maybe a letter to NAVELEX. It would be a great find to uncover an archive of them somewhere, but most of that was before digital imaging and storage were for real, so although they probably exist, they most likely are in the basement of some building in Crystal City, in stacks of banker boxes..

Date: Fri, 23 Feb 2001 11:05:48 -0500
From: "Paul Bigelow" <pbigelow@us.ibm.com>
Subject: [R-390] Increasing the power supply filter capacitors

Has anyone tried increasing the power supply filter capacitors in the AF deck? Despite new tubes, checking tubes (for leakage as well), swapping the audio deck replacing the SS rectifiers, implementing EIB 895, unplugging the various decks (except power supply and audio), pulling V602, there is still noise at the audio output (maybe 60hz or 120hz or both). Although low level it is clearly audible with the RF gain turned completely down and the volume at 3 or 4. The noise is heard at standby with volume at 3 or 4 as well.

Not having another, operable, R-390a I am wondering if the noise is normal. Would the SS rectifiers need bypass caps?

Date: Fri, 23 Feb 2001 21:52:55 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] OT Hot Chassis Situation

By my schematic analysis, the power switch is in the ground side of the line when the radio is on and the chassis found to be cold. Then, when the line switch is open the chassis is connected to the hot line through the radio circuits and a probably very leaky hot side line bypass capacitor. It would be safer to use a double pole switch in the line cord circuit to break both sides.

Date: Mon, 5 Mar 2001 08:45:35 -0500
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: [R-390] R390A AC Line Filter

Who's had direct experience in rebuilding the AC line filter on the rear of the 390A?

For instance:

1. What's on the inside? I presume an inductor in series with each lead and then capacitors to ground from the load side of the inductors. Any ideas on the values for the caps and inductors?

2. Any bad chemicals inside?

3. Looks like a small torch will enable de-soldering the top plate. Any hints/kinks?

4. What have folks used to replace the guts? I see that Qualtek (http://www.qualtekusa.com/catalog_2/emi_filters/index.html) has a 5 amp filter, model 851-05/006 (LXWXH = 1.33"X1.77"X0.79") similar to Corcom 5VB3/5EB3. Has anyone tried this one? If not this one, which replacements?

5. Mine (from a 1960 or so EAC) says on the side "Sprague, JX filter, Y-15228, 2X4 amp. 250VAC 60CY, 85 degrees C" and on the top plate "97JX70A."

I know there was a partial thread on this topic in the recent past (seems to me that thread stressed the safety question -- a very good question to stress). However, any help greatly appreciated.

Date: Mon, 5 Mar 2001 08:55:21 -0600

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R390A AC Line Filter

I've disassembled a couple of these (they were already broken). I took a hacksaw to the solder joint. There is some gooey stuff, but not as bad as the dreaded ukumpucky(sp?) in the electrolytics. To preserve the look and connectivity on the rear panel, I used the flat plate that was left from the sawing process and soldered the connections to the little stubs that protrude from it. The cabinet I'm installing my radio into has about 2" of extra depth. I have a 10.5" x 19" piece of 1/8" aluminum plate that will serve as a back panel. It will have a fuse, an on/off switch, a switched outlet on the rear, and an internal outlet that will be fed by one of the block-style filters shown on the QualTek page you reference and a CL80 inrush current limiter.

The back panel will also have all the necessary terminals from the rear panel extended to it so I don't have to remove the back panel to get to the diode load, etc. The antenna terminals will also be fed to BNC connectors so I can quit fooling with those connectors for which I don't have connectors to mate to them.

I can tell you that running without the filter is quite annoying. Everytime anything in the house switches on or off, I get a nasty click.

Something else to consider is to replace the existing filter with the built-in style shown on that page that uses a "computer-style" connector. I didn't do this as I wanted to preserve the looks of the radio's rear panel as much as possible.

Date: Mon, 5 Mar 2001 11:15:05 -0500
From: "Jim Miller" <jmiller@iu.net>
Subject: Re: [R-390] R390A AC Line Filter

If the problem is excess leakage (such as tripping GFIs) this is pretty normal for the 390a. The filter is pretty aggressive. I solved it by buying a line isolation transformer (Hammond makes a 300 VA model). Radioshack www.techamerica.com) has them, or could possibly find one surplus. It was either spend $90 for that, or spend an entire Saturday rebuilding the filter. I chose to not spend a Saturday doing that.

Date: Mon, 05 Mar 2001 11:16:47 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R390A AC Line Filter

>Who's had direct experience in rebuilding the AC line filter on the rear of the 390A?

Never rebuilt one but I have some opinions anyway:

0. (you did not ask about this): Make sure you are not fooling yourself by thinking that some "leakage" from the thing makes it need rebuilding. The thing NORMALLY causes an ungrounded chassis to go to half the line voltage. Unless a cap is SHORTED in there, be very careful of assumptions you are making in your fault diagnosis.

> 1. What's on the inside?

Potted coils and capacitors. Its rather a mess

>2. Any bad chemicals inside?

Maybe in the caps, but don't worry too much about it.

>3. Looks like a small torch will enable de-soldering the top plate. Any
>hints/kinks?

Work outside, face downwind and wear eye protection and gloves. Fasten the thing FIRMLY to something heavy and you will be able to pull off the soldered plate once all the solder is melted.

>4. What have folks used to replace the guts?

If you replace the guts with components of equal value (the caps in particular) and then get "leakage" the same as you did before and it trips your GFI devices, remember: I told you so.

IF your unit is really shorted, I suggest you get a really nice little IEC filtered line cord connector, make up a plate to mount it in the hole left by the FL-1, and use any computer cord you can find to run your radio without fear of normal levels of RFI getting in or out, with no GFI devices popping, and with confidence that the radio is properly grounded.

<soap box mode ON> Ask yourself these questions:

1) Do I run my R-390A in the vicinity of multi-kilowatt transmitters operating at the same time I need to copy military operational message traffic on RTTY with essentially one hundred percent reliability?

2) Do I want to set myself up for a surprising tingle if the thing gets ungrounded some time in the future once I have forgotten all about this situation?

3) If my line filter safety cover is missing, how am I going to really, for sure, handle that potentially lethal danger in the way my widow will wish I had?

<soap box mode OFF>

Date: Tue, 6 Mar 2001 08:22:38 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R390A AC Line Filter

Fortunately, in the line filters I disassembled, the stuff came out pretty readily. It is less dense than the stuff I've encountered in the electrolytic filter cylinders. I don't recall there being a final layer of tar-like substance in the bottom that was so difficult to melt out of the electrolytics. What doesn't come out with an appropriate digging object can most likely be wiped out with mineral spirits. Note, I did not clean these fully. The connections on them were broken or loose, so I didn't try to clean them up and reuse them.

Date: Tue, 6 Mar 2001 13:13:02 EST
From: DAVEINBHAM@aol.com
Subject: [R-390] Re: C603 and C-604

Here is the method I use for dealing with the dreaded black ukkumpucky in the C603 & C606 capacitor cans in the R-390A: First, remove the subchassis containing these capacitors from your radio. See the Y2K manual for instructions on how to do that.

Second, unplug C603 & C606 from the subchassis and set them aside.

Third, invert subchassis and support it with anything suitable to keep it upright.

Fourth, solder in some axial lead capacitors you got either from my recap kit or your local electronics store.

Fifth, turn chassis right side up and superglue a poker chip or other round-tuit over the now vacant sockets for C603 & C606. This is to keep you or anyone else in the future from plugging anything into the vacant sockets. Reinstall subchassis in radio.

Sixth, Plug radio in and turn it on. Drop the old capacitor cans in the trash as you go get a beer. Listen to your radio knowing you have now dealt with the dreaded black ukkumpucky and won !!!

Date: Mon, 12 Mar 2001 07:12:20 -0500

From: "Warren, W. Thomas" <wtw@rti.org>
Subject: [R-390] R390A electrolytic replacements

Here's one good way to make up replacement electrolytic caps for the R390A.

1. Obtain from JIT Components two "CA-8 octal headers (key rotated 45 degrees)" -- these are the octal plug headers for the CA-8 plastic relay case -- two "CA relay case housings" and one "CA housing 1/4" spacer." You will note from JIT's web page and drawings that the standard CA-8 octal header has the guide key perpendicular to one edge. With the key rotated 45 degrees (with the header specified above), then the whole assembled relay case will be parallel to the edge of the R390A AF chassis.
http://www.jit-components.com/euc.htm

2. Order two 47mF/350V Radial lead, 16mm D X 25mm L, and three 33mF/350V Radial lead, 16mm D X 20 mm L electrolytic capacitors. Good ones to use are the Panasonic EB series, with Panasonic part #s respectively of EEU-EB2V470 and EEU-EB2V330S respectively and available from Digikey.

3. Mount the two 47mF's on one of the headers with the negative cap leads to pin 1 and one each of the positive leads to pins 3 and 5. Mount these capacitors VERTICALLY so that they fit across the diagonal formed by opposite corners of the CA-8 octal header.

4. Lay the three 33mF on the table, side by side, with the negative leads in a row. Daisy chain the negative leads from the top cap to the middle, from the middle to the bottom, and solder. Solder a couple inch piece of hookup wire to each of pins 3,5, and 7 of the header. Now solder the negative lead of the bottom cap into pin 1 of the header. The result should be the three caps, MOUNTED HORIZONTALLY, standing above the CA-8 header, and mounted so that the axes of the caps are perpendicular to the edge of the CA-8 header. Now use some spaghetti to additionally insulate the hook-up wires from pins 3,5,7 and hook up to the respective capacitors.

5. The 2 X 47mF cap can now be mounted in the CA housing with 4 3/8" X #4 SS self tapping screws. There's plenty of headroom to accomdate the 25 mm height of the caps plus a couple of mm for lead clearance between the caps and the header.

6. The 3 X 33 mF cap can now be assembled with the extra 1/4" spacer. This
is a bit of a snug fit, but it does work fine. You will need 4 3/4" X #4 SS self tapping screws to complete the job.

7. If you need the inside dimensions of the CA housing, they are 31.5mm X 31.55mm at the base with a 4mm X 4mm interference in each corner due to the corner reinforcement used to hold the mounting screws. Inside depth (or
height if you prefer) is 45.5mm.

Date: Sat, 17 Mar 2001 11:12:19 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Micro-switch problem

Failure mode of the microswitch on the FUNCTION control usually is the leaf contacts fusing closed. It can be taken apart and the contacts burnished. I think Dallas Lankford wrote about this in the Hollow State Newsletter.

I leave the control in the ON position to avoid this problem and softstart the radio-- the AC fuse blows otherwise. I use a 2 Ampere fuse instead of the 3 Ampere with the ovens switched off. Ovens aren't required if you operate in a basically even temperature room. Operation in a hut on the desert is a different matter. :-)

Fair's stash of R-390* parts is dwindling, thus it's best to call. The front panel isn't difficult to lower. Support the receiver on a pair of 2 x 4 blocks so as to relieve strain on the harness.

Date: Sat, 17 Mar 2001 09:58:45 -0800
From: jan@skirrow.org
Subject: Re: [R-390] Micro-switch problem

There is also a step by step repair in one of the R-390A threads on my Boatanchor Dreams website.

Date: Mon, 19 Mar 2001 08:38:14 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Micro-switch problem

Depends on what you mean by "went out". If it won't turn on, you might check whether the microswitch's plunger is releasing. That happened to mine. When it's pressed in, it's "off" and when it's released, it's "on". Mine wouldn't come on and I discovered the plunger was stuck in the "down" position. A few flicks of a small screwdriver tip across the plunger freed it and it has worked fine ever since. If it won't turn off, the switch is probably bad, but may be fixable.

Date: Thu, 14 Jun 2001 20:01:13 -0400
From: Bob Camp <bob@cq.nu>

Subject: Re: [R-390] Test

One thing that is possible with the rectifier tubes is that one goes and nobody notices. It makes for some more hum, but with the regulators not enough to make them pull off the covers and see what's wrong. They only stop using it when both of the rectifiers blow. Somehow I doubt that's it though, I'd bet on a major power surge of one sort or the other.

I have noticed that tube prices have gone up over what I used to pay at the distributor. I can't say that they are any more expensive than when I bought them down at the drug store or hardware store though. Now I gotta work on the math - Chuck Rippel says to have 4 sets of tubes on hand as spares. Now is that four complete sets for each radio? If so at 20 or 30 to a radio times six or eight radios that's about 1,000 or so tubes. Looks like I have a ways to go, especially if they have to be tubes that actually go into the radios :)

Date: Thu, 14 Jun 2001 20:32:52 +0000
From: blw <ba.williams@home.com>
Subject: Re: [R-390] Test

That is just the running spares load. That doesn't cover what you actually need.

Date: Sat, 16 Jun 2001 19:41:27 -0600
From: "Barrie Smith" <barrie99@marsweb.com>
Subject: Re: [R-390] Test

After some delay, I received new 26Z5W's, and new 6082's for the R-390. Tested them before installation and they all checked good. Put them in the radio and the 26Z5's blew at once upon power-up, taking the AC fuse with them. I do now have a manual that I downloaded and printed. However, the schematics, for me, at least, are virtually unreadable. There must be something, probably right out of the Hv power supply, that's gone dead to ground. Any thoughts?

I do have two more new 26Z's, but I'm depleting the rather slim supply, and don't want to risk them until I'm sure I've found the problem.

Date: Sat, 16 Jun 2001 22:28:59 -0400
From: Jim Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Test

Interesting... the same has happened to me with "new" 26Z5's ... I bought a 390a that came with them and they blew when I turned it on. When I replaced them with solid state diodes, the receiver worked OK... Bought some more 26Z5 replacements and the same thing happened. Never more... I decided to stay with the solid state rectifiers and let it go. Could be something to do with higher line voltages? Or leaky filter caps? Jim N4BE

Date: Sat, 16 Jun 2001 23:03:37 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] Test

I know next to nothing about the non-A except there's one in the other room whispering (or whimpering ..) fix me please. That being so here's what I would do:

1) Don't plug any more expensive rectifier tubes in the radio any time soon:)

2) Fire up the radio and measure the 25 volt filament winding on the transformer (pins 8 and 10 on the transformer and 4 and 5 at the tube sockets. Then check the high voltage, should be 285 VAC to ground at pins 5 and 7 on the transformer and pins 1 and 6 on the rectifiers. Ground should be on pins 6 and 10 of the transformer.

3) Make sure that pin 6 isn't shorted to pin 5 on the tube socket. If it is you get high voltage AC out of the transformer on the filament windings.

4) Check the connection at J818-14 / P181-14 on the power supply module. That's 25 volt filament power going out of the power supply module to the rest of the radio. It *really* seems odd that the filaments on the rectifiers go and the rest of the radio sits there.

5) Check F102 the B+ fuse. It should be 3/8 amp 250 Volt. Make sure some bright lad hasn't replaced it with 38 amps or some such thing back about 20 years ago :) Everything "downstream" of the rectifiers goes through this fuse. It's kind of amazing that it hasn't blown.

6) Pull P118 out of 818 and ohm out pins 3 and 8 on each of the rectifier tubes to ground. They should read open circuit. Then check each of them to pin 5 on J818. Each one should read 47 ohms.

7) Take some nice cheap throw away Radio Shack (they're open on Sunday) 1N4007's and jury rig them into the rectifier tube sockets. Power the thing up, see what happens. Once you get it running with nice cheap diodes throw them away and try the tubes again. One diode in each tube socket from pin 1 to pin 3 should do it. Banded end on the diode goes towards pin 3. If you are going to run for long this way I'd also put a second diode from pin 6 to pin 8 with cathode going to pin 8 in each

socket.

7) When the rectifiers "blow up" I'm assuming that the filaments are going *very* bright for a short period of time, then going open. If the rectifiers are arc-ing over or melting down then you probably have a different set of problems.

Here's what my schematics show on the tube base :

Pin 1 - plate #1 goes to Pin 5 or Pin 7 on the transformer
Pin 2 - n/c
Pin 3 - cathode #1 - goes to one of the 47 ohm resistors that go to J118-5 / P118-5
Pin 4 - filament - goes to ground
Pin 5 - filament - goes to Pin 8 on the power transformer
Pin 6 - Plate #2 - wired same as plate #1
Pin 7 - n/c
Pin 8 - Cathode #2 - wired same as cathode #1

The four 47 ohm resistors that go to each of the cathodes are R801 through R804. R801 Goes to Pin 3 on V801. R804 goes to Pin 8 on V802. I have never seen a TM-856, but the schematics out of it are very nice. I assume that what I have are originals since they seem to be old enough to be. I wonder what ever happened to the rest of the manual.

Date: Sun, 17 Jun 2001 00:41:04 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Test

Is your PTO unit hooked up OK? All connections snug-- nothing open, etc? If you power up the R-390 (non-A) without the PTO unit hooked up or if there's a critical connection open, the B+ voltage shoots way up. Joe's advice is good. By all means, do those continuity and resistance checks. What's the state of those four 47 Ohm resistors under the 6082's? Jeez, did those 26Z5W's really turn to toast instantly? Bummeroo! AC fuse the right size?

Got a Variac? Use it for softstarting and ramping up the line voltage to somewhere between 110 and 115 VAC. Room needs to be quiet while listening for arcing. Watch for smoke or expensive odors. Don't linger at low Variac settings as this puts the regulator tubes under strain. Even though the radio can run as low as ~ 90VAC, don't do it because over time it will cause a whole 'nother set of problems!

When all finally is well, consider inrush current limiters. They run hot, so keep that in mind when installing them so as not to singe nearby wiring or components.

Keep us informed, OK? Good luck.

Date: Thu, 02 Aug 2001 00:13:12 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Ovens stay on with switch in off??

The R-390A oven switch controls just the oven for the oscillator/crystal deck next to the RF deck. The other two ovens stay on all the time (17MC/200KC crystals and PTO) and all three have individual thermostats.

No need to clip leads-- you need those unswitched ovens to be operational. If you suspect a stuck thermostat, check it out by watching the voltage to the respective heater.

You are right in that it's a good idea to turn off the oven switch. Ordinarily the receiver is stable enough with the oven switch "off."

If frequencies are varying all over the place, the trouble must lie somewhere else. Hope you find it OK.

Date: Thu, 2 Aug 2001 04:35:17 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Ovens stay on with switch in off??

The 17 kcs oven is supposed to be on all the time.
The other two are switched I believe.

Date: Thu, 02 Aug 2001 13:36:20 -0700
From: plmills@attglobal.net
Subject: [R-390] R390 & R391 power connectors

FYI, Fair Radio sells power connectors for the T-195 transmitter. These are the same connector as used in the R390 and R391.... all you need to do is remove the cable and substitute a 115 volt power cable.

Date: Thu, 02 Aug 2001 17:52:08 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Ovens stay on with switch in off??

MY opinion (without having checked either a schematic or a real radio):

1) The 17 kc/200kc small small round oven is supposed to be POWERED all

the time, and in the heat mode some of the time.

2) The PTO and the crystal oscillator module oven are BOTH switched on and off by the "OVENS" switch on the rear panel.. Note the "S" in the name.

3) The "OVENS" switch should be in the OFF position.

Date: Thu, 2 Aug 2001 20:29:46 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Ovens stay on with switch in off??

This is EXACTLY correct. I recommend that if one has any doubt about the pto ovens switch, (I have seen them short in the on position) clip the wires. My .02 cents worth.   Les Locklear

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Date: Thu, 02 Aug 2001 20:35:16 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Ovens stay on with switch in off??

You're absolutely right. I mispoke earlier when I stated that only the oscillator/crystal deck oven is switched. Together the PTO and crystal/oscillator deck ovens consume ~ 1/3 of the rated AC power for running the receiver. I leave the ovens "off" and use a 2 ampere fuse instead of the nominal 3 ampere fuse for AC input. I soft start with a Variac and leave it set at just under 115 VAC (never below 110 VAC) to offset our rather high line voltage here-- 127 Volts.
Receiver works fine and runs cooler.

Date: Thu, 02 Aug 2001 20:47:01 -0500
From: "Robert M. Bratcher Jr." <bratcher@pdq.net>
Subject: Re: [R-390] Ovens stay on with switch in off??

I've always had the switch off (here in Texas) but have a question. Whats wrong with leaving the ovens on all the time?

Date: Fri, 03 Aug 2001 02:14:02 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Ovens stay on with switch in off??

Answers interspersed with your text-- PLUS a trivia question at the end!

Barry Hauser wrote in part:

> As covered way back several times, in addition to reducing heat and power
> consumption, it's safer to keep the ovens off in the event the thermostats

> fail closed and cook things, right?

Yep, that's another reason. Long term cooking by a runaway oven can't be a good thing, especially for the PTO.

> Someone just mentioned that soft-starting with the non-A could be
> detrimental in view of the action of the 6082's. I'd imagine with the A's,
> if the 26Z5W's are still in place, they won't start going unitl about 90
> volts -- do I have that right?

That's right, ~ 90 VAC line voltage is where the receiver comes to life. Lingering at that level causes the non A's 6082's to come under extra strain and one should ramp voltage right up to between 110 and 115 VAC if soft starting with a Variac.

> Norman -- how quickly to you crank up the variac? Are your rectfiers
> solid-stated out? I've got about 126 VAC here.

No sand-state rectifiers 'roun' cheer-- just those good ol' hard workin' 26Z5W's. I used to crank up slowly over 20 seconds or so, lingering at 90 VAC until the receiver came to life, then cranking the rest of the way. After realizing this puts strain on the VR circuit, I stopped doing that. Now I just crank from 0 to +110, -115 VAC in one smooth movement over about five seconds or so. Object is to bring up filament temperatures evenly and also to prevent my TWO amp AC line fuse from blowing. Nominal AC line fuse rating is THREE amps with ovens "on."

Have you ever noticed that occaisionally a "hot spot" on a tube filament will glow very brightly for a moment when full voltage is applied? I take that to be a narrowing of the filament at that point and a potential cause of early failure, thus it would seem to follow that if I bring the filament temperature up evenly over a few seconds, I can glean longer tube life in that instance. It certainly can't hurt to do this as a matter of course for the sake of all the tubes. (You may have observed the brightening phenomenon in a classic All-Amercian Five AM table top receiver with its series wired filaments and pilot light.)

> This might be a good time to reprise the bucking transformer/current
inrush limiter >alternative. Yeah, I know it's been covered before, but don't
> recall if it was all wrapped up into a complete package. If you're line
> voltage is fairly constant at 5-10 V. over optimum, what filament
xformer
> would work? Did we ever resolve that the current inrush limiter was a
good thing to do --
>any downside to them? Which ones to use on an A -- non A too?

Right you are. Al Tirevold's R-390A FAQ site, <http://www.r-390a.net/faq-HiVolt.htm>, has the skinny on the bucking transformer option. I think a 6 or 12 VAC filament transformer rated at over three amps secondary is all you need. Can't remember which inrush limiter one uses. Jan Skirrow has that info on his site. Link to it from the R-390A FAQ (q. v.). If I understand right, this device introduces AC to the receiver more gently than connecting directly across the AC line and drops the voltage a smidge over the inrush limiter's internal resistance.

OK now, a change of pace: On this day in history USS Maddox was attacked in the Gulf of Tonkin, 2 August 1964. (I read all about it in the Taiwan Post back then.) Trivia question: Who was Leslie King, Jr?

Date: Sat, 04 Aug 2001 13:50:05 -0400
From: "Bruce Ussery" <bruceussery@hotmail.com>
Subject: Re: [R-390] contact

<snip> ....And BTW, the rectifiers are solid state. I've measured UNregulated B+ at 350vdc at 110VAC input; 385vdc at 120VAC input. I don't know if that's much higher than it would be with tube rectifiers. I've looked in the manual but haven't found info on that yet. That's why I was so skittish about my AC input setting. Now I'm gonna go outside and play...

Date: Mon, 06 Aug 2001 12:11:40 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Ovens stay on with switch in off??

...If you're line voltage is fairly constant at 5-10 V. over optimum, what filament xformer would work?

5 to 10 volts at 3 amps.

> Did we ever resolve that the current inrush limiter was a good thing to do -- any downside to them?

Heat generated inside the radio.

>Which ones to use on an A -- non A too?

Use the same thing.. the power drawn is similar, is it not? (I do not have the details) See Jan's page on the topic: at: the current limiter document for download:
http://www.islandnet.com/~dma/Boatanchors/TechTalk3.pdf

For details on how they work and such:
http://www.ametherm.com/Inrush_Current/welcome.html

Date: Wed, 08 Aug 2001 15:11:53 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] contact (To 26Z5W or not to 26Z5W?)

>If the sockets were still there it would be an easy decision to switch back. Might >eventually do it anyway. What's a little more tube heat since for "home use" we >can easily add a little fan for long term survival? Has anyone ever felt like tube >failure and the resulting
>expense is a significant issue?

I'd replace the sockets, preferably using ceramic base sockets or phenolic from, say, junker mil-spec stuff. I've not had to replace a 26Z5W in the three years since having gotten into these fascinating beasties.

The tubes are very rugged-- new ones typically test 55/55 out of a minimum acceptable 40 on the TV-7*. I've checked tubes on veteran rigs and they are still strong-- amazes me every time.

Maybe I'm too conservative, but never have regretted restoring stuff to original spec. There are soft mod exceptions such as replacing a failed selenium rectifier with a solid state bridge rectifier in the low voltage DC.

But with the HV rectifiers, you have to offset the elevated B+ with a voltage dropping resistor which adds about the same heat that the 26Z5W plates dissipate. Thus solid stating only subtracts the filaments' heat. That's 26.5V x .2A x 2 = 10.6 Watts.

Date: Thu, 9 Aug 2001 08:31:05 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] contact (To 26Z5W or not to 26Z5W?)

Just to stress a well known mod for the 26Z5, a very good substitute is the 12BW4 (with some slight re-wiring below the chassis). In my case, I've done two R-390A power supplies with 12BW4's, and see that the B+ drops from 239 volts (with 26Z5's) to 228-230 volts (with 12BW4's). And of course, the 12BW4's are available at prices well below $5. Not a bad trade-off for 30 minutes work for re-wiring.

Date: Thu, 09 Aug 2001 09:39:10 -0400
From: "Bruce Ussery" <bruceussery@hotmail.com>
Subject: RE: [R-390] contact (To 26Z5W or not to 26Z5W?)

Good info Tom. I stumbled across a very nice description of that mod yesterday while searching for 26Z5W info, at:
http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm

Thanks for the voltage numbers. I'll add this to my info file.

(Here is the info from
http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm)

12BW4 Rectifier Tubes in the Collins R-390/390A

by Dexter Francis, N0YLJ
920 Little Valley Road
Salt Lake City, Utah 84103
cwest@ xmission.com
(801) 363-8823

When I finally added a Motorola R-390 to my collection (S.N. 960) I found that the power supply needed a full rebuild. Rather than stay with the increasingly rare and costly 26Z5Ws, I decided to try to find a less expensive and more common full wave rectifier tube. A pair of nine pin miniatures, with 12 or 13 volt filaments in series, with similar base connections to the 26Z5W, would be perfect. The 1964 RCA Tube Data book (RC-23) indicated that the 12BW4 was a good candidate, having a similar base diagram and a 25% higher peak plate current capacity. The only big "hitches" were the differences in the base connection diagrams; The 12BW4' s cathode connection is on pin 9, the 26Z5's cathodes are on pins 3 & 8. The 12BW4's plates are on pins 1 & 7, the 26Z5W's plates are on pins 1 & 6. If not for the 26Z5's filament center-tap, you could just connect pin 1 to pins 6 and 7, pin 3 to pins 8 and 9 and rewire the filament supply to provide 12 volts.

Note that a 26Z5 (9BS) has two separate cathodes with a pin for each (3&8) while the 12BW4 (9DJ) has one cathode connection (pin 9). The R-390 did not take advantage of the center-tapped filament (pin 9) on the 26Z5W by connecting it to the center-tap of the 25.2 volt filament winding of the power supply. (Pin 9)

The 26Z5W had an internal resistance of 220 ohms at 100 ma. (22V = 0.100 A x 220 ohms). The 12BW4 has a total impedance of 82 ohms per plate or 41 ohms for two plates in parallel, so it appears the voltage drop across the 12BW4's should be lower than the 26Z5W' s.

Details

Since my R-390's power supply was completely carbonized, I decided to disconnect all the wires to the sockets clean it all up and start fresh. The R-390 power supply can be removed from the chassis, so the changes are fairly easy to do. Move the wires on both sockets from pin 6 to pin 7 and pin 8 to pin 9. Add a jumper from pin 1 to pin 7. Move the filament circuit feed wire from pin 4 on one socket to pin 5 of the other socket, and break the connection from pin 5 to pin 5 between the sockets. (This will put the filaments in series.) George Rancourt tells me he has also done this mod on one of his R-390A's and that it worked very well. The measured plate voltages are right on spec @ 240 Volts. After nearly 50 years of modifications and "improvements" to the R-390 it was gratifying to find a "new" one that increases the reliability of the power supply, reduces stress on the tubes, and is fairly easy to do. Using less expensive tubes than the 26Z5W was a welcome bonus.

Date: Thu, 9 Aug 2001 08:49:08 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Looking for Audio Deck (and Fair's solid state line regulator)

I guess I was thinking of the ability to get 115V when the line voltage is consistently 120V+. I suppose a bucking xfmr is a much cheaper and easier solution, though.

Date: Thu, 09 Aug 2001 09:12:57 -0500
From: "Paul Staupe" <ptstaupe@comdisco.com>
Subject: Re: [R-390] contact (To 26Z5W or not to 26Z5W?)

In one post, you cleared up a debate that's been bothering me for several years. The supposed advantage of solid state was all the heat they would save. Never mind the full B+ voltage applied to the cold plates when the the R-390* was turned on. It never seemed like a good trade off before... now it surely is not a good trade off.

Date: Thu, 9 Aug 2001 10:16:10 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Looking for Audio Deck (and Fair's solid state line r egulator)

Third look: it is spec'd at 115VAC +/- 5%. It could easily deliver 120VAC and be in spec. Probably a poor "solution".

Date: Thu, 9 Aug 2001 12:42:57 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] contact (To 26Z5W or not to 26Z5W?)

I should have added to my original note that the input voltage to the power supply was 115VAC for both the 26Z5's (239 VDC output) and the 12BW4's (228-230 VDC). My results seem at little at variance with the author (Dexter Francis) quoted by Bruce and also by George Rancourt quoted in the Francis article:

http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm
I'll supply the exact wiring changes I did to Dave Medley for his web page.

Date: Thu, 9 Aug 2001 18:29:07 -0700
From: "Bob Tetrault" <rstetrault@home.com>
Subject: Re: [R-390] contact (To 26Z5W or not to 26Z5W?)

A few Watts here, a few Watts there, pretty soon it adds up to real heat. It all adds up. And I have not heard a cogent argument in thirty-five years why not to have B+ on a plate before the filaments warm-up. So don't be swayed by a paltry 10 Watts of filament power saved by going to SS. It is real heat, saved from a location that propagates all that heat into a lot of other stuff. Sure, you may not notice for quite a few years, but the heat goes on cooking, and statistically, it'll bring something down.

Date: Thu, 16 Aug 2001 07:13:39 -0500 (CDT)
From: Dave Merrill <r390a@enteract.com>
Subject: [R-390] Fuse Holders

There are two kinds of fuse holders:

- spring in cap
- spring in base

And you can't mix caps!! Duh!

I've got R-390As from the same contract with both types, though each receiver has only one type of course.

Date: Thu, 16 Aug 2001 16:56:26 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Fuse Holders

Here is one more of those little parts that are almost the same every where.

How do I know which NSN to use so the one I order will look like the other two fuse holders on the receiver? There was no change order when some one though the spring in the base with a cap that lifts the fuse out of the holder would be safer. Fuse holders changed and that was that. When you ordered a part you just get the new style. After all the old ones are issued out of stock.

Date: Thu, 16 Aug 2001 19:55:16 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] Fuse Holders

>Nolan,
>Here is one more of those little parts that are almost the same every where.
>How do I know which NSN to use so the one I order will
>look like the other two fuse holders on the receiver?

Shoot me a picture of the one you're trying to match. I may have a spare. One thing I never throw away when I scrap stuff is fuse holder caps. :-)

>There was no change order when some one though
>the spring in the base with a cap that lifts the fuse
>out of the holder would be safer.

I know the one you're talking about. I think it was called a fuse extractor type. I think that they became popular over the early types simply because of safety.

>Fuse holders changed and that was that. When you ordered a part you just get
>the new style. After all the old ones are issued out of stock.

I know the feeling. I looked for a long time to find the correct one for one of the old WWII sets. There are a couple of designs that seem to be timeless though.
Another hard one to find was the brown fuse holders for some of the URM-25* signal generators.

Date: Thu, 23 Aug 2001 15:06:33 -0700
From: Dan Merz <djmerz@3-cities.com>
Subject: [R-390] Voltage rating audio unit caps

Hi, has anyone ever used 250 volt rated caps for replacing the 5 capacitors in the plug-in cans on the 390a audio unit, the 30-30-30 and 40-40 units? I know these are specified/marked as 300 volts - any experience out there with lower-rated caps? I have some 250 volt ones that I'd like to use and there must be some margin. My set has tube rectifiers not solid state. thanks, Dan.

Date: Thu, 23 Aug 2001 19:37:50 -0700
From: "Bob Tetrault" <rstetrault@home.com>
Subject: Re: [R-390] Voltage rating audio unit caps

Leakage current is the limiting factor as you approach the rated voltage with electrolytics. The cap manufacturer rates the working voltage as that voltage that the cap will support for a specified lifetime at a certain temperature, usually well above ambient 25C, <<at a certain leakage

current>>. It is the leakage current, not to mention ripple current, that ultimately causes the internal temperature to begin to rise and thereby limit the cap's lifetime. You can use them at the rated voltage if you know what the actual temperature they are subjected to in the chassis. Your expected cap lifetime will be very much shorter, generally, when it is operated near the max rated temperature and max rated voltage.

Just as in the thread of infinite lifetime; leakage in Brown Beauties, Black Beauties, Hermetic Beauties, etcetera, etcetera, and even in those with old man's debility: an intermittent inability to take a leakage, the phenomenon runs our lives, individually and collectively.

Date: Thu, 23 Aug 2001 22:20:27 -0700
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Voltage rating audio unit caps

Hi all, so far no one has said they tried the 250 volt caps so I ordered 350 volt ones from Mouser, needed another part anyway so couldn't gain any time by using what I had anyway. I'll save the 250 volt ones for something else. thanks for the several comments, Dan
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Date: Fri, 24 Aug 2001 08:30:23 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] Voltage rating audio unit caps

I've built up both replacement electrolytics from Panasonic 350 volt capacitors and put them in plastic relay cases. It takes a bit of fussing (maybe 20 minutes for the 2 X 40mF and 30 minutes for the 3 X 30mf), but works very well. I haven't done the routine of gutting the original can caps and replaced the innards. If you're seriously interested in the details of the Panasonic caps and the relay cases, let me know, and I'll dig the directions out and publish them here. That will take a couple of days.

Date: Fri, 24 Aug 2001 07:27:53 -0700
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Voltage rating audio unit caps

Warren, thanks for this idea. Are the Panasonic caps smaller than others? Or did that just happen to be the brand you used? I ordered some Xicon radials from Mouser, 350 volt version, and planned to just stick them in an octal tube base salvaged from a dud tube. Your relay case idea would be neater and safer. I've done the "put em back in the original can" for some other radios I've restored but this is a pain.   I think I might have some octal socket relays
but without checking, I'd say from memory they might be a little small,
Dan

Date: Fri, 24 Aug 2001 10:35:46 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] Voltage rating audio unit caps

I used the Panasonic caps because they're as small as commonly available (16 mm D X 35 mm L, according to memory, for the 30 mF's) and their wide temperature range. I bought some relay cases from an outfit in Florida. I can supply the dimensions of the caps and relay cases from my data at home. The trick is to stack the 3 30's inside the relay case. It works, but takes a bit more fussing than simply plugging in the caps and soldering. Again, glad to supply details if you're interested, but it will take a couple of days.

Date: Sat, 25 Aug 2001 00:30:16 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Voltage rating audio unit caps

Here's how Walter Wilson rebuilds plug-in caps using the original shells: <http://www.knology.net/~wewilson/filter_capacitors.htm>

If you prefer to try square-shaped plug-in cans, be they ex relays, ex filters, etc., ensure that the octal plug will orient correctly. With some cans you can re-orient the octal base and that's cool. Jan Skirrow made up a few of these -- complete, ready to plug into your R-390A -- and I bought a pair before they sold out. Very nice job. So far I've not had to replace or repair any original plug-in caps, so it may be a while before I get to try Walter's neat-o method. Whichever way you choose to go, use the 350VDC caps--nothing lower. That was good advice from a list member.

Date: Wed, 29 Aug 2001 19:26:08 -0700
From: Dan <hankarn@pacbell.net>
Subject: Re: [R-390] Ukkumpucky !!!

Hi gang, I am working on a deal to get the canned Caps for our beloved R-39XX done in a consolidated order by Everett at Frontier Caps. I have about 40 plus to run myself and cannot do them as well and the price that he can and for sure in the time frame and way he does them. This is for the 4 pin plug ins only. What I purpose is getting a "FIRM NUMBER" of request so I can get a "FIRM PRICE" from him and then report back to the group with a total price shipped to me prepaid and I ship the total order to him for his services, freight back to me and mailed to individuals depending on quantify.

I am guessing about $10.00 a pair?? ME no makum money on this, just love to break even.HiHI I would like to have "FIRM" feedback by 9-10-01 to get a quote from him. One exception is that you need to test the base by using a "HEAVY HOT soldering iron across 2 pins ti see if the base remains solid, if it warps or shows signs of deforming etc. then there is a $5.00 upcharge for a new base. No discount for opening the can and getting the Ukkumpucky out as he says he can open about 15 before his cup of coffee gets cold.

He says one at a time at $30.00 with a good quantify my guess is a total of about $20.00 maybe less. He buys in quantities in excess of 1000 of caps at a time. If you are dead serious then please respond with a total number of pairs so I can firm up a price. If the frugal el cheapo's want to go in the back door, be my guest you get to pay the NORMAL PRICE. This is being done for the people that can stand in front of the mirror and shave with a straight edge and not bleed to death. Plus walk away with a "SMILE on THEIR FACE" MONEY TALKS and we all know what walks.

Date: Thu, 30 Aug 2001 15:35:00 -0700
From: Dan <hankarn@pacbell.net>
Subject: [R-390] Re: The Dreaded Black Ukkumpucky

Dave, Everret is quoting $30.00 each to rebuild and said for a good quantify he can get the price down considerably. The $10.00 is a guess for a pair or an order for shipping and handling. I will firm all of this up and repost it. Sorry for the confusion. Hank

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Date: Thu, 30 Aug 2001 17:07:57 -0700
From: Dan <hankarn@pacbell.net>
Subject: Re: [R-390] Ukkumpucky !!!

OK guys, here is the scoop. I just had a LL with Everett at Frontier Caps. I am sending him one of the 30-30-30 for a test run. He will then firm up the price, he thinks in the range of $18.00 to 20 each in quantities of 100 each or more. Their happens to be on exception and that is the plastic base on the 4 pin caps. He says to take a soldering GUN and stick it in the plastic between the pins if it melts quickly then those caps will be $5.00 more due to the fact he has to replace the base. The idea is to ship caps, money and mailing LABELS to me. I will then ship them to him as a lot and he will re-work them and ship them back to me. I pay him for the lot and I ship them back to the individuals. That will involve my guess about $10.00 or less per pair to do the handling. This is in addition to the re-work of the caps. What do I gain? NADA By doing a group order my 40 caps will cost all of us less money in the long run. He cuts them in a lathe and when re-worked they are soldered together. His estimate is about 6 weeks for turn a round after he does the sample. So far I am up to about 100 pairs.

Date: Fri, 31 Aug 2001 19:07:04 -0500

From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Power stays on

Well, my R-390A lights up (at least the illumination on the Veeder- Root counter) as soon as it's plugged in. That's with the Ovens switch set to ON; I haven't tried it with the switch set to OFF. I just got it today, and am still feeling it out. Care to share the solution? Or is this not exactly the problem you were discussing? I've never had a _really_ _solid_ receiver before; it is a wonder to behold and a pleasure to use, even though it's a little bit ill just now.

Date: Fri, 31 Aug 2001 20:35:25 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] T Shirt- - Power stays on

Yes, that's the classic problem. AC power is switched via a microswitch which is mechanically coupled to the front panel Function switch. When the microswitch actuator gets really dirty it can stick ON. Sometimes exercising the switch action back and forth will liberate the actuator, but the proper fix is to drop the front panel and clean it with some solvent; recommend you get a manual and get comfortable with your new find before doing this. The Oven switch is not related to this problem, but you should turn it OFF and leave it off as they cause more harm than good.

Date: Fri, 31 Aug 2001 18:43:48 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] T Shirt

The problem with the radio not turning off is covered in the R-390Y2K manual safety section. It also covers starting up an unknown radio. At least,... that's what I tried to do. Joe

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Date: Mon, 03 Sep 2001 15:45:45 -0500
From: David Medley <d.j.medley@att.net>
Subject: [R-390] FL101 Line filter

A fairly common fault in the r-390 is a bad line filter. As far as I know there is no available replacement. The solution usually adopted is to remove it and wire the line cord directly to the appropriate terminals inside the radio. I have had several inquiries recently from guys seeking replacements. So I decided today to study the possibility of repair. The first item is to get the lid off the unit. Turns out it is silver soldered on. After futile attempts with a soldering iron I resorted to the use of a propane torch and a Dremel tool with a cutting disc. This was successful and the lid came off and I was surprised with what I found inside. First the whole thing was packed in beeswax which is a whole lot easier to handle than black goo which I had expected. Next there were six toroids, three each connected in series to make two chokes. Next there are four weird capacitors and herein lies the problem. These are rather crude, foil and paper impregnated with wax and encased in a light cardboard wrapper. Each has three connections. One ground and the other two form a through connection. It is the through connection that fails in these units thus disabling the whole filter. This is where I can use some advice. There are two possible ways to solve this problem:

1. Find a replacement unit small enough to fit in the existing can. This is necessary because the power connector is integral with the can.

2. Rebuild the existing unit. The problem here is to find replacements for the 4 capacitors. Perhaps somebody out there with experience in line filters can suggest a suitable replacement. To install these and refill the can with wax would be a fairly simple task. I am sure there is something better than wax today and I would welcome comments on this subject also.

Date: Mon, 3 Sep 2001 17:35:48 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] FL101 Line filter

Four feed-through caps? That would be one for each pin in the power connector. That means two of them are in the DC input circuit that never got used. If the caps are all the same, maybe you could rewire the AC line to the DC caps - but only if they have the right voltage rating. Wonder why the through wire goes bad? It must be rated for more current than the fuse, eh? Might be time to autopsy a cap. But the users might be better served by replacing the guts of FL101 with the guts of a surge supressor plus a couple of .01 MFD caps rated for line voltage duty (non-flammable), one from each AC lead to the filter case. Seems to me enough people have complained about the "leakage" of an 0.1 MFD cap in the original filter. For those of you who ripped out or bypassed FL101: Do you have any trouble with RF noise that you can hear even with the antenna input shorted?

Date: Mon, 03 Sep 2001 19:12:59 -0700
From: plmills@attglobal.net
Subject: Re: [R-390] FL101 Line filter

Well, it got used on the R-391. You could feed 24 VDC through those connections to power the autotune mechanism.

Date: Mon, 3 Sep 2001 21:10:02 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] FL101 Line filter

Are you sure this should be a through connection? I've seen 3 legged ceramic caps used in filters and these were two caps in the same package with a common terminal to gnd. If so, I'd expect roughly equal C from either end lead to the gnd lead. The caps I've seen with through connections were metal cased, with HEAVY terminals I would expect to pass all the way through, not turn into skinny wire/fuses, and were generally used to pass AC connections through bulkheads.

Date: Tue, 04 Sep 2001 14:33:12 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] FL101 Line filter

Ok, here we go: My thoughts on line cords and filters.

1) The line filter in the R-390 and the R-390A are not the same. They are not the same physically and not the same electrically. One of the points of "cost reduction" in the A version of the radio is the line filter. The connector was eliminated and the filter was redesigned to have fewer sections and less attenuation for incoming and outgoing RF.

2) R-390 and R-390A line filters were intended to keep RF from nearby transmitters OUT of the radio and to keep signals generated in the radio from getting out. Most of us need neither function.

3) With line filters that have not had a shorted capacitor, the "hot chassis" is caused by normal voltage division by the line-to-chassis capacitors and is NOT a failure of the caps. Repeat, they are NOT leaking. They are NOT shorted. They are dividing the line voltage in half. Ground the chassis and the voltage goes away. This is not necessarily a good situation, but grounded three-wire line cords with properly grounded outlets will keep the chassis from being hot. The current through the normally operating bypass caps will trip many ground fault interrupters. All our radios should have three-wire line cords and be used with grounded outlets (or isolation transformers.)

4) Isolation transformers will solve the "hot chassis" problem and may supply reduced line voltage, too. SOLA constant voltage transformers normally have isolated output windings. They are both noisy and hot but are inherently current limited and will treat your radio(s) to lower, safer line voltage.

5) If you remove the line filter and install just a line cord:
  A) Put in a filtered IEC connector and use common computer line cords.
  B) Install a plain three wire cord and bypass it if you need to.

6) The proper way to bypass power cords is with one capacitor from the

hot to neutral and one capacitor from neutral to ground. If used with a grounded three wire power cord, this arrangement is fail safe against failure of either capacitor and will present no hot chassis problem if the ground is not good. Do not put one capacitor from each line to chassis.
Roy

- - Roy Morgan, K1LKY since 1959
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roy.morgan@nist.gov --

Date: Tue, 04 Sep 2001 17:08:10 -0500
From: David Medley <d.j.medley@att.net>
Subject: Re: [R-390] FL101 Line filter

Hi Roy. Thanks for the learned dissertation on line filters. Very interesting and helpful. Today I conducted an autopsy on one of the failed caps with some interesting results. The cap comprised two strips of aluminum and one of waxed paper. One al strip is narrower than the other. The narrow one is the ground connection. This is all tightly wrapped into a unit about 1" square. At the center of the wrap there are two connections to the wider Al strip. These are the feed thru connects. The failure mode is where these connections are made. The wires are simply pushed in and sealed with wax. The one I dissected showed evidence of considerable sparking and burning and eventual failure. This alone would cause a pretty hot chassis quite apart from the other considerations you mention. There are folk out there who want their radios to be as close to original as possible and I do think it spoils the radio to remove the filter and wire the power cable directly. There are others who use the radio with Ham installations and in this case the filter is essential. I am still searching for suitable replacement caps and several list members are helping me in this endeavor. Dave

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Date: Fri, 14 Sep 2001 15:38:35 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] R-390A Restoration Bulletin 6: reassembly

Bill Hawkins asked me where I put the ICL.(inrush current limiters)

I put mine in the most obvious place, namely, I soldered it in place of the short jumper from FL101 to F101. I kept the leads at their full length, which suspends the limiter in mid-air at the rear of the center underside compartment behind the PTO. There are no other heat sources nearby, so all it does is warm up the PTO slightly, surely not a problem with the ovens off. (Of course I have them off!) The long leads keep the solder joints cool at the expense of shock and vibration resistance. Since I'll be turning my set on and off a lot, I consider it de riguer, not just a good tradeoff.

I'll measure the average drop across the ICL. I hope it's about 5V, because my line voltage is a very consistent 120.0 . If the ICL is running too cool (a possibility with a CL080 and no ovens), maybe I could wrap it in a little ball of fiberglass insulation. The trick would be finding something to bind it up in.

Date: Tue, 18 Sep 2001 22:43:57 -0700
From: Dan Merz <djmerz@3-cities.com>
Subject: [R-390] Voltage reduction box

Hi, I just more or less completed a transformer unit for reducing the line voltage from 120 to 114 and 108 volts ala the circuit posted on R-390a FAQ page. I was a little unsure why that circuit put the primary of the transformer on the receiver side of the circuit rather than on the house line side but I wired it up as shown in case there was some hidden safety issue that I didn't think of. If you put the primary on the line side, you get a little more reduction, about a 1/4 volt so it doesn't really matter much. I get around 114 volts with my line at 120. I used a Radio Shack 6.3 - 6.3 ct 3 amp transformer that I had in my transformer pile and put a spdt switch in so I could get either 114 volts or 108 volts by selection of either the center tap or the full 12.6 volt tap. I have other radios and situations where I would like to reduce the voltage a little more than the 6.3 volt tap provides.. I debated what to put this hookup in - a box of some sort, rather than a plastic bag with cords in and out. I ended up getting two of the blue pvc wall outlet boxes at Home Depot, the kind with captive nails for attachment to house studs that sell for 38 cents each.. I removed the nails and sawed/dremel tooled/filed away the nail holders to make the outside of the box smooth. The RS xfmr slid very tightly into one of these and I put a combination switch/single outlet in the other. I attached the two boxes together by a single screw thru one of the xfmr ears that was at the top. I may glue a pvc strip across the bottom for added integrity. I drilled 2 sets of matching 3/4 inch holes thru the mated box sides near the transformer primary and secondary to pass the transformer wires into the other side. I put a fuse holder and the spdt switch for the transformer leg selection in the other box below the combination switch/outlet. This made a relatively cheap unit, though the switch/outlet was $7.50. You could reduce this cost some if you used a double outlet and put the switch elsewhere, but I liked this configuration. I wired this switch per the posted FAQ circuit to turn off the power to the entire unit rather than just the outlet . The switch/outlet has a breakaway tab for this option. A metal cover plate added another buck. I was pleased with the compactness of the unit and it provides something I've wanted to have around occasionally without using my variac which is in a much larger box and which I've never gotten around to providing with a 3rd ground wire - usually use it in front of an isolation transformer for working on a variety of old radios. A check of voltage tonight was 120.7 line, 113.5 and 107.5 (switched to full 12.6 tap) with the last two measurements on the R-390a plug going into my unit with the set operating. The RS transformer is warm but not uncomfortable to touch after a couple of hours so I think the close contact on two sides with the pvc box will be ok. I don't plan to cover the box with the transformer without further evaluation of the heat generated. Dan.

Date: Wed, 19 Sep 2001 04:48:06 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Voltage reduction box

I made a similar one some years ago with a Fair Radio filament transformer, used a blue Home Depot double switch box with one AC outlet, three wire cord and a fuse. The box is labelled so my grandkids whom I don't even have yet don't plug a heater into it 50 years from now.

Date: Sun, 23 Sep 2001 17:17:09 -0700
From: "dave faria" <dave_faria@hotmail.com>
Subject: [R-390] To Float or not to Float

Can some tell me how to get to the list archives?? I know the subject has been discussed but, I did not read the responses. I've got a 390 non "a" ready for alignment. It shows 61VAC above ground. I can float all the equipment and do the alignment but, if this voltage is abnormally high I want to fix this problem before going any further. If someone does not mind responding to an old question I would appreciate it.

Date: Sun, 23 Sep 2001 18:32:42 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] To Float or not to Float

>It shows 61VAC above ground.

It should be equal to ground. Use a ground wire to make it so.

Date: Mon, 24 Sep 2001 10:20:21 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] To Float or not to Float

Dave Faria wonders about the list archives and about his 60VAC from chassis to ground. I know of two list archives accessible via your web browser. One, "r-390" on yahoogroups, is no longer updated but IMO has a much better search facility than the other, which is on qth.net (the reflector host) and is up to date. The R-390*'s line filter has a cap from each side of the line to the chassis. If you don't ground the chassis (but you should!), it will sit halfway between hot and neutral due to the caps, which act like a voltage divider. Many R-390*s come with 3-wire power cords. If you do ground the chassis, you must run the radio from a branch circuit without GFCI protection, as the current through the caps is more than enough to cause a trip. I seem to remember some discussion about floating just the line filter case. The filter will still be partially effective and you can ground your chassis without tripping your GFCI.

Date: Mon, 24 Sep 2001 14:36:27 -0400
From: Tom Leiper <twleiper@juno.com>
Subject: Re: [R-390] To Float or not to Float

Why not just power it with 230V and it will "float" at neutral...thus minimizing leakage ground currents. This does NOT mean hooking the chassis to neutral, or neutral to ground (other than at your main CB panel) since that would result in improper currents. It will also keep the load balanced on your CB panel when you fire up those 23 R-390's.

Date: Mon, 24 Sep 2001 20:06:16 -0400
From: "Peter Cade" <butrosg@bellatlantic.net>
Subject: Re: [R-390] To Float or not to Float

Or........You can always ground the chassis the good old fashioned way, with a separate lead running to a 5 ft length of copper pipe driven into the ground, or sump'n similar...... Actual "ground" grounds often make big difference.....

Date: Mon, 24 Sep 2001 19:23:17 -0500
From: "Paul Staupe" <ptstaupe@comdisco.com>
Subject: Re: [R-390] To Float or not to Float

Tom, Great idea! I had to look at my tag to make sure I was remembering correctly, but it sure says 115/230 VAC. Now if I can only get the power company to speed up the generators to 62 Hz, I'll be able to stay in spec, save all that leakage to ground by going to 230 VAC, AND save some extra milwatts that heat those nasty transformer cores!

Date: Tue, 25 Sep 2001 09:06:26 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] To Float or not to Float

Whether through the Equipment Grounding Conductor or a rod, grounding a 120V R-390* with stock line filter _will_ trip the GFCI. GFCIs compare hot current to neutral current. The slightest difference and -- pop! The line filter makes just such a difference, by suscepting from hot to ground instead of to neutral. (Susceptance: the inverse of reactance. If I'd said "conducting", I just *know* someone would have cried foul :-) Tom Leiper

recommends 230VAC. I love how you guys figure out every possible solution. I'm just going to do what's easy, namely, run it off a non-GFCI receptacle, or use an isolation transformer. Those of you who choose the 230V route, knock yourselves out :-)

Date: Tue, 25 Sep 2001 13:10:27 -0400
From: Tom Leiper <twleiper@juno.com>
Subject: Re: [R-390] To Float or not to Float

I was just recommending that for somebody who is obsessed about the problem and doesn't want to change or touch the filter as a possible solution. They can rewire the primary instead... Personally, I just wire mine up using three wire power cables with the case grounded, and let that stuff "drain" away. If you have a GFI breaker, either get rid of it or put in another circuit for the BA equipment. Most of my stuff is in two six foot racks which are fed by their own branch and bucked down to 114V. On my workbench I have a big ground cable with an
alligator clip that I usually clamp onto whatever boatanchor I am working on anyway.

Date: Thu, 27 Sep 2001 16:21:39 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: [R-390] Capacitors for RFI Suppression of the AC Line: Basic Facts

The subject of power line bypassing gets repeated coverage on these lists, with many folks contributing lore, suggestions and advice. I found a 17-page document on the topic that may be of interest to any who want more information on the topic:

"Capacitors for RFI Suppression of the AC Line: Basic Facts"
<http://www.bravoelectro.com/assets/multimedia/erfifct.pdf>

This is document is on the web site of a capacitor supplier, Bravo Electro Components, Inc., and covers such topics as:

- The needs for line bypassing including types of power line transients to be expected.
- US and International standards for line bypassing
- Summaries of electrical tests required for bypass capacitors
- The seven classes of RFI capacitors and their major attributes
- Evaluating RFI capacitors
- Self-healing, stability, and aging
- Specific application advice for capacitors available from the company.

Date: Fri, 28 Sep 2001 02:49:37 -0400
From: eengineer <eengineer@erols.com>

Subject: [R-390] C606 rebuild

I am getting ready to take apart C606 in one of my R390A's. I have seen people cut the base off with a dremel tool, yank out the guts and somehow stick the two aluminum sections back together again. Has anyone ever pryed the bottom of the can to avoid cutting the cap with a dremel tool? do the guts come out? How hard is it to re crimp the can and how does it look? If you cut the bottom of the can with a dremel, what do you use to stick it together again? (There are lots of aluminum glues out there)

Date: Fri, 28 Sep 2001 15:24:35 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Capacitors for RFI Suppression of the AC Line: BasicFacts

I have a question for the group. My R390A doesn't have the original line filter installed. I took a mechanically defective one, sawed it open, and connected the wires to the internal pins -- thus keeping the original method of attaching the 115VAC line on the back. I built a back panel for the cabinet in which the radio is mounted and I included a "standard" over-the-counter AC line filter inline with the AC main that feeds the radio.

I thought this would all but eliminate the snaps, crackles, and pops I get when various things turn on or off (e.g. a light switch, the freezer motor, etc.) but they are still there (maybe I shouldn't eat Rice Krispies while listening?). They may be attenuated a bit, but I still get quite a bit of this type of noise. I compared this last night to my Kenwood TS440SAT and the same events that cause noise in the R390A are not heard in the Kenwood.

Are the original filters better at keeping this kind of noise out? I wasn't wild about the idea of keeping the original filter in that I run off of a GFI and don't have an isolation xfmr. Has anyone done any comparisons? Are those of you with the original filters bothered with excessive line noise?

Date: Fri, 28 Sep 2001 19:58:15 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] Capacitors for RFI Suppression of the AC Line: BasicFacts

Some of the simple line filters are just a couple of capacitors and that's it. The modern ones are set up so they work with GFI's. This keeps many of them from doing as good a job as they might. You can get some that are much better than the original 390 parts. The ones you want are about 6 inches long by 2 by 2. They generally have three sets of capacitors in them and several toroids. You can find them on the surplus market cheap. Brand

new they cost quite a bit. One possibility with the 390 - take a look at how you have the antenna run into it. The one thing that the modern radios have going for them is that they are designed from the start for the 50 ohm coax we usually use on antennas these days. The 390 is set up to do an *excellent* job if you run 120 ohm shielded twin lead into it. It's been a while since I saw anybody use that on an antenna ....
The main problem is that the 120 ohm stuff is balanced. The 390 is set up to have very high isolation when run from a balanced line. When you hook up an unbalanced line it's not running the way the designers intended it to run. You hook up the unbalanced signal across the balanced input leads. This makes one side of the balanced input ground. That does not give you as much ground isolation as you would get from a true balanced configuration. A balun would be one solution to the problem. That said I run coax straight into my 390 and don't seem to have to muchtrouble.

Date: Mon, 3 Dec 2001 02:10:55 -0800
From: "GLEN GALATI" <ELDIM@worldnet.att.net>
Subject: Re: [R-390] Selenium Rectifier

After a thorough review of my R-390A manuals, the only Selenium Rectifier is CR-102 which is mounted on the lower rear chassis near the spare fuse holder to the rear of the Power Supply module. This is NOT used for the AGC/MGC. The AGC Rectifier is V509A (5814A Vacuum tube). It seems you have a short somewhere betwen the Function Switch and the AGC Line, posibbly a bypass capacitor that may be shorted. I'd suggest un-plugging P-112 Connector from the IF SUBCHASSIS and see if the fuse still blows. That should eliminate the IF Subchassis if the Fuse still blows. Then try making some resistance measurements from the Plug back to the switch. If the Fuse only blows with P-112 connected then try and see if C-548 (0.1ufd) is shorted.

Date: Mon, 3 Dec 2001 11:09:38 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] AGC Fuse Blower.

The gentleman I got my "new" Motorola R-390A from said the only thing he knew was wrong is that the fuse blows when put in the AGC position of the mode switch. If in MGC, it performs fine. Don,

- --

Also look into the wiring harness around the front panel. Two problems occur.

One loop of the harness likes to hang out the bottom. This can get chaffed and cause a short.

Problem two is when the front panel get reassembled. A wire will get pinched between the plates. The short may not pop up as soon as the unit is reassembled. But over time the insulation does get pressed enough so that a short occurs.

Roger KC6TRU San Diego.

P.S. Don't we all just love it when some one tries to lead us down the garden path. Selenium Rectifier in the AGC circuit indeed. Qualified service people all know the only Selenium Rectifier is **CR-102 which is mounted on the lower rear chassis near the spare fuse holder to the rear of the Power Supply module. It is used to provide DC voltage for the Antenna rela**y.

God only knows why the cost cutters did not ask for an AC coil in the antenna relay and ignore the 60 HZ hum it may or may not impose on the signal going through the relay assembly.

Date: Mon, 3 Dec 2001 14:04:28 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] AGC Fuse Blower.

The R-390A's antenna relay is not energized during normal use, so there's no hum. See the Cost Reduction Report. They tried an AC relay energized in AGC and MGC, and while it gave adequate isolation in STANDBY and CAL, it was very picky when energized and tended to chatter and hum-modulate the signal. They gave up on it and went to a DC relay + rectifier, reversed so it's off in AGC/MGC to eliminate the last of the hum. Mine turned out to have a dead coil on the UNBALANCED side. Who knows how long it's been bad. I was able to resolder the fine wire which was broken at the terminal.

Date: Sat, 22 Dec 2001 19:05:34 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] [R-1051] R-1051 AC Power Cord

> I'll go your been-there-done-that one better ... There is at least one
> other connector that uses the same shell and pin spacing, but the pins
> aren't the same size. Forgettabout forcing 'em.
> Oh, and here's one more ... some are keyed differently -- with the keyway in
> the middle of two pins vs. lined up on a pin. Might suppose that would......

Oh sure, tell me now :) Just modified a 3 pin connector with the correct shell diameter (as someone who is likely to buy any 3 pin connector I see at the swap meet, I can testify there is an AN type connector with a smaller shell) last week to rotate the pins to the correct location only to find afterwards the socket pins are also for a larger diameter male pin. Now

wondering if I can find smaller pins that will fit the shell insert properly.

Date: Sat, 29 Dec 2001 17:08:40 -0500
From: "Gregory W. Moore" <gwmoore@moorefelines.com>
Subject: Re: [R-390] Part(s) wanted (twin electrolytic filter cap)

> Try "Bob's Antique Radios" for great boatanchor replacement caps and
> electrolytics. http://www.radioantiques.com/supplies.html
> 10uf caps @ 450VDC are fine as tolerance is very wide on these parts.
> I have rebuilt electrolytic cans by slicing them apart just above the base
> with a Dremel tool and cutting wheel, gutting the contents, then fitting
the
> void with new electrolytic caps. I then fit the cut tube over the old base
> (the end of the aluminum shell can be expanded by reaming it with a
closed
> set of pipe pliers or similar) and glue it back together with super-glue.
> Most of the time there is plenty of space to hold the new caps inside the
aluminum can.
>
> 73 de Bill, AB6MT
> billsmith@ispwest.com

Good idea with the reaming or resizing the tube bases. I have also cut a few electrolytic cans open with my Dremel. I have a large box of new ones that was given to me, so I have enough practice cans to play around with. Some can be spread open from the base carefully. You can reseal those bases back like they were originally by curling the metal rim back down flat on the base. One other good alternative to super glue is Liquid Solder. That stuff is putty like and dries very very hard. You can shape it nicely with your fingers or a tool. I just read somewhere that gasoline dissolves the dreaded black unkumpuky. I'm wondering if cooling holes should be drilled in those electrolytic cans once the caps are replaced. Would trapped heat be a problem?

From: "Al Parker" <anchor@ec.rr.com>
To: "blw" <ba.williams@charter.net>, <R-390@mailman.qth.net>
Subject: Re: [R-390] Part(s) wanted (twin electrolytic filter cap)
Date: Sat, 29 Dec 2001 07:18:59 -0500

The caps won't generate enough heat to worry about, unless they're awful leaky, which your replacements shouldn't be for many years.

Date: Sun, 30 Dec 2001 05:18:06 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] Audio Caps

If you are squemish about cutting into those cap cans, simpy wire the new caps under the deck. it is a tight fit but even I can do it. Looks neater than the cluster-foxtrot created by skipping the cans and installing new caps on top.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Audio Caps
Date: Sun, 30 Dec 2001 15:30:28 -0600

One nice solution I saw someone do (he used to subscribe to this list but I can't recall his name at the moment) is to feed the positive leads through the sockets and solder them underneath. Take the negative leads, solder them together into a single solder lug (one with a hole large enough for the screw that fits into the post that sticks up beside the original caps) and secure the negative ends to the post. The positive ends of the caps were flush down to the sockets so no HV was exposed. Looked neat enough to me.

Date: Tue, 08 Jan 2002 11:10:18 -0500
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] sp-600-jx-17

> Try replacing the OA2 voltage regulator tube, a weak one will cause drift.
> Also, look at the bottom of the power supply transformer, if your voltage is
> over 117 volts, I would suggest moving it to the 139 volt tap. Les

This is some of the best advice I ever got on here, mainly because it was so *easy* and it made such an improvement. Les, I still can't thank you enough for the tidbit about checking the transformer taps - what a difference it made for me.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] sp-600-jx-17
Date: Tue, 8 Jan 2002 10:20:46 -0600

I don't have an SP600 so I don't know, but I assume you're talking about changing the input tap effectively reducing the output voltages of the transformer. If this is the case, why does this help with drift? Is the OA2 unable to regulate properly if the voltage it sees is too high?
Also, is that SP600 drifting towards North Alabama by any chance? >;-)

Date: Tue, 8 Jan 2002 20:09:14 -0800 (PST)
From: Rodney Bunt <rodney_bunt@yahoo.com>
To: R-390@mailman.qth.net
Subject: [R-390] sp-600-jx-17 - bucking transformer - How to....

You can use a "bucking transformer...

```
 o-------------|
               \
                / 10v winding "Bucking Winding"
               \
               /
               |
Input voltage |---------------o Outupt is 110v
  120v         |
               \
               /
                \ 110v winding "Mains winding"
               /
               \
               /
 o-------------|---------------o Output is 110v
```

To calculate the Output Voltage

Output = Input Voltage*("Bucking Winding" Volts+"Mains Winding" Volts)/"Mains Winding" Volts............ PS: make sure the Bucking Winding has a current capability equal to, or greater than, that which is drawn by the Output Load. A lot cheaper than a Variac...

Date: Wed, 9 Jan 2002 01:10:52 -0500
Subject: Re: [R-390] sp-600-jx-17 - bucking transformer - How to....
From: twleiper@juno.com

A good idea. I power two six foot racks full of BA equipment with a 12V 0.5KVA buck/boost transformer. Knocks it down to 110V. You can pick them up by the scores for about twenty bucks at any good scrap yard that has electrical/electronic junk.

From: "Chuck Rippel" <R390A@R390A.com>
Date: Wed, 9 Jan 2002 12:44:13 -0400
Subject: [R-390] SP600JX17

One thing to keep in mind is that SP-600's, even after recapping and taking the extra step of adding the mod which regulates the filament voltage to the top 4 tubes, still drift quite a bit until the entire chassis heat saturates.

As to setting the input line voltage, the best way to determine the correct A/C Line input voltage (@60 cycles!!!!!) is to monitor the tube filament voltage at your tube of choice other than the rectifier, regulator or the (12AU7??). Set the line input voltage to a value that yields 6.3VAC at the tube filaments. That puts the other voltages right about where they need to be.

PS: if the input volts are too high, then the 0A2's get very hot, and very bright !!! No wonder they drift, and stop regulating....

Date: Wed, 9 Jan 2002 16:07:46 -0500
Subject: Re: [R-390] sp-600-jx-17 - bucking transformer - How to....
From: twleiper@juno.com

> How I identify a buck/boost transformer if I start cruising through the local scrap dealers?

It'll be about 4X5X6 inches (for proper rating), usually painted gray, and will have a terminal diagram that shows connections for 120/240 on the primary and 12/24 on the secondary. Usually they mount to the wall, with connection covers on the top and/or bottom. Here's one:
http://www.grainger.com/Grainger/productdetail.jsp?xi=xi&ItemId=1611603428

What you will be doing is hooking the secondary in SERIES with the the load to boost or buck the voltage depending upon which polarity you hook up either the primary or secondary.

Date: Mon, 21 Jan 2002 09:42:51 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] PSK-31

A caution........ **Many R-390A's chassis float 20-50V off "ground"**

Connecting an ungrounded R-390 to a computer might cause you and the computer great unhappiness. I learned this the hard way. I was using a PK-232 to copy HF FAX with dot matrix printer (many years ago) and fried the PC board in the printer.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] PSK-31
Date: Mon, 21 Jan 2002 08:49:08 -0600

In my case, it shouldn't be a problem as my R390A does not have an FL101. I use an external, modern power filter with a 3-wire ground fed by a GFI-protected circuit and an external ground.

That along with the audio isolation transformer should keep my laptop about as safe as I can make it with this setup. Of course, anything can (and sometimes will) go wrong...

Date: Mon, 21 Jan 2002 10:56:59 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] PSK-31

> Many R-390A's chassis float 20-50V off "ground"

Correct me if I'm wrong, but I think that should not be allowed. The chassis should be grounded using a full three-wire grounded power cord set. There are a number of old R-390A's around where someone just connected the neutral and hot with a two-wire cord, but the correct installation is with the green wire pulled out, fitted with a a solder or crimp-on terminal to a screw on the rear panel. The hot should go to the fused/switched side. Tingles Verboten!

Date: Thu, 7 Feb 2002 17:23:18 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Perhaps Dumb question

>My R-390A/URR just blew F103, 1/4 amp. The rig is now dead in the water.
>Before I go into my maniac mode, can someone(s) suggest a narrowed
>down search? Obviously the IF deck is dead too.

For dumb questions, you have come to the right place. You may want to gather up a bunch of fuses, or a 120V light bulb in its place. Try powering up the rig with the modules out, until you isolate the module with the problem. Once you do that, look for a bad capacitor that bypasses the circuit that is on that fuse, it is B+ if I am not mistaken. Good luck
Tom

Date: Fri, 15 Feb 2002 17:39:44 -0600
From: Tom Norris <cthulhu@fhtagn.org>
Subject: [R-390] I Hope Everyone Is Happy Now....

Well, the last of the good prices is now out of stock, Jan at http://www.die-wuestens.de just sent me an email that he had a large rush of orders and no longer has stock of the 26Z5W, nor do any of his colleagues that he normally trades with. I am now down to two spares and will be forced to <gasp> solid state my 390A's in the future if the rectifiers fail. I do have a plan, I have a couple of 2 minute delay-on-make relays that would work wonders in keeping the B+ off the tubes till the filaments are warm..... Or I could use them to drive a step start contactor and motorized variac, or or, well, the possibilities are endless, you know. :-) And no, I am not upset in the least with the lack of tube rectifiers, two of my sets in the last few years have come either stock or have been Navy modded for solid state diodes anyway....

From: Llgpt@aol.com
Date: Fri, 15 Feb 2002 19:41:38 EST
Subject: Re: [R-390] I Hope Everyone Is Happy Now....

Or, you could just instal 1 kv 3 amp diodes and let 'er rip.....I've been doing that for years with no ill effects. But, I must warn you some have accused me of being a witch!! And no, I am not upset in the least with the lack of tube rectifiers, two of my sets in the last few years have come either stock or have been Navy modded for solid state diodes anyway....

From: "CORYHINE" <CORYHINE@msn.com>
Subject: Re: [R-390] I Hope Everyone Is Happy Now....
Date: Fri, 15 Feb 2002 19:09:54 -0600

Or, you can put a thermister in the line to let the voltage come up slowly. This is a trick I have used in all my Collins equipment. Lessens the shock of the cold start.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Mon, 4 Mar 2002 09:25:18 -0600
Subject: [R-390] Fan Power Supply Voltage and RTTY Question

Power Supply question:
I built a simple power supply to drive a cooling fan for my R390A. I used an 18VCT in a "double half wave" rectifier configuration (the same way the R390A HV power supply is done). I slapped a cap across the output (20mfd as I recall) and it was delivering a clean 14VDC no-load voltage on the scope. Fine, I thought. Good enough to drive some small fans.

Well, when I connect the fan, the voltage drops to about 9 volts (according to the DVM). The fan is drawing about 120ma. What causes the sudden voltage drop? I need to look at the voltage on the scope, but I suspect the cap is discharged through the load between half cycles and the DVM "sees" 9VDC when, in fact, it is a rippled DC signal. Does this sound plausible?

RTTY question: When tuning for RTTY, I know tha most all of them are LSB and tuning to the wrong side of the signal will invert the mark and space signals. When you tune through a RTTY signal -- say from a lower frequency, through zero, to a higher frequency, which "side" of the signal is the right "side": the one "below" the zero beat or the one "above" it? I think this may part of my inability to copy RTTY correctly. Last night I finally was able to get the "five number" coded patterns I've heard others talk about. Sadly, I don't remember which "side" of the signal I was on...

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Fan Power Supply Voltage and RTTY Question
Date: Mon, 4 Mar 2002 10:21:44 -0600

Yeah, I figured the cap was too small. Thinking about it, the fan is supposed to draw 150ma at 12VDC which makes it somewhat equivalent to an 80-ohm load. This makes for a 1.6ms time constant -- not nearly enough. I should've known better -- however, I'm not sure it's a bad thing. This only causes the fan to run a bit slower and thus quieter. Maybe I'll leave it alone.

>Barry, The problem is that the capacitor is too small.
>The maximum no-load voltage you will get from a simple power supply is 1.414 times the rms secondary voltage (the peak value of the secondary voltage). Since you said you were seeing 14 volts and the transformer is supposed to be 18vct I assume you were using a full wave center tap configuration. This should result in 9 * 1.414, or about 12.7 volts, so the transformer is probably giving you a little more than 18 volts or you meter is off a little.

Anyway, the problem is that with your 120ma load and 20uf capacitor, the ripple voltage is very large. You can calculate what the ripple voltage will be for a given case this way:

Vripple = Iload/(120*C)
Where: Vripple = ripple voltage (volts), Iload = load current (amps), C = capacitance (Farads)

If you rearrange things, you can find the capacitor needed for a given load and ripple voltage: C = Iload/(120*Vripple)
so for example, if you want 1 volt ripple at 120ma:
C = 0.120/(0.120 * 1) = 0.001F (which is 1000uF)

This assumes a full wave rectifier at 60Hz. If your supply is half wave, use 60 instead of 120. You can see a description of why this works near the bottom of this page: http://courses.ece.uiuc.edu/ece343/zdesign.html

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From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Fan Power Supply Voltage and RTTY Question
Date: Mon, 4 Mar 2002 10:56:47 -0600

A 20 mfd cap with a load of 0.1 amp will drop 5000 volts per second or 40 volts per half cycle of the line. It might as well not be there. So yes, 9 VDC is plausible. A 1000 mfd cap will drop about 1 volt per half cycle. OTOH, 9 volts causes the fan to run quietly.

Date: Mon, 04 Mar 2002 15:20:38 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] Fan Power Supply Voltage and RTTY Question

I have installed a fan in my R-390A and plan to do so for the R-390 when the restoration is complete. I used one of those toy power suplies/chargers that plug into the wall, rated at 9VDC 300MA. The fan is 2.75 inch, 12VDC, 120MA. The P/S is mounted underneath, to the rear and to the left of the PTO. I used a large tie wrap about 3/8 inch wide cut to length. Holes were drilled in it. The screws that secure the partition between the PTO and the Audio chassis were used to support the P/S. I soldered wires to the AC plug on the P/S. The other ends of the wires are soldered to the AC input. I do not use the Function Switch to turn on power. The AC is switched externally. The DC O/P is connected to the fan with a small connector. Never did measure the DC O/P under fan load but the fan cools the radio very well and runs quiet. The fan has been running for 10 months about 10 hrs/day.

Date: Tue, 05 Mar 2002 09:59:09 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Fan Power Supply Voltage and RTTY Question

You need 2000 uF not 20. Roy

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
To: "R390 (E-mail)" <R-390@mailman.qth.net>
Date: Wed, 13 Mar 2002 11:00:32 -0600
Subject: [R-390] Power supply fun

Some of you may remember my post a while ago about filtering on a simple 12V power supply. It is a gounded centertap full wave configuration and I had a 20mfd cap for a filter. When I applied the load, the voltage dropped (naturally as I realize now) and it was suggested 20mfd is insufficient. Yesterday, I picked up a 1000mfd cap. Before I replaced the 20mfd cap, I did a little snooping with the scope. Under no load, I was getting a nice flat 12VDC. Under load, the deep "valleys" would appear (as a result of the cap discharging through the load). This accounted for the 9VDC (approx.)

reading I was seeing with the DVM.

Replaced the 20mfd cap with the 1000mfd cap.

Under no load, still the nice flat 12VDC. Under load, however, I now get a fairly flat line with just a hint of a ripple (maybe 1/2 volt). It's funny, but you can read about these things, but they don't sink in until you actually do the "labwork". Next time, I'll be a whole lot less likely to make the same dumb mistake. I think what I was basing my original value on is the fact that the same rectifier configuration in the R390A only uses the 30mfd and 45mfd caps. What I wasn't taking into consideration, though, is the chokes and the overall filtering design. It makes quite a difference! I realize this is pretty "ho-hum" for some (most?) on the list, but, like I said, sometimes you have to actually do the experiment before it sinks in. This was fun...

Subject: Re: [R-390] Power supply fun
To: R-390@mailman.qth.net
From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Wed, 13 Mar 2002 09:48:11 -0800

It's this learning part of the field that I do like so much. This is the part that's fun, You feel so good when you get it right. A lot like how I feel when I stop banging my head against the wall.

From: Buzz <buzz@softcom.net>
Subject: Re: [R-390] Power supply fun
Date: Wed, 13 Mar 2002 10:23:47 -0800

I like the saying, "The journey is the reward".

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Thu, 14 Mar 2002 08:23:04 -0600
Subject: [R-390] Power Supply, Capacitors, and Dead Horses

Sometime during the night last night, I happened to think of something relative to the power supply filtering thread. With a single cap across the rectifier, when power is applied, isn't the current demand on the transformer and rectifier components nearly infinite? Is this a potential

problem? Should there be some kind of current-limiting resistor (or other component) in series with the cap? So far, it works okay and I realize this sudden current demand is short, but is this something to be concerned about?

Date: Thu, 14 Mar 2002 08:27:53 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Power Supply, Capacitors, and Dead Horses

Scott, there's always some resistance (wire in transformer, wire leads etc) so current is limited by this but no doubt the initial current surge can be very high, and this increases with input capacitance. Sometimes a resistor is put in to limit this surge. On my 25 volt supply for my R 392, I used brute capacitance filtering and I always blew the 3 amp 110 fuse when I turned it on unless I brought it up with a variac to limit the initial surge. I think I'm using about 20000 mfd. My solution was to wire in a relay that switched out a surge resistor once the voltage came up - this was my solution because my transformer (about 18 volts ac as I recall) didn't have enough extra volts to accomodate the voltage drop in the surge resistor if I left it in the circuit. There's probably a better way, but I had the relay on hand. Dan
----
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Power Supply, Capacitors, and Dead Horses
Date: Thu, 14 Mar 2002 11:32:18 -0600

It only looks like a dead short on the schematic. The rectifier has internal resistance, the transformer windings have resistance, and the core has non-linear resistance. It definitely will not support infinite current. Capacitors are not perfect, either. Rectifiers have a single cycle surge current rating that is 10-20 times the continuous rating. This, and the impedance of the components is what allows modern power supplies to work. If you add more resistance you run into lower output voltage than you'd think. This is because the rectifier only conducts during a small part of the cycle, determined by the ripple voltage.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Power Supply, Capacitors, and Dead Horses
Date: Thu, 14 Mar 2002 15:07:28 -0800

At the instant of turn-on, if it happens at a point other than the AC mains zero-crossing, there will be a current spike limited only by impedance. During steady-state operation, the peak ripple current is limited not only by impedance but by the fact that the voltage is not changing instantaneously. $I = C * dV/dt$. For 120VAC, the waveform is described by

$$V(t) = 170 * \cos(377*t) \text{ so } dV/dt = -64090 * \sin(t),$$

so the peak rate of change is about 64V/mS. I'm doing this from memory, so take it for what you paid for it. Bet you thought I wandered off. No, I'm just still messing around with VFO temperature compensation. I'll do a fresh post for that.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Thu, 11 Jul 2002 12:47:04 -0400
Subject: [R-390] Re: Miltronix EAC

The single "tube" you refer to on the modified power supply unit is probably a thermal time delay relay. This would allow sufficient time for tube warm-up then would apply B+. An example of an R-390A power supply modified this way can be found at: members.aol.com/ac5zt/r390a.html One opinion holds that application of B+ before cathode warm-up causes deterioration ("stripping") of the emissive coating. Another says that stripping is not an issue with indirectly-heated small receiving-type tubes but does need to be considered for large directly-heated filament power tubes. However, it is noteworthy that tube-type Tektronix oscilloscopes (which use indirectly heated tubes) have a delayed B+ feature.

From: "Bill Smith" <billsmith@ispwest.com>
Date: Mon, 29 Jul 2002 23:40:59 -0700
Subject: [R-390] R-390 Power-on micro switch

Interesting venture tonight. Attempted to use the R-390 to tune into Amos 'N Andy (7415) tonight at 9:00pm PDT, but the receiver wouldn't turn on. Ha, the notorious micro switch had failed. It had been difficult to turn off the receiver in the recent past, but this was the first time I couldn't get it to turn on. Leaped over to the SX-62, then embarked on the project to remove the R-390 front panel. That done, and the switch unsoldered and in my hand, a cover was removed by the careful application of a pick to press out two friction-fit pins. Once inside, overheating was evident. The plastic cover was melted to the extent it interfered with the operation of the micro switch contact assembly. But the switch contact, though intact and toggling correctly, wouldn't pass a continuity check with an ohm meter. A file evened out the melted plastic, but in spite of burnishing the contacts, there was still resistance between switch points. Careful measurement yielded the culprit. The (silver?) contact button on the business end of the middle leaf was swaged into the leaf, but was not making electrical contact. Apparently this small spot was generating the resistance that had generated enough heat to melt the plastic. The apparent solution was to apply a spot of solder between the of the wafer and the button. 'Twasn't easy, the metal had to be filed a little before it would adsorb solder. Another ohm check with the Simpson 270 verified "0" ohms resistance when the switch is operated. The micro switch was reassembled and the receiver put back together. We'll see how long it works, but I wonder if a new switch is available? Hopefully the R-390 will run with the repaired switch for a while.

Date: Tue, 30 Jul 2002 03:45:37 -0700
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] R-390 Power-on micro switch

Bill, What a drill to go through.. I would say you are lucky to get it to work. I have NOS Micro switches, they are $11.00 mailed First Class. or $20.00 for 2.

Date: Tue, 30 Jul 2002 09:54:01 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390 Power-on micro switch

I believe that we can help our radios by some improvements:

1) Add inrush current limiting

2) Add a line voltage bucking transformer to reduce modern 122-125 volt line voltages down to the design target of 115

3) Add fans, ESPECIALLY in the R-390 non-A

4) Add a line relay that is operated by the microswitch and turns on the rest of the radio.

All these things could be combined into one modification and most likely done with no holes drilled. I'm looking for my round tuit to get started on this project.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R-390 Power-on micro switch
Date: Tue, 30 Jul 2002 08:59:49 -0500

5) Leave the switch in the "StandBy" position and use an external switch.

I constructed a back panel for my desktop rack with a rocker switch that controls power to the radio and the DC supply for the fans. The microswitch is good in this radio, but I think it doesn't hurt to leave it alone. Yes, I do have inrush limiting as well. I do need, however, to add a bucking xfmr.

Date: Tue, 30 Jul 2002 11:54:09 -0400
From: Thomas W Leiper <twleiper@juno.com>
Subject: [R-390] MIcroswitchs? We don't need no stinking microswitches...

Roy, all you really have to do is #2 because you leave your radios on 24 / 7 anyway...DON'T YOU? So, there is no (1) inrush or (3) excessive heat or (4) need for any kind of on/off switch. I buck the whole rack down 12 volts except for the SP-600's, which have the rather deluxe feature of multiple primary taps. You can also convert BA rigs that use a 5V rectifier tube to solid state and use the 5V filament winding to buck the primary instead...that is a particularly elegant way to cool down your CV-591 by a few thousand degrees kelvin.

From: "Chuck Rippel" <R390A@R390A.com>
Date: Wed, 14 Aug 2002 11:44:44 -0400
Subject: [R-390] Solid State R390A Supply

>One thing to try, put a .01uf disc ceramic across each rectifier diode. This
>cleaned up a couple of my solid state supplies. You might also try a .01
>from the transformer secondary leads to ground, and make sure the case of
>the the power supply and receiver are tied together. Hope this helps
Jack

Good point. I have done that on occasion however normally, its not an issue. I use about a 3KV ceramic disc. Seems that Antique Radio sells them.

From: DCrespy@aol.com
Date: Sun, 25 Aug 2002 09:37:32 EDT
Subject: Re: [R-390] They followed me home <GRIN>.

Phil, a few notes (I hope will supplement Barry's good advice):
>
> QUESTION 1: Seeing as how these units have the rectifier tubes in place,
> how high do I need to bring the Variac before they will start conducting
> enough to start forming the caps, at least some?

You can reform the caps outside the unit. I think this is easier, especially for the plug in caps found in mil receivers. Let the cap charge through a 10 to 30 K , 5+ watt resistor, connected to a 200 to 300 volt DC source. If you watch the voltage across the cap. It will rise very slowly as the cap reforms. Leave it on this rig for an hour or so. Then discharge it, plug it in and fire up the rig. BE VERY CAREFUL, A CHARGED CAP IS VERY DANGEROUS (experience based advice!). .... <snip>

From: "AI2Q Alex" <ai2q@adelphia.net>
Date: Wed, 11 Sep 2002 19:59:28 -0400
Subject: [R-390] CU-714/SRA-22 ramblings

Just a word of thanks for the many kind replies from R-390 listers on my newly acquired CU-714/SRA-22 surplus antenna tuner, part of the old URC-32 radio set. I sholuld've recognized the nomenclature of this beastie from all the work I did on the USS Albacore sub, but for some reason that thought eluded me until this afternoon. Anyway, after studying the wiring I can see that it's an L-network, with the vacuum capacitor motor also driving a hefty switch, so it can be set up with the cap in either series or parallel with the coil. In the original usage, whether the cap is in series or parallel can be indicated with a lamp or LED, as they bring out the switch extra contacts for that purpose. The unit's other two motors drive (a) the coil itself, and (b) the tap on the coil. So, by using either motor I can set the inductance and where I want to tap-down on the inductance. Also, as I see it, if I put a manual switch on the RF leads, and re-wired the RF feed and output, I could reverse them, which might add some flexibility to its use in the shack, making it more adaptable to many more kinds of end-fed antennas and verticals. The motors are marked 115V 60 Hz, so I tested them out tonight using a variac and isolation xfmr. The capacitor-drive motor works FB as-is, and can be reversed by switching pole connections on the motor itself. The coil motor and coil-tap motor required a phase-shift capacitor to make them run. I grabbed an old 1 uFd bathtub cap, rated at 600-V, and that worked just fine. They can be reversed with switches to reverse the phase of the applied 115 V (swap the leads with a toggle switch). With a few switches, I should be able to make this puppy work in any config needed. Also, I haven't tested them yet, but the coil and coil-tap motor geartrains have pots hooked up to them, so with a DC power source of a few volts I should be able to drive a meter or two so that I can see how far the coil and coil tap has moved. Sort of like on some Yagi rotator boxes. I'm thinking that this would be a good thing to tune my present top-loaded phased 80-meter vertical array. All I need is one more CU-714/SRA-22 (if I'm lucky), one for each vertical. Then I'd be able to QSY from the fone to CW portion of the band, right from the shack, without having to go outside on cold winter nights or during storms. Gotta feed the R-390, R-390A, and R-392 properly. I hope present-day equipment is built this good, so that it works well against those SOBs Bin Laden and Saddam (Madass spelled backwards) Hussein.

From: "Philip Atchley" <k06bb@elite.net>
Date: Mon, 28 Oct 2002 08:03:44 -0000
Subject: [R-390] R-390A's, Sandstate sets and Desert Storm static damage

You know, I keep reading about how "Uncles" modern radios used in Desert Storm suffered so much static damage from windblown sand etc that he rushed in R-390A's, KWM-2's etc. I have seen large static buildup on wire antennas, so I know it's real. When I was in the Barracks in Spain (mountaintop site) I had a longwire about 120' long or so stretched between two wings of the building. On more than one occasion I saw arcs over an inch long jump from the disconnected antenna to the radio case (tube radio 8^). And this on what seemed to be clear but windy days! But, what doesn't make sense to me about these stories are two things.

1. It seems to me that on a receiver (or even a transmitter) it wouldn't be all that difficult to couple the antenna to the set through a Balun or Unun so that the receiver ALWAYS has a DC path between the antenna and its ground thus making sure that a high DC couldn't be coupled into the radio and likewise on the antenna side a DC path to ground to prevent any Voltage buildup. Where you get into trouble is when there is no DC path to drain the static off. Any Radio man worth his salt ought to know this.

2. In desert conditions like Desert Storm it "seems" to me that dirt and grit getting into the gears (and slug tuned coils) of a R-390A or tuning mechanism/tuning slugs of a KWM-2 would prove far more troublesome to reliability! (Ask those who bought "Blue stripers" and had to clean em).

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Wed, 18 Sep 2002 14:29:44 -0700
Subject: Re: [R-390] Solid State rectifiers vs Tubes

It certainly could have. SS rectifiers cut off so sharply that they generate a goodly amount of noise, kind of like a spark-gap. I ALWAYS bypass for RF any I install. Disk ceramic caps both "across" every diode, and sometimes, depending on the noise problems I have with them, from each end to ground. Tube rectifiers generate inherently quieter DC...except mercury vapor types, of course, but even those can be taken care of easily. I have had considerable problems with noise from SS rectifiers getting into my receivers. For the R-390 or R-390-A where one has trouble getting those 26Z5s, you all might consider changing them to 12BW4s. For details go to: http://www.mines.uidaho.edu/~glowbugs/ and click on link # 10.

Date: Fri, 20 Sep 2002 22:28:21 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Solid State rectifiers vs Tubes

Gruss aus North Carolina! Les wrote back and says he uses .01 uF @ 1 KV disk ceramics. (That's his story and he's sticking to it.) Still waiting for other responses.

Date: Fri, 20 Sep 2002 16:48:39 -0400
From: Helmut Usbeck <vze2gmp4@verizon.net>
Subject: Re: [R-390] Solid State rectifiers vs Tubes

I've wanted to bring up diodes in power supplies for a while now. For the most part, the usual 1n400X doesn't produce any noise that one can hear.

If you put a scope on the high voltage line you might see 50 millivolts and switching spikes. Older power diodes from 20-30 years ago where more prone to this. I designed digital ckts for quite a few years and noise problems from power supplies where common, there was no going back to tube rectifiers. The way the noise is generated is due to a mismatch between the secondary of the transformer and the diode impedance. Papers were written about this way in the fifies. Anyhow the old "put a ceramic .01 cap across the diode" doesn't work. We also can't rewind the power xformers for 390's either, so what I've been using is either a fast recover diodes, or Hexfred diodes, both designed to be hash free.

1N4937 1amp 600volt, fast recovery type
HFA08TB60 1 amp 600 volt Hexfred
Both available from Mouser, Digikey and such.
Don't cost more than a buck or two.

The old .01 cap thing is for keeping RF generated by the radio's oscillators and such out the power supply to prevent "hum" modulation. Transmitter power supplies usual have these. Another way of knocking out the hash is to put a resistor of low ohmage in series with the diodes, but in order for this work correctly the impedance of the secondary and other data of the diode needs too be had and along with some math, hash can be also gotten rid of. That resistor that one sees in some older solid state design wasn't just there just for surge protection.

That's it in a nut shell.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Fri, 20 Sep 2002 22:40:52 -0700
Subject: Re: [R-390] Solid State rectifiers vs Tubes

Use 0.01 MFD at 1 KV...or thereabouts. Not too critical as long as they will handle the voltage.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Fri, 20 Sep 2002 22:44:03 -0700
Subject: Re: [R-390] Solid State rectifiers vs Tubes

I would use something around 0.01 MFD at 1 KV...at least that is what I have used for years. Yes. You can hear un-bypassed SS rectifier noise in your receiver almost always. Sometimes it is really pretty loud. VERY annoying!!!!

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Fri, 20 Sep 2002 22:59:46 -0700
Subject: Re: [R-390] Solid State rectifiers vs Tubes...a reply...

> I've wanted to bring up diodes in power supplies for a while now. For
> the most part, the usual 1n400X doesn't produce any noise that one can hear.

Hmmm...perhaps you are correct. I have never looked at my HV line with a scope nor tried to track the noise back with a scope. None-the-less, when I by-pass the SS diodes with a .01 MFD 1KV disk capacitor, the noise goes away. I have had this problem in several receivers: ARC-5s with built-on and separate power supplies, HW-16 (two of them), home-brew receivers (two of them).

> If you put a scope on the high voltage line you might see 50
> millivolts and switching spikes. Older power diodes from 20-30 years
> ago where more prone to this. I designed digital ckts for quite a few
> years and noise problems from power supplies where common, there was no
> going back to tube rectifiers. The way the noise is generated is due
> to a mismatch between the secondary of the transformer and the diode
> impedance. Papers were written about this way in the fifies. Anyhow
> the old "put a ceramic .01 cap across the diode" doesn't work.

I am certainly not going to argue the point with you since you obviously know more about it than I do. I arrived at my solution empirically and only guessed at its cause. Again, none-the-less, my solution worked 100% of the times I had to use it.

> We also can't rewind the power xformers for 390's either, so what I've been
>using is either a fast recover diodes, or Hexfred diodes, both designed to be >hash free.

So the hash problem has been recognized by the industry, then, and a solution devised?

> 1N4937 1amp 600volt, fast recovery type
> HFA08TB60 1 amp 600 volt Hexfred
> Both available from Mouser, Digikey and such.
> Don't cost more than a buck or two.
> The old .01 cap thing is for keeping RF generated by the radios
> oscillators and such out the power supply to prevent "hum" modulation.

That definitely works for regenerative receivers, which are most susceptible to that problem.

> Transmitter power supplies usual have these.

Yes, but in that case, they are used primarily to keep the "switch- off" transient from blowing the diodes. Voltages in transmitters are usually higher than in receivers, and are usually switched on and off more often... My RSGB handbook addresses this issue at some length and suggests a series combination of capacitor and resistor across transformer primary and secondary and across any filter choke, in addition to by-pass capacitors across every diode.

>

> Another way of knocking out the hash is to put a resistor of low ohmage
> in series with the diodes, but in order for this work correctly the
> impedance of the secondary and other data of the diode needs too be had
> and along with some math, hash can be also gotten rid of. That resistor
> that one sees in some older solid state design wasn't just there just
> for surge protection.

>

> That's it in a nut shell. --Helm. WB2ADT

Thanks, Helm.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Solid State rectifiers vs Tubes
Date: Mon, 23 Sep 2002 09:35:01 -0500

I checked the manual's "change pages" for the SS-diode to tube modification and, sure enough, the distortion figures were changed for the better -- at least in part of the frequency ranges. IIRC, it went from 0.2% to 0.1%. Now if I just had a method to measure this. I don't have a distortion analyzer :(

Date: Fri, 27 Sep 2002 23:32:23 -0700
Subject: Re: [R-390] Solid State rectifiers vs Tubes...a reply...
From: ronald j deeter <k6fsb@juno.com>

I've been following the thread and.....RE a conversion to SS rectification a few things - beware of the higher B+ voltage generated by SS of tube rectifiers. Potential problems, in particular resistors on the audio board (R390A), potiental for stripping the emmissitivity of cathodes of the tubes that have not yet come up to temperature, more heat generated by components due to higher voltage, stress/shock from immediate HV, to name a few . also remember tube rectifiers do have a voltage drop, if memory serves 22v for 26Z5's. there are ways to compensate. The advantages and disadvantages must be evaluated carefully before converting.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Tue, 1 Oct 2002 10:25:33 -0700

Subject: Re: [R-390] Power Supply Modification

Although the SS mod can be helpful, in addition to the higher voltage problem, there can be other problems using them. For a possible solution to this common problem visit the following URL: h

http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm

I have used this mod and it works very well. The tube used for this mod is cheap.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 02 Oct 2002 13:08:59 -0400
Subject: [R-390] Power Supply Modification

For solid state rectifiers in the power supply a series 220 ohm 10 watt resistor may be added in the common lead to the rectifier cathodes. The official Navy modification calls for installation of the resistor under audio chassis. Excessive heat under the already hot audio chassis is the result. A better location is on the power supply. I've found it most convenient to connect the resistor from the high voltage secondary center tap to ground (don't forget teflon sleeve for the leads). Each rectifier may consist of two 1N4007 in series. For more information on pros and cons of solid state rectification for the R-390x, go to r-390a.net . Select "References" then "Pearls of Wisdom" then "Power Supply". You will find a lively and informative compilation of postings to this forum from the last few years.

From: "Philip Atchley" <k06bb@elite.net>
Date: Mon, 21 Oct 2002 21:14:21 -0000
Subject: [R-390] A story of two grounds.

Sometime back I re-capped and serviced this '67EAC R-390A that I'm presently using and it performs VERY well. I chose to go the "under chassis" route for the 'lytics rather than rebuild the cans.

One thing that I noticed was that this set had some 120Hz noise in the Local audio that, while not loud was noticable with the volume turned all the way down. NOT a hum, it was more like the line related switching noise one hears from Triac controlled lamps etc. So today I decided to troubleshoot it (I HAVE to get a helper to move this thing around !). I suspected a ground loop.

To make a long story short. When I mounted the capacitors under the chassis I mounted two solder lugs under existing screws, cleaning under them to make sure they made good contact. This so I could make a VERY neat installation of the capacitors as the lugs provided a convenient mounting point for the ground end of the 'lytics. I've done this before with good luck. Previous sets had the Solid state rectifiers while this one has intact tube rectifiers. Anyway, on a hunch I replaced the ground lugs with two insulated terminal strips (Radio Shack) in which I had cut off all but one insulated lug. I then connected the negative end of the capacitors to these lugs and ran a ground wire back to the two appropriate Capacitor Octal sockets giving the capacitors their original ground points.

Upon testing, Voila! That did the trick. IF I put my ear on the speaker I can 'just discern' the noise. In normal operation certainly not noticable like it was.

MORAL OF THE STORY: I'm sure Art Collins spent a lot of money researching and designing the grounds in our beloved R-390A's, don't try to second guess him!) One additional Note: The ground lug where these caps are originally grounded IS NOT all that far from where one of my ground lugs was located.

Date: Sun, 08 Dec 2002 20:47:23 -0500
From: william ohlsson <wohlsson@comcast.net>
Subject: [R-390] F102 FUSE BLOWING

Hi guys, Just picked up a r-390a from the estate of a silent key...I wanted one because I loved them when I was in the navy. Figures that I would have problems right from the start. The F102 1/4 amp fuse blows. I need some direction on where to start and who is a good source for parts to replace all the bad ones that your going to tell me I need. I'm not a real expert when it comes to repairing radio's, but I'm will to give it a shot. Especially don't really want to ship this for repair, just to have it destroyed en route.

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] F102 FUSE BLOWING
Date: Sun, 8 Dec 2002 22:06:11 -0500

Bill, Congratulations on getting your first R-390A. I hope you have fond memories of these fine receivers from your Navy days. Your problem could be one of the filter capacitors, more likely C606. The last one I worked on that blew fuses had a bad C606 electrolytic. You can either rebuild the existing aluminum cans, or wire new caps underneath the AF deck. My website shows how I rebuild the aluminum caps if that's the way you decide to go.

Date: Sun, 08 Dec 2002 22:34:47 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] F102 FUSE BLOWING

Walter gave you very GOOD advice. I would like to add to it. Check the tubes in the audio deck also. I had mine blow the same fuse. Look on the board underneath the Audio Deck. Look for overheated and possibly discolored resistors - especially the first one, a 2 watt job. That's what I found, and the cause proved to be an audio tube shorted. These are lot's of fun to use and work on. Good Luck! And keep us posted on your efforts. Between the lot of us, we'll get you back up and running.

Date: Sun, 08 Dec 2002 22:42:12 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] F102 FUSE BLOWING

In fact, here is my quote on the find in mine: "The module isolation found two cripsied resistors. Replaced same, recapped module. Popped fuse again, FINALLY tested tubes. One each 6AK6 AF module shorted. Now back up and running just great!"

Date: Sun, 08 Dec 2002 10:59:55 -0500
From: william ohlsson <wohlsson@comcast.net>
Subject: [R-390] F102 PROBLEM --THANKS

Thanks to all you guys for the quick response. Have the af deck out on the bench now and will let you know what I find. by the way, this one is a Collins ser#1834 and looks pretty clean. Thanks again and 73's to all....

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] F102 FUSE BLOWING
Date: Mon, 9 Dec 2002 06:27:29 -0500

In addition, there is an excellent section in the TM 11-856A, p. 102, section 90, regarding how to check for B+ shorts. Unplug the AC power cord from the outlet, set the MC knob below 8MC, remove rectifier tube XV801, and connect an ohmmeter between pin 3 (or 8) and ground. You should have greater than 15000 ohms. Check with the BFO switch both on and off, and with the function switch in all power-on positions. If the reading is below 15000 ohms, remove the power connectors from the decks in the following order:

AF deck (P199 and P120)
IF deck (P112)
RF deck (P108)
VFO (P109)
Crystal Osc deck (P110)
Power Supply (P111)

If removal causes the ohmmeter reading to suddenly jump when disconnected (and it started below 15000 ohms), thoroughly check this deck for problems. In the aforementioned manual, paragraph 119 gives DC resistance checks for each subchassis. You'll need to check tubes for shorts, and then bypass capacitors for shorts. If the short persists after all power connections are removed (prior to P111), the short may exist in the chassis wiring harness (if no problem found in the power supply subchassis). There are further details in the manual for those cases when the B+ short only exists intermittently or when B+ voltage is present. I did not find a similar troubleshooting section in the R-390A Y2K manual, but someone else on the list may be able to find it and point to it there as well.

From: "Tadashi Ishimori" <tadashi@a3.ctktv.ne.jp>
Subject: Re: [R-390] F102 PROBLEM --THANKS
Date: Tue, 10 Dec 2002 00:22:55 +0900

Bill, A couple of month ago, I had a same problem on my 390. At last, I found a defected choke coil (L603) in AF module. There are three choke coils in AF Deck. Please check the conductance between each terminal post of the choke coil (L601,L602, L603) and chassis. The conductance will be zero ohm, if the coil touches to their 'Hermetically-Sealed Case'. Good Luck!

Date: Sat, 21 Dec 2002 19:40:46 -0500
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] in rush current limiters

I have seen the mod for a soft start for the 390-A and thought about doing it. While browsing on ebay, I noticed an external in rush current limiter that can be used. I wonder if anybody has used one of these before. It can be seen on Ebay, item # 1945055954. I am thinking of buying this item and wonder if anybody might have some input or experience with such an item.

From: "Scott Seickel" <polaraligned@earthlink.net>
Subject: Re: [R-390] in rush current limiters
Date: Sat, 21 Dec 2002 20:33:07 -0500

Well Scott, that e-bay item would be the expensive way to do it. I purchased an excellent rebuild kit from Walter Wilson and it included the Keystone CL-80 inrush current limiter. You just solder it in-line with your AC power supply. If you do not need a complete rebuild, you can purchase the Keystone Current limiter from Mouser electronics for $2.17. The web page in their catalog is:
http://www.mouser.com/index.cfm?handler=productsearch._listproductsearch&searchtype=starts+with&criteria=cl-80&searchby=PartNumber

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From: "Jim Shorney" <jshorney@inebraska.com>
Date: Sat, 21 Dec 2002 22:11:32 -0600 (CST)
Subject: Re: [R-390] in rush current limiters

Man, this is brilliant. This guy on eBay takes a couple of current limiters like you describe and a PTC for fusing, mounts it all in an electrical box with an outlet, writes some flowery text about it, and sells it for 30 bucks. I gotta order some of those from Mouser and get in on this deal...

Date: Sat, 21 Dec 2002 22:31:14 -0600
From: Tom Norris <cthulhu@fhtagn.org>
Subject: Re: [R-390] in rush current limiters

The ebay solution is *convenient* though. It is also portable. Could use it with several receivers. On the subject of convenience versus price, does anyone have a good schematic for a solid state ballast similar to what Chuck Rippel sells for $50. Yes, converse to what I say above about being convenient, I have several 390A's that I would like to fit with some sort of similar item. I may end up just buying them from Chuck, his are stable and RF-quiet.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] in rush current limiters
Date: Mon, 30 Dec 2002 09:56:08 -0600

I did this myself a while back. I used a mini-box, single AC receptacle, fuse, CL-80, and a "computer-style" socket. I have it powering an old RCA upright "curtain-burner" I rebuilt. I didn't want to modify the chassis so I just ran a new 3-wire cord out to this box. Works fine.

Date: Tue, 31 Dec 2002 06:30:28 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Finally!!!

Gasoline or Kerosene are out since the workshop also houses the oil burner. I keep forgetting about WD-40. It is a good solvent and sure makes fast work of removing tar blobs on the car. Perhaps WD-40 to remove the gunk and alcohol to remove the residual WD-40. I was looking at the AC cord connection. Is it accepted practice to attach the neutral (green) wire to one of the studs that is used to secure the cover over the filter input?

From: Llgpt@aol.com
Date: Tue, 31 Dec 2002 06:39:57 EST
Subject: Re: [R-390] Finally!!!

Yes, that is the accepted method.

Date: Tue, 31 Dec 2002 12:52:21 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Finally!!!

The three wire cord ground goes to one of the studs in the vicinity of the power connection. If you do not have a line cord cover plate I would recommend either getting one or making one. Without a cover there is a major health hazard there. Be careful with a lot of WD-40 and an open flame. I suspect the stuff is flammable.

From: "Jon & Valerie Oldenburg" <jonandvalerieoldenburg@worldnet.att.net>
Subject: Re: [R-390] Finally!!!
Date: Tue, 31 Dec 2002 12:08:22 -0600

> Be careful with a lot of WD-40 and an open flame.

It is quite flammable, main ingredients include white gas and propane as a propellant. Great stuff for home flame-throwers on those pesky critters!
Jon

Date: Tue, 31 Dec 2002 11:07:00 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Finally!!!

Neutral is WHITE and goes to one of the power terminals, NOT the one that goes to the fuse or the switch! Ground is GREEN! And goes to the chassis. Please don't swap them.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Finally!!!
Date: Tue, 31 Dec 2002 13:11:55 -0600

Good call, Joe. When I read that, the mistake didn't register with me. Neutral and ground are terms that sometimes are not clearly defined. Thanks.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Tue, 31 Dec 2002 14:51:37 -0800
Subject: [R-390] Re: AC connections...

> the neutral (green) wire to one of the studs that is used to secure the cover over the filter input?

The NEUTRAL is NEVER GREEN: it is WHITE in the US and Canada. As an old time electrician, "Green is Ground, the world around." The NEUTRAL wire must never be switched alone either. Only the "hot" side of the circuit is ever switched alone, although BOTH white wire and hot wire may be switched (together) if necessary.

From: "Jim Shorney" <jshorney@inebraska.com>
Date: Tue, 31 Dec 2002 20:36:13 -0600 (CST)
Subject: Re: [R-390] Finally!!!

>Neutral is WHITE and goes to one of the power
>terminals, NOT the one that goes to the fuse or the switch!

Taught to me by an electrician years ago: 'White won't bite'. Neutral, being (theoretically) at ground potential, won't shock. Neutral is always white, 'hot' is black.

>Ground is GREEN! And goes to the chassis.

Green because grass grows on the ground? Funny people, these electricians.
My 390a appears to have an original 3-wire cord. How common it this?

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Tue, 31 Dec 2002 19:21:20 -0800
Subject: [R-390] 6082 tubes...

I have never owned an R-390-A (although I hope to someday), but I have owned an R-390 and I presently have an R-389. Both of the latter have a pair of 6082s in them as shunt regulators. Does the R-390-A have the 6082s, or did Collins eliminate those in the interests of economy?

Date: Tue, 31 Dec 2002 23:16:38 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 6082 tubes...

They dropped the 6082's from the 390A radios. The only regulation on the B+ comes from a normal VR tube arrangement. This took a major amount of heat out of the radio. As far as anybody can tell this does not create a problem when run off of normal line voltage.

Date: Wed, 01 Jan 2003 09:45:23 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Finally!!! NOT!

Not to beat a dead horse to bad but .... Back quite a while I had a neutral lift off in the brand new house I was living in. It's a fairly spectacular event even if it does happen fairly slowly. Over the next year most of the neighbors also had the same exciting experience. In almost all cases it was aluminum lead in wire and bad torque on the clamp bolts. In most cases it was on the power companies end of the circuit. Once it was all done there was a *lot* less RFI in the neighborhood. I have always wondered if complaining about the RFI more *might* have gotten the problems spotted earlier and saved a whole lot of aggravation. It also would have saved CP&L coming out at 2 AM in the morning to find the problem.

From: ToddRoberts2001@aol.com
Date: Thu, 2 Jan 2003 00:54:12 EST
Subject: Re: [R-390] in rush current limiters

>Let's see - the item on eBay - take a dual outlet (69cents) a plastic outlet box (69cents) a small 3-wire line cord (99cents) two current inrush limiters $2, a small circuit breaker (99cents) - put the thing together for $5-$6 bucks and sell it for $30 bucks on eBay. Sounds like a nice profit margin! One thing I am not fully sure about current inrush limiters is - don't they run "hot" in normal use? And do they fully return to zero resistance when they are at operating temperature? - Todd Roberts WD4NGG.

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] in rush current limiters
Date: Thu, 2 Jan 2003 06:33:58 -0500

Todd, Inrush current limiters do indeed get and stay hot when in use. Also, they must be properly sized for the equipment. That's one of the problems with the ePay version: depending on the current limiter selected, it is optimally sized for a certain load. These things also have max current ratings. For instance, the CL-80 (commonly used in the R-390A), is rated at 47 ohms when cold, max current of 3 amps, and resistance drops to about 0.5 ohms at max current. If you were really pulling the max 3 amps through the limiter, you would expect a voltage drop of about 6 volts (current/resistance). Used in the R-390A with the ovens OFF, the drop across a CL-80 current limiter is between 2.5 and 3 volts. So if incoming line power is 120 VAC, the radio will only see 117 VAC after the 3 volt drop across the limiter. This is not a bad thing, since the receiver was designed to run of 115 VAC. But it is apparent from these observations that a "one size fits all" solution is not really valid here. If you have one of these ePay solutions, just don't go plugging your power bar into it to feed the whole station.

Date: Wed, 01 Jan 2003 12:55:01 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] The ground round

Surprisingly this does get back to the R-390. The world is an odd place :) One thing that is fairly common is for the bypass capacitors in the line filter to go out. Generally they get leaky. I don't think I have ever bothered to check the bypass cap on the neutral side of the line filter for leakage. If it's leaky and your neutral starts bouncing around odd things might happen. This would be especially true if somebody got the black and white wires mixed up on your wall plug. Truth in advertising - I have actually seen such a plug :) Checking the line filter thing is easy. Just plug in the radio and unground it. Then check for 60 volts AC on the chassis. If you get 0 volts or 120 volts then one or the other of the bypass capacitors is shot. Probably something I need to start doing. Might be a good idea to go wire that wall plug the right way as well .....

Date: Thu, 02 Jan 2003 13:15:47 +0100
From: Heinz und Hannelore Breuer <hbreuer@debitel.net>
Subject: Re: [R-390] in rush current limiters

Not exactly! Last time I checked Ohm's law was still U = I * R not U = I/R

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Thu, 02 Jan 2003 16:05:45 -0500
Subject: [R-390] 6082's and regulators

I've always found the R-390 non-A / 6082 regulator topic to be very interesting. Some have installed MOSFET pass elements to replace the 6082's, saving filament heat production. Some have advocated moving a solid state regulator outboard to remove even more heat.

Others have tossed the solid state idea overboard. Subbing the easier to find 6080 for the 6082 has been discussed, complete with schemes to reduce heater voltage to 6.3v to operate 6080. Attendant has been a free-for-all in the spirit of the BallasTube thread.

A few have run the R-390A on completely regulated B+ (from an external supply) and report a "different feel" when tuning. Maybe the "different feel" was due to a different AGC effect with regulated B+ not varying with AGC-induced power supply loading changes. Maybe it was a different soreness in the wrist caused by tuning drag variation with different heating of those gummed-up geartrain lubricants.

I wonder if anyone has found any real measurable differences when operating an R-390A from a regulated B+ supply.

Subject: RE: [R-390] 6082's and regulators
Date: Fri, 3 Jan 2003 12:19:46 -0800
From: "David Wise" <David_Wise@Phoenix.com>

>............Can you even measure a change in the
>supply voltage as you tune a signal and if so how much?

I'm sure you can. As signal strength varies, so does the AGC and consequently the RF amp, mixer, and IF amp cathode currents, which make up a respectable fraction of the unregulated B+ load. <Anecdote> While working on the 3DW7, I spent many evenings listening to the beat note of an SE-3 external BFO against my HP8640B crystal-locked signal generator. As I ran the attenuator up and down, the beat note changed by about a whole-note IIRC. </Anecdote>
I'll report back with hard data. This isn't the only source of frequency variance. AGC on the mixers causes small changes in their dynamic interelectrode capacitances, which reflect back to their respective oscillators. I didn't say these are large effects, just that they exist. There's a fascinating section on this phenomenon in the Radiotron Designers Handbook.

From: "polaraligned" <polaraligned@earthlink.net>
Subject: Re: [R-390] Some progress
Date: Sun, 5 Jan 2003 11:05:58 -0500

I think it is a good idea also to address all the ground connections while you are servicing each module. The chassis, being make of aluminum, oxidizes and makes poor connections. I loosen up the ground and clean the connection point then use Ox-guard- or other aluminum electrical connection compound. Use of a compound for aluminum electrical wiring is a must, and aluminum house wiring has a very high failure rate because of the oxidation of the wiring.

Date: Sun, 05 Jan 2003 11:55:16 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Some progress

I agree, and I tighten all screws on the chassis, particularly the tube socket screws. This causes the washers to bite into the aluminum. There is no aluminum wiring in my house. Many a homeowner has gone through an expensive rewiring to correct the problems with aluminum. The Canadians like aluminum wiring. I have a friend in Toronto who claims zero problems with aluminum. I don't know what they are doing up there, but it seems to work for them.

From: "polaraligned" <polaraligned@earthlink.net>
Subject: Re: [R-390] Some progress
Date: Sun, 5 Jan 2003 12:06:03 -0500

Well, maybe Joe can expand on this, but I believe aluminum wiring is OK if done right. That means using devices designed for aluminum wiring and using the right compound on the connections. I think most electrical services use an aluminum feed from the pole to the panel. The busses in the panels on many services are aluminum. And the electrical inspector will want to see a proper compound on the service connections.

Date: Sun, 05 Jan 2003 12:17:56 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Some progress

There are several answers about what they are doing with aluminum wire.

1) The connector has to be designed for aluminum wire. Most of what we used
down here wasn't.
2) You have to use goop on the wire with some of the connectors. Again something we forgot.
3) Avoid salt air and moisture in general. How they handle this I have no idea.

On a 390 the aluminum chassis connections are another good reason to avoid the dunk and wash approach to cleaning. It is pretty common to tear a R-390 module apart and find white stuff caked up between steel and aluminum. If the rot gets too bad the aluminum is pitted. The only answer seems to be to keep them dry. I suspect that if you find the white stuff piled up on the module mounts it would be a *very* good idea to do a screw re-tighten job on the whole module.

From: "Jim Shorney" <jshorney@inebraska.com>
Date: Sun, 05 Jan 2003 11:22:38 -0600 (CST)
Subject: Re: [R-390] Some progress

Yep. I've got a chunk of this very cable as the earth ground for my <Drake> transmitter. Multi-strand aluminum clear through.

Date: Sun, 5 Jan 2003 10:38:04 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Some progress

> Well, maybe Joe can expand on this, but I believe aluminum wiring
> is OK if done right. That means using devices designed for aluminum wiring
> and using the right compound on the connections. I think most electrical
> services use an aluminum feed from the pole to the panel. The busses in the >panels on many services are aluminum. And the electrical inspector
> will want to see a proper compound on the service connections.

Yes, all the way through. Still aluminum isn't as good as copper, mostly because of the connections. Aluminum is softer than copper and the connections should be tightened regularly as they come loose due to vibration, even in a house, also from heat cycling, whether from using the circuit or just winter/summer variations. The outlet nearest the main entrance is the one most prone to having the screws come loose because of the wall being vibrated by slamming the door! The kitchen counter will be the next worst, repeated plugging and un-plugging and high current draws from the appliances. Then this for owners of BIG radios, or lots of radio equipment: I posted this to the T-368/BC-610 list: House service neutral? Happy New Year everyone!

During the discussions of the size circuit needed to run a transmitter such as a T-368/BC-610 one important item was overlooked. That is the condition of the neutral wire going from the panel out to the pole. Many times this is allowed to deteriorate to the point where it is no longer safe to carry such a large 120 volt load. In an overhead service the neutral is the group of wires wrapped around the two hot wires inside the service entrance cable. If the covering of this cable has disappeared, for whatever reason, those wires are open to corrosion damage which may not take long to cause them to disappear altogether!

This is often not considered by the average homeowner. What will happen if this fails is that 240 volts will be acrossed all of the 120 volt circuits with the appliances making a voltage divider. What voltage each appliance sees will be determined by its impedance. Some will go POOF, some will just get hot enough to burn the house down. A 21 amp load being cycled on and off repeatedly will certainly stress an already weak neutral. ALL newer houses, I mean 30 years old, have aluminum service entrance cables! They haven't made copper service entrance cable in 40 years!

How long has it been since the bolts in your panel and meter socket were tightened? Are they tight enough to pass enough current to trip the breaker? Got any "blue" terminals? Melted plastic? Smoke trails up the siding? If its not moving, GROUND IT!!,.......... does your service actually HAVE a ground?   Joe

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Subject: RE: [R-390] 6082's and (voltage) regulators
Date: Tue, 7 Jan 2003 13:45:15 -0800
From: "David Wise" <David_Wise@Phoenix.com>

> > From: Bob Camp [mailto:ham@cq.nu]
> > Can you even measure a change in the supply voltage as you tune a signal
>> and if so how much?

Question: How stable is the R-390A?

Test setup: R-390A with ultra-regulated VFO filament, powered by external regulated B+ supply via the main B+ fuseholder, with SE-3 external BFO. Receiver driven by HP 608D at 20MHz. (Too much work to extricate the 8640B from the bench it's on.)

608D frequency set for a few hundred Hz beat note on its calibrator heterodyne output. SE-3 BFO set for almost the same note; actually a Hz or two off.
SE-3 BFO set to the same "side" as the 608D calibrator, so generator drift affected both notes equally. Listening to 608D on one side of stereo headphones, SE-3 on the other. With one note in each ear, they beat together in my brain. I counted beats against a clock second hand while cranking the signal up and down, then the B+.

I could have run the two heterodynes into a scope in "add" mode and timed the envelope peaks and valleys against the graticule, but I didn't think of it until just now.

Signal from 3.5uV to 350mV (100dB). Result: About 5Hz.

B+ from 210V to 220V. Result: About 1Hz.

So the tuning is affected more by AGC than B+.

I did not measure the oscillators independently; this is a system result based on the combined effects of the 2nd and 3rd oscillators. They might both be drifting; if so, they drift almost exactly the same amount. I did not check the first oscillator or the BFO. The BFO is undoubtedly more sensitive than any of the conversion oscillators, since its screen voltage changes. No R-390As were harmed in the course of this experiment.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] 6082's and regulators
Date: Tue, 7 Jan 2003 16:14:55 -0800

Excellent methodology, Dave. And, BTW, your 3DW7 was an elegant and powerful solution that truly saved a lot of BTU's.

Date: Tue, 07 Jan 2003 20:03:18 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 6082's and regulators

Hi, Hey, good data !!! Here's what I *think* is going on.

1) signal changes, drives AGC
2) AGC goes to the mixer tubes

3) Gain of the mixer tube changes
4) Input impedance of the mixer tube goes up as the gain drops
5) Oscillator load pulls

If that's the case then the next question would be which oscillator pulls the worst. I would bet on the PTO being the one that moves the most but that may only be crystal oscillator chauvinism (alarm alarm - day job creeping in to hobby echo - alarm alarm). Take Care! Bob Camp

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Subject: RE: [R-390] 6082's and regulators
Date: Wed, 8 Jan 2003 09:14:55 -0800
From: "David Wise" <David_Wise@Phoenix.com>

The short answer (to which I alluded in the final quote paragraph below) is that when a tube is operating, its interelectrode capacitances depend partly on the density of the electron stream. It gets really complicated for pentagrid converters: in some cases the capacitance is negative. Some radios (the Zenith Transoceanic is an example) deliberately introduce a small capacitive coupling between oscillator and mixer electrodes to neutralize it. What continues to amaze me is how stable Collins managed to get it. Some serious design horsepower there.

From: "Tom Warren" <wwarren1@nc.rr.com>
Date: Wed, 29 Jan 2003 18:02:27 -0500
Subject: [R-390] One-Fuser to Three-Fuser

Does anyone have detailed instructions for converting a one-fuser 390A to a three-fuser? By that I mean essentially a wire-by-wire set of instructions. I can certainly read the wiring diagrams and figure it out, but hey, if someone has been here before and put out a set of directions, I will forever praise (well, at least for two weeks) his name. I'm converting a one-fuser Motorola '56 mainframe to a three-fuser. I see that Motorola told a little white one also in that the Y2K manual says that after SN 2XXX (it's in the manual and I didn't write down the number) they all became three-fusers (that is, on the '56 contract plus all of the '58 contract). But my mainframe SN is 32XX (again number not written down) and it's about as one-fuser as it comes. My SN 32XX mainframe has other miscellaneous holes for extra coax connectors associated with the outboard frequency stabilization modifications done to this particular 390A. I've actually disassembled the entire Motorola mainframe to its components. I have a spare three-fuser back panel, so I won't have to drill those funny D-shaped holes. I also have better side panels and other pieces than in the original Motorola mainframe. So I'm going to reassemble with the best parts I have. Many thanks for any potential help. Tom, W4PG

Date: Tue, 4 Feb 2003 22:00:36 -0600

From: windy10605@juno.com
Subject: [R-390] finally got one

I've had quite a bit of ham and military radio gear over the years but never a R-390. It was impressive to "hear one in action" some years ago ......and to see that gear/cam tuning setup. Finally located a reasonably priced one in what looks to be in excellent, untouched condition (but it doesn't work ...no surprise there). It's a R-390A made by EAC. lubrication has been done per the manual, but there are still some sticking slug racks which I disassembled and all but one work smoothly now. Tubes are OK, fuses are there, one disconnected ?? connector found, and next we look at supply levels. There is only the slightest hint of audio through the 600 ohm headset, S-meter goes about 1/3 upscale and stays there. Does anyone have the plug in electrolytics ? I was able to reform one but the other is defective and will have to have the innards replaced or find another one.

From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] finally got one
Date: Tue, 4 Feb 2003 22:24:28 -0600

I would check with Chuck Rippel....He either can rebuild them or will get you the information that will allow you to rebuild them in the original cans. Check www.r390a.com

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Date: Tue, 04 Feb 2003 22:39:10 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] finally got one

Kees, or you can do what I did following the lead of others - buy some new caps and mount them topside in a gutted relay enclosure with plastic shroud and octal base. This made me happy and is easily reversible if the next guy wants the set to look "more original", Dan

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Date: Wed, 5 Feb 2003 05:14:49 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Electrolytics

I've mounted them below the AF chassis. You may have to relocate one or two to a different location, but once you have the leads insulated and tie-wrapped down, they can be made really secure.

From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Electrolytics
Date: Wed, 5 Feb 2003 11:12:06 -0600

Greetings group... That works as well...the thing to remember is that you need to electrically remove the original caps....I received a radio a while back that had caps placed under the chassis (not a 390 series) but also still had the leaky original caps in circuit as well. Got to get them old ones out of the circuit...Probably knew that but it was worth mentioning.

Date: Wed, 5 Feb 2003 15:09:31 -0600
Subject: Fw: Re: [R-390] Electrolytics
From: windy10605@juno.com

I think I've got it, replaced the internals with 3 new electrolytics and, since I was a little aggressive removing the internals of the old electrolytic (didn't realize how much "tar" there was inside), found some aluminum tape and it looks pretty good. Next time I'll use a razor saw and cut off only the rolled lip and "heat" the internals to remove them ....outside. <snip>

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Thu, 06 Feb 2003 13:37:47 -0500
Subject: [R-390] ElectrolytiCapacitors

Kees wrote:

>I think I've got it, replaced the internals with 3 new electrolytics
>and, since I was a little aggressive removing the internals of
>the old electrolytic (didn't realize how much "tar" there was inside),
<snip>

The Official R-390A List designator for electrolytic capacitor internals is not "tar", it is "uckumpucky" :)

>found some aluminum tape and it looks pretty good.
>Next time I'll use a razor saw and cut off only the rolled lip
>and "heat" the internals to remove them ....outside.

<snip>

A hacksaw carefully guided into the radius where can flares out to base diameter works well also. Make one light cut motion, roll the cap slightly, make another light cut connecting to the first, roll again, etc. After a few revolutions the saw will start to break through. Done right, this leaves a very even cut square to can's axis. When can is cut, uckumpucky can be very easily removed. Do not cut through internal aluminum connecting straps yet; these along with base provide a way to pull out uckumpucky. Heat can with profane gas torch, keep flame moving and heat more around top end of can (do not heat the now loose base). Wear leather work gloves, grip base and can, gently pull base away and uckumpucky will come out with it. Heat more if stuck. If you overheat, can will start to rise off of base on its own, as though posessed and rising from the dead. If you have lathe access, cap can be opened by facing off rolled edge and rubber gasket right down to plastic base. Metal spacers/shims may be inserted between pins for support then pins gripped in vise. Taking care not to melt base, apply heat then gently pull can off leaving base with attached (semi melted) uckumpucky. Is the other (non-disumpuckyed) cap made by General Instruments? If so, redo that one before it fails, spewing corrosive goo all over the inside of your radio. The General Instruments caps are much more prone to failure than caps of other manufacture; at this age quick failure is almost guaranteed. Resultant B+ short circuit is not a nice thing to do to transformer/rectifiers/chokes even in a 3-fuse radio.

>Found a qty of "line to 4-8 ohm" transformers ...apparently
>they work well from 600 ohms to 8 ohms. Gads, I threw away
>about 20+ of them because I didn't know what they could be used for
<snip>

Besides the usual audio applications, they can be used as step up transformers in bias supplies. Connect low impedance winding to 6.3 VAC filament line, rectify and filter output from high impedance tap of your choice I did this in the otherwise all line operated Hallicrafters HT-9 transmitter to replace 45V bias battery.

Date: Fri, 07 Feb 2003 17:19:41 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Some more R-390A questions

It is *normal* for the R-390's to trip GFI's. They made them back when things got wired differently. When ever you use a 390 or other radio gear from before about 1960 you need to be careful of having a "warm" or even a "hot" chassis.

Here's what's going on and why:

Warm Chassis - both sides of the AC line are filtered to the chassis with some reasonable sized capacitors. This results in the chassis floating at roughly 60 VAC when the chassis is ungrounded. A simple check with a high impedance AC voltmeter will confirm this. The thing to check for is a voltage way off of 60 VAC. If the chassis is at 120 or at 0 VAC with the ground lifted then you have a capacitor problem. I would guess that about 99% of all the military and Ham gear made back then came out with a warm chassis. It will give you a bite if you have it ungrounded. You should always make sure it's grounded. The current through these capacitors is often just enough to trip a GFI (thus your problem). The solution is to either put the radio on a non-GFI circuit or to get an isolation transformer. Depending on the way your house is wired you may or may not have any non-GFI plugs. Hot Chassis - One side of the AC line is hooked directly to the chassis. Yup, not a typo - the AC line is on the chassis. A fast way to spot these is often the fact that there is no transformer in the radio (or TV). It was a cost saving measure that must have been a lot of fun back then. I am amazed that it didn't kill people left and right. If you have one of these my recommendation would be to not plug it in to the wall. Get an isolation transformer first and run it through that.

Date: Fri, 7 Feb 2003 16:39:20 -0600
Subject: Fw: Fw: Re: [R-390] Some more R-390A questions
From: windy10605@juno.com

I appreciate the comments on GFI tripping with the R-390A. The other military gear like my TV-7 and all the URM/25s I've had were perfectly happy with a 3 wire cord.

I pulled the audio chassis because it's easy to do and found all the capacitors and resistors to be in fine shape. No changes in value outside tolerance and no leakage on the capacitors. Since I had it apart, I did replace all five coupling capacitors with mylar units because I had them. From this I'm assuming the rest are overall in pretty good shape too. Also found some rectangular aluminum cans with octal plugs on the bottom. Should make a really nice set of electrolytics which can be readily disassembled.

The heterodyne osc reads low on all frequencies (the TP reads around 0.5-1.5V). I know that's a problem and may be the cause of everything else. That's where it was left when the GFI blew.

Have to figure out how best to replace that filter without hosing something up because the R-390A will have a 3 wire cord and everything in the shack/shop is on GFI (concrete floor, using power tools laying on your back under a car, sweaty, etc).   Thanks for your comments.

Date: Sat, 08 Feb 2003 20:28:07 -0500
From: Dave and Sharon Maples <dsmaples@comcast.net>
Subject: RE: [R-390] R-390A AC FILTER

-----Original Message-----
Behalf Of ToddRoberts2001@aol.com
Sent: Saturday, February 08, 2003 1:17 PM
Subject: [R-390] R-390A AC FILTER

I wonder if anyone has any opinions on using one of those IEC-type connectors on the back of an R-390A radio for a line-cord input? I have one R-390A that someone had modified this way and really like it. A typical IEC 3-prong plug will fit through the original mounting hole so the IEC connector can be mounted flush on the inside of the back panel without having to enlarge the hole. This takes care of grounding the set also when the connector is properly bonded to the chassis. I know at least one mail-order house that has the IEC input connectors with a Line-Filter built-in with a 3-AMP rating for about 2-3 bucks each. It is really nice to be able to unplug the line cord when moving or working on the set and not have the cord getting in the way. Properly done the mod looks very nice. 73 Todd Roberts WD4NGG.

All: That's what I did with mine, and used a Corcom filter on it to boot. Like it just fine.

Date: Sat, 8 Feb 2003 10:11:11 -0600
From: windy10605@juno.com
Subject: [R-390] R-390A AC filter ??

Does anyone know what's inside the AC line filter ? (circuit wise). I searched the archives and could not find anything.

Date: Sat, 08 Feb 2003 12:24:50 -0500
From: Albert Solway <asolway@sympatico.ca>
Subject: Re: [R-390] R-390A AC filter ??

Kees, Go to Chuck Rippel's site at, http://www.r390a.com/

Down load the Y2k Manual. It's on the Chucks first page. This is the best all around site for R-390A info. Page 5-50, Figure 5-24 of the manual shows the innards of FL101, the AC line filter. Component values are not given but the schematic is shown. I am sure others will respond with more info.

From: Llgpt@aol.com
Date: Sat, 8 Feb 2003 13:27:40 EST
Subject: Re: [R-390] R-390A AC FILTER

Many of the R-390A's that went through the depots towards the end of the utilization of the R-390A/URR by the military had this modification done at the depots. I have had two different 67 EAC's that had this done. (IEC-type AC connectors) Les Locklear

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From: "Al Parker" <anchor@ec.rr.com>
Subject: Re: [R-390] R-390A AC FILTER
Date: Sat, 8 Feb 2003 13:38:29 -0500

I did it in my R-390. Some may say that it's desecration, or some such, but it is reversible, and it's nice to not have a cable hanging out when you want to move things around. I don't think my heirs will mind ;-)

From: ToddRoberts2001@aol.com
Date: Sat, 8 Feb 2003 15:45:12 EST
Subject: Re: [R-390] R-390A AC FILTER

If anyone would like to see a picture of the R-390A with the IEC line-cord mod you can go to this address
members.aol.com/toddroberts2001/Item9.jpg

Date: Sat, 8 Feb 2003 16:47:36 -0600
Subject: Fw: [R-390] R-390A AC FILTER
From: windy10605@juno.com

Couldn't figure out a clean way to modify the original filter ....so That's what I just completed on this R-390A: 1) found a sealed, metal enclosed filter rated at 3A, about the same size as the original, which has an integrated IEC connector, 2) relocated the bathtub capacitor to make room, 3) made an aluminum adapter plate to match up the 4 holes in the R-390A (old filter and relocated bathtub capacitor) to the new filter, 4) since the receptacle is now recessed, shaved a little plastic off the cord end to allow complete insertion. Works great, no additional holes, reversible, no more tripped GFI, no more "tingle".   73 Kees K5BCQ

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] looking for parts
Date: Mon, 17 Mar 2003 08:16:32 -0600

<snip> >Now it won't turn off. The filaments stay on as does the dial lights.
>Looks like the micro switch on the function switch is staying closed. ....

The microswitch isn't all that hard to fix. Drop the front panel, disassemble the mode switch and it's right there. My Motorola would not turn off when I first got it. I cleaned and jostled the actuator and the microswitch started working again. By the way, these are designed such that the actuator has to pop "up" to break the connection. If it doesn't turn off, the actuator is stuck in the "down" position. Barry(III) - N4BUQ

Date: Wed, 26 Mar 2003 17:47:29 -0600
From: Terry O'Laughlin <terryo@wort-fm.terracom.net>
Subject: [R-390] powerline noise

My QTH has a horribly high noise level starting from what appears to be a raspy fundamental that wanders between 400 and 450 kHz. It persists to well over 15MHz and has rendered all my shortwave radios essentially useless. It even overwhelms my R-390, R-390A and R-388 on a medical isolation transformer circuit with a Kelvin ground. My antenna ground system is extensive as well. I tried tracking it down with my Sony 2010 and it seems to follow some of the power lines around the neighborhood. But I can't pinpoint it. I've been assuming for 2 years the source is the aluminum recycler (smelter) 2 blocks away (the largest electrical user on the east side of town). My Sony 2010 detects little or no noise around the factory and tons in a one block radius of my house. I assumed it was the recycler because the noise is often much lower or gone on Sundays. I let this go for a long time assume I couldn't get the Al recycler to deal with EMI. Now that it appears to be coming from somewhere else I want to nail down and get somebody to fix it. Any ideas?

From: "Mark Richards" <mark.richards@massmicro.com>
Subject: RE: [R-390] powerline noise
Date: Wed, 26 Mar 2003 19:00:09 -0500

If you think that this is something that's being generated by your electric utility, they have to investigate it, and within a specified period (which escapes me at the moment). Same thing with the smelter. If they are radiating crap, they have to clean it up. The FCC will get involved if the utility does not comply (sometimes with a nasty-gram). Check in with the ARRL. They have considerable experience in this area and are often called on to act on the Amateur's behalf. We had an issue with our local power company and they contracted with a former FCC inspector who had all the necessary test gear to locate the source, at least one of which they found. It's in the utilities best interest. In our case, the utility replaced some equipment which was about to fail.

Date: Wed, 26 Mar 2003 19:22:05 -0500
From: Dave and Sharon Maples <dsmaples@comcast.net>
Subject: RE: [R-390] powerline noise

Terry: First, I think I'd check to see if my own house was in order. If you can drop power to your entire house, do that with the Sony on batteries and see if the spur goes away. If it does, then restore power and drop breakers one at a time till you find the offending circuit, then go figure out what equipment is causing the problem. Since it's strongest close to your house, chances are good that it's something in the house. I have a TV set that causes these kinds of problems from time to time, as well as some network gear that does also. Be sure you are listening to the fundamental so that you get the most signal from the device. Hope this helps.

Date: Tue, 01 Apr 2003 17:58:06 -0500
From: MURPH <rickmurphy1001@earthlink.net>
Subject: [R-390] Line Filter and R390 IF strip

My R390A has a line filter problem (little tingle hooking up the Ant while the AC is connected to a non grounded plug). Does anyone know where I could purchase one? Wanted - R390 non A If strip.

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Line Filter and R390 IF strip
Date: Tue, 1 Apr 2003 20:51:41 -0600

Sigh. Off we go again. Not your fault, Murph. I don't know how you'd have found this in the archives. There is nothing wrong with the filter. Look up the impedance of 0.1 mfd at 60 Hz. It will tingle. The problem is that you are not thinking like a person in the fifty's. The first thing that you do is to ground the receiver frame to a water pipe. Violins, no more tingle. (wait, maybe that's viola)

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] Line Filter and R390 IF strip
Date: Tue, 1 Apr 2003 18:53:41 -0800

Probably means it is working. The little tingle is a little AC current which is supposed to be bypassed to a solidly grounded receiver.

Date: Tue, 1 Apr 2003 23:40:38 -0800 (PST)
From: Rodney Bunt <rodney_bunt@yahoo.com>
Subject: Re: [R-390] Line Filter and R390 IF strip

The bypass capacitors on the mains go leaky and you are feeling this. I have a problem in Australia, as we have "earth leakage" circuit trip relays in the switch board of my house, this goes off ALL the time when plugged directly into the 240v. Had to put the receiver on a isolation transformer, and doesn't trip the switch board anymore. Will get around to replacing those caps soon.

Date: Wed, 02 Apr 2003 15:54:32 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Line Filter and R390 IF strip

>The bypass capacitors on the mains go leaky and you are fealing this.

They are (probably) NOT leaky.

> Will get around to replacing those caps soon.

You may be wasting your time. You'll have to unsoder the sealed metal can they are in, and un-pot the contents. Assuming you use similar valued new caps, when you get it all put back together again, you'll find the same or similar "leakage" current in the ground wire.

From: "Miguel Bravo" <miguel_bravo@telefonica.net>
Subject: Re: [R-390] Line Filter and R390 IF strip
Date: Thu, 3 Apr 2003 11:02:07 +0200

In Spain and probably in all CEE countries the GFI is compulsory and once it fired down and you only get a very small shock you love them. But nobody tell you not to have more than one, so I had put one before any of the breakers. It is expensive but each piece of home covered by a breaker can have those 30 mA max. leakage before its GFI open. If kitchen open its, the computer still work. And I can check a radio without risk from those watching TV. You only need to push the check button once a month or so if didn't get a shock in between.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Thu, 03 Apr 2003 17:16:03 -0500
Subject: [R-390] Line Filter

>My R390A has a line filter problem (little tingle hooking up the ant
>while the AC is connected to a non grounded plug). <snip>

One of the key phrases is "non grounded plug". It is essential that you use a 3 wire power cord with green (safety ground) connected to radio's chassis. Otherwise, a line fault to chassis could render chassis live and you dead. Check your outlets; safety ground should show a low impedance to neutral. Unless you are using an isolation transformer, a separate earth ground alone will not do; most separate earth grounds have too high impedance to sink sufficient fault current to trip a panel breaker or even blow the radio's fuse.

The R-390 series line filter has capacitance from line to ground and neutral to ground. If ground is not connected, this forms a voltage divider putting chassis at about 60 VAC. The line filter capacitors are paper type; these are just as susceptible to leaking and failing shorted as those Black Beauties used elsewhere in the radio. It would be a good idea to not use those caps as line bypasses. A proper safety ground would protect against shock in a failure event but why put it to the test? Some have replaced caps inside the filter (reportedly potted in beeswax); opening soldered housing requires patience, a torch, and a small hole drilled in filter housing through which pressure will vent and scalding melted potting will spew. When replacing those caps, only use types specifically rated for line bypass service. Regular caps will not cope well with the sometimes huge transient voltages found on the line.. If the radio is powered from a circuit having a GFCI (ground fault circuit interruptor) device, that GFCI will trip even with good caps in the filter. A GFCI senses line and neutral currents; if they are different then GFCI trips (the difference current is that which leaked out through another path; possibly someone's body). GFCI's trip at milliampere levels, hence the R-390 series filter will trip one by design.

Here are some proposed/ tried solutions to line filter problems. If using original filter recapping it is still a good idea.

1. Power from non-GFCI protected outlet. Installation of non-GFCI protected outlet may violate local electrical code.

2. Use Isolation transformer.

3. Insulate filter from chassis. Filtering will not be as good, but no cap breakdown/GFCI difficulties.

4. Recap filter with smaller caps for compatibility with GFCI's. Filtering will be degraded; whether or not significantly I do not know.

5. Recap filter and change configuration so as not to annoy those GFCI's. Bypass line to neutral, then neutral to chassis (grounded). Original values may be used.

6. Remove filter entirely. A pair of caps (AC line rated of course) wired as in (5) above may be added. With resultant inferior filtering, line noise may or may not be a problem.

7. Fabricate adaptor plate and replace filter with IEC chassis mount filtered connector (available inexpensively from Mouser). The connector's internal filter uses large inductors and small capacitors; good filtering and GFCI compatibility result. Units rated for lower current carrying ability have larger inductors; a 3 amp or 5 amp unit would be good. A standard computer power cord is used with these connectors, making for a neat and clean installation. Rumor has it that some recently surplussed R-390A's had this setup installed by the Gov't.

The hot side of line always goes to fuse and power switch. Do not fuse neutral. When in doubt, check routing with ohmmeter.

Wei-Li has done us all a great service by compiling by topic the traffic through this list over the years. For a lively and informative discourse on line filters and related topics, goto r-390a.net. Click on "References" , "Pearls of Wisdom", "Power Supply". You will find line filters mentioned beginning at about page 40.

From: "Michael Young" <myoung76@bellsouth.net>

Date: Sun, 6 Apr 2003 14:49:36 -0400
Subject: [R-390] R390 Filament Wiring

Does anyone know why the military chose series wiring for the filament chain in the R390? Does the R390A use series or parallel wiring?

Date: Sun, 06 Apr 2003 15:23:10 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R390 Filament Wiring

In theory the R-390 was going to have a configuration in which it ran off of 28 volts DC rather than 110 volts AC. They put extra pins in the cable harness and such to make this possible. The AC supply was going to come out and a dynamotor plug in to the same location on the chassis. All of this must have seemed like a good idea at the time since it justified adding extra cost to every radio built.

The problem came when they tried to find a DC source that was quiet enough I suspect that the 28 volt DC supply was something of an issue all by it's self. Once they got the dynamotor brushes into the act the RF noise went up quite a bit. A big spinning dynamotor must have shook the chassis a bit as well. Conventional wisdom is that they tried the trick on a couple of radios.

Once they tried to use them in this configuration they gave up on the project and just ran them off of 110 instead. By the time the R-390A came along the whole idea was long dead. That allowed them to wire the filaments in a little more conventional fashion. It also lead to the development of the R-392 which is a pure 28 volt radio. Given that the 392 is a tuned IF radio rather than mechanical filters I tend to look at it more as a 390 clone than as a clone of the 390A. If you look at it that way then the 392 is the box that goes where a 28 volt 390 would have gone. Quiz time - does any of that make sense ?

Date: Sun, 06 Apr 2003 12:48:50 -0700
From: David Ross <ross@hypertools.com>
Subject: Re: [R-390] R390 Filament Wiring

Bob's statements about the R-392 being a follow-on to the R-390 bring to mind some thoughts about the R-391 & the GRC-19 set. The GRC-19 amounts to a R-392 paired with a T-195 - the T-195 is a Collins-designed 100W AM/CW/RTTY transmitter with eight Autotune channels. The R-392 is of course manually tuned. What's the sense of having an automatically tuned transmitter paired with a manually tuned receiver? I'd bet that the GRC-19 radio set was originally intended to have a 'hardened' R-391 as it's receiver. By 'hardened' I mean packaged like the R-

392 is - watertight case with seals on all the knob shafts, that sort of thing. And it would use the DY-78/URR plug-in 28VDC dynamotor power supply which was already available for the R-390. Having a suitably modified R-391 paired with the T-195 would provide eight Autotune channels both transmit & receive. Drawbacks of course would be the size & weight of the hardened R-391. The size of this hefty R-391 version was probably what killed the idea - doggone GRC-19 would be too large to fit in it's intended target, the back of an M-38 Jeep... just a thought...

Date: Tue, 13 May 2003 14:31:50 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] drill a hole next to or just under the KC tuning

Is drilling holes permitted or is this an unforgivable heresy? I'm still debating a couple of 9/64 hole in the rear panel to locate a 220 ohm Dale resistor near the B+ fuse if and when one of the 26Z5 tubes dies and I have to go to silicon. I think that will be better (and easier) than putting it under the AF deck. I'll repeace the selenum bridge at the same time as it will have to move to make room for the resistor. BTW would a high power Zener be better than a resistor to keep the B+ voltage down with the solid state mod?

From: ToddRoberts2001@aol.com
Date: Tue, 13 May 2003 15:26:35 EDT
Subject: Re: [R-390] drill a hole next to or just under the KC tuning

Hi Gord. I don't think drilling holes in an R-390/R-390A is unforgivable as long as they are NOT in the front panel, are mostly UNSEEN, are NICELY DONE and for a good practical reason, and can be REVERSIBLE. Drilling 2 small holes in the rear panel to hold a power resistor or perhaps to mount an IEC-type power connector I would not consider heresy. Drilling a hole in the front panel to mount a toggle-switch I would consider unforgivable heresy.

The other thing I would add is that if making ANY kind of wiring changes to the radio, PLEASE leave documentation on what you did. It would be very frustrating for someone to bring home a radio from eBay or a hamfest and find several wires hanging out the side of the IF deck with no explanation. Any modification done to the radio should make it BETTER.

Solid-stating the power supply with no regard to increased B+ I would consider a BAD modification. Adding a power resistor to bring the B+ back to normal is better, but there is still the question of : is it better to have full B+ instantly on all the tubes before the filaments have had a chance to warm up? In most cases I would keep the radio as the original engineers intended. A lot of design thought and details went into building the radios by engineers that had a world of experience in all aspects of the radio. 73 Todd Roberts WD4NGG.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 14 May 2003 17:37:05 -0400
Subject: [R-390] B+ Dropping Resistance (was Drill a Hole...)

For the non-heretical who wanto use chassis mounted poweresistor to drop B+, said resistor can be mounted to a flat piece having holes for resistor mounting plus holes matching diameter/spacing of some exisiting component's mountings. The adaptor would then be sandwiched between component and chassis, and perhaps use longer screws. Flathead screws for resistor countersunk into adaptor would permit flush mounting to chassis. Pigeon Poop (heatsink compound) could be used for improved heatransfer.
A power resistor (lead mounted, no holes required) can be installed on the power supply unit from transformer HV center tap to ground. It can be spaced away from rectifier tube sockets to provide free air circulation. A disadvantage is proximity to PTO and resultant heating although the rectifier tubes do that anyway.

Locating resistor under audio module chassis worsens the already existing heat problem there.

Under chassis location of power resistors cooks components in a lot of tube gear. I've pondered (but not tried) disumpuckying above chassis filter caps, moving poweresistors to inside capacitor cans (perhaps with thermally conductive potting), and mounting new leaded caps under chassis.

>BTW would a high power Zener be better than a resistor to keep the B+ voltage down with the solid state mod? <snip>

Vacuum rectifiers have a forward voltage drop characteristic which is roughly approximated by a constant voltage in series with a resistance. Using silicon (with its lower voltage drop) plus resistance to replace tube rectifiers would result in degraded regulation. One claimed that he could detect FM’ing of PTO at high audio level when doing this. I've not noticed any untoward effect on PTO stability from use of series resistance to drop silicon rectified B+. Silicon diodes plus resistance is an official gov't approved modification.

Using a power zener for constant B+ drop has been discussed here. Power zeners tend to be expensive and difficulto find. A small zener and power transistor can be connected to perform same function. Note that either of these arrangements would dissipate same power as a resistor but must dissipate it at a lower temperature probably necessitating a sizable heatsink (or sunk to chassis).

If using power transistor plus zener, you have a pass element and voltage reference so you could add error amplification and make it a regulator...ad nauseum.

At r-390a.net you will find Wei Li's brilliantly conceived "Pearls of Wisdom" where postings of this topic have been neatly distilled for convenient reference.

Date: Thu, 15 May 2003 14:54:57 -0400
From: K2CBY@aol.com
Subject: [R-390] B+ Dropping Resistance (was Drill a Hole...)

Perhaps this is heretical but I saw little point in retaining the tube sockets on the PS chassis once the rectifiers had been replaced with solid state diodes. I yanked the sockets and plated over the holes with 16 ga. aluminum. I mounted the rectifiers on the underside of the chassis and a dropping resistor on the top side where it can get some air. (Putting the resistor on the PS chassis also eliminates the need to use a "special" audio chassis, so audio units can be freely swapped.)

The VFO and BFO shouldn't chirp no matter what, since they derive regulated B+ from the VR tube mounted on the audio chassis. The only way a dropping resistor in the unregulated line could affect this is if it lowers the regulator supply side voltage to the point where the gas tube loses ignition.

The only thing that bothers me about the solid state rectifier conversion is that B+ comes on full blast almost instantaneously. It takes 30 to 40 seconds for the filaments to heat up enough for the tubes to draw current through the dropping resistor and lower the B+ bus voltage. Putting an inrush protestion thermisor in series with the AC line helps but doesn't cure the problem.

For essentially the same reason, I favor replacing the ballast tube with a 12-volt tube having a controlled heater warm-up time (in my case a 12BY7 from an old Tektronix scope) rather than a fixed resistor.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Mon, 19 May 2003 16:13:25 -0400
Subject: [R-390] B+ Dropping Resistance (was Drill a Hole...)

>on the PS chassis once the rectifiers had been replaced with solid state
>diodes.I yanked the sockets and plated over the holes with 16 ga.

aluminum.
<snipped>

It would seem that this list has defined "heretical" as major drilling/blasting or ripping out wire harnesses.

>The VFO and BFO shouldn't chirp no matter what, since they derive regulated
>B+ from the VR tube mounted on the audio chassis.

VFO has unregulated plate voltage and regulated screen voltage. Neither plate nor screen supply of BFO is regulated. VFO and BFO are both electron coupled oscillators; frequency stability is relatively insensitive to plate voltage variations. A given percentage frequency shift in BFO also represents less absolute shift than with higher frequency oscillators.When operated from single unregulated supply (as is BFO) the electron coupled oscillator can be made to have very flat frequency vs voltage characterisic by correct selection of screen resistors (ART-13 PTO is a good example). I would be surprised if Collins didn't take that approach when they designed BFO. I doubt that voltage variations caused by slightly degraded power supply load regulation (when adding series resistance to drop silicon rectified B+) would have noticeable FMing effect . Perhaps frequency variation claimed by that list member was caused by another fault.

>the only thing that bothers me about the solid state rectifier conversion is
>that B+ comes on full blast almost instantaneously.

Some have claimed that delaying application of B+ until after heater warmup is of benefit only to extend life of thoriated tungsten (transmitting type) tubes and is not necessary for indirectly heated tubes as used in R-390 series. It is noteworthy, however, that Tektronix tube type oscilloscopes (which use indirectly heated tubes) have B+ delay feature. By use of thermal relay (as in Tek scopes) or solid state devices such a feature could be easily added to the R-390 series.

>For essentially the same reason, I favor replacing the ballast tube with a
>12-volt tube having a controlled heater warm-up time (in my case a 12BY7
>from an old Tektronix scope) rather than a fixed resistor.

From low impedance (non current regulated) heater supply the 6BA6 draws about 2 amps startup surge; that surge would likely be duplicated in the characteristic of 12BY7 or other tube used as ballast replacement. The 6BA6 VFO and BFO tubes whose heater current is normally regulated by ballast do not have controlled warm up characteristic so any advantage of that attribute in a ballast replacement is lost. With the traditional 42 ohm resistor used as ballast replacement the startup surge would be about 530 mA-considerably lower than when using 12BY7. The lower (as compared to some other ballast sustitution schemes) surge may reduce thermally induced heater mechanical stress and possibly increase VFO and BFO tube life.

From: "Bill Hawkins" <bill@iaxs.net>
To: <r-390@mailman.qth.net>
Subject: RE: [R-390] B+ Dropping Resistance (was Drill a Hole...)
Date: Mon, 19 May 2003 16:49:50 -0500

Well, Tek used a number of regulated supplies and all were based on the value of the -150 volt regulator [Warning - Do not adjust -150 unless you are prepared to realign the entire scope]. This was reason enough to delay the application of high voltage. Another reason is that the no-load voltage across filter caps (and wiring) is higher than the loaded voltage. I don't think that either concern applies to our favorite receivers. Anybody nostalgic for a 535/545 series scope? I have 5 of them.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 21 May 2003 15:49:18 -0400
Subject: [R-390] B+ Dropping Resistance (was Drill a Hole...)

<snip> "Another reason is that the no-load voltage across filter caps (and wiring) is higher than the loaded voltage. I don'tthink that either concern applies to our favorite receivers."

My R-390A has silicon rectifiers and a 220 ohm series resistor. Audio output tube screens measure 240 volts at turn on. As it warms up it drops to 190 volts. Some have experienced RF deck coil insulation breakdown which they have attributed to elevated B+ before warmup, but I doubt that to be the cause. Also, that voltage surge forms electrolytic filter capacitors to a voltage higher than that encountered in operation and so might improve filter cap reliability in the R-390A. Drew

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Date: Tue, 17 Jun 2003 19:32:26 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] need help

I wonder if someone can point me in the right direction. First I will tell you that I do not have much experience with these rigs. The lamp in my 390A stays on even when the power is turned off. It seems logical to check out the power switch with an ohm meter. I wonder if someone has had this problem before? I would like to aviod taking the front panel off if possible. I do hear a relay clicking when I turn it on and off. I do have a manual somewhere but cant find it at the moment. I just totally re-modeled my radio room and cant find anything right now. Thanks for any advice. Scott (another Scott)

Date: Tue, 17 Jun 2003 17:13:01 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] need help

Oh, no! Not another Scott! Line up over there with the Barrys. Well, Scott, Your problem is obvious to the assembled multitude, even I have dealt with the subject switch. You will/should probably take off the front panel, it's not too tough to do. Set the radio on two 2"X4" blocks so that the side panels rest on the blocks but the front panel is free to drop to the bench top. Then remove the two big knobs and their bushing retaining nuts, remove the BFO knob, the BANDSWITCH knob, the ANT TRIM knob, and the 15 Phillips-head screws that hold the panel on.

Then you can just lay the front panel on the bench in front of you and gain access to the microswitch that is causing the problem. It is attached to the FUNCTION switch. The clicking relay you hear is the antenna relay which is operated when setting the FUNCTION switch to STANDBY, the radio should NOT be left in the STAND BY position ever, the B+ raises to a possibly damaging level. While you're in there put some oil on the transmission gears, the knob bushings, and anything else that looks like it moves, or moved at one time.

Then clean, clean, clean, do a very careful visual inspection of everything, smell for trouble spots, look for smoke trails, oil anything that moves, and clean, clean, clean. Ya' see, this will be the best way to get familiar with the beast. Just look at that gear train! Have you ever seen anything like it? Smart guys built that!

Date: Tue, 17 Jun 2003 19:14:05 -0500
From: Dave Merrill <r390a@rcn.com>
Subject: Re: [R-390] need help

Sounds like you have trouble with the microswitch that the Function Control operates. This is a common failure mode and it's remedy is covered in Wei-Li's excellent 'Pearls of Wisdom' under (not surprisingly) 'Power Switch' http://www.r-390a.net/Pearls/

Date: Tue, 17 Jun 2003 20:16:34 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] need more help

Okay, Does anybody have a function switch for sale. Thanks, Scott

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Date: Tue, 17 Jun 2003 21:15:23 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] need more help

I can see you're new aroun' here. It's not the function switch, and they're generally not for sale as a matter of principle. Most other parts are for sale, but not function switches. You can buy a panel with some stuff hanging on it, but not a function switch. And if you buy a panel, the microswitch may well be bad on it. It is the microswitch on the function switch assembly that you need -- but you don't need it yet -- and you can't have one -- yet. It is in the hallowed tradition of R-390-ers (both A, non-A and hybrid) to first attempt a fix of any defective part. While it is customary outside this circle to treat a microswitch as a "sealed unit", such notions are eschewed, discouraged and basically run outta town on a rail, in these parts. That would be like stopping cold in one's tracks when encounteringthe dastardly challenge: "Do Not Open. No user serviceable parts inside. Refer to a qualified technician." Most likely the contacts have fused in the microswitch. Before I forget, make sure the screwdriver operated switch in the back is turned to "Ovens Off". Don't ask, just do it and read up on it later. So, unplug the receiver from the AC outlet, drop the panel (according to procedure) and put an ohmmeter across the the microswitch terminals. Operate the switch from off to standby to AVC, etc. When going from off to the other positions, it should go from open to nearly zero ohms. Most likely, it will read zero ohms in all positions. If so, it's either because the contacts have become fused or the microswitch position is not properly adjusted, such that it's always on. Or perhaps, there may be some gunk around it that needs to be cleaned away. See if you can make it make/break the connection by some studious fiddling. (Fiddling is a form of tinkering, and this is also required) Does it click at all? If it just needs to be adjusted, that will be obvious. If not, the next step is to remove the microswitch, take it apart, being mindful of airborne springs, and free up the contacts. Then burnish them with a stick or something and treat them with some DeOxit (which you are required to have). Reassemble and test. Some of them are put together with small screws -- others are riveted, presenting a minor challenge to the determined man with a drill. Replace the microswitch, and carefully adjust position so that it now works. If you had to drill out the rivets, replace with suitable screws and nuts. Once you've tried all that -- and it still doesn't work -- submit a full report, have it notarized, and then come back. (Some people here and there have NOS microswitches. Maybe Dave Medley. Maybe Hank (Dan) Arney, or maybe you can get a used one from Fair Radio. I have two NOS switches, but you can't have 'em. Y'see Scott, to better understand and get properly indoctrinated, follow this guide: An R-390 guy needs to fix a loose plank on his deck. Needs two 10-penny nails. Down to his last two, but one is bent and the other is broken in half. Go to

Home Depot -- Naaaahhhhh! Ace is the Place -- NOPE! Straighten out the first one and weld the other one back together. OK, a little grinding to get it smooth enough to drive in. It's not so much the money, more like the guy who climbs the mountain "because it's there". Heck, we'll even fix gassy tubes. The broken ones are more of a challenge because it's tricky to re-fuse the glass fragments, and then a bit dicier to replace the vacuum.
Barry PS -- did you read the "Pearls"

From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] need more help
Date: Tue, 17 Jun 2003 22:43:34 -0400

I have a replacement microswitch left over from a past repair, but you will have to disassemble your function switch and replace the microswitch. That's not hard, however.

Date: Tue, 17 Jun 2003 19:59:45 -0700
From: hankkarn <hankarn@pacbell.net>
Subject: Re: [R-390] need more help

I still have the NOS micro switches. $12.50 each mailed in USA.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] need help
Date: Wed, 18 Jun 2003 08:08:11 -0500

Scott, My first R390A did the same thing. The tiny "button" on the microswitch was stuck in the "down" position. I moved it a bit further down with a flat instrument and let it snap back out a couple of times. It was fixed. Easy. If yours doesn't come back to life that easily, then you might have to disassemble and fix as others have suggested or buy a replacement.

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] need help
Date: Wed, 18 Jun 2003 10:17:18 -0500

Think the relay clicking sound is caused by the DC part of the function switch. As you know, the microswitch is probably stuck on. But this is not something that you need to fix. Nolan ran his sets all the time (24-7) and it was 10 years before he had a tube fail. So let it run ten years - or until there's nothing left to listen to with an analog receiver.

Date: Thu, 19 Jun 2003 19:57:43 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] micro switch fixed

I would like to thank everybody for the help. My problem was indeed the microswitch. I went to the Pearls Page, read the instructions and took the front panel right off. It was much easier than I thought. It took about 5 minutes to fix the switch and another 10 to put it back together. 5 more to take it back apart and tighten the zero adjust thingy and then 5 more minutes to put it back together again. Not too bad for a rookie. It was a lot of fun actually. Thanks again for all of the help.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] micro switch fixed
Date: Thu, 19 Jun 2003 18:21:20 -0700

You have ventured out onto the tip of the iceberg...

Date: Thu, 19 Jun 2003 21:41:02 -0400
From: Christian Fandt <cfandt@netsync.net>
Subject: Re: [R-390] micro switch fixed

He says it was a lot of fun . . . Looks like we got him fellas!

Date: Thu, 19 Jun 2003 18:54:01 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] micro switch fixed

YUP! He's a goner, he's hooked. Someone get him an R-391.

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] micro switch fixed
Date: Thu, 19 Jun 2003 23:01:05 -0400

Right-o! Scott has been transmogrified. Beyond rookie, knob-twister, tube jockey ... Once you drop an R-390(A) panel, there's no turning back. Can a full gear train teardown be far behind? Willing to bet that within six months to a year, some pilgrim will come along posting "Hey guys, my radio won't shut off !". Within 10 minutes, Scott will be on the 'net with the answer. Speaking of R-391's, hope to have the HSN autotune edition out in a month or two, so he'll be able to rebuild one of those too.

Date: Sat, 05 Jul 2003 10:57:37 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] New 390A owner & fan

<snip>> Question:
> It has only a single fuse holder on the rear panel which I think is correct
> for this serial number but if the additional B+ fuses were worth fitting in

> production, should I add them to my back panel like the factory or hide
> them internally? Or not bother?

There is some value to the added fuses (one is for filament). An overload on the B+ will blow the 1/8th amp fuse much sooner than the line fuse, which might not blow until after collateral damage occurs. Frankly, though, I have no idea how often this may happen. If you are going to retrofit, it might make more sense to fit the proper fuse holders to the back panel, using some of the drawings (Y2K manual, etc.) to position them. The correct way is to use a "Greenlee Punch" which has the correct "D" shape or circle with a flat on one side. This keeps the fuseholder from rotating in the panel. If not, then improvise or make sure you get the fuseholders with the large starwashers which bite into the rear surface and perhaps secure with a drop of epoxy or something. Internal fuseholders would be more convenient and keep the back panel "authentic" to the version, however, I haven't found any that were very confidence inspiring. Tempted to use the inline type often used in automotive installations, but I don't think they're rated for high voltages. <snip>

Date: Sat, 5 Jul 2003 08:33:32 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] New 390A owner & fan

> > Question: It has only a single fuse holder on the rear panel which I think is
> > correctfor this serial number but if the additional B+ fuses were worth fitting
> > in production, should I add them to my back panel like the factory or hide
>> them internally? Or not bother? Internal fuseholders would be more
>>convenient and keep the back panel "authentic" to the version, however, I
>>haven't found any that were very confidence inspiring. Tempted to use the >>inline type often used in automotive installations, but I don't think they're >>rated for high voltages.

A high percentage of the inline types I've used for car radios have failed with the plastic cracking, so that the assembly flys apart, leaving a hot lead dangling. I'm not a purist and would have no problem with added fuseholders, on the rear panel if neatly done. If the modules are all original, rather than a depot dawg, it could possibly affect the resale value.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: RE: [R-390] New 390A owner & fan
Date: Tue, 08 Jul 2003 13:22:54 -0400

<snip> On single fuse R-390A's, you can check r-390a.net, references,

pearls of wisdom for horror stories relating to damage done when failures didn't blow that one fuse soon enough. There was a field change to add 2 fuseholders so obviously the designers realized that there was a problem. If you have an aversion to "drilling and blasting", and don't feelike adding in-line style fuse holders, you can add pigtail type leaded fuses. A convenient place to do so would be under the audio module on unused terminals of the sockets for the plug-in electrolytic filter capacitors. Pulling audio module to replace fuses so installed would not be much hardship because blowing those fuses should be a rare event indeed. A measure of added protection can also be realized by "downgrading" the main fuse to 2 amps for 110v AC line or 1 amp for 220v AC line. Check also the aforementioned reference for information relating to the AC line filter. That filter has paper capacitors and like the rest of those capacitors in the radio are a prime candidate for leaking or shorting with associated unpleasantries. This is especially of concern to you on the other side of the pond with your 220 volt AC supply.

Date: Tue, 8 Jul 2003 16:08:51 -0700 (PDT)-
From: <jlap1939@yahoo.com>
Subject: [R-390] CL80....

If someone could drop me a short reply sometime... I already had my radio IN the rack, and so I put the Keystone thermistor in the "brute force" line filter I made, (this was a few yrs ago, after my switch stuck, and by a stroke of luck, came back apart with a bit of tapping on the front cover...! I put the thermistor in RIGHT THEN...) All has been fine, but I often worried about the new limits it might face, as due to the location, the four tube Teleregister receiver amp/monitor I use runs through the same filter..(The filter has four outlets...). Now I have had to add a 40 W light, as the location is changed slightly, and I needed more light to read...The amp/mon is a four tube VTVM unit, with a very large low pass filter, and a series of line filters. To be honest, there have been times when I have turned on the SP 600 while the 390 was still on, as well as the tele. amp...(In order to warm up the 600, as it drifts for a half hr or so...to start with..) In other words, all this can at times run through the one thermistor... How Bad is that??? This is probably too much load. huh?..What about just the 390 (or 600), and the amp...Sorry to say I still don't relate amps and watts, and voltage very well..(well...I mean not at all, in fact....?) Don't even know the amps for the thermistor, (In my "little" mind I seem to remember 3 amps, maybe???) Also, another subject: <snip>

Date: Tue, 8 Jul 2003 17:37:34 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] CL80....

Friends, I'm a dumb one... just re-wire the filter so only the 390 is going through the thermistor...just got a note.. But...I thought it would be better for the other gear too..is why I was thinking about letting it stay as it is...

Date: Wed, 09 Jul 2003 08:17:28 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] CL-80

If the 390 is on, the thermistor will be hot so it will not protect the other set when it is turned on. I put my CL-80 in a box on the back of the 390A covering the power filter pins too.

From: "Phil Atchley" <k06bb@elite.net>
Date: Thu, 10 Jul 2003 02:13:34 -0000
Subject: [R-390] Error in Power supply Mod page.

<snip>While perusing the modification page I downloaded from the
http://r-390a.us/R-390A_Modifications.htm

website I discovered a very glaring error in the Power supply (solid state) modification. The procedure says to connect the Cathodes pf the solid state rectifiers to <Pin 4> of the tubes. THIS SHOULD READ <PIN 3> AS PIN 4 IS A FILAMENT PIN AND IS ESSENTIALLY GROUND FOR B+. I'll notify the owner of the website but I wanted to post it here in case somebody tries to do this modification following the website info. I guess the moral of the story is that if you intend to do ANY modification of equipment, no matter how minor you should ALWAYS check the schematic to be sure that things are as stated in the Mod procedure! IF I had gone ahead and done this and powered it up I'd have had "maximum smoke", possibly blown line fuse (hopefully but also VERY LIKELY THE POWER TRANSFORMER WOULD HAVE BEEN SMOKED AS THIS IS BEFORE ANY B+ FUSES IN THE SET! .

Date: Sat, 19 Jul 2003 09:08:33 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Variac

Wise thing to do? Three items? The two rec, one 390 non, and one SP 600, and the Rec. Monitor, 40W. Would this not solve the prob of inrush voltage, as well as other "overstress"? Just never understood when it was discussed before, and since it was mentioned by someone, it made me think of it again..

From: Llgpt1@aol.com
Date: Sat, 19 Jul 2003 12:23:50 EDT
Subject: Re: [R-390] Variac

My personal opinion, I do not use one. Don't see any need for it. People who insist on 115v may need to have one.

Les Locklear

Date: Mon, 21 Jul 2003 08:58:05 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Variacs

Have got a lot of "no no no" from many...who pointed out your Variac is probably not right anyway... So,, What is the correct voltage to be applied to the 390 series??? What are they supposed to run on.... Seems I read it, but can't find it right now... Why is control ever needed, and (subject to everyone getting mad at this old man again), why is it that way? How much variation is there, and how does it vary throughout our fair land..Why can't the power cos. get it right, or do they even want to, and how much additional (we don't know about) does it cost you and me,, and...do they care if the power is "right"..? Wht is "right" and how can the average person ever know?? (Maybe its' like the pharms...we don't "understand" the cost of R&D, and the expense of operating, which is why some pills cost $40 bucks each..)(Give me a break...) If all is not as it should be, why do they get all those hugh tax breaks, and raised rates, when they claim they have to "build" again... Does Europe or the East run any better, (or different) Put another way, can I take my R-390 with me to Mongolia?? Or Iraq?

Date: Mon, 21 Jul 2003 13:07:00 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Variacs

The power companies are sort of caught in a Catch-22. The days when these old boatanchors were made and originally used, the cost of producing power was a LOT cheaper. Remember the gas prices in the '60s? The problem they face is the increased cost of production AND the LOSSES caused by transmission and distribution. One method of reducing the losses caused by transmission and distribution is to increase the voltage, thereby lowering current. Remember that power losses are based on the power formula $P=I^2 \times R$. By reducing the current they reduce their loss in transmission and distribution. They waste less power in the transmission lines. This is NOT a trivial loss. I was involved in power line transmission and distribution preventative maintenance. The best way to find problems is to perform infrared scans of the lines, connections, and transformers. For the best results these scans are performed during the summer months when loads are at the highest, and are also done at night.

You would be amazed what can be seen. Our scanners were originally manufactured by either Motorola or Magnavox (my memory doesn't recall like it used to.) In any event, these devices could spot a bird at over a quarter mile. We would find some spring loaded in-line splice connectors that had developed a poor connection from quite a distance. We photographed the bad spot through the scanner, and return during daylight hours and photograph the bad spot during the day so they could easily locate the problem. Copious notes and logging are made during the entire process, to ensure the repair crew can locate the problem.

I've unlocked the cover to the enclosed pad mounted transformers to scan them, only to find there was NO need to scan it. The connections were glowing a medium red in the dark. I remember one in particular. Not only was it glowing, it had been installed when the use of aluminum power lines was at its peak. This one had a puddle of molten aluminum lying on the concrete pad. Obviously this one was marked urgent! It was repaired the very next morning.

The whole purpose of the infrared scans is to reduce the expense of just waiting until it fails. Once they have a failure, there is loss of equipment and labor costs.

As part of this progression to harness these expenses, our line voltages have risen over the decades. I have a dedicated AC voltmeter plugged into my ham shack. During the course of a 24 hour period, it has read as low as 122VAC and as high as 127VAC. Our old equipment was designed for anywhere from 100VAC to perhaps 115VAC. My BC-610's transformers were designed for 100VAC input. So with a 20%+ over voltage condition, I would expect their
lifetime to be reduced. This is why there is so much discussion over methods to reduce the voltage applied to this equipment.

First, the components are already aged. Second, they are being subjected to voltages from 10% to 20+% over their original ratings. Roy Morgan, K1LKY, has given several great treatises regarding proper variac connection, and fused plugs, not to mention providing us with the color code equivalents of the Asian power cords to American standard color codes for wiring. There is NOTHING wrong with the use of an ADEQUATELY rated variac to protect our treasures. Neither is there anything wrong with adding a "bucking" transformer. These devices allow us to run this aged pieces in a modern world, and extend their life spans.

Date: Mon, 21 Jul 2003 13:35:15 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Variacs

Mea Culpa! Mea Culpa! Mea Culpa! My "forgetter" works better than my

"rememberer"! They are indeed 110VAC primaries. I trying to locate a rack, preferably a short one. I have a Superior Variac rated at 50A. I had to add a 30A breaker and a circuit with 10 gauge wire to provide power for the "Beasts". They run close to 30A when transmitting. Therefore the 25A 12 gauge circuit in the shack was holy inadequate. If I keyed up for more than one or two minutes, I
would ALWAYS trip the breaker.

Date: Mon, 21 Jul 2003 23:04:03 -0500
From: "Dave Kamp, KW0D" <kw0d@netexpress.net>
Subject: [R-390] Variacs & original spec...

Hi all! The whole variac concern is very valid to me, on account of the age of these machines... But interesting to note that in the R390A's spec, listed on page 1-6 of Rev 8 of the 21st Century R390A/URR Technical Reference:

:---> 115 or 230vac +/- 10%... Which comes out to 126.5v on the high end. My mains are pretty darned stable here... between 119 and 122, less a tad'a sag when the air-conditioner cycles on...

Date: Tue, 22 Jul 2003 09:09:09 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Variacs

Dear Friends, As per Dave Kamp in his last post...10% tol. would give you more than enough room for the top...Surely no USA sources go as high as 126.5V...??? So it may make it a bit irrel. for the 390 series..??

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Variacs
Date: Tue, 22 Jul 2003 11:17:52 -0500

While the radios will run at 126.5VAC and be within the tolerance specification, I think you have to look at what's happening to the various voltages inside the radio at that level. Filament, B-plus, etc., are all affected by this variance. When tubes were cheap and plentiful, this may not have meant as much, but now that this isn't the case, I think it may be wise to err on the low-voltage side and possibly prolong the life of some of the unobtanium found in these radios.

Date: Tue, 22 Jul 2003 11:16:57 -0500
Subject: Re: [R-390] Variacs & original spec...
From: blw <ba.williams@charter.net>

I have a nice one that Roy Morgan sold to me. It is a 240v unit that is fed by a transformer stepping down to 120v. No problems this way and I already had the xformer here gathering dust. I mounted everything on a heavy, treated 2x6 piece to sit beside the rack. This feeds a power strip with a R-390A, Heath HD-11, Bogan amp, and an AC voltmeter that is on the rack. Anyway, this is all pretty much invisible when I turn on the power as everything switches on. I keep the variac set to around 113-115vac all the time. The variac is nice to have installed as I can run anything that is on the work bench over to the variac if I need to slowly bring up the voltage.

Date: Tue, 22 Jul 2003 12:53:57 -0400
From: Llgpt1@aol.com
Subject: Re: [R-390] Variacs

That is pretty much why I do not see a need for a variac. And, on the SP-600 series, use tap # 5 (130 volts). Les Locklear

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Date: Tue, 22 Jul 2003 13:52:38 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Variacs

As to "Surely no USA sources go as high as 126.5V...???", you are obviously mistaken, having NO knowledge what the situation is HERE. This has been read and verified with an HP-410C, a Weston AC Panel Voltmeter, and a Digital VM. It IS a concern for SOME older pieces of equipment. I've been involved in electronics and electrical areas since age 13. My family has a long history of being electrician's since the 1920s. My grandfather was the Foreman during the construction of Chicago's McCormick Center. I CERTAINLY know how to read meters and understand what is presented.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Tue, 22 Jul 2003 11:21:22 -0700
Subject: Re: [R-390] Variacs...and line voltage...

Ken Gordon affirms: :-) Measured line voltage here in Moscow, Idaho is 127 VAC, rising to 128 at times of low load, and I have seen it, rarely, for short periods, pop up as high as 131 VAC. I run my SRR-11/12/13 and other receivers on their 130 Volt tap, and my R-389 on a bucking transformer. As I said, building a bucking transformer is so cheap and easy, there is no reason not to have one Oh. BTW, I am an Electronic Instrument Specialist (got the fancy meaningless title in lieu of a raise) at the University of Idaho's College of Science, and correct line voltage is important to maximize the longevity of some of our equipment. We use bucking transformers where necessary, primarily if there are no adjustment taps on the power transformers, or if the gear is foreign made, usually Japanese, and requires 100 VAC. Depending on the load, I use either RS transformers, or buy appropriate ones from Fair Radio Sales.

Date: Tue, 22 Jul 2003 11:41:55 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Variacs

Thanks for additional info posted...I am still interested in the subject, and will keep info, as I am sure some others might do as well. Who has, if I may ask, a permanent and effective mon.. system to moniter line voltage and current..Is it common in use, and how could it most simply be done, to still supply useful info..? It seems to me it would be useful to those in complex and careful research..which I am sure some of you are involved in. It would be useful for any comm. gear that might be simply "plugged in", it seems to me...in particular for "antique" gear...

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Variacs
Date: Tue, 22 Jul 2003 14:50:06 -0400

There may not be an absolute "need", particularly for an SP-600. If using the 130 V. tap, that should cover 126 volts. However, many others, like the '390's were designed with 110-115 in mind. While 10% more is tolerable, it's not ideal or the midpoint for which the components were chosen. So, using a variac or buking transformer to cut it down may contribute to longer component and tube life. Here we have 126 volts typically, with some variation. During the summer, it can sag as low as about 95 vac.

A variac provides the ability to provide some boost if needed. Not to mention that it provides yet another knob to tweak and meter to read. (Adds "tinker-value".) If the rectifiers have been solid stated out, you can use the variac to bring up the receiver slowly which may help some over the long haul. If the 26Z5W's are still in there, it's unlikely to make a difference as they don't forward conduct until a threshold voltage is reached anyway. (Something like 90 volts, as I recall). Necessary -- no. Helpful -- maybe. But be careful of the variacs with a range switch, typically 0-120 and 0-140 volts nominal -- very nominal. More likely to be 0-130+ and 0-150+ with more typical input voltages. Keep it on the low range and put some tape over the switch.

Date: Tue, 22 Jul 2003 15:36:28 -0400
From: "Veenstra, Lester" <lester.veenstra@lmco.com>
Subject: RE: [R-390] Variacs

Of course, a variac can be wired so you cannot get a boost. That is, the output is always equal or less than the input, never higher.

Date: Tue, 22 Jul 2003 15:51:04 -0400

From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Variacs

Les, Very true! But most folks simply wire them the way shown in the instructions. Since a variac is simply a variable auto transformer, it definitely can provide voltages higher than the input

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Date: Tue, 22 Jul 2003 14:34:26 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Variacs and Line Measurement

Friends... For a MONITOR for your lines??? READ ON: What about your lap top or desk top, and a program, as suggested by (someone)? It can be left "on" all the time, and there are...(????) programs to record vari. in line voltage and even current...(????) If true, I need to find such, and find out how mine varies here... Wonder however, if the "Bucking tran.." might be best all around...Looked a lot at them a few yrs back, but failed to understand..(I get hurt when I am dumber than everyone else...)(I pretty much stay hurt....)!! <snip>

From: Llgpt1@aol.com
Date: Tue, 22 Jul 2003 16:20:18 EDT
Subject: Re: [R-390] Variacs & original spec...

Plug 'em in and either they smoke or they don't............we dont need no steenkin' variacs.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Variacs & original spec...
Date: Tue, 22 Jul 2003 16:50:55 -0500

So, what you're saying is if Art had intended for radios to have VARIACS installed in them, he would have included it in the design of the R390[A], right?
:.)

Date: Tue, 22 Jul 2003 18:05:54 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Variacs & original spec...

A Variac should be rack mounted with large AC volt and ammeters (with brass bezels), an array of 1/2 inch jeweled pilots lights ('cause there purty) for each piece of equipment. The Variac should have a large old style "steering wheel" type knob. Since I can't do that, it will stay on the workbench where it will get some use.

Date: Tue, 22 Jul 2003 18:07:51 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Variacs & original spec...

I forgot one item...... A LARGE knife switch for mains disconnect.

Date: Tue, 22 Jul 2003 17:30:29 -0500
From: "Dave Kamp, KW0D" <kw0d@netexpress.net>
Subject: [R-390] Was variacs, now bucking transformers...

Okay, so I opened a big can'o worms over the variac/line voltage... and the bucking-transformer came up... I've got a 1A SOLA here, that I've used on my HQ-140X, and found that it cuts down power-line pops, clicks, and a 'little' drift (usually when the AC compressor kicks on). I can understand how it 'bucks' a change in voltage, but how does a bucking-transformer prevent a 130v input from creating more than 115v output? I haven't tested the SOLA on a variac, but I'll do that- I'll sweep it from 95 to 140 over a 5-minute span, and see what it outputs... and if it does, (and 1A is enough) I'll put it on the R390A...

From: Llgpt1@aol.com
Date: Tue, 22 Jul 2003 18:53:24 EDT
Subject: Re: [R-390] Variacs & original spec...

Not sure if Art intended that or not, just my way of doing business...........either they smoke or they don't. With 33 R-390A's, 1 R-390, 1 R-389 and 20 SP-600's passing through my hands and never owned a variac. YMMV

From: Llgpt1@aol.com
Date: Tue, 22 Jul 2003 18:55:33 EDT
Subject: Re: [R-390] Was variacs, now bucking transformers...

You have a AC inside your 140X??? Mine never ran that hot........<grin>

Date: Tue, 22 Jul 2003 18:32:16 -0500
Subject: Re: [R-390] Variacs
From: blw <ba.williams@charter.net>

RELAX, as John appeared to be making OBSERVATIONS from his EXPERIENCES. He brought up a few INTERESTING points and this is a pretty good thread. No need for us to get SNIPPY. It sounds like you CERTAINLY do know your meters.

From: "Richard Biddle" <theprof@texoma.net>
Subject: Re: [R-390] Variacs

Date: Tue, 22 Jul 2003 19:09:35 -0500

I will still use a panel mount 5 amp variac for the R-390A with an isolation transformer in front of it for a slow power-up.   Paranoia to prevent power transformer thump. Never did try the soft-start with the RTC.

A friend recently handed me a box with an interesting gadget a Chicago Standard Transformer Corporation P-6161 Isolation Transformer. Primary is 125/115/105 volts switch selectable with a 115V secondary @ 250 watts.   Now all I need to do is build a PIC microcontroller to monitor the line voltage and a relay to select the primary.

Date: Wed, 23 Jul 2003 08:48:02 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: Variacs

Don't go too low on the voltage. There is a comment in the Radiotron Designers Handbook about cathode contamination if the filaments run too cool. Out line voltage here is nominally 117 and is there most of the time, but this summer it often droops to 112. Ain't deregulation wonderful.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Wed, 23 Jul 2003 08:16:23 -0700
Subject: [R-390] Bucking transformer...

Since someone asked about the subject, I can send to anyone who wants it, a pretty small (24 K) .bmp file of the connection I used to bring 125 VAC down to 100 VAC for a lab instrument at work. It uses an RS transformer. I tried to send it through the system, but it was caught as spam.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Bucking transformer...
Date: Wed, 23 Jul 2003 10:20:50 -0500

Here's a link to the typical schematic from the R390A FAQ page. Is your circuit different?   <http://www.r-390a.net/faq-HiVolt.htm>

From: "Drew Papanek" <drewmaster813@hotmail.com>-
Date: Wed, 23 Jul 2003 16:37:52 -0400
Subject: [R-390] AC Line Monitoring Musings

" Who has, if I may ask, a permanent and effective mon..
system to moniter line voltage and current..Is it
common in use, and how could it most simply be done,
to still supply useful info..?"

Most such systems nowadays are PC based with a plug-in card. You may not care for the half a kilobuck price tag for card and software, however (at least for the systems I've seen). One could easily assemble a voltage monitoring system using an RS-232 computer-controllable DVM (about $60 from RadioShack, more from other sources). The DVM connects via a standard cable to a PC's serial port and includes software for the PC. I don't know if the software performs periodic data logging. (Perhaps a job for a little QBasic code and that old 386 you've got sitting around collecting dust.) For those truly fanatical about power quality, a UPS or power conditioner (intended for PC systems) would serve well. The better units charge an internal battery continuously from AC input power and deliver AC output from an internal inverter continuously powered by the battery so the AC output is essentially unaffected by line input variations. Of course, all that hardware generates more RF hash & trash to interfere with listening...

From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Was variacs, now bucking transformers...
Date: Wed, 23 Jul 2003 17:11:10 -0400

A bucking transformer does not "buck" a change in voltage. All it does is reduce the voltage by connection of the secondary in series opposing (or bucking) the input voltage. If the phasing of the windings were reversed, the transformer would aid or "boost" the voltage. With either connection, a variation in input voltage will affect output voltage by essentially the same percentage. Sola is perhaps best known for their constant voltage transformers. Is your Sola unit just a bucking transformer or is it a constant voltage transformer which also includes a Bucking Function (say that three times fast!). The constant voltage transformer regulates its output voltage by way of resonance raising the magnetic flux peaks high enough to clip the sinewave peaks via magnetic saturation. There is an extra winding connected to a large oil filled capacitor to establish resonance. They work quite well if you don't mind the increased harmonic content of the output voltage, the sometimes loud (mechanical) hum and the heat. Their primary (no pun intended) advantage over the power conditioning UPS is simplicity, low RFI, and extreme robustness.

Subject: RE: [R-390] Was variacs, now bucking transformers...
Date: Wed, 23 Jul 2003 14:53:20 -0700
From: "David Wise" <David_Wise@Phoenix.com>

The output waveform is not a sine wave; it's closer to square. This means that unless it's true-rms, your voltmeter is lying to you. In any case, there's no right voltage. The radio was designed assuming a crest factor of $\sqrt{2}$. The filaments respond to rms, but B+ responds to peak. Apropos of nothing: The circa-1960 IBM mainframe in my basement contains two CV transformers.

Date: Thu, 24 Jul 2003 10:43:28 -0400
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] Variacs & original spec...

>So, what you're saying is if Art had intended for radios to have VARIACS
>installed in them, he would have included it in the design of the R390[A],
>right? :) Barry(III) - N4BUQ

>(who has a VARIAC but doesn't usually run his R390A on it because his line
>voltage isn't all that far out of spec...) Plug 'em in and either they smoke or they don't.............we dont need no steenkin' variacs. Les

Geez, I leave for a while and you guys are trying to re-invent the wheel again. I tell ya! Where's my paddle? Les is right! Someone please quote for me the information from the R-390 manuals as to the power *input* specs for these receivers. Isn't it something like 110-125 VAC? And if so, wouldn't that seem to imply that the designers were indeed bright enough to build into the equipment a margin of safety to account for variations in line voltage? I think it's Hank who is fond of the saying "trying to separate the fly shite from the pepper". This
would appear to be one of those situations, Hank! I s'pose if you've got nothing better to do, you can delude yourself into believing you need to build something or otherwise 'improve' these fine receivers to account for some perceived shortcoming. Hey - if it feels good, do it. Sorta like the 'need' to call an R-390 a 'nonA'? (-: Meantime I'd offer the following: I'm sure that the voltage levels are indeed excessively high in some areas (meaning higher than 125vac), but not here. Mine runs right around 117 most of the time. If I were me (!) and the voltage in my area ran over 125 regularly, I'd be talking with the power company to address the problem. Your R-390 should be the least of your worries if this is the case - the toaster and microwave will be doing the Rhumba across the counter tops! Thanks to Prof. Locklear for pointing out to me some years back the simplicity of addressing this in the SP-600 by changing the tap on the transformer(built-in feature 'by design'). I had drifting problems and was *sure* there were a ton of components out of spec. I tend to do that though, check for a fried transformer when the radio no-workie before looking for a blown fuse. Just smack me.Glad to see this is all I missed. Would've felt slighted if the radioactive meter or black gooey cap innards threads had come back around while I was away. Been back for a week now, after a cross-country trip to reteive a nice old 1400 lb. Collins BC transmitter, just finally catching up. Now you can see why I have trouble finding time for things like fixing those broken gear clamps. 73

de Todd/'Boomer' KA1KAQ

BTW, Roy Morgan used to bring up a very valid point about VARIAC use - bad idea long term unless you plan on welding the dial into place or wiring it for constant voltage. Only takes one sneeze, one errant bump, small earthquake, diabolical pet, etc to move the power setting up to meltdown point. Hey, if you're worried about what 120V will do to it, try to imagine 150 or...*gasp* 240VAC! *sizzle*

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Thu, 24 Jul 2003 14:09:53 -0400
Subject: [R-390] RE: Was variacs, now bucking transformers...

On constant voltage transformers Dave Wise wrote:

> "The output waveform is not a sine wave; it's closer to
> square. This means that unless it's true-rms, your
> voltmeter is lying to you. In any case, there's
> no right voltage. The radio was designed assuming
> a crest factor of sqrt(2). The filaments respond to
> rms, but B+ responds to peak."

With the choke input B+ filter in the R-390A, B+ responds to average voltage (which has strong dependence on peak). If one were to change sinewave input to fully square-wave input then adjust for correct RMS to satisfy heaters, then B+ would end up about 11% high (neglecting changes in voltage drops due to altered peak currents and saying nothing of the changed "swing" of the input choke). For a capacitive input filter, the aforementioned RMS condition would lower B+ about 29%.

As you say, there ain't no right voltage. Situation Normal, All "Bucked" Up.

Here's fodder for a new dead horse:

How about running R-390A on a CV transformer with taps set for correct RMS to heaters? Then tap into one of the rear panel fuseholders to insert an outboard soiled state regulator which would drop B+ back to normal. If your '390A's power transformer didn't hum before, it probably would now with the harmonic content. R-390A transformer would run a little warmer too, but
hey, you'd be fully regulated, dammit. For the R-390 non-A, one could set CV transformer taps for correct heater RMS, and let the 6082's take care of the B+. With the lower voltage out of that capacitor input filter they'd run cooler. If regulator circuit drops out on ripple valleys (not in The Land of Chuck), parallel some more capacitance across that 10 uF(?) filter cap. If still not enough headroom, an external DC source could be connected in

series to jack voltage back up. Along with the already regulated B+, you'd now also have regulated heaters.

" Apropos of nothing: The circa-1960 IBM mainframe in my basement contains two CV transformers."

Decatron tubes? Mercury delay lines?   Rotating drum memory? Bearskins and stone knives?   You are one serious boatanchor collector! Does that mainframe work?   Drew

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Date: Fri, 25 Jul 2003 23:46:34 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] AC Line Monitoring Musings

If building such a system, I'd measure the output of a transformer, not plug the DVM leads directly into the power line - potentially a large short circuit if the common lead of the DVM goes to common of the serial port, and is plugged into the hot side of the power line.

Date: Sun, 03 Aug 2003 19:16:42 -0700
From: David Medley <davidmed82@yahoo.com>
Subject: [R-390] Isolation Transformer

I am being driven crazy by the earth leakage cutout thingies or whatever you call them. The leakage due to the line filters especially in older radios trips them all the time.Can anyone advise me where I can get an isolation transformer about 750-1000 watts.

Date: Mon, 04 Aug 2003 08:16:00 +0300
From: Sheldon Daitch <sdaitch@ibb.gov>
Subject: Re: [R-390] Isolation Transformer

Without being too flippant, Newark and Allied have isolation transformers, but I suspect you might not like the price. Also, there is a place out in Van Nuys, I guess it is, C&H, that has some pulled (RFE) items, and they might have something more in line with pricing.

Date: Mon, 04 Aug 2003 05:27:14 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Isolation Transformer

This was on the Collins reflector.

>Subject: FS: mother of all isolation transformers for boatanchors
>Date: Sat, 02 Aug 2003 11:44:41 -0400
>

>Hi Gang,
>I had hoped to wire this transformer into a dedicated hamshack circuit to
>reduce 120VAC to 110 VAC, but I'm not allowed to in this house. This is an
>amazing transformer. Here are the details: Model: Signal Transformer DU-7.5
>Primary Windings: dual primaries, each tapped at 104 VAC, 110 VAC and 120
>VAC. They may be wired in parallel or series.
>Secondary Windings: dual secondaries, each tapped at 104 VAC, 110 VAC, and
>120 VAC. These also may be wired in parallel or series.
Frequency: 50 Hz - 400 Hz
>Current: 62 Amps parallel connected, 31 Amps series connected
>Power Capacity: 7.5 KVA
>Isolation: Electrostatic shield of 2 mil copper foil between priimary and
>secondary windings Weight: 105 lbs
>This is a new and unused transformer, current production. You can see the
>spec sheet at
>http://www.signaltransformer.com/signal/products/pdfs/pgs28_29.pdf
>Price: $125
>Now the bad news: this is pick up only in Oxford, OH, near Cincinnati. I
>can't handle shipping this brute.

Date: Mon, 04 Aug 2003 15:17:34 +0300
From: Sheldon Daitch <sdaitch@ibb.gov>
Subject: Re: [R-390] Isolation Transformer

Hank, Nope, and it gets even better. We left Greece end of April, medivaced out due to some family issues, and right now, as I type this, I can look outside and see the arid land of the IBB site in Kuwait. I volunteered for a two transmitter installation mission into Baghad, and we've been here since the 27th, awaiting some clearance issues for TX locations in Baghdad. Learned a few hours ago that we will be headed out of here, Kuwait City, probably very early Friday morning. Sounds like a winner of the Harris combination. The 350K is one nice 7unit, as far as I am concerned. If I ever get to where I think I might be settling down with fewer and fewer moves, I think I'll try to get one.

From: "Ed" <ca.urso2@verizon.net>
Subject: Re: [R-390] Isolation Transformer
Date: Mon, 4 Aug 2003 05:35:22 -0700

C & H Sales Co.
2176 E. Colorado Blvd.

Pasadena, CA 91107
1-800-325-9465
(626)796-2628
FAX 626-796-4875
Web: http://www.candhsales.com

From: "Dennis L. Wade" <dwade@pacbell.net>
Date: Mon, 4 Aug 2003 07:33:00 -0700
Subject: Re: [R-390] Isolation Transformer

This is a truly awesome place to browse around any given afternoon. Work *used* to take me to Southern CA (I live in No. Calif) at least a couple times per month, but...alas...we have the California State Budget....nuf said...

From: "Gary E Kaufman" <gkaufman@the-planet.org>
Subject: RE: [R-390] Isolation Transformer
Date: Mon, 4 Aug 2003 11:47:38 -0400

You can grab most any 2 large filament transformer with the appropriate wattage ratings and put them back-to-back. I used a pair of 56v/3A transformers for many years set up as 115:56<--->56:115 with good success while repairing AC/DC tube radios. There was about a 5% voltage drop over line voltage. Admittedly this may be tough if you really need a 750-1000 watt unit. Also check with local hospitals - most any medical device in patient contact requires isolation. I've pulled some very nice isolation transformers out of discarded equipment. The medical engineering folks are often very helpful and might be willing to donate some discarded equipment that you can pull them from.

Date: Mon, 4 Aug 2003 11:39:14 -0400 (EDT)
From: <ah7i@atl.org>
Subject: RE: [R-390] Isolation Transformer

Have a pair of 240-120 (or the other way round if you like) here. IIRC 1KVA CCS but may be a little bigger. Can wire for isolation, step up, step down or 480V if you need... They are in Canton GA...destination ebay but I'm no where near that pallet yet so if interested, write...

From: AdamAnt316@aol.com
Date: Tue, 5 Aug 2003 13:41:23 EDT
Subject: [R-390] Line filter issues?

Recently, I have experienced loud buzzing noises on the lower bands of my R-390A. This noise interferes with all but the strongest signals on the BC bands, and is pretty much unnoticeable by the 3MC band. I am getting this noise whether the set is turned on or off, and whether the variac I have the set plugged into is turned all the way up or down, with the only cure being to unplug the setup completely (I found this out with a small transistor radio). I'm guessing that the line filter is to blame; is there a way to repair it, or does it need to be replaced entirely? If replacement is the only way, what would be best to use to do it? TIA. -Adam

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Date: Tue, 05 Aug 2003 14:24:33 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Line filter issues?

If the radio is turned OFF you still get buzzing sounds? Where are the sounds coming from? If there is no power to the radio and it is buzzing, there may be some problem with the grounds and power lines in your outlets.

> guessing that the line filter is to blame; ....

The line filter is soldered shut and is filled with goo (I think). It's a chore to get one open and fix things inside. Replace the line filter with a small piece of metal into which is mounted a modern IEC RFI line cord connector. These are the things found on all modern computers and other equipment.. Some have RFI filtering and some don't.. New prices are very modest, and they can be found at hamfests for even less money.

From: AdamAnt316@aol.com
Date: Tue, 5 Aug 2003 15:36:31 EDT
Subject: [R-390] Re: Line filter issues?

Here's more on the issue. A couple of weeks ago, when testing a small homebrew amplifier/speaker combination to use with the diode load input, I noticed some buzzing coming from the speaker. At this point, the hum was not audible from the set's audio on any band, with much of it unnoticable if there was a good signal from the receiver, or if the speaker was moved away from the set; it would go away completely when unplugging the variac setup I always use to power up my radio, and was still present when using no variac whatsoever. However, during a recording session of a local BC oldies station, the hum began coming through over the BC station with force. At first, I attributed it to the fact that I had taken off the Utah plate for display purposes, but putting it back on made no difference whatsoever. Earlier today, I decided to see if the noise was still coming through, and it was still present, so I began turning off various appliances in the house (none of the other line-powered BC sets I've tried have exhibited this interference), but this had no effect on the buzzing. I then tried using a small transistor radio tuned to the same station to trace the source of the buzzing. I got clear reception until I got within a few feet of the receiver. I thought that it was perhaps the homebrew variac setup which was causing the interference, but trying a commercial variac instead had no effect, and unplugging the R-390A from either variac got rid of the buzzing altogether. I can live with the problem for now, since it doesn't appear to be affecting most of the SW bands, but I would like to find a solution which wouldn't affect the look of the set too much (i.e. I'd rather not have a IEC connector present in the back of the set, but if there's no way around it, so be it; I'll just have to replace the molded plug on the new IEC cord with the military-style three-prong plug from the old one!). How hard is it to access the old line filter without displacing the rest of the radio? TIA.

Date: Tue, 5 Aug 2003 16:12:59 -0400 (EDT)
From: <ah7i@atl.org>
Subject: RE: [R-390] Isolation Transformer

OK, I took a closer look at these transformers. They are Isolation transformers.
1KVA. 120 in and out. The taps may be changed for 240V in plus some other variations. Output taps may be changed as well for 100-125V Have two of them. They are pretty with covers over taps showing arrangements for various voltages. No exposed terminals. They weigh 32lb. Packed will weigh 35lb. How about $55/each plus ship from 30114... I have fed ex ground account with pickup so it won't be too bad. estimate $40 for cross country.. and around 20 for adjacent states.

Date: Tue, 05 Aug 2003 19:11:25 -0500
Subject: Re: [R-390] Re: Line filter issues?
From: bw <ba.williams@charter.net>

I don't have much help for you here, but I had a similar problem a while back. I have a nice 6' rack that had my R-390A in it near the top. There was a SP 600 beneath that, and a tube amplifier below the amp. A variac sat on the base of the rack below all of the gear with a lot of metal between it and the top of the rack. I had bought the Quantum QX Pro loop which is incredibly sensitive on MW/LW. Well, the rack made a great reflector in the shack with the loop located on a lower shelf unit so I put the loop on top of the rack. I have a swivel chair that sits kind of high up and I could rotate the loop well enough for the time being. I was getting terrible buzzing everywhere and the loop was just about unusable in this setup. I finally moved the loop and my LF receiver to the other end of the house where it is very quiet there. A few months later I brought the QX Pro back to do some testing with the R-390A again. The buzzing was gone. The only thing that I know of changing was the variac location. I had moved it to the side of the rack, sitting on the floor. Anyway, the buzzing is gone now. My guess was that the variac was causing the problems but I never checked into it.

[this post also placed in Antenna]

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] Re: Line filter issues?
Date: Tue, 5 Aug 2003 21:56:41 -0700

Welcome to the world of low-frequency interference troubleshooting! You will run across a number of strange stories and experiences, all as grey as the plains of Kansas in the Wizard of Oz. They're all caused by the Wicked Witch of the East and her switching broomstick. First of all, the noise sources you are hearing are generally produced by square waves. Sources are a sparking contact, a light-dimmer turned almost all the way on (maximum current switching = good transmit power), a defective part that is arcing, etc. The signal has many harmonics, and is generally coupled to the power line in the house. Of course it travels right outside the house to the power pole and down the street. It generally is a very complex wave, thus has many peaks and nulls. You'll have quite a time mapping it with a transistor radio on broadcast frequencies. Phasing and intensity will give you all sorts of indications, particularly when filtered through the ferrite-loop antenna of the radio which is itself very directional. Try walking down the street some time with a bad street light. You'll discover all sorts of peaks and nulls that seemingly have nothing to do with the offending pole (assuming you have already spotted the dimming light). The secret is to use your 2m handheld tuned to the aircraft band. Or at any rate, a high-frequency receiver with an AM detector. The higher harmonics are attenuated somewhat, and are more easily adsorbed thus don't travel as far. Thus you will have a better chance of zeroing in on the real source of the noise. If you can attach a small 3-element beam to the antenna, so much the better. This is essentially what is used by the electric company when a representative comes out with a noise sniffer. The unit is a regenerative receiver tunable from 300-350 MHz mounted on the end of a 4-element beam.

There are two ways of eliminating noise. One is to divert it, adsorb it; another is to attempt to ignore it.

Diversion, if you will, can be accomplished by good grounding. Remember, though, that any wire exhibits inductance with length. Even a 3-foot ground wire from a receiver to earth ground may be too long to provide a good "drain" because of its inherent inductance. Naturally, a 20-foot ground line from a second story to ground will not improve things, in fact, will not be effective except perhaps for frequencies below, say, 500 KHz. A good ground is never-the-less the first thing to install.

Another way is to attempt to adsorb the noise before it gets into the receiver. Radio Shack interference filters can be very effective. I don't have a catalog number handy, but look for the square devices. They are actually two "C" shaped sections held together by a snap-together plastic shroud. Wire is wrapped through them (as many turns as possible). Make sure the ends of two ferrite halves meet together, otherwise currents cannot not circulate in the ferrite and the filter won't work as well as it might. They can be installed in line cords, speaker wire, control wire, even coax can be wound through them. If you install them on the back of a radio, keep the wiring between the filters and the radio as short as possible. The wire between the filter and the radio is unsheltered antenna!

They are also great for suppressing noise from a computer. Start by grounding the computer case. Then, unplug everything from the computer, turn it on, turn on the receiver, and plug in computer cables one by one, noting any increase in noise. Install filters on offending connections as close to the computer as practical. If you can't get them to make a difference, somehow the noise is traveling through another path and you'll have to search to find it.

You can attempt to "ignore" noise by use of common-mode approaches. This approach makes use of something called a balanced line. You will notice that the antenna input connections to the R-390 are balanced, and so are the audio output connections. A full explanation of this approach is better found in text books, but basically the idea is that noise will be induced equally in two balanced lines. If the lines are connected properly, the noise can be nulled out. Wire telephone lines make good use of this approach.

Unfortunately, Collins took the balanced line approach very seriously and established a ground at center of the two balanced antenna inputs. In fact, instructions to adjust a capacitor divider that establishes this ground are provided in the alignment instructions. The ground point in the receiver is away from the back of the cabinet, and there are all sorts of sneak paths that may be particular to an installation which disturb the balance at RF frequencies. At any rate, while not perfect, it doesn't hurt to attempt to feed the receiver with a balun at the balanced antenna terminals. You will know if you are effective, if you can short a section of coax that feeds the antenna line to the balun and the receiver falls absolutely silent on all frequencies. The receiver here is quiet, although some strong broadcast stations can still be heard when the receiver is tuned on frequency.

The same approach can be used on the power line and the audio lines. Power Isolation transformers are used in some commercial broadcast installations to balance power lines. There, the center-tapped secondary of the isolation transformer is grounded. If you have an isolation transformer without a center tap, a virtual ground can be established with capacitors (.5 mfd, AC rated) from each secondary line to ground. The capacitor value isn't critical, but make sure the caps are rated for very high peak voltages. Good to protect them with MOV's too.

Audio lines are probably better protected with Radio Shack filter chokes, but hum (developed from "ground loops") and some noise can be eliminated by use of transformer input to external amplifiers. Hope this helps, or at least provides food for discussion.

Date: Wed, 06 Aug 2003 11:41:02 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: [R-390] Re: Line filter issues?

>Yet another update on this project; ... a dimmer-type toggle switch......

It could be that the buzzing has always been from that dimmer, and the power cord on the R-390A, with it's line filter working, was acting as an antenna to radiate the noise coming in from the power line. ALL dimmer type devices are suspect: touch-lamps, floor standing lamps with dimmers, wall mounted dimmers, even halogen lamps (some of them have a diode in their base to reduce the wattage consumed.)

Touch lamps are notorious for causing trouble because they make the RFI even when not lit. You will learn a lot about RFI control if you make attempts to quiet such devices by the use of inductors and capacitors.

From: AdamAnt316@aol.com
Date: Wed, 6 Aug 2003 13:14:30 EDT
Subject: [R-390] Re: Line filter issues?

Here's yet another update on this set of experiments. With the dimmer switch either all the way up or all the way down, and as many other interference-producing appliances as I could locate around the house turned off, I still appear to be getting line noise. For the most part, it has been quieter than it had been recently, but nowhere near as quiet as it was a few days ago before the buzzing began (examples of older recordings vs. recordings I've made since the buzzing began available upon request). I did some more recording of the sound levels coming from my radio on the 900KC oldies station (WSNH), and also monitored how much base noise I was getting under the music levels using the line level meter (mainly using the dots on the lower scale, not the VU portion). For the most part, with the line meter control set to 0 and the line gain control set to 4, the base noise level was 25, and the music averaged around 75 (quieter portions sounded noisier, while portions with peaks near 100 were not as noisy). I did get some bursts of band-swamping interference levels similar to what I had been receiving previously, one of which lasted a few minutes, while most lasted a second or two (none of which could be attributed to the dimmer switch, since it was either all the way up or all the way down all of the time). In later parts of the recording, noise levels subsided to half their normal line level meter readings for unknown reasons, but did not go away completely. As far as noise levels go, the noise received was loudest in the following ranges: 1100-1700KC, 1800-2400KC (noise levels often reached the 100 mark in this range), 3400-4300KC, 4400-4900KC, and some not-quite-as-loud portions on the 5000KC band. Frequency ranges in between the loud portions listed were usually quiet, but sometimes with white noise bursts occuring every 4.5 seconds (even on the 7000KC band). I still think that something is not right with my line filter, since I only get the interference with the 390A plugged in, and not just from the variac alone. Do you think I would have luck replacing the one in my set with one from Fair Radio or American Trans-Coil? Alternatively, does anyone in the group have any working spares they might be willing to sell to me?

From: AdamAnt316@aol.com
Date: Fri, 8 Aug 2003 16:54:14 EDT
Subject: [R-390] Line filter issues possibly solved!

Yet another update: I think I may finally have found the solution to this enigma! I decided to check the line cord connections in the back of the 390A to see if the noise went away when taking off the power cord wires. While loosening the nut holding the neutral on, I noticed that the connecting lug was moving an awful lot along with my loosening attempts. After finally managing to get the bolt fully loosened, which badly bent the connecting lug, the noise did not go away, so I loosened the nut holding the hot lead, removed ground lead from the rear panel, then removed the hot lead from it's terminal on the line filter, upon which the noise stopped radiating. Discouraged, I then attempted to remount the neutral lead to it's terminal on the line filter, upon which the connecting lead began moving surprisingly well in the opposite direction, shearing the neutral connecting lug off. I then noticed a crack which went all around the ceramic insulator on the line filter. Stress must've cracked the insulator at the point where the terminal screw ends, and this allows the terminal screw to rotate freely. I suspect that there was enough of a connection to allow the radio to work, but it also formed one hell of a diode-like semiconducting connection, which sent even the tiniest amount of line noise radiating from the line filter out the neutral lead like an antenna. What would be the best method to remove the line filter, especially that cramped screw? Also, might anyone have a spare line filter lying around that they could spare?

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Mon, 11 Aug 2003 16:39:06 -0400
Subject: [R-390] Re: Line filter issues possibly solved!

" Might anyone have a spare line filter lying around that they could spare?"

American Trans-Coil has the filters; you might also try Fair Radio Sales. The line filter's internal capacitors are paper type; these are just as susceptible to leaking/arcing/failing shorted as those Black Beauties used elsewhere in the radio. Recapping the filter would be a good idea.Some have replaced caps inside the filter (reportedly potted in beeswax); opening soldered housing requires patience, a torch, and a small hole drilled in filter housing through which pressure will vent and scalding melted potting will spew. When replacing those caps, only use types specifically rated for line bypass service. Regular caps will not cope well with the sometimes huge transient voltages found on the line. While you're in there you could change filter configuration to eliminate nuisance tingles from the chassis and stop tripping of GFCI's. Bypass line to neutral, then neutral to chassis (grounded). I'm not sure if that would reduce the filtering effectiveness. You could also fabricate an adaptor plate and replace filter with IEC chassis mount filtered connector (available inexpensively from Mouser and other sources). Units rated for lower current carrying ability have larger inductors which make the filter more effective. A standard computer power cord is used with these connectors, making for a neat and clean installation. Rumor has it that some recently surplussed R-390A's had this setup installed by the Gov't. For a lively and informative discourse on line filters and related topics,
goto r-390a.net. Click on "References" , "Pearls of Wisdom", "Power Supply". You will find line filters mentioned beginning at about page 40.

From: "Dave and Sharon Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] Line filter issues possibly solved!
Date: Tue, 12 Aug 2003 19:27:50 -0400

All: I know I will be hung in Effigy (that's a small town in IL) for suggesting this, but I replaced the line filter with a modern, up-to-date CORCOM line filter / IEC connector combo. I can now use any one of a dozen instrument cords to connect the radio, and I get a good 3-wire connection (assuming of course the cord's good to start with).

From: Llgpt@aol.com
Date: Tue, 12 Aug 2003 19:33:35 EDT
Subject: Re: [R-390] Line filter issues possibly solved!

Believe it or not...........many of the "later" depot conversions were done exactly this way. I had a late 67 eac that was done at the depot, I think it's a neat mod, and eliminates having to coil up the cord for moving or transportation.......... But, as others have said, I'm a witch and have used solid state devices on R-390A's for years. Les Locklear Gulfport, Ms.

From: AdamAnt316@aol.com
Date: Tue, 12 Aug 2003 23:16:59 EDT
Subject: [R-390] Re: Line filter issues possibly solved!

I've heard much about that sort of mod, but would rather keep my 390A in it's original form if all possible. I'm planning on replacing the original line cord (which is intact for the most part, but has a crack or two in the outer rubber jacket) when I get the replacement line filter, but will most likely replace the molded plug of the new cord with the old metal military plug (looks like a two-pronger which was later retrofitted with a third prong). Plus, since my set only has the two small holes for the line filter input terminals, it'd probably be hard to put in an IEC connector without heavily-butchering the back panel. I'm sure that there are at least a few people out there who've replaced their line filters simply so that they'd have a removeable power cord on there, and that they'd hopefully be willing to get rid of the old line filter assembly; otherwise, I'll probably end up going with a $17 Fair Radio pull (I know that American Trans-Coil wants only $7 for one, but their $25 minimum order policy makes going that route even more expensive than going with FR; I'd be willing to pay $7 for someone's old line filter, provided that it was working before it was pulled out for the retrofit). As always, TIA.-Adam

----
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Line filter issues possibly solved!
Date: Wed, 13 Aug 2003 08:50:40 -0500

<snip>...replaced the line filter with a modern, up-to-date CORCOM line filter....

Only way to go...   Barry(III) - N4BUQ

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Wed, 22 Oct 2003 13:27:49 -0500
Subject: [R-390] Isolation transformer

http://www.surplussales.com/Transformers/IsolationXmers.html

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Wed, 22 Oct 2003 13:33:24 -0500
Subject: [R-390] Isolation Transformer

List, (Sorry about the previous message. I'm not sure what I did, but it was sent,prematurely). I'm looking to buy an isolation transformer for various BA work and found these.

http://www.surplussales.com/Transformers/IsolationXmers.html

Particularly, I'm looking at these two items:
(TP)64196-173022, new - as removed from new, unused equipment.
(TP)6634 New in the box.

Of these, does anyone have any recommendations for either? I assume either is overly sufficient to power a two or three R390s, but not sure about other considerations. Any suggestions? Thanks, Barry(III) - N4BUQ

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Isolation Transformer
Date: Wed, 22 Oct 2003 15:28:37 -0400

The first one looks like it would work well. For the second one you need 220 VAC for it to be useful as a 110 VAC source but otherwise should be OK. Getting an oversize transformer is always desirable as they will run hot if used at their full capacity for extended periods of time.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Isolation Transformer
Date: Wed, 22 Oct 2003 14:38:10 -0500

I thought 120/240 : 120/240 meant that I could select 120 or 240 on the input and either one for the output. Is this incorrect? In other words, if I use 120 as the input, then am I forced to use 240 for the output and vice-versa?

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Isolation Transformer
Date: Wed, 22 Oct 2003 15:59:17 -0400

Some transformers are like that (selectable 120 or 240) and have a pair of windings on the pri and sec so that you can wire them in series or parallel as desired. But the 6634 model specifically states "isolation step up/step down transformer" and "120/240 or 240/120" so I think that's what it really is. Might be a good idea to shoot them an email first if you're interested in that particular model.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Wed, 22 Oct 2003 13:46:44 -0700
Subject: Re: [R-390] Isolation Transformer

This one is capable of around 5 amps maximum, but I wouldn't run it at that for very long. And it is 115 to 115 so it would work well for you.

> (TP)6634 New in the box.
 This one has either dual or center-tapped primary and secondary windings, so you can connect it as any combination of 115 or 220 input and 115 or 220 output. However, current capability is about 4.5 amps for 115 and 2.25 amps for 220 input.This one would be more versatile around the shack. I think, all else being equal, I would go for this one.

> Of these, does anyone have any recommendations for either?

I would recommend the 2nd one.

>I assume either is overly sufficient to power a two or three R390s, but not
> sure about other considerations.

I dunno if you could power "...two or three..." at once, since I don't remember what the power drain of an R-390 is, but you could at least run one. As I said, at 115 volts, the first transformer will provide about 5 amps max, and the second will provide about 4.5 amps max. I don't think that would be enough for 2 R-390s, let alone 3.

From: David Hallam1 <david.hallam@RapidSys.com>
Date: Fri, 31 Oct 2003 06:45:11 -0500
Subject: [R-390] R-390 Voltages

I have a problem with a R-390 voltage and would like to know if anyone can suggest a starting place to look for the source of the problem. The unregulated B+ measured at capacitor C101 is only about 177 VDC. However the regulated B+ as measured at J601 is right at 180 VDC. This is with a pair of new 25Z6W's

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From: "Steve Hobensack" <stevehobensack@hotmail.com>
Date: Sun, 02 Nov 2003 18:40:47 -0500
Subject: [R-390] variac

Using a variac to lower voltage for a boatanchor is overkill. The age old trick of using a filament transformer works great. Hook up the low side of the filament transformer in series with one of the AC lines going to the rig. Hook the high side of the filament trans across the ac line. Be sure to check the resultant voltage. If the polarity is wrong, you will boost voltage instead of buck. Be sure the current draw of the rig is not more than the filament trans low side winding can handle. Return the variac to the test bench.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Wed, 5 Nov 2003 08:31:24 -0600
Subject: [R-390] Isolation transformer questions

Thanks to a list member, I'm the proud owner of a very nice isolation transformer (Model DU-1 shown in the following page)

http://www.belfuse.com/Data/DBObject/pgs28_29.pdf

I'm wondering about connecting the secondaries. Normally, I would connect both 120V secondaries in parallel yielding the full 9A capacity; however, my line voltage is a bit higher than I'd like. I know I could use one secondary and one of the other secondary windings to "buck" 6 or 10 volts, but that would limit the current to only 4.5A. My question is this: what would be the result of connecting the 120V secondary in parallel with the 110V secondary of the other winding? Is there an "averaging" effect? Will this damage the transformer? I've never thought about this before and wonder what will happen.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Isolation transformer questions
Date: Wed, 5 Nov 2003 09:54:42 -0600

Thanks to those who replied. I figured this would be too simple and probably would not work, but I thought I would ask. Since I want to keep all the smoke inside the transformer, I'll either stick to standard wiring or get a bucking transformer setup if it becomes necessary.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Wed, 5 Nov 2003 10:50:05 -0600
Subject: [R-390] Another xfmr question

At the risk of being chased off the list...

http://www.belfuse.com/Data/DBObject/pgs28_29.pdf

The same transformer in question 1 has a primary tap at 110VAC. Is it unadvisable to run the primary at this tap given a line voltage of 123VAC? Using the 120VAC primary, the 110VAC tap is a bit too low. I was thinking if I run the primary at the 110VAC tap and use the 104VAC secondary tap, I might get closer to 115VAC on the output. I assume this isn't as horrible as my first question, but I assume there are some drawbacks to this plan as well. Is it simply an effeciency thing that won't harm the transformer or is there more smoke risk?

Date: Wed, 05 Nov 2003 12:21:34 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Another xfmr question

>The same transformer in question 1 has a primary tap at 110VAC. Is it
>unadvisable to run the primary at this tap given a line voltage of

123VAC?

I predict it will work fine, for two reasons:

1) these are "industrial grade" transformers. That means continuous duty.

2) They are meant for 50 cycles to 400 cycles.. That means it has a larger core than would be needed for 60 cycle minimum operation.

>Using the 120VAC primary, the 110VAC tap is a bit too low. I was thinking
>if I run the primary at the 110VAC tap and use the 104VAC secondary tap, I
>might get closer to 115VAC on the output.

You will get (roughly) 104/110 of the input voltage, or about 95 percent. So if your input (line) voltage is 122 like it is at my house, you'll get about 115 volts out.

>Is it simply an effeciency thing that won't harm the transformer or is there >more smoke risk?

I predict no smoke. You could always send the folks at Signal Transformer company a short note asking if this is ok (say it's intermittent duty and you expect to not be drawing full rated load.) Here is your link to their "Contact Signal" page. In about two minutes you'll be done:
<http://www.belfuse.com/signaltransformer/ContactSignal.asp>

Last notes:

1) Fuse at least the input of the thing.

2) Use three wire grounded line cord and ouput outlets.

3) House the thing in a case that protects you, the cat, and the kids from contacting the open
terminals on the thing!

From: "B Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] Another xfmr question
Date: Wed, 5 Nov 2003 12:24:56 -0500

I think if the core is not saturating it will be ok. A way to see if the core is saturating at the higher voltage winding - hook up the primary (110 ac winding) in series with a 50 watt light bulb. Connect nothing to the secondary. Hopefully the bulb will not light or just glow dimly. Now reverse the procedure - connect the power and bulb to the 104 volt winding. If the bulb is no brighter or just a little brighter or hopefully if it is a real good transformer the bulb should not glow - your can use the former to drop the voltage.

BE CAREFUL - = YOU COULD BE KILLED IF THE JUICE GOES THROUGH YOU.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Another xfmr question
Date: Wed, 5 Nov 2003 11:36:36 -0600

Yes, I plan to do all three of your "end notes". I may drop the guys at Signal a note and see what they say.

Date: Wed, 05 Nov 2003 13:06:33 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Line Regulators

>Our line voltage runs up at about 123. I use a variac and a topaz isolation
>transformer for the R390A. I got a Marlin P. Jones (www.mpja.com) catalog in >the mail today that had a handful of line regulators. The ATVR2000 is 2KVA >with 110V/4% output with input from 80-140 for $50.00 with meter.

I am not familiar with the regulator you mention, but that thing *may* be a solid state switching type device, and if so it *may* product enough RF hash that you will not be able to listen to your radio any more.

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Isolation transformer questions
Date: Wed, 5 Nov 2003 13:19:22 -0500

I dunno, Baaa... watch what you're doin' there. The text on that page reads as follows:

"As shown on the schematic diagram the "DU" line is designed with dual primaries and secondaries. All four windings are identically rated at 0/104/110/120 volts. This permits series or parallel connections on either primary or secondary. Therefore, a nominal 110 to 110 volt, 220 to 220 volt,110 to 220 volt, or 220 to 110 volt transformer can be set up. The winding taps permit intermediate series ratings such as 208, 214, or 230 volts.

It is also possible to make auto-transformer connections by connecting a primary group in series with a secondary group. Such nominal ratings as

440 to 220 volts or 220 to 440 volts can be set up, in addition to the standard ratings described above. A further advantage to auto-transformer connection is the fact that the KVA rating of a particular type is doubled. It looks like it has a full complement of multi primary and multi secondary taps. Says it allows for "intermediate settings, such as 208, 214, or 230." But I take that to mean that you can also do 104, 110, 120, or maybe even mix 'n match the two sets of secondaries to get 110+120/2=115 -- which is what you're asking, I guess.

They say you can do 214, for example, so it would seem that you could do that. Now they say you can make autotransformer connections by connecting a primary group in series with a secondary group -- but (folks) correct me if I'm wrong -- what they don't say is that if you make an autotransformer out of it, it's no longer an isolation transformer. If your line voltage is running something like 125-126, as it does here, I would go with the 120/110 primary/secondary arrangement which would give you about 115. If it runs down to 110, then that might be OK as well -- unless you swap that 1L6 back into your TO ;-).

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Isolation transformer questions
Date: Wed, 5 Nov 2003 13:24:47 -0600

Bingo. 110 might be okay for some BA gear, but my TO's "new" 1L6 doesn't like the input below 115VAC. By the way, I got the following response from Signal about running the primary on the 110V tap and the secondary on 104V:

>Dear Barry.
> Thank you for visiting our website.
Your input/output configuration would not caused any damages to transformer (may shorten life slightly, but usually we recommend to stay within 10% deviation range from nominal voltage. Should you have any further questions, please do not hesitate to contact us.

Best Regards,
Sergey Dubatov
Design Engineer
Signal Transformer Co
Ph. 516-239-5777 x 173
Fax 516-239-7208
sdubatov@signaltransformer.com

Very fast response to my question!

From: "Kenneth G. Gordon" <keng@moscow.com>

Date: Wed, 5 Nov 2003 13:08:41 -0800
Subject: RE: [R-390] Isolation transformer questions

I think Barry (X) asked about connecting two of the secondary windings, a lower voltage one and a higher voltage one, in PARALLEL, hoping to get an "average" voltage.This WILL NOT work, as the winding with the higher voltage will simply try to pull the winding with the lower voltage up to the higher voltage, causing the higher-voltage winding to put out a lot of current, possibly overheating the transformer. He could, possibly, GET an "average" voltage simply because the higher-voltage winding would be so heavily loaded that its output voltage would be lower. I don't think this is a good idea. Connecting various combinations of primary and secondary windings in SERIES is another matter and no harm should result from nearly any combination, whether phased adding or subtracting, as long as the total current drawn from the combination doesn't exceed the transformer's capabilities..

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Thu, 6 Nov 2003 08:46:49 -0600
Subject: [R-390] Isolation Transformer update

I did some experimentation last night. With no load and the primaries connected in parallel at the 120V tap, the primary drew about 350mA. At the 110V tap, it drew almost 500mA. I then connected the series 75W light bulb. The 120V tap caused a dull glow while the 110V tap produced about twice that brightness (although still quite dull). I didn't attempt the primary at the 104V tap. I did notice the transformer produced a bit more hum at full voltage when at the 110V tap than at the 120V tap. I did not notice any heating, but I didn't leave it on very long either. Do these results sound typical? I've never examined the primary current draw on a transformer at no load.

Date: Thu, 06 Nov 2003 12:01:22 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Isolation Transformer update

>I did some experimentation last night. With no load and the primaries
>connected in parallel at the 120V tap, the primary drew about 350mA.
At the
>110V tap, it drew almost 500mA............................

The change in brightness with current is very dramatic and non linear at the point where it's glowing dull-ly. so "twice the brightness" may be only 10 % more current.

>I didn't attempt the primary at the 104V tap.

With the light bulb in series, you can't hurt anything.. If the transformer is a dead short the bulb will turn on to normal bright ness and pass only half an amp. And, measure the voltage at the transformer.. For low bulb brightness, it will be close to line (applied) voltage. At higher brightness, it will drop substantially -- you may have had only 90 volts on the transformer. Your current measurement may be fooling you. the thing is VERY reactive at no load, so that 500 ma may be well out of phase with the applied voltage. You certainly should not expect to multiply the 500 ma by the transformer input terminal voltage to get the dissipated power. A one ohm resistor in series and a dual trace scope to watch voltage and current is very instructive here.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Isolation Transformer update
Date: Thu, 6 Nov 2003 11:14:51 -0600

Yes. I did notice the input voltage at the xfmr was around 100V and fluctuated a bit. I assume the bulb does not provide a constant resistance at the low currents.

> Your current measurement may be fooling you. ....

The 561 is only single trace... :(

Date: Thu, 06 Nov 2003 20:14:07 +0100
From: Heinz und Hannelore Breuer <hbreuer@debitel.net>
Subject: Re: [R-390] Isolation Transformer update

Didn't you mention before that the transformer is rated 9A or was this per winding and doubles if used in parallel? Anyhow you have either a 1kVA or even a 2kVA transformer and for something like this about 30W to 50W iron loss is quite good. You will get some cooper loss too at maximum current but this is well within specs.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Isolation Transformer update
Date: Thu, 6 Nov 2003 13:19:45 -0600

It is 9A with the windings connected in parallel (1kVA) (4.5A per winding). It is a very nice unit and I think it is okay, I was just a bit surprised that it drew that much current at "idle".

Date: Thu, 06 Nov 2003 20:49:28 +0100
From: Heinz und Hannelore Breuer <hbreuer@debitel.net>
Subject: Re: [R-390] Isolation Transformer update

The current was probably not in phase with the voltage when running the transformer idle, so the actual dissipated power was less than 30W to 50W. OTH I just checked my data books and found 93% efficiency for a 1kVA transformer, this is 70W total loss dissipated in heat for this kind of transformer. Iron loss alone is about 40W the rest is cooper loss both in primary and secundary windings. The higher current at the 110 primary is expected because you have less windings per volt and the core gets a higher induction closer to saturation. Standard cores run at about 12,000 gauss, hypersil transformers at 15,000 gauss or even higher. If you go higher the cores hums louder. A welding transformer is a typical application were the transformer is rated very close to saturation. But it usually only runs a few seconds at a time.

From: "John KA1XC" <tetrode@comcast.net>
Date: Thu, 6 Nov 2003 22:41:30 -0500
Subject: [R-390] R-390A and the Selenium Rectifier

I'd like to get some wisdom regarding the selenium rectifier used to make the DC for the relays. I've got an Imperial (really mostly Teledyne) radio of about 1963 vintage, and the selenium rectifier seems to be working fine. However, I'm doing a top to bottom refurb (recap etc) on this radio for a friend and I'm wondering if this might be a likely failure down the road and would be worth replacing with a silicon bridge. If this was an R-390 it would be an easy decision as the copper oxide rectifier stack is always toast!

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] R-390A and the Selenium Rectifier
Date: Thu, 6 Nov 2003 23:14:30 -0500

Generally a good idea to replace all seleniums with silicon as a preventive maintenance. I'm not exactly on schedule in that department -- lot's of radios of various kinds with seleniums and even some copper oxide ones. The cosmetically correct thing to "rectify" the situation is to bypass them, leave them in place and install the silicon rectifiers or bridge next to the original. I haven't had a selenium fail lately -- last one I remember was when I was about 12 years old and the Se rectifier went in the little Motorola TV (a '47 model, I think). Boy did that stink to high heck! Very pungent. Lot's of smoke. I still can smell it more than 4 decades later. Not sure what the power rating was for that square-finned wonder - maybe about 5 deadhorsepower or maybe 3-skunkpower. My uncle knew immediately what it was that blew and replaced it with the latest technology -- one of those shiny-tiny top hat rectifiers -- I guess it was half-wave -- not sure. I was amazed how small it was.

From: "Glen Galati" <eldim@worldnet.att.net>
Subject: Re: [R-390] R-390A and the Selenium Rectifier
Date: Fri, 7 Nov 2003 01:48:28 -0800

I think you still got Sel rect poisoning. I know I do, the taste is still in my mouth. I say OM, "if it's working-leave it be". Check voltage or front to back resistance, and if its better than 10:1, leave it in. I've only worked on ten or so 390A's in my Air Force career, and never seen one go south. Of course that was 20-40 years ago, and a lot of signals have passed the airwaves in that time. I think the real experts should step forward at this time and relay their thoughts on the subject.

From: "Scott Seickel" <polaraligned@earthlink.net>
Subject: Re: [R-390] R-390A and the Selenium Rectifier
Date: Fri, 7 Nov 2003 22:38:01 -0800

For safety reasons it should always be replaced. If it goes the fumes are very toxic..

Date: Sat, 08 Nov 2003 08:03:59 -0500
From: K2CBY@aol.com
Subject: [R-390] R-390A and the Selenium Rectifier

I had the selenium rectifier fail one leg to open on my Motorola Contract 363-PH-54 chassis about 10 years ago. No short, no smoke, no smell. The symptom was a very loud buzz from the antenna relay and a failure to pull in completely when the FUNCTION was switched to CAL. I assume the same symptom would appear if BREAK IN was enabled and the ptt line grounded. The symptoms of a failed selenium rectifier are so obvious and it is so easy to get to that I wouldn't bother with pre-emptive replacement.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
To: r-390@mailman.qth.net
Date: Fri, 12 Dec 2003 16:12:17 -0600

Ronnie, I saw someone do this to an AF deck and it looked pretty good.

1. Remove (and save) the original caps leaving the clamping post in place.

2. Insert the positive end of each new individual cap down through the octal socket and solder it to the same lug through which you inserted the lead.

3. Tie all the negative ends together into a single solder lug and tie the solder lug down to the old clamping post. If you ever decide to rebuild the old cans, these replacement caps are easily unsoldered and removed. When

I rebuilt my AF deck (before I saw the above), I used some old octal plugs and soldered the caps to the appropriate pins.

Date: Fri, 12 Dec 2003 15:54:27 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Capehart update

I've replaced the audio deck PS filter caps by placing individual replacement caps under the audio deck. The top looks naked, but looks better than having a cluster of electrolytics sticking out the top IMO. Some guys have cut open the old cans, put new caps in and sealed them back up for plug in replacement.

Date: Fri, 12 Dec 2003 19:32:57 -0500
From: Bernice & Al <bernice@videotron.ca>
Subject: Re: [R-390] Capehart update

I went through the same about 3 years ago. Continue working with Walter Wilson. See his site at http://r-390a.us/filter_capacitors.htm

I used the same technique for my Bluestriper. End result was very good. Used the same method on my SP-600 also. After cutting open the cans I screwed in the lag screw then heated them in boiling water. The innards came out very easy. A coating of tar about 1/16 inch remained. To remove the tar I put them in the freezer. The tar chipped out easily when frozen. Any remaining tar was cleaned using mineral spirits as Walter indicates. I drilled and tapped for 2-56 screw. This leaves a bit more wall thickness in the aluminium stud than the 4-40 screw that Walter uses. In my capacitors I used 2-56 stainless steel screws to mount a solder lug. The new cap leads were soldered to the solder lug. I thank Walter for compiling and providing all the information on rebuilding electrolytics.

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Capehart update
Date: Sat, 13 Dec 2003 11:21:02 -0500

I may have to try the 2-56 size screw, as I do sometimes have trouble with the 4-40 size. Some cans are easier to work with and drill and tap the screw holes than others. I always use the brass screws, and solder directly to the brass. I usually cut the screw heads off the brass after tightening them down and before soldering.

From: "Ronnie Davis" <rdavis24@carolina.rr.com>
Date: Sat, 13 Dec 2003 20:07:37 -0500
Subject: [R-390] Capehart Update

Well got a late start today, but managed to get the filter caps done C603 and C606. This was a learning experience as one might say. After I got several emails from list members, I decided to give it a try. Once I got the can off, I could tell for sure that it needed to be redone due to all the corrosion in the bottom on two lugs. The other one was not as bad but when ahead and done it also. After I got the things cleaned up and the caps soldered on, I had to put them back in the radio to see if I did something wrong. Well all worked, and matter of fact it works the best now that I have heard it so far. Pulled the caps back out and put some JB Weld on the cans and put them in C-Clamps for the night. Hope the JB Weld holds good. Not quite as bad as I thought it would be but it was a major job for a beginner like myself. Glad its done, hope its awhile before I do another set hi. I want to Thank Walter, Adam, Al, Tom and several other list members for all the help, could have not done it without the help. Well looks like its on to
the IF Deck now.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Mon, 10 Nov 2003 08:49:53 -0600
Subject: [R-390] Another isolation transformer question

Please indulge me one more question. Are there any problems connecting the transformer as in the schematic at the bottom of the following page?

http://members.aol.com/n4buq/r390a/

I'm thinking it might be nice to have two different output levels from the same transformer. I thought about a switching system, but this seems simpler. Of course, grounds, fuse, etc., will be included, just not shown here.

Date: Mon, 10 Nov 2003 11:12:49 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Another isolation transformer question

(Secondaries are connected in parallel at both the 115 and 120 volt points):

I think that will work fine.

From: "K3PID" <k3pid@comcast.net>
Date: Sun, 14 Dec 2003 10:57:01 -0600
Subject: [R-390] Sneaky Devil

I am working on the power supply for my R-390 undoing a sloppy solid state "upgrade" by restoring the rectifier tubes. I couldn't find the heater wires that run from the transformer to the two sockets although I was certain that they had to be there. The lacing was intact and didn't look like it was disturbed but the wires were nowhere to be seen....the sneaky devil had clipped them off and tucked them into the harness! I had to clip the harness to pull them out.... Now of course I will have to replace the lacing on the harness..... Oh the joy of restoration.

PS: I haven't laced a cable in about 35 years but I am actually looking forward to renewing that lost skill (Art?).-

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Date: Tue, 16 Dec 2003 11:52:03 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390 J-104

>Looking for a J-104 connector. This is the power connector on the back of
>the R-390. Does anyone have a spare that would like to sell?

If you mean the chassis mounted connector that is part of the radio, that is an integral part of the line filter. You will have to dis-assemble the line filter to get the old one out if it is still there. Or if it is missing, very likely the line filter is also gone. No doubt removed by some fool who thought the bypass caps were "leaking" when in fact they were not. (Half the line voltage on your chassis means the thing is not properly grounded, it does not mean that the caps are leaking.) One reasonable alternative is to make up a small metal plate to mount a common IEC "computer type" power receptacle that has RF filtering built in if you want it. It can mount with the same holes used for the original line filter so if you ever find a filter complete, you can retro fit the original part. If you mean the cord mounted connector that plugs into the radio, that is a different thing. Be careful because there are VERY similar looking connectors that will NOT work. Important points are the number and sex of contacts, and especially the sex of the central locking screw. It needs to be either male or female to mate correctly with the connector on the line filter.. make sure you know which is which if you should run into a connector at a hamfest. I have about 4 I bought that are the wrong kind.. heheh In any case, the place to ask for these, either a compatible separate chassis mount connector or the line cord mounted one is:

> >William Perry Company
> >92 Beechwood Rd. (Rear)
> >Louisville, KY 40207
> >502-893-8724
>No web site that I know of.
>Email reported 7/03: wmperry@covad.net
>
>
>You call him or send him a note.

>Then you wait a few days and in your mail box will show up the right
>connectors.
>Then you send him a check.. Simple.
>
>"The William Perry Company is a wholesale electronic surplus company
>located in Louisville, KY. We are a family owned and operated business
>that has been around for over 35 years. We specialize in wholesale
>electronic surplus, scrap metal, resistors, military connectors and
>commercial connectors. Connector manufacturers include: Amphenol,
>Bendix, Cannon, Burndy, Cinch and Winchester.

Available series
>types in inventory:MS3110, MS3112, MS3116, MS3120, MS3122,
MS3126,
>MS3102A, MS3106A, MS3106B, MS3102E, MS3106E, MS3108E, PT-BT-
KPT,
>PTSE-BTSE-KPSE, 97 A/B, CA E/R, D-SUB, STANDARD K, 17, 26, 57, 67,
165 and 48 series, dust caps, bushings, cable clamps, contacts, co-axels,
strain
>reliefs, tools and much more!
>
>We can be reached with orders or inquiries at 502-893-8724 or fax
number-
>502-893-9220. We are located at 702 Beechwood Road, Louisville,
Kentucky
>40207."

From: "Bruce Ussery" <wa4zlk@acer-access.com>
Date: Tue, 20 Jan 2004 00:07:24 -0800
Subject: [R-390] R-392 microswitch

I'm trying bring this recently acquired R-392 back to life. It would work long enough to tell it's in decent shape (although the dial seems to read 10 kHz high - I may have questions about that later). But it keeps dying - dial lights and all, which I traced to the microswitch activated by a cam on the main function switch. I've got the beast extracted, and it acts like it might be fixable if I can get into it and clean the contact. I've pried the seam with an X-acto pretty firmly but no luck yet. Was just wondering if there's a secret method, or do I just need to pry harder. Don't want to get in a hurry and trash it with no spare in sight. It seems somewhat free all the way around the seam. Is this the same switch that sticks ON on the R-390A? (Don't have one of those yet.) I'll take it to work tomorrow and look at it better under a microscope. Yikes.. it's already tomorrow...

From: "Bruce Ussery" <wa4zlk@acer-access.com>
Subject: Re: [R-390] R-392 microswitch
Date: Tue, 20 Jan 2004 12:51:05 -0800

> Subject: Re: [R-390] R-392 microswitch
>I have repaired a number of these from the R-390/390A radios. I assume the >R392 is the same. You just have to pry harder to get the lid off. If you look >carefully you will se there are a couple of studs that also hold it on. When you >get it off make a careful note of where all the parts go before you disassemble it >to clean it. The usual failure mode of this is "stuck on". I don't know that I have >struck the mode you have but you will find out when you open it.

Under a microscope the little pins (about .040 in. dia.) holding the lid on became obvious. They are flush with the body so easily missed, especially late at night with tired eyes. I pushed them further in with a sharp tool and it came right apart. The contacts looked nasty but cleaned right up. Contact resistance now reads about 10 milliohms consistently instead of many ohms. Now I just have to decide the best way to close it back up since the little pins are pushed into the body forever. And should I leave the contacts dry or maybe add a dab of Deoxit? Thanks, Bruce

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From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Fri, 23 Jan 2004 18:48:59 -0500
Subject: [R-390] RE: Intial Power up ofa R30A Radio

> " I have heard that I should check the 2 capacitor cans and verify they
>are good & functional due to the possibility they could be dried out or
>shorted which can lead to damaging the Collins mechanical filters for
>the band the radio is set to when powered up. "

The capacitor whose failure can damage the mechanical filters is C-553. It is located under the IF module and has one end connected to the bandwidth switch. A friend of mine toasted a couple of his filters when that cap failed.The mechanical filters are expensive and hard to find; replacing C-553 is cheap insurance.

The two can capacitors may need to be reformed by current-limited application of voltage. They are especially prone to failure if branded General Instrument. I had one fail and take out a resistor in the audio module, badly scorching the under chassis circuit board.

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Tube Shields/Temperature Instrumentation
Date: Sun, 21 Mar 2004 11:26:57 -0600

Don't forget that a 5% drop in line voltage is a 10% drop in power. Try an adjustable line voltage and see where the set begins to lose sensitivity. Could we get a report from those who use a Variac to gently start their radios? Dig out a six (or 12) volt 2 amp filament transformer and buck that line voltage back a bit. Add a fan and the shields won't matter. The R-390 series was designed for a wide range of line voltage. The heat-removing shield is only required at the high end. Thoughts for a cold spring day.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Mon, 22 Mar 2004 18:40:39 -0500
Subject: [R-390] RE: More Tube Shields/Temperature

<snip> Try an adjustable line voltage and see where the set begins to lose >sensitivity. Could we get a report from those who use a Variac to gently start >their radios?

I run the R-390A at the far end of a long circuit and with a space heater also occasionally on that circuit I measure 100v . Not really a Variac per se, just a heavily bled series resistance , I guess. Under the aforementioned conditions I measure 4.6v on the 6.3v (nominal) tube heater bus. Voltage that low could cause tube cathode deterioration. Per my unscientific evaluation technique, sensitivity does not seem to be affected, but maximum audio output level is significantly reduced.

From: "Michael Murphy" <mjmurphy45@comcast.net>
Date: Fri, 9 Apr 2004 11:16:39 -0400
Subject: [R-390] R390A Basics Finished

Well folks, I have finally completed the basics on my 1960 Stewart Warner. This radio had good synchronization and basically worked on all bands like a normal radio. All tubes were tested as good. I had five problems which were driving me nuts:

- 1. The classic stuck ON power microswitch
- 2. I had a weak band (8-16 MHz) with no antenna trimmer action
- 3. Sensitivity to varying wildly day to day. Shorting the hot plate trimmer
  on the RF coils to ground (Z20x series) would temporarily fix the problem - spark!.
- 4. Cal signals weak.
- 5. I had a a weird audio gain control problem at the top of the range and
  generally low audio gain.

Anyway, I did the did the basic IF Module and Audio Module cap and resistor changeouts and pulled the front panel and did the RF Deck. The power supply was inspected but not touched. 149.9 Volts on E-607. I also did the typical gearset cleaning using Mystery Oill and a lube with Mobil-One. The thing was reassembled. I then did a quick tune up per the manual.

The results: Main AC Microswitch - The stuck microswitch was indeed stuck but after removing it and inspecting it, the contacts were not fused; the u-shaped flopper was not flopping. A slight bend to the spring metal that pushes it fixed the problem. I cleaned the contacts and re-assembled it, testing for contact action as I performed each step. By the way, this switch can be
installed backwards and it actually still functions. The power wires will be on the wrong side of the switch! <snip>

From: DJED1@aol.com
Date: Fri, 16 Apr 2004 15:38:31 EDT
Subject: [R-390] Microswitch replacement

I began having problems with the microswitch in my R-390A failing to turn off the radio.   After disassembling and playing with the switch twice, I called Fair Radio to see if I could get a replacement.   The answer was yes, but at $10 each.   I ordered two since I assumed they were clipped from rigs that couldn't be salvaged.   I was pleasantly surprised to receive two NOS switches which has never been soldered.   So now I've got a spare to leave to the next generation.   I also took the oportunity while I had the radio apart to tweak the calibration and end point on the Cosmos PTO I have installed.   Nice smooth tuning but the calibration seems to drift after a couple of years.   Now I can enjoy the radio for the next several years.

Date: Fri, 16 Apr 2004 14:59:50 -0500
From: Dave Merrill <r390a@rcn.com>
Subject: Re: [R-390] Microswitch replacement

Are you sure they are "new OLD stock" or do they look more recently made? Same manufacturer as the original? It sure would be nice to find a current stock replacement.

From: "Robert Nickels" <w9ran@oneradio.net>
Subject: Re: [R-390] Microswitch replacement
Date: Fri, 16 Apr 2004 22:05:55 -0500

I work for Honeywell Sensing and Control, makers then and now of the Original MICROSWITCH. I don't have the exact cross-reference p/n in hand, but you can still buy an equivalent switch brand-new from (where else?) Allied Electronics. I think you'll find what you need on page 666-667 of their catalog:

http://www.alliedelec.com/catalog/pf.asp?FN=667.pdf

I think they do have a minimum order but if you can't find ways to spend money outta the Allied catalog, I can't help!

Date: Fri, 16 Apr 2004 23:11:22 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Microswitch replacement

Sorry you can only download the MicroSwitch service pack *if* you have a current support agreement in place and are the listed support administrator for your site. In addition any benchmarking using the contents is strictly forbidden unless authorized in writing ....

It's pretty common to have an "extra" switch position. Generally it shows up past the CAL position. It was put there to allow you to turn on the SSB option if I remember correctly ....The *big* thing to do when you replace the microswitch is to make sure that it's nice and tight. You want a good positive action on the switch. If it loosens up you can get a partial closure. This is a really fast way to kill your nice new switch ....

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Microswitch replacement
Date: Fri, 16 Apr 2004 23:59:19 -0400

I took a look at the pages mentioned below and didn't see any pin plunger style microswitches that match the fit and form of the type used in the 390's.

From: DJED1@aol.com
Date: Sat, 17 Apr 2004 20:14:49 EDT
Subject: Re: [R-390] Microswitch replacement

They were identical to the one in the radio, so I'm assuming they were old spares. I couldn't fine anything else with the four mounting holes that the original switches have.

From: "Lee Bahr" <pulsarxp@earthlink.net>
Date: Sat, 24 Apr 2004 23:11:32 -0500
Subject: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

I'm about ready to take my Dremmel Tool out and cut my C603 and C606 power supply filter caps open to RECAP them from my "cap kit". If I screw them up on my first go round, how hard is it to find replacement cores to try it all over again if I fail the first time? Are they available? It would make me feel a lot better knowing they are not impossible to locate or I had spares if I did screw them up. Anybody have any units bad or good available? (I've got many can electrolytics, but none that plug in. In fact I have never seen any like this before. But then, I am new to R-390A restoration). Lee, w0vt

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Date: Sun, 25 Apr 2004 08:49:05 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

It is pretty hard to screw this up............ I did it because "it was there", but it is really not worth the effort. Just pull the caps and solder the replacements across the terminals.

From: ToddRoberts2001@aol.com
Date: Sun, 25 Apr 2004 09:48:11 EDT
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

I have looked into the problem of replacing the filter cans C603 and C606. The best way I have found is to buy several 8-pin Octal Base Plugs available from many sources. I bought some aluminum tubing that was a close fit to the Octal Plugs and cut a few lengths equal to the originals. The newer late-manufacture HV Electrolytics will easily fit inside the aluminum cylinders. After wiring up the caps the aluminum tubes can be glued to the Octal Base and then put a nice looking end cap or hole plug on the open end of the tubes to seal them up. I have found the 8-pin Octal plugs grip pretty tight when plugged into the octal sockets with the new lighter-weight cans so there is no need to use the clamps around the cans. You have to really tug on them to pull them out. The original heavy filter cans only had 4 pins and didn't hold very tight in the sockets and needed the clamps to stay put. The end result is a nice-looking pair of plug in caps that can be easily changed out if ever needed.

Date: Sun, 25 Apr 2004 09:49:54 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

Actually that reminds me of another way to do it. Grab a dead old octal tube and use the base to mount the new capacitors on. An old metal can octal should have just about the optimum base on it. An octal relay base would do the same thing. There's nothing very fancy about the wiring required to properly connect a power supply capacitor ...

Date: Sun, 25 Apr 2004 09:51:37 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

What is commonly available are plug in cans with octal bases on them. They don't look like the original capacitors but most of them fit just fine in the same location. Some of the cans are plastic and others are metal. I prefer the metal ones, but that's because I dig them out of the trash at work. Since the cans are square rather than circular they have more volume to stuff things in to. That makes the recap job a little easier and may allow larger capacitors to be used. Opinion is mixed on just how large a capacitor to use if you do go larger. Bigger capacitors give less ripple, narrower current spikes and higher voltages. Less ripple is good there is some debate about the higher voltages. Narrow current spikes are not a good idea. The caps that are located after a choke don't have any problems but the input capacitors do. If you decide you need to pick up some more plug in capacitors what you need to be pretty careful about is the can height. The parts in there are just about maximum height to clear the bottom cover. You don't have to worry much about value or voltage since what ever is inside is probably long dead anyway. A visit to the local ham fest is usually the best route. At one time Fair Radio would sell you an audio deck minus the connectors. I don't remember if they left the capacitors in place or not. Either way they are a likely source if you need to go mail order.

Date: Sun, 25 Apr 2004 09:22:28 -0700
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

I went whole hog on 18 sets for the ones I am rebuilding. cut the cans open on an engine lathe, cut off the ends of the old ones, stripped out the guts, boiled the cans to loosen up the crud, then scraped them clean on the inside. Then had to squeeze one of the 0.47ufd in a vise to fit in the can. Drilled the pins and inserted small brass screws to solder to. Sealed the cans with JB weld and had adhesive labels made to state the value and date done. Would I do it again NO WAY. My choice would be Frontier Capacitor who does them for about $40.00 each with a guarantee. No these are not for sale. I have a few labels left, silver with black lettering. They say rebuilt by KN6DI on them.

Date: Sun, 25 Apr 2004 15:01:46 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

BTW, Antique Radio has replacement electrolytics for the 75S receivers. They are $29 or so. Worthwhile because the can is too small to rebuild and there is very little room in the power supply section of the chassis to fit three replacement capacitors.

From: "Lee Bahr" <pulsarxp@earthlink.net>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606
Date: Sun, 25 Apr 2004 15:28:05 -0500

I want to thank everyone on the reflector for their help given regarding the C603 and C606 capacitors. Some of the help was given privately and some over the reflector. I appreciate all the response and I now know I have alternative solutions and a way out of this if I do screw up the old caps. I have decided to rebuild them myself if possible for the learning experience. If that fails, I'll use alternative A or B or C. It feels good to know I have a fix one way or another if I mess up the old caps. I was given the following advice and probably the best solution from them needs to be decided by each individual when replacing existing C603 and C606 caps in his own receiver, depending on the value of TIME, COST, SKILL, and APPEARANCE:

- 1. Rebuild the old ones, "it's easy", (cut with dremmel tool, heat can, pull guts out, clean with solvent, screw in screws into old pins, cut off screw heads and solder new caps to pin screws. Then epoxy old can head to base aligning can parts as it was before cutting apart).

- 2. Same as above but "it's difficult" and all brands of replacement caps don't fit the old can space.

- 3. Hand wire discrete caps in the radio and forget the cans, rebuilding isn't worth it.

- 4. Fit an aluminum tube sized to fit an octal tube base and make your own can to fit new caps within the tube. The 8 pins will hold the caps in place without the holding bracket as needed with the old caps.

- 5. Buy old caps from Fair Radio if they still have them to attempt solution
  #1 over again. (Fair Radio does not include these caps when buying an audio module from them).

- 6. Buy old pin caps from flea markets and rebuild them per solution #1.

- 7. Buy ready recapped C603 and C606 caps from Frontier who does this professionally.

Hank Arney says he had some labels made up with his name on them to cover up the splice area of the can after re-capping. I've been thinking for someone doing this infrequently, a person could make up his own labels by using aluminum tape used on heating/air conditioning pipes. The stuff is available at places like The Home Depot.

You could then make clear labels with black lettering to affix over the aluminum tape once it is in place over the splice. The aluminum tape sticks to metal like crazy and it is fairly heat resistive too. The joint would look very professional. Well, that's what list members sent me regarding C603 and C606. Again, I want to thank all those that took the time and responded to me. Hopefully your info will help others facing the same problem make their decision on how to best approach replacing C603 and C606.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Mon, 26 Apr 2004 18:07:13 -0400
Subject: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

>What is commonly available are plug in cans with octal bases on them. ....

Ahhhh! Man after my own heart. I'm reading this on a monitor acquired from "Curbside Computer" :) Gutted cases from square octal based relays work well also. Of benefit is that there is no black uckumpucky to dig out as with the original caps. One could also dispense with any kind of octal plug. The new caps could simply be installed under the audio deck chassis. They could also be installed from above; use radial leaded caps and insert leads through the existing chassis sockets, solder leads to terminals underneath.

>Opinion is mixed on just how large a capacitor ....

The stock value caps are probably on the large value side. Perusal of the Cost Reduction Report reveals that larger values were used to compensate for the tendency of electrolytics to reduce capacitance at very low temperatures. Drag out the fat caps for when you stick the radio in your igloo.

>Narrow current spikes are not a good idea. .....

All is copacetic in spikeland. The R-390A B+ power supply is choke input. No worries there.

>If you decide you need to pick up some more plug in capacitors ......

The 2 section cap could be a much shorter can. For uckumpractice, the first one I gutted was an octal can (not from an R-390A) about 2" tall. I didn't use that can, but it had plenty of space to accommodate a pair of 47uF, 350v radial leaded caps.

[On Fair Radio...]>Either way they are a likely source if you need to go mail order.

How about that other place further out west? They'll sell you a reformed (iffy proposition at best) NOS cap for "only" about $40. If one simply must attempt to use original or NOS electrolytics (with their original insides), it would be well to remember that the General Instrument units used in the '67 EAC contract are by far the worst.

Date: Mon, 26 Apr 2004 19:36:25 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Re: [R-390A] Electrolytic Can Filters C603 & C606

You can also buy new octal relay cases that start out empty -- if you can't find free ones or want to start up a volume operation. I think it was Jan Skirrow who was doing that and stuffing them with new electrolytics -- bought a couple of sets --- very nice.

Date: Sun, 25 Jul 2004 22:42:08 -0400
From: Bob Camp <ham@cq.nu>
Subject: [R-390] Power Transformers

One of the things that there "are no more of" is the power transformers in our favorite radio. Given the way they made these we are unlikely to get together and make up a batch of them. Obviously this is not the only part in the radio that might be in this category ten or twenty years from now. Let's just focus on the power transformer right now.

I have never seen a R-390 with a blown power transformer. How common is power transformer failure in these radios? Certainly it is not in the top ten or even the top 20 observed failures. That alone is an encouraging thing. It is especially encouraging when I compare it to the number of computer power supplies I seem to see.

There are things we can do to lengthen the life of the transformers we have *if* it's an issue. All of these things have an impact so you really don't want to fix one thing only to break another. So, has anybody ever seen a blown power transformer in one of these radios? If so do you have any idea what caused it to fail?

Date: Sun, 25 Jul 2004 22:52:55 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-1051

This is from about ten years later but I suspect it is also relevant to the comparison. The first R-390A I ever played with I picked up with at Fair Radio in about 1972. It was a Saturday morning and business was slow in Lima. We went back to an warehouse that was full of an enormous pile of R-390A's. I picked one out and we carted it back to the main office to run it through a basic check before I drove it back to Rochester. Along the way we passed a stack of these odd radios with a bunch of knobs on them. At the time I had no idea what they could be, but I have sense figured out they were R-1051's. The stack was pretty good sized, but no where near as big as the R-390 stack. I asked about them and the comment that came back was "FMS (Foreign Military Sales) nobody seems to want them in this country". The 1051 has been suffering by comparison with the R-390 for a long time ....

Date: Sun, 25 Jul 2004 22:01:18 -0500
From: "Don and Diana Cunningham" <wb5hak@sirinet.net>
Subject: Re: [R-390] Power Transformers

Fair Radio still shows them on their website for $25, unless they have run out and haven't fixed the site yet.

Date: Mon, 26 Jul 2004 08:12:54 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: Re: [R-390] Power Transformers

The power transformers can go bad in a certain way. I have a '62 Imperial-Tel. Before pitching the transformer in the *hit can, I used a screwdriver and chizzled off the back plate and removed the potting near the plate voltage leads. The potting had carbon tracked across the little porcelan feed-through bushings. There was a dead short. The repair was easy. Break out the tubes and replace with good insulated hook-up wire, then melt the potting back in. Be sure to do both HV bushings.

Date: Mon, 26 Jul 2004 08:55:24 -0400
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Power Transformers

If for some reason Fair Radio is no longer supplying R-390/R-390A power transformers (they are different), I have a number of them I could part with for the same price, $25 (plus shipping).

Date: Mon, 26 Jul 2004 16:19:02 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Power Transformers

<snipped> >So, has anybody ever seen a blown power transformer in one of
>these radios? If so do you have any idea what caused it to fail?

The only "failure" that I have personally witnessed is emanation of a loud acoustic hum. The transformer in my '67 EAC exhibits that behavior, but electrically all is copacetic. I had heard of a remedy consisting of baking the transformer at sufficiently high temperature to reflow the internal tar. After removal of the rectifier bracket and associated wiring I tried baking for about an hour at 250 degrees F IIRC. Small amounts of tar leaked out of a corner proving that the tar had liquefied. After cooling, I powered the transformer (no load) and it still hummed loudly. I tried baking several times again with transformer in various positions and it still hummed upon subsequent test. My final "solution" was to loosen the 6 captive mounting screws a turn or two and stuff an old glove between the transformer and the table upon which the receiver sits. That acoustic isolation damped the sound down to an acceptable level and has worked well for at least 15 years now. I have read anectdotal reports of dielectric failure of the rubber feedthroughs for the high voltage terminals. Those were repaired IIRC by replacement with insulating tubing.

Date: Mon, 26 Jul 2004 16:54:19 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Power Transformers

Yes. - Use a line voltage reducing transformer.
- Apply a fan to any non-A type radio (R-390, R-391, R-389)
- Install a line inrush current reducer
- (Do NOT run your radios on a variac that can get turned up past your line voltage
inadvertently.)

>So, has anybody ever seen a blown power transformer in one of these radios?

Nope.

Date: Mon, 26 Jul 2004 20:33:12 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Power Transformers

Well here are a couple of ideas. As far as I can tell they are not really needed at this point. We don't seem to have very many failed power transformers out there. At the moment there also seem to be a reasonable supply of replacements at reasonable prices. Seems like this may be something the list will need to deal with in another few decades. Here are a couple of ideas 20 years ahead of the need:

1) Since we don't run the heaters on the crystals any more (oven switch always off) we don't need as much current into the transformer. We should be able to drop the main line fuse to about 2/3 of it's specified value.

2) The mod you mentioned is one I had forgotten about. Fusing the high

voltage is a good idea. If the fuse was in the return tap it should blow when the high voltage arced inside the transformer.

3) A MOV on the primary, or on the high voltage secondary is a cheap way to reduce the insulator flash over failures. They are cheap and fairly small. I don't see a down side in using one.

Transformers are amazingly good at handling short duration over current/over power situations. Long term overload will over temp the insulation and once the insulation goes you are in trouble. There's my ideas. We'll know if they are needed in a 20 or 30 years. See you then!

Date: Thu, 29 Jul 2004 10:46:23 -0700
From: "Marshall M. Dues" <mmdues@hal-pc.org>
Subject: [R-390] Re: reforming electrolytics per MIL-HDBK-1131A

Thanks for the heads up on reforming electrolytics. I found it at the following URL: http://www.dscc.dla.mil/Downloads/MilSpec/Docs/MIL-HDBK-1131/hb1131.pdf I found it interesting that they recommending discarding electrolytics that are older than 12 to 15 years old.

Date: Fri, 30 Jul 2004 17:15:58 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Hello

Congratulations on getting some "real" radios. You may want to take a look at http://www.hausernet.com/r390a/

For a copy of the Y2K version of the R390A manual. It is posted on Barry's site and he's a regular here on the list. There are also scanned copies of most of the military manuals available for download at various places on the net. You might also want to check out http://www.r390a.com/ as a good starting point for a lot of R-390 information. I would not worry about finding any 26Z5's. The military started replacing them with solid state diodes quite a while back. These days there isn't a lot of price difference between low voltage and high voltage diodes so I would go with 1KV rated diodes. The same applies to the cost of low current versus high current diodes. I would go for something like 3 amp parts. Both of those ratings are overkill but the 25 cent price difference probably won't impact your lifestyle to severely. <snip>

Date: Sat, 07 Aug 2004 18:33:31 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Halloween Set

Main power to the radio is controlled by a microswitch ganged to the function switch shaft. It is fairly common for this little item to weld it's self in the on position. Last time I had a problem with one of these I got the parts from somebody on the list. It was either David Medley or Hank. The fix is not to hard except you have to unmount the front panel to get at the switch. It's a little time consuming is all. When you mount the new one you want to make sure it's snug on the mount so it goes full on / full off. If it gets loose it may weld again. The flashing is a bit odd. Other than the heater thermostat in the crystal oven I can't think of anything in the pilot light circuit that would cycle. You may have a bad wire from the power transformer to the filaments. It's P111 / J111 in the Y2K manual. You might also make sure the "ovens" switch on the back of the radio is set to off. Everything about these radios is fixable. I do not know of any parts that are in the "can't get or replace them" category. Dive on in and see what's wrong. They were designed to be repaired.

Date: Sat, 7 Aug 2004 18:41:56 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Halloween Set

No Bob, Don't get going on the micro switch! That could be worse than the ballast blast.

Date: Tue, 17 Aug 2004 18:22:00 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] 400 cycle ac

A lot of times an old 400 cycle powered military or aircraft radio can be made to operate on single phase AC power by replacing the power transformer with a single phase 60 cycle unit. Voltages do not have to be exact but close. The filter cap value will need increased. The transformer will be larger and present a size problem. Usually an external power supply is homebrewed.

Date: Thu, 7 Oct 2004 23:58:24 +0800
From: face@netunltd.com.au
Subject: [R-390] R390 Posts HT Dropper, HT AC regulator

A better way to reduce HT on the 390A after Si diode replacement, an idea for a simple HT voltage regulator and an introduction .... "Fresh Grist to the Mill" from Perth, Western Australia

Hi. I am new to the R390 chat scene and as this is my 1st post to anyone on the i/net... please bear with me if I don't seem very polished. I bought my R390A around 1974 (Capehart S/N 1881) Although I have maintained and used many professional brands of radio gear since the days of valves, my R390A still amazes me with its depth of mechanical and radio engineering know-how as well as its fine performance My R390A came, I believe, from our NW Cape, U.S. submarine comms station ALONG WITH A BOX OF UNUSED, BRAND NEW SPARES , including all the ovened bits !   sadly, though the deal was ALL the spares, the set of boxed valves (tubes), spare XTALS and mech filters were missing after I paid my A$400 for it.. I am still waiting for them !! Only other thing amiss was the dial lock mechanism and knob. My R390A had been in a rack with others and had stayed on one fixed frequency throughout its working life. The guy that sold it to me claimed it had frozen in position and he had to remove it to free the dial ! The unit had both the top and bottom covers missing, probably to keep it cooler in the rack with its hot brothers stashed top and bottom of it. My unit is still in its original condition, but hasnt been used since I changed location some 2 years ago. I Have obtained a 50 ft pole so hope to have another LW + Vertical antenna strung up soon and be back to marvelling at its performance. I will take advantage of all the excellent knowledge you fine fellows have passed on and shall replace problem caps first as you suggest. Now to the more interesting bits:

So far all the mods I have seen to reduce too high an HT after replacing valve rectifier with Si diodes are as follows.

1. Put a buck transformer in series with the line

2. Put a drop resistor in the HT line, after the filter caps.

1. (bucking xformer) is the neatest approach, it needs no mods to the R390 proper.
This is an excellent approach when the line voltage is too high (I used this in my own R390 as our line voltage in WA goes up to 275 Volt in places !!!).
BUT for simply reducing the effects of too high HT due to diode replacement, (when line voltage normal) it will also REDUCE THE FILAMENT VOLTAGES in the same ratio ! Not too good for maintaining valve life as it could wind up poisoning the filaments. It reduces the performance of the set by reducing tube Gm as well.

2. (Series res in HT line.)
Ok, but if placed after the HT filter cap, it adds to the internalresistance of the HT line and can affect performance on strong signals or high audio levels due to HT fluctuating with signal level. Putting it before the filter cap is better and protects cap from excess surge current at switch on as well. Even better, put resistors, one each in series with diode anodes to HT wire ends of HT transformer, halfing power dissipation of each resistor. (saves money,too)

BUT you have to be careful installing the resistor(s) in this above situation as they are at full HT potential to chassis and add to the hazards of servicing. A better way is to lift the centre tap (CT) of HT pwr transformer secondary winding from chassis, and place a power resistor between this CT wire and chassis. The resistor now operates AT A LOW POTENTIAL to chassis and can be safely clamped down with an Al bracket (a square pwr resistor is handy for this), helping to heat sink the resistor and keep the under chassis temperature down a bit.

You can pick off a useful dc voltage from the ungrounded end of the resistor using another diode.. useful for activating low voltage, current stuff such as solid state additions, provided you dont exceed the total HT transformer VA specs. And if your finger accidently brushes against the exposed active end of the resistor, you wont notice it as its only at a few volts above ground! (by the amount by which you want to reduce the HT). The value of resistance will vary according to the excess Ht voltage you wish to reduce, which itself depends on your local line voltage. Simple Ohms law applies here.

I have used this approach in West Aussie with complete success many times in the distant past.

I really have not seen this posted before anywhere, at any site, but if it has been I would not be surpised. The technique was quite common over here when we had our own radio industry in the vacuum days, and I am merely passing on what used to be common place. If it saves a shock or two, then maybe its worth passing on.

REGULATING THE HT LINE:
Since we are now operating, with the above mod, at a low voltage to chassis, its quite feasable to put an AC voltage regulator (possibly using a couple of Lm317 V regs) to keep the Ht constant between light and heavier Ht loadings. I have actually done this in the days of Ge transistors using a long tailed pair of transistors as the reference/control inputs, then driving a pair of cross inverted power transistors with isolating diodes. All this in series with the HT winding CT to ground. (Used in some tube fitted nucleonics counting gear... again to compensate for our high local West Aussie line voltages.. up to 270V AC here, remember!)

If there is any interest in the HT ac regulator, I might knock one up and fit it to my R390 when I get a chance, then pass on the circuit to others.

Hope this note has been of some interest to other R390 admirers.

Addendum:

Been observing feedback comment on running tubes on DC. Read an article in an old Wireless World once, (by 'Free Grid'), that valve radios which had been running prior on dc line supplies had a high failure rate (open filaments), when changeover to AC line occurred. (early 30's ??) It seemed that running heaters on Dc for a period crystalised the heater material and when put onto AC they didnt like it.

John R. Byers (face@netunltd.com.au <mailto:face@netunltd.com.au>)

Date: Fri, 08 Oct 2004 06:07:49 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R390 Posts HT Dropper, HT AC regulator

Hmmmm .... It appears the inflationary trend in mains voltage is being perpetrated by a worldwide conspiracy. Oh yeah, they'll say they had to pump up the voltage to force the juice through the lines and reduce strain on old power lines due to increasing current draw downstream - or something like that. Anyway, I have observed the same "up over" as you have down under. I'm located about 30 miles East of Manhattan/NY. At times of low usage -- spring and fall with moderate temperatures and low air conditioner up-time, the voltage can run as high as 127. During very hot days in the summer, I've monitored it as low as 95 V. I don't know what your "nominal voltage" is there. In the US, in the last 50 years or so, it is variously advertised at 110, 115, 120, rarely "125", and sometimes (as spec'd on the '390 I believe) the odd figure of "117", which, I suspect was a hedge, but became popular for a time. If the ideal voltage for the '390 is truly 117, 10 volts extra may be a bit much -- as a regular diet. One question is whether you are trying to adjust for sustained high or low voltage vs. momentary fluctuations including surges and dips due to on-site activity. If it's the former, a Variac (autotransformer) can be a viable solution, providing you monitor it full time with an accurate voltmeter. For safety's sake, if the receiver is on, but not attended to, you can crank it down a bit below optimal, then tweak it when doing critical listening. Some are concerned that a slip of the wrist could sink your ship, uh , boatanchor.. The solution -- possibly chose one with a range switch -- for example, some nominal 120 vac units have range switches labeled 0-120 and 0-140. Of course, the labeling is "nominal" and is subject to the same inflation discrepancy, so the "120" may have been 120 when the supply voltage was 110 in days of yore. Now, 120 may be more like 130, but it won't be 140 plus 10-15%.

If it is a cabinet enclosed unit and does not have the switch, very often the autotransformer itself has the extra taps about 20 degrees off the end taps and you can choose the appropriate one to add a switch. Another solution is to fashion a mechanical stop which can be defeated when necessary. The advantage to using an autotransformer is that you can also use it to step up the voltage during a sustained power sag, AKA "brownout". (Definite downside to a bucking transformer) Another advantage or disadvantage, depending on your persuasion, is that it provides yet another knob and meter to enjoy.

Alternate possible solution, but a reach would be a high quality external voltage regulator/filter as is typically used with computer equipment. There are separate regulators and those combined in with battery backup. There are a number of different combinations of those. Some of the battery backups are simple and just switch over from charging the battery to running off it with the transverter. Not much use for this application. There are others that add an integrated VR circuit, but still simplistic. I believe there are some that use the battery along with VR circuitry to regulat full time, as if the battery were a glompus storage/filter capacitor. However, some and perhaps all of these are too noisy. I have not tried them. The better ones have good filtering, but they are primarily designed for use feeding computers with switching power supplies, so I don't know -- anyone try any of these? Another consideration is that some are more "twitchy" than others and may introduce some transients of their own -- along with the noise.

As long as you don't develop a habit of nervously twiddle the variac knob, they're quiet. Now before this sets off a rant that the R-390's are robust and were designed to handled wide swings in line voltage, etc., I'm referring to conditions of sustained high voltage in excess of 125, and perhaps nearly equivalent to John's ~270 observations, which may put a strain on things long term. If your line voltage runs 115-122 or something, I'd then say, well ... fuhgeddabowdit. (30 miles East of NYC, remember? ;-) and barely a stone's throw from one of the most infamous power companies on the planet, including a nuke plant that was powered up just long enough to be contaminated, but never went on line. Yeah, it coulda' been woise. If there were a problem at that plant, it would have been almost impossible to get off "Lone Guylund". The evacuation plans were evaluated after they built the thing, in the aftermath of Three Mile Island. We should probably build all our nuke plants down under and pipe the juice in. The locals don't seem to mind the our subs -- or maybe they do. Are they stationed there for strategic reasons -- or where they exiled?) All that was OT, but safely isolated in parentheses. Which reminds me to remind you that autotransformers are not isolated which is not a problem driving transformered equipment, but bear in mind if you "borrow it" for some other project. Well, I wrote way too much again, so will now submerge for another six month stealth tour.

Date: Sun, 10 Oct 2004 17:50:35 +0800
From: face@netunltd.com.au
Subject: [R-390] R390 Posts: Excess line input voltage Noise Figures

First, thanks to Bill,Barry and Cecil for their replies and advice.. It's nice to feel wanted. Aint the net great!! Aplogies too, for inadvertently replying to Barry alone and not via the administrator. In my inexperience I simply replied to Barry's email, thinking it would also go to mailman. Wrong again, John!
So I shall reply to you all by re typing and re submitting this condensed version and sending it correctly ..... serves me right !

EXCESS LINE VOLTAGE TO R390A
Barry replied by suggesting I use a variac in front and twiddle the knob to maintain line constancy. (tongue in cheek, maybe?). I replied that I had solved this problem by (first) using a servo feedback motorised variac with a front panel screwdriver adj. When this broke down on me I used a constant voltage, ferroresonant transformer, (CVT) with sine wave output option (an Advance Model CVN230A) This gave a very well regulated, transient free 230v AC constant output to run my R390A and allowed me to remove the line bucking transformer previously installed.. Barry's reply was that he uses a similar CVT, but that it 'ran hot' and was noisy, which I take to be lamination buzz.

REPLY: Barry, if your CVT is not actually faulty, thats usually caused by not running the CVT at, or close to, its rated output current. These things are designed to run under a load close to the rated maximum output and literally shake themselves to bits when they aren't. ! Not only do the darn things then run hot, they add a whacking big amount on your electricity bill !!!!

Mine has a max rated output of 230W with a power factor of 1.0. The R390A is rated at 225W which matches it pretty well. My CVT then runs quiet and cool . You wouldnt know it was there. One of the big advantages of running a CVT in front of the R390 is its ability to suck out damaging line transients. I made up a box adding silicon carbide voltage supressors to go across inputs and outputs when I first used this thing, but removed them as they wern't needed, even in the electrically noisy environment I was in before moving house (was on a main industrial line feed 50 ft behind a pole mounted line boost transformer). Also, they were only 275 v rated and was scared they would smoke out on the frequent high line peaks I had then (275v RMS measured when quiet !!!).

Barry also replied that servo controlled variacs often fail because of brush wear tracking carbon dust over a small segment of the winding due to motor hunt when stabilizing. A valid and sensible point , Barry! I will check mine out next time I find it. (Its buried neath a near ton of gear forced into a garden shed. Moving from a five bedroom house with three large rear sheds to a 2 bedroom plus garden shed forced the loss of a pile of

good gear..but i'm sure thats still around. Methinks a servo'd Variac in front of my CVT would make a 'cool'
combination for my R390A.

Not everyone out there's got that sort of gear to hand, though. Nor does it solve the over high HT when changing to Si diodes.
===
Bill suggested that high HT does not impact on R390 performance much.

REPLY: That may well be so. Probably because of the R390 remote cut of valves used in the RF/IF stages, necessary for AGC. I remember, as a student, being given the task of designing a VTVM, though transistors were plentiful enough then, but expensive. If my memory is reliable on this, I found that the sharp cut off twin triode (12AX7) initially used, DC drifted a lot, but a wider grid base 12AU7 fixed the probem. (same pinout) Seems that sharp cut off types had a 'u' more dependant on small changes of anode current than the others. Could be that pentodes have the same characteristics and the remote cut off types used in the RF/IF stages of the R390 don't worry too much about stability of HT supplies. Bill could be quite right there.

BUT: ....they will run hotter !!! (as will all the dropping resistors in the HT chain) We should be kind to our bottles and keep dissapation down. Hence I think keeping HT at the recommended level by Collins is probably a neat thing to do. Less stress on the filter caps too.

Bill suggested that my suggested mod of placing a resistor in the CT return of the HT transformer would increase stress on the (winding) insulation.
REPLY: The voltage across this resistor to chassis is going to be around 20 to 50 volt, at a guess. (depends on line voltage and R390 settings and condition). The transformer insulation is factory tested to some 2,000v, usually for one minute. An increase of 50v is not going to cause a surgeon generals health warning here. But, the measured voltage between the end of the resistor (chassis) and
the outer end of each secondary winding is still the same. There's no algabraically added voltage between transformer winding and core. All we have done is add a few ohms exrtra to the secondary winding resistance. The AC voltage drop across it isnt added to the AC secondary voltage, it becomes part of it. There is still the same voltage as before across the secondary windings and between them and core. The stored charge on the capacitive input filter used on the R390 takes care of worsened transformer regulation due to increased resistive losses in the xformer winding. It's the relatively low voltage across this proposed dropping resistor which seems so attractive to me for regulating the HT voltage to a fixed setting, independent of AC line and R390 load current (within reason, anyway). If the needed voltage drop acroos this 'R' is more than ,

say an LM317/337 max rating, we just add a couple of rated Zeners in series to drop it to a safer value to use. Furthermore, with good, working vacuum bottles getting scarcer to get (certainly the case in Aussie) it does seem that preserving tube working life would be enhanced by ensuring operation inside specs.

So far as my R390 is concerened, all this is armchair theorising on my part. I havn't had to do a thing to it since buying it. So until I get my hands dirty and actually do the above mods, I will be taking all your advice thus far to heart and thank you all for contributing. <snip>

Date: Sun, 10 Oct 2004 11:18:23 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R390 Posts: Excess line input voltage Noise Figures

Excellent documentation .. just a bit of clarification on my input .. ("B:")

EXCESS LINE VOLTAGE TO R390A
Barry replied by suggesting I use a variac in front and twiddle the knob to maintain line constancy. (tongue in cheek, maybe?).

B: Yes 'n no. (no - not a flip-flopper ;-) Yes, when I mentioned that using a variac with a full time voltmeter would provide yet another knob (big one) to twiddle and meter to keep (a third) eye on. ;-) Seriously though, I suggested a variac for sustained high (or low) power line voltage. For example, during the cool months, we get 127 volts here fairly consistently. However, during summer, it can go as low as 97 volts during a brownout -- announced or otherwise. Many mounted variacs have a range switch, usually 0-120 and 0-140 or similar. Some don't, but I've found almost all of the actual autotranformers inside the box have the addtional taps (usually choice of two) that would allow you to add a low range. As a safety, to protect agains a slip of the wrist, keep it on the lower setting. Also the "120" nominal or "115" can be higher than that as they were labeled assuming 115 or 120 going in.

I replied that I had solved this problem by (first) using a servo feedback motorised variac with a front panel screwdriver adj. When this broke down on me I used a constant voltage, ferroresonant transformer, (CVT) with sine wave output option (an Advance Model CVN230A) This gave a very well regulated, transient free 230v AC constant output to run my R390A and allowed me to remove the line bucking transformer previously installed..

Barry's reply was that he uses a similar CVT, but that it 'ran hot' and was noisy, which I take to be lamination buzz.

REPLY: Barry, if your CVT is not actually faulty, thats usually caused by not running the CVT at, or close to, its rated output current. These things are designed to run under a load close to the rated maximum output and literally shake themselves to bits when they arn't. ! Not only do the darn things then run hot, they add a whacking big amount on your electricity bill !!!!

B: Hmmm??!! Well, might not be so, or might be worse than I'd figured. See next comment.

Mine has a max rated output of 230W with a power factor of 1.0. The R390A is rated at 225W which matches it pretty well. My CVT then runs quiet and cool . You wouldnt know it was there. One of the big advantages of running a CVT in front of the R390 is its ability to suck out damaging line transients.

B: The unit I was referring to is a Solar 20 amp wall-mounted unit that I bought used and had installed by an electrician. It's hard wired off the CB panel in line with one 20 amp circuit, downstream of a 20 amp breaker. This is in the office and feeds three or four PC's with CRT monitors and a big old HP IIIsi laser printer. The PC's probably draw 2-3 amps each. The laser printer varies depending upon whether it's printing or idling, or the fuser and rollers are cycling at idle. (to keep dry and prevent flat-spotting.) I think it draws about 10 amps when running, so in combination, I'm probably running close to the capacity of the CVT. It was installed about 8 years ago -- no problems, but it has always run hot and buzzes loudly. Given the amount of heat and acoustic noise it generates, you have me thinking about the possible cost. Our utility bills run high around here. As I mentioned to John, we're still paying for the nuke power plant that wasn't (Shoreham). It was just brought up enough to contaminate itself during testing before it was cancelled to Three Mile Island, and no real way to evacuate Long Island..   The Sola CVT I have appears to be the same one that Fair Radio lists for about $250. Looks small in the photo -- they're big and heavy and boatanchors in their own right.

<snipped>

Barry also replied that servo controlled variacs often fail because of brush wear tracking carbon dust over a small segment of the winding due to motor hunt when stabilizing.   A valid and sensible point , Barry! I will check mine out next time I find it. (Its buried neath a near ton of gear forced into a garden shed.

B: Before applying power to a used or long-stored variac -- or one that may have been played with, new or used, check the wiper track and clean it off with a brush. The wiper fallout tends to pack in between the exposed windings. From what I learned (on this list), they can tolerate shorting between two, maybe three windings, but more that than can result in burnout. A motorized-servo-controlled unit might be especially prone as the unit "hunts" over the same small arc repeatedly. Even with a regular variac, you'll find the buildup is much greater in one small area - where most of the adjustments are done. The plating on the copper may also be worn off which makes the carbon stick even more. The brush straddles two windings a at time to prevent intermittents as you are adjusting the thing.) Once there is smoke, it's probably too late for simply cleaning the track. Typically, a burnt out and permanently shorted unit will show a band of parallel windings with blackened insulation. Don't confuse this with the black potting material that goes all around 360 degrees where the unit was dipped.

All this depends on your line voltage and persuasion as to what degree of voltage control is needed for an R-390A. They were designed when mains voltage ran about 10 volts lower (in US), like 110 or 115. I'm looking at 126-7 most of the time. John is getting 270 vs 240 full time. He suspects a conspiracy with bulb manufacturers based on his illuminatatory experiences. I suspect a dastardly plot to make the little wheel in the watthour meter spin faster for the same amount of juice.

Of course, they'll tell me this theory is at odds with Ohm's Law -- but when was the last time anyone dissected one of those things? Also, complicating matters, at the office I have what's called a "demand" meter. It's very demanding. The deal is you pay for the peak wattage draw per 15 minute time slice, or something like that. It's digital, therefore even more suspicious than just the spinning wheel dingus.

Date: Sun, 10 Oct 2004 11:44:03 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R390 Posts: Excess line input voltage Noise Figures

<snip> The whole line voltage thing has been hashed over a number of times. The general conclusion is that the radio works a bit better with a higher line voltage. One of the several reasons we always see the radios beat the military sensitivity specifications is the higher line voltage. As long as you keep the ovens turned off the total amount of heat in the radio is well below what the military considered acceptable when the radio was designed. Cooler is always better when it comes to reliability so more heat is never good by it's self. There does not seem to be any significant evidence of major heat issues on the R390A. There are some issues on the R390 not an A in the vicinity of the high voltage regulators. That's a thread unto its self and the short answer seems to be to use a fan on the 390 not an A.

The "normal" power line load from a R390A is quite a bit less than the rated 240 watts if you have the ovens turned off. Roughly half of the power into the radio goes into the ovens if they are turned on. There are some "interesting" ratings listed on the transformers that make this a bit hard to figure out. Like a lot of things on the 390 the origin of the transformer markings has had several threads devoted to it over the years.

A 10% change in line voltage should increase the power into the radio somewhere in the 10 to 20% range. Since most of the power is going into constant current loads or constant power loads (tubes) the number is a bit closer to 10% than it is to 20%. Net heat rise may be another 10 degrees or so. That's not insignificant, but you can get more change with mounting the radio tight in a case versus well spaced out in a rack.

The US government bought a *ton* of tubes for the 390 back in the 1980's. They then proceeded to take all of the radios out of service. The net result is that there are probably enough tubes out there to keep the R390's running for another hundred years or more. The only odd exception to this is the ballast tube. I have yet to see a reasonable explanation of why they didn't also buy a ton of these as well.

Most of the heat change in the radio when you change the line voltage shows up in the tubes themselves. Plate current does not go up a lot at the higher voltage so power in the dropping resistors does not go up very much. Obviously this does not apply to the dropping resistor in series with the voltage regulator tube or to the ballast tube. However most of the impact will be on the tubes. Since we are awash in tubes this probably is not a terribly bad thing if it makes the radio work better.

Higher voltage also puts more stress on the capacitors in the radio. The capacitors that we hit the hardest are the good old paper insulated parts and the electrolytics. I have yet to see anybody recommend keeping these in the radio. The obvious conclusion is that you should replace the caps with ones that have a higher voltage rating than the originals. The mica and ceramic parts all seem to be significantly over rated in terms of voltage so they do not appear to be an issue.

Running MOV's in front of the radio is not a bad idea at all. On a radio with solid state diodes in it there is a possibility of damage. This is especially true if you are running the original fuses. (With the ovens off you can run smaller fuses). The issue is that as you have observed you need a fairly low voltage rating on the MOV's to have them do any good. A 250 volt rated part on a 120 volt line does a nice job of protecting the diodes. It also will take a *lot* of hits on a typical power line. There is a significant body of evidence that running parts this way eventually causes them to fail. When they fail they pop open. You need to be sure they are mounted in a fashion that when they have enough room around them to explode. If they don't then you wind up with a fire ...

Depending on the brand of constant voltage transformer you have running hot may not be all that unusual. One of the basic regulation techniques is to saturate the core of the transformer. You then depend on the stability of the saturation loop in the core to give you the regulation. Regardless of the load this kind of transformer is always running the core in a "hot" state. That's not to say that there aren't problems that will make it hotter than it should be, only that they tend to be hotter and louder than a normal transformer.

One thing that we do not seem to have an infinite supply of is the micro switch based power switch on the radio. It obviously works a bit harder when you have a higher line voltage. The weird thing is that the switch seems to fail when you turn the radio off rather than when you turn the radio on. Some line regulators have a nasty habit of being a bit slow to react. They tend to boost the line voltage as you drop the load. This may not be a good thing as far as the micro switch is concerned. The fix is obvious, but not terribly easy: Drop the front panel, pull the power switch and make sure the microswitch is nice and tight on the assembly. Nothing is ever simple ....

Date: Mon, 11 Oct 2004 10:00:34 +1000
From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Subject: [R-390] constant voltage transformers

A reason that I have experienced for CVT s to run hot , these units are usually ferroresonant devices and if the capacitor that resonates the transformer goes open circuit they run hot and buzz, you can check the cap easily if you have a clamp meter and measure the cap ac current or you can disconnect the cap and put your ac amp meter in series, [SOLA units are particulaly prone to this problem] but I have never known a 390 or 390A power transformer to burn out and we run them on 240volts , in Australia our power is not balanced to earth
as in the U.S. , our newtral is earthed at everyones power board and this has caused a lot of the line filters to fail due to the capacitors inside them not being desighned for this service, but i have never known anyone having trouble with the transformers . 51J rxs are a different story I have seen a number of these burn out also I have been using my recievers 390A for 25 years and I don't use the 3TF7, I have substituted 12BA6 tubes in VFO&BFO and used the 3TF7 socket as a double triode prod det as per Fundamentals of SSB handbook and a miniature relay to switch the audio lines fed from the BFO HT, so only the IF module is modded, and so when the BFO is switched off, it reverts to the original circuit, also I bought some 51J4 audio output transformers from

FairRadio and they are the same package as 390A O/P transformers BUT they are for a 6AQ5 and they have a 3 ohm as well as 600 ohm windings so I have converted the audio modules and now have heaps of audio and at the right impedence. sometimes I think people worry unnecessarily about 3TF7 s and other probs these recievers ran in service for over 20 years and I am a great believer in NOT reinventing the WHEEL HI best regards to everyone Bernie N

PS Using a HP5245 counter on the PTO I haven't been able to find any difference in rates of drift WITH OR WTHOUT the 3TF7 and in correspondence with various retired Collins engineers they reckoned the regulator in the 390A was overkill.

Date: Thu, 14 Oct 2004 13:07:15 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: [R-390] SS Rectifier Replacements

Has anyone had any experience with the Weber Copper Top solid state replacement rectifiers? I just ordered a pair to replace the 26Z5W diodes in my R-390. They are supposed to be plug in and have the same electrical drop characteristics as the vacuum tube. I was quoted a price of $10.00 each for them. That is a cheaper price than buying new tubes. The only tubes I have ever had fail in my R-390 are the 26Z5W and the 6082.

Date: Thu, 14 Oct 2004 14:16:33 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] SS Rectifier Replacements

I ordered a replacement for a 5U4 on a HQ-180 a couple of years ago, worked out very nicely. Well constructed etc. But, it was just as hot as the original tube was, so no relief from the approximately 15 watts of heat.

Date: Thu, 14 Oct 2004 14:42:59 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] SS Rectifier Replacements

Losing any heat would be desirable, but my motivation was to get rid of the failure prone 26Z5W tubes without increasing the B+ voltage and the price was right. Thanks for your input.

Date: Fri, 15 Oct 2004 19:59:17 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] SS Rectifier Replacements

Pretty much everybody has gone with common garden variety silicon diodes soldered to the back side of the tube sockets. If you want to go a little crazy you can put a resistor in-between the diodes and the input to the filter. Two or three amp 1KV diodes are pretty darn cheap these days. The current in the radio is low enough that a two amp diode is way overrated for the application. Typical parts from Digikey are in the 20 to 30 cent region per diode. About the wildest thing I can think of doing would be to put a couple of 1KV diodes in series with each other to improve the overload performance.

Date: Sun, 26 Dec 2004 10:11:07 -0500
From: Bernice & Al <saglek@videotron.ca>
Subject: Re: [R-390] 30 & 45uf caps

Have a look at this site, http://r-390a.us/filter_capacitors.htm Walter provides details on rebuilding C603 and C606. I have used his procedure with a few minor changes. I drill and tap for a 2-56 screw. I use stainless screws rather than brass to mount a solder lug to the original aluminum post. The caps are soldered to the lug. Works fine for me.I have used variations of Walters procedure on other radio restorations.

Date: Mon, 27 Dec 2004 00:15:13 +0000
From: "richard may" <richardmay@hotmail.com>
Subject: [R-390] AF Caps

Here is another ways to do it. Carefully peel back the crimp on the bottom of the can. Clip the wires and remove the tar and old caps. The best way I have found is after removing the base, boil the cap in water. You will have to dig out the mess. Once the can is clean, drive the old pins out, working from the bottom of the socket. . A wood board with a hole drilled in it makes it easy. Lay the socket on the board so that the pin will go into the hole as you dirve it out. Replace the pins with number 10 copper wire, leaving the ground pin just long enough so that when the can is replaced, the wire will not short to the can., This wire is the "piller" on which to mount the other caps. The other pins can be shorter. Once you have the new pins in place use epoxy glue on the cap side so that they will stay in place. Solder the new caps in place vertically. Replace the can and carefully bend the crimp back into place.

Sprague has available replacement axial lead caps that will fit in either the 45 or 60 mfd can. I don't remember the part number but I know that Newark Electronics and probably other major suppliers sell them.

A word of caution. DON'T plug the can into the AF deck with uncured glue. I did this and found out too late that the new copper pins slid up into the can. The second set I rebuilt, I made the pins a little long and clipped them to size once the glue was set.

Good luck, I't not as hard as it sounds.

Date: Mon, 27 Dec 2004 00:38:26 +0000
From: "richard may" <richardmay@hotmail.com>
Subject: [R-390] Re: Rebuilding Power supply cans.

You can rebuild the cans yourself. This is how I did it. I carefull removed the can by uncrimping the bottom. Once the can is loose, clip the old wires holding the can to the socket. Boil the can in water to soften the tar. Dig the can clean. Once this is done, clean the socket and drive the old pins out from the bottom. The best way toi do this is to drill a hole in a board. Place the socket on the board so that the pin will go into the hole as it is driven out. Once the pins are out, replace them with #10 solid copper wire. Oversize them on both ends for the time being. Once they in place, epoxy them into place on the top (Inside of can). The ground pin should be long but not long enough that it will short when the can is reassembled. The other pins should be cut off short but long enough that they can be soldered. Install the new caps. The completed caps should look like a christmas tree, with the long wire being the support column. Once completed, replace the can and carefully recrimp. Cut the pins to fit the socket. Good luck, It isn't as hard as it looks Richard May W8FCW

Date: Mon, 10 Jan 2005 08:08:04 -0600
From: "Dallas Lankford" <dallas@bayou.com>
Subject: Re: [R-390] Servicing Advice on Signal Generator URM-25D

<snip> And electrolytics... dare I bring up that topic again.? I think not because the doctor is probably lurking and I am not in the mood right now for a tussle. But here is a war story I don't think anyone can object to. A European friend of mine sent me his Telefunken E 1501 to fix. While fixing it I noticed that the power supply was quite noisy (loud mechanical hum). The E 1501 is modular, so I removed the power supply module to give it a look-see. While I was examining the power supply I noticed that a previous owner replaced two of the electrolytics in a misguided attempt to reduce the mechanical hum. Why have I concluded this? Because the "zipper crew" did not remove the old elctrolytics, but merely "scabbed in" the replacements. So I measured the resistsances of the old electrolytics with my DVM. They seemed fine (no shorts, no leaks, reasonably high resistance after charging for a while). Later I will actually power up the electros with a DC supply and check the m for leakage under operating voltage. If they pass that test, I will remove the replacements and restore the originals. I gave seen this kind of thing before in a Hammarulnd HQ-180A. Fortunately, that zipper crew also left the old electrolytic can in

place, and I restored it. Have fun, Dallas (ed. also posted under restoration_general)

Date: Wed, 12 Jan 2005 11:21:53 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Caps and more caps

>I must be shopping for my R-390A's at the wrong store.

Bob, anywhere you can get one is a good place. :-)

>... Electrolytics on the other hand certainly leak, ... I check ... for
>both leakage and value. ... I don't worry about the leakage until it's
>about 5X the specification. I don't see how an extra few ma of current in
>a power supply bypass cap is going to bother the radio much at all.

I will suggest a reason: Leakage in an electrolytic filter cap causes heat. Heat is the enemy of electrolytic caps, especially the old ones. The heat generated inside the cap will accelerate the degradation of the thing and hasten it's failure. This is part of the danger of "bringing it up slowly with a variac" (without monitoring the reforming/leakage current.) When an electrolytic reaches it's limit of reforming voltage, further increase in applied voltage increases the leakage current, the heat goes up and the thing leaks even more. Pow goes your transformer high voltage winding. Long live your radios.

Date: Fri, 4 Feb 2005 18:35:55 EST
From: RIKKA3TXR@aol.com
Subject: [R-390] Re: R-390 Correct B+ voltages

Sorry, a bit off topic but can any one tell me the correct B+ voltage and the best place to see it? I have a print of an original military mod. that discusses voltages exceeding 180vdc - 190vdc and installing the dropping resistor...another source 240vdc...yet another 280vdc..the Y2K manual I think is 215vdc... My line voltage is at 115vac and I have 200 ohms between T801 pin 6 and ground..V603&4 pins 5&6 are both at about 276vdc..V801&2 pin 6 is at 285 vac..The solid state mod is in the pwr. supply...The radio is working but voltages close to 300vdc just seem a bit high to me.

Date: Thu, 10 Feb 2005 21:37:48 -0500
From: "Gary E Kaufman" <gkaufman@the-planet.org>
Subject: [R-390] Weird 26Z5W variant??

It looks like Bendix made a hardened version of the 26Z5W numbered RXB-103379. Ok, don't laugh at my bid, but I grabbed a pair off of Ebay:

http://cgi.ebay.com/ws/eBayISAPI.dll?ViewItem&item=5748382448

Anyone ever see these before, or know why the military needed a hardened variant? Were these ever used in R390A's?

Date: Thu, 10 Feb 2005 21:51:24 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Weird 26Z5W variant??

Interesting, as I have "NEVER" seen any 26Z5W's that weren't Tung Sols. Possibly used in the R-648? Not sure if they used 26Z5W's or not. Les Locklear

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Date: Mon, 14 Feb 2005 11:59:08 -0500
From: "Tom Bridgers" <Tarheel6@msn.com>
Subject: [R-390] 12BW4 mod

After completing the 12BW4 mod (substituting for the 26Z5s) this weekend and plugging them in, I realized that the 12BW4 is substantially taller than the 26Z5. So much taller, I'm not sure I can put the bottom cover on without it hitting the top of the 12BW4s. Anyone else observed this, or do I have a pair of 12BW4s on steroids? By the way, the 12BW4s work great. Hello 12BW4s; goodbye 26Z5s. Thanks,

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Date: Mon, 14 Feb 2005 20:51:39 -0700
From: "Kurt" <r390auser@cox.net>
Subject: Re: [R-390] 12BW4 mod

I have done this mod and they do fit. Just barely. Find two tall tube shields. This will give you some peace of mind and protect the tubes from the bottom cover. The 12BW4's work great.

Date: Sat, 19 Feb 2005 21:18:38 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] 26Z5W Failure

Hi gang-- I leave my R-390A on 24-7-365. Yesterday, I lost all output. A quick check revealed both 26Z5W tubes didn't light. I replaced both tubes and was back in business, but I'm wondering if it is common for BOTH tubes to go out at once. Your experience? Sure, we can go silicon, but here I'm interested in how the original design worked... BTW, I guess I need a pair
of tung sols; those of you with 100 plus may want to part with some?

Date: Sat, 19 Feb 2005 17:50:48 -0500
From: "COL George D. Eveland, USA" <george-eveland@us.army.mil>

Subject: Re: [R-390] 26Z5W Failure

Gene: I've had same experience here--lost both filaments at same time....so now keep a couple of spare sets.

Date: Sat, 19 Feb 2005 18:17:00 -0500
From: "Joel Richey" <richey2@mindspring.com>
Subject: [R-390] 26Z5

Losing filament in both tubes at the same time is a little hard to believe, I think what happened since this is a full wave pwr supply you can lose one tube and the B+ stays the same value, the only difference is the ripple freq goes to 60 HZ instead of 120HZ, but the chokes and fliter caps in this RX are very good and you might not even know the difference. Might be interesting to pull one out and see if its noticable.. Joe W2DBO

Date: Sun, 20 Feb 2005 07:50:47 -0500
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] RE (r-390) 26Z5 failure

It is possible to loose one 26z5 at an earlier time and the radio operate normally. Each tube has two cathodes and two plates (four plates and four cathodes total). Both high tension leads from the power transformer are shared by each tube. If one tube goes dead, there is still full wave rectification.

Date: Mon, 21 Feb 2005 12:49:47 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 26Z5W Failure

The problem with the pair of tubes both going out at once is that there needs to be a reason. The tubes run for a good long time and rarely blow out. That makes the random chance of them both blowing at once pretty darn remote. That doesn't mean impossible, one of the list members might win the lottery this week. If we have a statistics professor still hanging around I'll let him explain that part of it.

When one of the 26Z5's goes the B+ drops but not by as much as you might think. The radio will work ok with only one tube lit up. You can verify this fairly easily by simply pulling one tube. Part of this is because the radio is designed to work down to about 90 or 100 VAC and we normally run them on 120 VAC. The filaments are more of an issue at low line voltage than the B+ ....

There have been numerous postings on radios with "a bit more hum than normal" that turned out to be one of the rectifiers (tube or solid state) being blown. Since the hum drops from 120 Hz to 60 Hz it's not as noticeable as you might think due to the radio's fast roll off in the bass region.

Since these are filament + cathode (indirectly heated) rectifiers there should be no interaction between the filament circuit and the B+ part of the circuit. Pulling lots of current on the anode or no current at all should have virtually no affect on the filament. That will hold true right up to the point you get a monster voltage surge down your house power line. At that point the cathode *could* short to the filament. This *could* pull enough current to pop the filament. .

According to the spec sheet I found the 26Z5W is rated for 1.3 KV cathode to anode, but only 450 volts from cathode to filament. Roughly a 2:1 over voltage on the AC input line could put the cathode / filament junction into trouble. A 2:1 surge isn't all that uncommon. The problem with this theory is that one tube should break over first and pull down the transformer output before the other one broke over. It's a whole lot more likely to pop the fuse or destroy the power
transformer first. It probably would be a bit hard on the first electrolytic filter capacitor as well unless you have a later build radio with a B+ fuse in it. You might want to check the value of the line fuse in your radio ...

The two filaments are wired in parallel. The voltage on one will not go up or down when you pull the other one. Unless we are dealing with space aliens here it's kind of tough to find a mechanism in the filament circuit it's self that would cause them both to to at once without taking out other tube filaments in the radio.

I in no way am disputing that both of the tubes were dead when you checked the radio. I'm simply questioning how they both got that way. If it was from a major surge then the radio may need a few other checks
...--
Date: Mon, 21 Feb 2005 18:56:48 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] 26Z5W Failure

OK, Bob, I think I see the problem now...One rectifier burns out at some time or another, the remaining tube half-waves at 60hz for a year or so, and when it finally goes, and the radio doesn't work at all, the guy that hasn't been doing the PM's on his radio says that both tubes have mysteriously failed at once! Guess I better stick my head under the rack more often to see if I still got two lit...

Date: Mon, 21 Feb 2005 14:16:01 -0500

From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] 26Z5W Failure

I have had one of the 26Z5 rectifiers go out without out affecting the other one. Don't know how long this situation went on as I only found it when I took the radio down for a complete alignment. Mine is a R-390 nonA. I had spares and installed them so the alignment could go ahead. However, upon looking at the replacement cost of a pair of 26Z5's, I purchased a pair of Copper Top replacement solid state 26Z5's from Weber's. Quite frankly, I purchased my
R-390 years ago and a pair of new 26Z5's were about the same price I paid for the radio. When I received them, I removed the vacuum tubes and installed the SS devices. There was no change the B+ after the SS device installation.

Date: Sat, 26 Feb 2005 20:52:47 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Standy or Off?

It is my understanding that "Standby" causes the HV to rise, stressing the tubes to which HV is still applied, the filter capacitors, and so on, even more than normal operation. My preference is to just leave it on all the time: no warm-up time, no additional stress, and normal operating levels everywhere.

Date: Sat, 26 Feb 2005 20:05:12 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Standy or Off?

Why use a ballast tube at all since it seems to be generally conceded that they don't do anything useful when operating from a household AC line? Replace it with a resistor or replace the 6BA6's with 12BA6's and use a jumper in the ballast tube socket; no irreversible modifications with comparable or better performance.

Date: Sun, 27 Feb 2005 03:05:19 -0000
From: "charles bolland" <ka4prf@peoplepc.com>
Subject: Re: [R-390] Standy or Off?

so far, it's four to zero - leaving the R390 on 24/7 - not in standby.

Date: Sat, 26 Feb 2005 21:20:40 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Standy or Off?

Standby is not recommended the unloaded power supply voltage rises to dangerous levels due to our line voltage being higher today than it was back in the 50's. I personally think that leaving the set on is probably best. Powering it on and off subjects the power supply to stresses each time it's powered up and the thermal cycling takes it's toll as well. The company I work for has about 1000 desktop PC.s and they have published a recommendation to all employees that those PC's should be left on 24/7 because lower failure rates have been documented in machines that are not electrically and thermally cycled. I would think that would carry over to other electronic devices as well. The 390 series was designed to run 24/7 and if you don't mind the cost of electricity that's what I would recommend.

As far as your ballast tube failures....The ballast tube undergoes it's most stress at power up. After that it should only have a barely perceivable glow. If it's brighter than that during run you may have a problem with one of the tubes it regulates. Also what is your line voltage...it may be excessively high. You may want to invest in a variac and set the line voltage to 115...everything will last longer that way....

Date: Fri, 25 Feb 2005 23:30:16 -0500
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Standy or Off?

My vote is for OFF. Put 1 in the OFF column. Thanks.

OK here's the beef..Why cook your radio? I do not use any of my radio gear enough to justify leaving anything ON. Why waste the power? Everything including the test gear gets turned OFF. Same goes for all three computers at the house and my work machine. I have been hearing this "always on" stuff for years but for me, OFF means less heat and component aging. If you want to reduce the POWER ON stress, which is the culprit that I think we are talking about, why not make the standby switch turn on only the filaments or better yet incorporate a timer relay that turns on the filaments for 2 minutes before applying the MV and HV. I made such a timer for the ART-13 power supply as a gimmick circuit. Not much to it; a relay, diode, cap and a resistor. The silly circuit has worked beyond my expectations.The 813 and two 811's which I run at 1550 V have been holding up since I put it on the air in 87. I like fans too.

Date: Sun, 27 Feb 2005 04:34:44 -0800
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] Standy or Off?

Put me in line with Mike. OFF

Date: Sun, 27 Feb 2005 11:54:02 -0500
From: Bob Camp <ham@cq.nu>

Subject: Re: [R-390] Standy or Off?

My preference would be for most radios to be turned off. Having something "smoke off" out here in the country with nobody home is an *expensive* sort thing. That has nothing to do with what's best for the radio. There is no doubt in my mind that the radios work better after a few hours of warm up. There is also no doubt in my mind that ballast tubes mostly go from power cycling or ibration. They love to be on all the time in a fixed environment.

If you are going to run a radio 24/7 there are a few things to be careful about:

1) The RFI filter is ahead of the fuse. It's well worth the effort to check it out carefully. The only thing protecting it the breaker box.

2) The line cord is a hand wired part on most of these radios. Make sure that the hot and neutral are correctly wired. The fuse and line switch should be in series with the hot lead rather than the neutral lead.

3) I must admit that not every fuse in the known universe is in stock in the basement. From time to time substitutions get made. Check both the fuses in the radio to be sure they are both the correct type and rating (no 32 volt DC fuses allowed ...). If the ovens are turned off on the radio the line fuse can be dropped in value from the normal listed value. This is a *very* good idea in this case.

4) Think about what happens if a part cooks out. Setting the radio on a box of reloading supplies probably isn't a real good idea. Properly spacing it out in a metal rack away from walls and furniture probably is a good idea.

5) Check the in the power supply. They have enough energy associated with them that they can be a problem if they go out. Fortunately they normally just drop in value rather than short out. When they get very leaky they will start to get hot and that's not good.

6) Think about where the smoke detector and radio are located (you *do* have a smoke detector in the radio room don't you?). Most smoke rises.... I will admit that in most cases this is much to do about nothing. R-390's do not burst into flames on a regular basis. The power transformers in them seem to be reliable and even if they do go the metal can is a pretty good fire barrier. Of course there is the smell. Speaking of the smell. The rectifier that drives the antenna relay is an issue. They are known to fail and when they do they both smell bad and the stuff is bad for you to breathe. If your radio still has an original rectifier in it you have a classic dilemma. Do you *really* want to replace a perfectly good working part? In general that's

not a good idea. If you don't and it goes with nobody home - wow If you run the radio 24/7 then at least disconnect the antenna during thunder storm season. R-390's are rugged radios., but RF transformers simply were not designed to take the kind of energy a near by lightning hit induces in an antenna. With a direct hit, well that's why we have home insurance .... One good thing about 24/7 operation. A warm radio is a dry radio. A lot of the strange problems in components are related to humidity issues. If you are in a high humidity area this could be a significant issue. Another thing about 24/7 operation - you are more likely to *use* the radio. This also is a very good thing.

Date: Sun, 27 Feb 2005 17:09:24 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] Variacs

Question for you men of experience: I thought I might add a variac to my shack to drop the R390 input to 108; I see there's always lots on the E-place. Any good, old, reliable, tried and true, that's the old standby brand names that I might be looking for? As always, Thanks for your advice!73 de NAOG Gene

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Date: Sun, 27 Feb 2005 13:06:06 EST
From: R390rcvr@aol.com
Subject: [R-390] Variacs

I almost always use a Variac for my boatanchors, and prefer a metered unit, with scales for both volts and amps. I also like an isolation transfomer, for a variety of reasons. For me, the easiest way to get all of this in one modest sized unit is a B&K 1653 or 1655. They are reasonably priced, and work great.

Date: Sun, 27 Feb 2005 10:26:05 -0800
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] Standy or Off?

Hi, since it's a voting situation, mine is turned off on the days when I'm not listening. I have it on about twice a week, usually all day. I've had the 390a for about 4 years - no tube failures since the initial tune-up/tube renewal, uses a 3TF7, which I've never had to replace (and that survived being in place during rough shipping). It has a filament transformer wired in to the line supply to drop the line voltage about 6 volts to about 114. This makes me feel good.... I don't know if it really makes a difference....it can't hurt and it was easy to do and others recommended it. I have a switch on my line supply transformer that lets me drop the line voltage another 6 volts to 108, put in because it was easy to do with the filament transformer I used. Maybe I should initially use this setting when I turn

the radio on to further reduce the transients on warmup and then switch to the 114 volt setting. So far I haven't bothered. I sort of assumed the rectifier warmup time would take care of such a benefit by itself. The idea that running a radio 24/7 makes it last longer is very appealing, but I think that benefit must be evaluated relative to consideration of other factors such as how often are you going to otherwise be turning it off and on, the effect of sustained temperature on all the components in the set, the power used, the heat generated in the room, and safety. I don't like leaving unattended old gear on in my home overnight, so I would probably turn the set off at night even if I used it every day, even though I consider the risk pretty small for a set like a properly
maintained 390a. That's my perspective and experience so far on the matter. I never use the Standby position and turn the radio off and on with a switch on the filament transformer box on the line supply. Dan.

Date: Sun, 27 Feb 2005 13:41:24 -0500 (EST)
From: John Lawson <jpl15@panix.com>
Subject: [R-390] On or off?

My radios are off unless I'm in the shop/shack working, or actually using the gear. Generally I'll put the R-390 on Standby when I first power up the bench, then switch it on and off that way (keeping the fils lit) until the end of the day. Same for the R-288/51J and the othe BA ham gear. During the week if I don't have time to go out into the shack the radios are off. Years ago I had a Heath DX-100 woof up the Mod Xfrmr while I was out shopping - the fumes formed an 'inversion layer' in the apartment I had at the time, and actually made a brown 'ring' on the walls and drapes... took forever to get things clean and lacquer-stench-free again. Pissed me off so much I gave the thing to the first person who would come and haul it off. As for wall-warts, I've known of more than one person who had major fires due to wall-warts failing, including one guy who lost a very valuable, and completely irreplaceable mini-computer collection when an Ethernet hub wallwart went up in his garge while no one was home... All mine, for the computer and comm stuff anyway, live in a steel box connected to a UPS - if one burns the damage will be confined to it.

Date: Sun, 27 Feb 2005 13:59:54 -0500
From: "Anthony W. DePrato" <wa4jqs@mikrotec.com>
Subject: Re: [R-390] Re - on 24/7 ?

Very Good Advice ! you talk about walwarts going up in smoke. i run the electronics dept along with a few more at an 800+ slip marina. i have over 100 handhelds i keep repaired and i have at least a half dozen or more wall chargers burn up a year. this past year i had a new handheld radio's battery pack short out and catch on fire while the guy had it clipped to his belt.. left a nice red spot before he could get it ripped off his belt.--

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Date: Sun, 27 Feb 2005 13:35:27 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Standy or Off?

Well let me clarify my position. What was asked was what the radio liked best as far as ensuring longevity. That is what I addressed. As far as my equipment I power everything down when I leave the shop. (except the PC) I probably sacrifice longevity in doing so but I have the peace of mind that I'm not exposing myself to an unnecessary risk of a fire that would take everything that is near and dear to my heart. My shop is separate from the house so you see where I am going with this. I usually go out and power up the work bench and a couple of radio's a few hours before I expect an evening of work to commence that way everything is warmed up nicely...including the shop if it's winter. I am also a little untrusting of things like my SX-28A and leaving it on unattended because the cloth wiring is showing it's age and frankly I don't
trust it. I don't worry as much about the R-390A's and the SP-600's as they are built to a higher standard to start with. I don't trust any newcomer to the shop for a while no matter the make, so they are not left unattended and powered up. I still believe if one took two otherwise identical R-390A's and placed them side by side, left one on 24/7 and only switch the other on when you sat down to listen the 24/7 would prove to be more dependable. The exception might be the radio listener that only used his radio once every couple of months....

Date: Sun, 27 Feb 2005 11:45:46 -0800
From: Buzz <buzz@softcom.net>
Subject: [R-390] Unplug, was On or off?

Back in the early '60's I worked as a Wurlitzer jukebox field repairman in the Chicago, Ill. area. Wurlitzer introduced their new stereo machine early that spring with a new stereo amp and DC power supply using diodes instead of a 5U4 and selenium rectifiers. One night in June we had severe thunderstorms north and west of the city. The next day when I came to work we had several complaints of, "no audio" so I loaded up a few spare amplifiers and hit the road to service the machines. As it turned out 18 machines had burned out diodes in the P.S. and most of the machines were turned off. One tavern owner told me that the sound went dead after a lightning strike. When I discussed my findings with my future father-in-law, who was a line engineer for Commonwealth Edison Co., he told me that it is not unusual for their sub-stations see several KV spikes on the lines during a thunderstorm and that voltage will easily jump a "off" switch and damage the equipment. Living in Reno, NV we quite often see afternoon thunder storms coming so I unplug radio equipment and antennas. I don't worry too much about the computers because they are equipped with UPS's. One day I had a nearby strike and I saw sparks falling from a nearby power pole and the bang was ear shattering. Later that evening I attempted to use my computer and I got a "no connection" message. After further investigation the modem cards on both computers had toasted resistors near the phone line connector. My thought is.... maybe some of your wall wart failures could have been due to power line spikes.

Date: Sun, 27 Feb 2005 14:59:57 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Standy or Off?

No matter what you do with boat anchors (on 24/7 or on/off) *eventually* they break if you use them. Not using them at all would be one solution to the problem. That kind of defeats the whole reason for owning them though. We all do things that have risk associated with them. We get up and drive to work. Might get in a wreck ....

Do radios typically cause fires when they break? - no they don't. Have I had a radio catch fire? - yes I have. Did the radio burn down the house? - No i was on the bench at the time and the fire self extinguished. Had the same problem with a video monitor and the same result (fire but it went out).

I also have had a lightning hit, no fire but lots of blown gear. Once had a 2,500 Amp 480 three phase breaker fail to trip and got to re-wire the left side of a building - real big mess ....

My experience is probably different than what others have seen. I certainly do run some gear 24/7. I do try to keep the amount of that gear to a minimum. Replacing a tube now and then is not all that hard. I don't like ballast tubes much so they're not an issue. Even a once every couple years dig for a real problem generally is not to bad. From what I have seen on a good radio the amount of work will be even less than that weather you run it 24/7 or power cycle it once a week. Replacing the east end of the house is a lot tougher. I won't even get into things that are harder to replace than simple possessions..

Watch out for the rant coming .....

A lot of this has to do with just how incredibly dangerous a modern house is if there is a fire. We live surrounded by all kinds of strange plastics. Even stuff made from wood has crazy stuff in the finish. A fire turns all this crud into *very* nasty stuff in a big hurry. It's amazing how little time it takes from the start of a fire to a major hazard being present. Boat anchors are not worth dying for ... Yes, it's a hot button with me - sorry for the rant ...

Date: Sun, 27 Feb 2005 15:11:15 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Unplug, was On or off?

A computer modem card and an R390 have a couple of things in common.

One is that they connect to both a power ground *and* another ground. Another is that they have to deal with some pretty low level signals at the input. A difference is that the modems are supposed to be better able to cope with overload ... It is not uncommon when there is a lightning strike for the "ground" in the whole house to rise quite a bit relative to earth ground. Your home is probably hooked to a copper ground rod with a chunk of normal electrical cable. The ground rod really isn't all that good as a low resistance ground. When the house ground bounces up to a few hundred volts anything that is hooked to another ground can get a major bunch of current through it. In the radio that's usually the antenna circuits, but it may also include odd things like the audio output. The modem is a bit more simple since there's only one line. One cute thing you can do these days is to put in a whole house surge protector. They mount at the breaker box and don't cost a massive amount of money. They will clamp the house voltage to a level that at least will not allow it to jump a switch that's turned off.

Modern gear is *supposed* to be designed for an 800V spike on the input line. That's not to say that everything is designed that way. The 800 volts comes from studies of normal home electrical systems. An 800 volt input spike could put a *lot* of voltage on the output of a R390 power transformer *if* it all got through. Of course a lot of it gets knocked out by the line filter. Even so a two or three times increase in the line voltage puts some significant voltage on the secondaries ..

Date: Fri, 4 Mar 2005 19:21:22 -0500
From: "Al Parker" <anchor@ec.rr.com>
Subject: [R-390] re: Filter cap rebuild

I haven't done the R-390(xx) one (yet) but did do a Drake R-4B one some time ago, and others. Pix & info available at:
http://www.thecompendium.net/radio/filtercap.htm
Not exactly the same, but the same principle. Hope it helps somebody, it's really not a hard process. I have also opened up and re-stuffed bathtubs from an R-388, also applicable to SP-600's, etc. I can put pix & details of that on a webpage if there's interest.

Date: Wed, 23 Mar 2005 11:51:09 -0800
From: "Dan Merz" <djmerz@3-cities.com>
Subject: [R-390] 390 non-a rectifier

Hi, I'm getting a 390 non-a back to life and am dealing with putting the missing rectifier tubes back and the missing ballast tube. I've refreshed my awareness of many of the past posts on replacing the 26z5 rectifiers with solid state, 12bw4's etc and the schemes for the ballast tube substitutions. I've decided to put a 12BH7 in for the ballast tube and tentatively grabbed the idea of putting 12bw4's in place of the 26z5, with a little rewiring required on the tube sockets. However, after looking at the 390 circuitry a little more, I realized that maybe with the 390 just putting in solid state rectifiers may be the best thing to do since the regulated B+ circuitry with the 6082 tubes/VR tube may take care of the extra voltage and immediate voltage application that seemed to be one of the disadvantages of using solid state rectifiers with the 390a. The 10 uf filter capacitor would still see the immediate voltage from the rectifiers but the rest of the radio past the 6082's would not. Am I right in thinking this way or is there still a requirement to put a 200 to 250 ohm resistor in to mediate the voltage with the 390? I didn't seem to find much about SS rectifiers being used specifically for the 390. 'm looking for one original knob to go on the antenna trimmer - a well worn one would be ok since the rest are in that condition. I think this knob is the larger type of two similar knobs?? Dan.

Date: Wed, 23 Mar 2005 15:18:22 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] 390 non-a rectifier

1) The 5651 tubes are voltage *reference* tubes and not voltage regulator tubes. They establish a stable reference voltage for the DC amplifier/regulator circuits to operate from. All the B+ current for the radio goes through the four sections of the two 6082 tubes.

2) You really should replace the eight 47 ohm 2 watt carbon resistor with higher power wire wound ones. (unless you do solid state and remove the ones in the power supply.) Four in the audio module under the 6082's and four in the power supply module.

3) I strongly recommend a fan to keep the 6082's cool. If you use solid state rectifiers they will dissipate even more heat than they would normally. And under normal conditions, they need a fan!

4) The main B+ filter cap is an oil/paper unit mounted near the front panel. It rarely fails and is likely to last forever. Right now I can't locate the voltage rating on it but I think it's above what you would get with solly state rectifiers by a safe margin.

5) I suggest you replace C608 in the regulator section. If it leaks, the regulator will not work right. It may well be a paper cap and prone to

leakage.

> or is there still a requirement to put a 200 to 250 ohm resistor in to mediate the voltage with the 390?

If you use marginal diodes, the inrush current may harm them. The resistor would reduce the peak current and make them fail less, if they might fail at all.

Date: Wed, 23 Mar 2005 17:36:44 -0800
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] 390 non-a rectifier

Roy, thanks for the perspective and tips. I see the cap at the front, C103, 10 ufd and there's C101, 10 ufd, near the power supply chassis itself, a formidable rectangular can. I did some more snooping and saw that the 47 ohm resistors in the power supply chassis are not there - don't know the story on that. The supply had bent over diodes stuffed in pin sockets when I got it but I don't know the history of this radio beyond that. I pulled the audio chassis and id'd the 47 ohm resistors there, they look good and measure 47,47,47 and 51 ohms. I suppose the 5 watt 5% variety of wirewounds would fit there and in the power supply chassis. I noticed a couple of Japanese cherry caps in the audio chassis on the vertical board so I'm not the first in there doing something.

I see what you mean about the 5651's being voltage reference tubes, they can only accommodate 3.5 ma current variation compared to the ones that I'm
more familiar with that take on all the current variation by themselves to regulate voltage. The manual has a pretty good explanation of this circuitry. I suppose considering the price of 6082's, I should be more concerned with treating them with respect than finding a sub for the 26z5's.
---*-*
Date: Thu, 24 Mar 2005 12:19:07 EST
From: DAVEINBHAM@aol.com
Subject: [R-390] R-390 Voltage Regulator

I know this is heresy, but considering the scarcity and price of 6082's, has anyone worked out a solid state regulator circuit for the R-390 ? It does not look too difficult to do, but I see no reason to reinvent the wheel if it has already been done and is in the public domain.The reason I ask is that I have just acquired a Collins R-390 from one of my former graduate students. This radio "died" twenty five years ago and has been living in his attic until he recently moved. Just what I need, another radio project.

Date: Thu, 24 Mar 2005 12:35:48 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] R-390 Voltage Regulator

IMHO, it depends on whether the radio has collector value or not, and whether you care about that value or not. Do anything you want if what you want is a working radio. Solid state devices subtract the filament power heat from the rest of the radio, so hack away at the insides. If you want to keep the set original, use an external regulated power supply. Remove the rectifier and regulator tubes to prolong life by reducing heat, but keep them with the covers for the day when other things become more important, in the hope that the set will still have collector value when the time comes to sell. Of course, the external connections to the set have to be reversible.

Date: Thu, 24 Mar 2005 22:06:15 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 Voltage Regulator

Solid stating the 6082 series regulator is not a bad idea. A plug in, no change to the receiver unit is very doable. If you have ever built a simple transistor series pass voltage regulator with zener reference power supply you can do one for the R390. There are three ways to deal with the heat sink for the transistor that will replace the 6082's.

1. Really engineer a heat sink to fit in the 6082 space.
2. Bolt a TO2 transistor to the side of the receiver with an adapter plate.
3. Use a somewhat long (2 foot) wire harness and mount the transistor on a heat sink out side the receiver (and maybe add its own fan).

First good thing is you will pull two each 6082s off line. At 16 watts each of filament power the receiver is 32 watts cooler.

Second good thing you pull the voltage regulator tube 5651.

Third good thing is a zener reference and series pass type transistor regulator will work fine.

Fourth good thing is it can all be plugged in with no drilling or modification to the receiver. This is fully reversible.

Down side is about 50 watts of power dissipated from one or two transistors. Remember operators use to fry breakfast and make coffee on these receivers. I have found more than one can of rations heating atop a receiver. Left it right there less I got shot for stealing someone's meal. The R390/A just will not get up to that heat level unless you turn the crystal oven on.

I am going to suggest some 8 pin octal relays as the starting point. Most relays come with plastic covers. remove the screws and discard the cover. Heat the socket pins and unsolder the relay. Save the relay coil wire for a stealth antenna. You know have a base to build on.

You may not need to build two units. The 6082 are triodes and run two tubes four triodes in parallel A triode section of a 6082 will handle 13 watts. Two tubes four sections is only 52 watts. The R390 likely does not run the 6082 at full capability, so somewhat less than 52 watts may be needing radiated as heat.

A 2N3055 will do a 100 watts.

If you are not going to slide this receiver into a real tight rack spot where you would likely scrape a TO2 transistor off the side of the receiver frame, you can mount the regulating transistor to the receiver main chassis. Heat sink and large surface area are key here. Plan the large TO2 style transistor to mount over one of the chassis vent holes along the side rail. Use a socket for the TO2 type transistor regulator. Plan a large sheet of metal that will lap over a couple vent holes so you can run some hardware through these holes to hold the new heat sink plate to the chassis. You can hang heat sinks off the 8 pin relay sockets. We will have to do the math on an R390 B+ line for the real current and the real voltage that is dropped. Someone on line here will have that information at hand. Running two transistors on two heat sinks on two sockets plugged into two 6082 sockets will want to be referenced to the same base reference voltage. You can plan a wire between the two plug in units rather than rework the chassis. Remember the goal is a plug in and easily reversible modification. Once we look at the number of watts we need to radiate as heat, we can consider how large the heat sinks would need to be and not be an operating problem. Remember the 6082 have been putting that heat out for years plus the filament heat. When this change goes in the receiver will still be running 32 watts cooler than the factory stock tubes.

Now you have a 100 watt TO2 type transistor bolted to the side of the receiver with plenty of heat sink. You plan to dissipate not more than 50 watts from it. Do not worry that you covered 3 vent holes, as you took 32 watts off line and are going to move another 50 watts to the out side of the chassis. Plan on using two relay 8 pin octal sockets. Rather than play with the 47 ohm resistors under the chassis, solder a wire into the socket pins for each 6082 cathode (a total of four wires) and each plate (another four wires). The cathode wires of course go to the emitter of the regulator TO2 type transistor (2N3055 or something comparable) and the plate wires go to the collector of the transistor. This will draw the current through all 4 of the 47 ohm resistors. This also keeps the current spread over all the tube socket pins. Rather than pass the full current through any one socket pin, keep the power spread out. Your new plug in wiring may take the load, but consider all the original wiring under the deck. Its so much easier to just build a mod that will work and play well with a little prior planing than to rewire a burned chassis.

The next operation is to build up a suitable reference voltage. The 5651 is only 85 volts. The solid state regulator wants a reference .6 volts above the desired B+ voltage. My choice would be for a couple 5 watt zener diodes in series with a proper filter cap across the zener diodes and a voltage dropping resistor between the high power supply voltage and the junction of the regulating transistor base and zener reference.

You could get complex and zener part of the voltage, then use a dropping resistor between the zener and the regulating transistor base. This regulation would not be as stiff as a full zener voltage.The 5651 reference voltage on the 6082 grid pins has its own dropping resistor under the subchassis. Using it for the reference may be more complex than just installing some thing new. Considering today's power line stability (you were not planing to use this receiver for field day were you ?) you could likely use no reference zener at all. A little voltage measurement on the receiver as is, and some math, you could likely determine a 1 watt voltage drop (use 2 watt resistors) between unregulated B+ (what ever is on the 6082 socket for the plate pins) and ground. The low transistor base current compared to the resistor current at 1 watt
between B+ and ground may be more than good for the application. Some where will be two resistors that provide a voltage division that would serve as the reference voltage.

I think this calls for an engineering evaluation and poll. What say yea all?

Find ground on one side of the tube filaments. The reference voltage diodes, resistor, and capacitance could all be mounted on the octal sockets. Depending on heat sink preference, and the regulating transistor, every thing can be mounted on the relay octal sockets and plugged in. Or a wire harness can be formed between the relay octal sockets and the regulating transistor mounted on the heat sink. The heat sink may be mounted either on the chassis, or as a whole separate unit on an extended wire harness.

Some where someone has done this already. Watch for some more mail here from the group. Some where someone knows exactly what value parts to be hunting up for this change. Go for it and get that receiver operational.   Roger L. Ruszkowski KC6TRU

Date: Sat, 26 Mar 2005 01:46:14 -0500

From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re: R-390 Voltage Regulator

On a soiled-state replacement for the series pass tubes in the R-390 non-A Roger L. Ruszkowski wrote (not in the order I quote):

>Third good thing is a zener reference and series pass type transistor regulator...

Someone used that approach and published the circuit and results in, IIRC, Electric Radio some years back.

>We will have to do the math on an R390 B+ ....

IIRC, current drain is about 200mA or so. The input voltage to the regulator has a high ripple content because of the Non-A's puny filter capacitor. The ripple is not a problem; regulating action removes it. Ripple peaks reach about 300 volt, IIRC. Finding Regulator power dissipation calls for calculus.

>A 2N3055 will do a 100 watts.......

Only sorta'. That would be when perfectly thermally coupled to a heatsink whose temperature was 25 deg. C. Any reasonable heatsink would get hotter than that. Two or more pass devices operated in parallel would be preferable. Devices in parallel need some emitter ballast resistance to share current equally. I would venture a guess at somewhat less than 10 ohms for each device. The 2N3055 hasn't sufficiently high VCEO to run at voltages encountered in a 'non-A. For easy availability and overkill on voltage rating one could use a TV horizontal output transistor, though somewhat low on hfe.

>Rather than play with the 47 ohm resistors ....

A single wire would handle 200 mA easily. For simple plug-and-play, though, 4 wires would effectively place all of the 47-ohm resistors in parallel and thereby reduce the output impedance and improve voltage regulation. Just one wire to a cathode pin could be used if its accompanying 47-ohm resistor were jumpered out under the chassis (so much for plug-and-play, but you were planning to tear down the radio for refurbishment anyhow.)

>The next operation is to build up a suitable reference voltage........................

Power zeners can be tough to get and are harder to mount than lower powered devices. An NPN with zener collector to base, a couple K resistor base to ground , emitter grounded and collector used as the power zener cathode substitute would work. The reference would be more free of ripple if a diode (1N4007 suitable) were inserted in series with the reference dropping resistor. That would keep the reference's filter cap from discharging back through the dropping resistor during ripple valleys.

>Depending on heat sink preference......................

A heat sink to fit in that space would need fan cooling. A small fan could be mounted atop the plug-in and powered off the filament pins. A small DC computer-type fan (with rectifier and dropping resistor) would serve. I would prefer Roger's "put the heatsinks outside the radio with a long cable" approach. With heat thusly relocated, evah' li'l bit he'ps. Instead of bipolar pass devices, power MOSFETs could be used. The IRF820 (available from Mouser) would suffice. That approach is used in a high voltage regulator in a tube tester project. Go to members.aol.com/sbench101. Click on RAT Tube Tester. Same considerations about sharing power dissipation between several devices apply. Use a few ohms ballast resistance in series with each MOSFET's source. Connect 1k (exact value not critical) in series with each gate terminal to quell oscillation tendencies; locate the resistor right at the gate terminal with short leads. The high gate impedance (zero DC current) makes a reference using low power zeners practical. Stack low-power zeners to, say, 200 volts for a reference. Bypass with 0.1uF poly for zener noise. Regulator input goes to 1N4007 then to 10 uF 250v electrolytic then to 47k (2 mA zener current; must be above the zener knee), 47k to zener stack. Strap a few hundred K pot across the zener stack and connect wiper to resistor'ed gate terminals. Pot will adjust output voltage. Selected fixed resistors could be used instead. For a voltage reference more in keeping with the theme use a few neon bulbs in series to replace the zeners. The parallel capacitance would have to be kept low to prevent relaxation oscillations. NE-2's would be run at about half a milliamp. Pretty to look at. Another interesting approach can be found in the National Semiconductor Linear Data book. That circuit uses the LM317 sort of cascoded with series pass transistors to stand off the high voltage.

That's mine 2 cents worth. Thanks go to Roger for bringing up this interesting topic. Any more ideas to share?

Date: Sat, 26 Mar 2005 04:37:11 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Re: R-390 Voltage Regulator

I acquired an R-391 (same electronics) a few years ago that turned up with a solid state VR setup. In addition, the audio circuit was also subbed out with one of those amplifier modules -- only one tube left on the audio deck. I posted to the list about it and we did some comparisons of regulation-- B+ at various AC line voltage levels, from about 95 to 130 vac. The results were fairly close to those of others with stock 6082's, etc. The mod had apparently been done some years ago -- I'd say maybe 15-20 years based on the components. Basically, as I recall, it was a dual Darlington pair with a couple of zeners and a few other components. I'm not well up on theory, so worked with Dr. Gerald Johnson at the time who analyzed the circuit and wrote it up in Hollow State Newsletter.

It 's possible to build the same or similar VR in a reversable way, on a small PC or perfboard cut to fit right into the shielded area occupied by the pair of 6082's. The board can be mounted onto a single (or two) octal tube or plug basis so it's simply "plug 'n play". There was some concern about where to locate the heatsink -- inside or out of the chassis -- however, the mod in my '391 doesn't have much in the way of that. Another -- availability of high voltage zeners, but there are workarounds. Actually, I think mine has two 90 volt zeners to get to 180 - not sure.

Anyway, one of the list members did just that and built a plug-in board. His results were similar and was in the process of writing a follow-up article for HSN last we communicated. We will hopefully be finishing that one day.

While 6082's can be a bit pricey, they're not up to the level of 3TF7's (yet) and tend to last a fairly long time. The main purpose of all this is to substantially reduce the heat generated that wafts up from their low, upside-down position. Of course, it's a good idea to place a muffin fan on that side of the '390/'391 to draw the heat out through the existing "portholes".

Date: Sat, 26 Mar 2005 08:58:54 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Re: R-390 Voltage Regulator

Depending on just how nasty you line voltage is you may have to use some fairly fancy parts for your series pass devices. Normal bipolar transistors suffer from secondary breakdown. This limits just how high in voltage you can go with them. This can give you a bit of a surprise when your "200 volt" parts turn out to only be good to 100 volts. Since you have some filtering ahead of the regulator you won't see the 8:1 type of spikes that are on a normal AC line. Anything much below a 2:1 surge is asking for trouble. There are a variety of simple faults
that will put 240 on your 120 line for a fraction of a second to maybe a second. That gets you up to something in the vicinity of 600 volts on the input to the regulator. Obviously 200 ma at a 300 volt drop is going to have some power associated with it. A reasonable heat sink has a time constant long enough to handle a surge so that part of it probably won't be

an issue.

The second thing you need to worry about is a short circuit on the output of the regulator. Unless you have some very exotic fuses the transistor will work better as a fuse than the fuse will. The math is about the same as for a over voltage. The transistors have about three hundred volts on them and the current is who knows what. If you have a current limiter in the design you get maybe 300 ma. If it folds back you might have 30 or 40 ma. With no limiter you depend on the line fuse and the current might be an amp or so. We don't short circuit the output of our supplies on a regular basis. Line transients don't come along every morning at 8:32. Both things do happen and a fire as a result is not a reasonable outcome. A fire that totals the radio is especially not a good thing.

Since we really don't know all the numbers exactly derating is normally used to give the design some "margin". If we want to do it according to the original design numbers on the radio we would cut all the ratings on the transistors in half. That means finding a part that will handle 600 volts and quite a bit of current.

A mosfet sounds like the most likely device to use. Coming up with a good high voltage driver that will survive the normal faults may be a bit exciting.

I have one 390 not an A and a whole box full of 6082's ....

Date: Sat, 26 Mar 2005 10:31:33 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Re: R-390 Voltage Regulator

If you are going to try the solid state R390 not an A regulator conversion here's a starting point on the pass device. For a whopping $5.67 you can get a IRFPE30 from International Rectifier. Data sheet is at http://www.irf.com/product-info/datasheets/data/irfpe30.pdf.

Into an infinite heat sink the part is rated at 125 watts at room temperature. At 70_C the part will handle 75 watts. Since we are running 20 to 30 watts that seems about right. The heat sink we attach it to probably will need to be a bit better than a radio bulkhead, but still smaller than the entire rest of the radio. With an 800 volt rating out to 2 amps overload and over voltage should not be a major issue. It also has a built in reverse protection diode so that's one less part you have to wire in. Looks like the only major issue is the power dissipation.

Without a lot of work 30 watts seems like a reasonable starting point. The MOSFET has a lot better saturation characteristics than the tube. That

means that we don't need quite as much headroom on the regulator. A simple trick is to put a resistor in series with the transistor to soak up part of the power. If half of the power is in the resistor that cuts our heat sink down to the 15 watt region. With a fan on it that can be a fairly small chunk of metal. With no fan you will need a
fairly large chunk of extrusion. Without going to far on heat sink design the part should be about 6 X 6 X 3 if it's a normal multi fin chunk of aluminum extrusion. That will keep the temperature down to the point that you won't cause burns if you bump into it. If you don't use the resistor trick then the heat sink goes to about 10X4X3. That's a pretty big heat sink ...

Bottom line is that the tubes run quite a bit hotter than the semiconductors. That makes them easier in the heat removal department. For the same margin in the design the volume of the semiconductor plus heat sink will be at least as large or larger than the tubes it replaces. Still hanging on to my box of 6082's ....

Date: Sat, 26 Mar 2005 12:45:18 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Re: R-390 Voltage Regulator

The R-391 that turned up with the solid-stated regulator has no real heat sink to speak of, was modded long ago -- so probably run a long time. It literally runs cold. There was nothing particularly high tech -- couple of transistors -- small tab mounts, couple of zeners and a few other parts. As I recall, there was a smudge of heat sink grease and a hole on one side of the 6082 shield where it looked like the modder tried to mount one of the transistors. That tab mount is just sticking up on the perboard -- with some telltale heat sink grease on it. This is not to argue -- just what was observed. It was written up in HSN a couple of years ago.

I'm more than a bit rusty on the theory, but as I recall, when figuring the parameters for a VR circuit, it's has to do with the maximum portion of the power that's being dissipated by the VR -- not the total of the supply. In other words, if the unregulated coming in is 200 vdc and the VR is set to maintain 180, it's dissipating 20 v X whatever ma's. Something like that. If I'm not mistaken, the B+ fuse is the same as in an R-390A -- 1/8th amp, so a max of 125 ma? But, I dunno about that ... but this VR runs cool with no heatsinking, not even mounted to the frame or module. AC voltage runs high around here: 126-127 v., and when I tested it, I ran it up to nearly 135 with the variac. The zeners in the circuit are also small, though I can't tell the wattage by
just lookin'.

Date: Sat, 26 Mar 2005 14:30:30 -0500

From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Re: R-390 Voltage Regulator

Your point is well made. A lot depends on exactly what the input voltage to the regulator is. The assumption I was going on was that the unregulated supply was in the 300 to 350 volt range mentioned earlier. That and the quoted current drain of 200 ma got me to the roughly 30 watts. If the plate current is roughly 100 ma and not 200 ma that also makes a big difference. The tube line up is pretty similar to the 390A so the current should be in the same general vicinity.
Unregulated B+ of 250 volts and 100 ma of current would get you to 7 watts (versus 30) in the regulator. If you put a resistor in series to dump half of it then you are down to 3.5 watts or less. That's well within the simple heat sink region provided you aren't using a marginal transistor to start with. You still have the problem of fold back and dissipation during a short or an over voltage on the input. They both scale with the current level, but a 25 watt dissipation still seems likely in the event of a short and no current foldback. Of course if the parts are cheap enough you could just replace them when they fry. Seems like a less than perfect design solution on an otherwise bulletproof radio though.

Date: Mon, 18 Apr 2005 16:59:58 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Rats - There goes a pair of 26Z5W's

Probably blew up the filter caps. B+ rises in Standby because the load is smaller. If the caps were old and used to the nominal B+, they would conduct greatly increased leakage current when it was high. As they warm up due to the increased power dissipation they leak more. Hotter, hotter,... SHORT! Better check them before you replace the rectifiers.

Date: Mon, 18 Apr 2005 23:00:31 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Rats - There goes a pair of 26Z5W's

I suppose that wasn't the case. I popped in my other set of 26Z5W's and it seemed to be okay. The filter caps are rebuilt so I suppose they withstand the increased B+ and they don't leak quite as much as the originals did. I still think I shorted the PTO can to something - probably the rectified 25V on the selenium rectifier, but I don't see how that would have blown the 26Z5W's. Oh well. It gives me something else to buy...

Date: Tue, 19 Apr 2005 09:19:00 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Rats - There goes a pair of 26Z5W's

Often when you loose the filter caps in that way (fast runaway to detonation) you get some side effects. The most pleasant of the batch is the wonderful odor of cooking MFP varnish. Next up the list is the marvelous puff of smoke as the electrolyte boils off, that one general will clear the area while high capacity exhaust fans are brought in for a couple of days. Finally there is the actual for real and for certain indication of a problem when the capacitor relief / over pressure function fails totally and the capacitor detonates. Pieces of aluminum shrapnel flying past one's face are a good sign this has happened.

You don't notice this stuff happening normally because the capacitors take years to degrade. You do not get much of a pressure build up in that case. I certainly have seen all three cases though not all in R390's. With a modern electrolytic the top simply opens up and there isn't as much drama as with the good old parts. With some of the older parts you can do a good job of ripping open the aluminum can. That's a *lot* of pressure.

The main thing that you have to watch is when you rebuild capacitors in the old housing. If you pack the housing nice and full of stuff and then seal it very well you do not have an vent path for any gas that is evolved. If you do a *very* good job you increase the probability of a detonation. I have never seen or heard of this happening with rebuilt capacitors so it's just a theory at this point. It would be very nice to keep it in the theory category. I have no need to destroy a statistically significant number of rebuilt capacitors simply to measure the over-pressure wave.

Date: Tue, 19 Apr 2005 10:43:11 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Rats - There goes a pair of 26Z5W's

If one tube decided to short cathode to heater (for whatever reason), this would ground the other cathode at the same time, and in seconds both would fuse openat the thin metal ribbon connecting the cathode sleeve to the pin. This will be pretty obvious if you examine them. I hope you're keeping a close eye on your radio!

Date: Fri, 22 Apr 2005 18:17:42 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] D-Hole Punch

>Anyone know a good method for making the D-hole needed for the fuse holders on the rear panel?

I assume you are adding two fuses to a one fuse radio. Instead of cutting holes, you could install pigtail-type fuses underneath the audio deck on unused terminals of the filter capacitor sockets. Another option would be

to install just one B+ fuse (better than none) on the power supply module in series with the transformer's high voltage winding center tap. To replace these fuses it would be necessary to remove the module in question but that should not pose a hardship because changing B+ fuses should be a rare event indeed.

From: Flowertime01@wmconnect.com
Subject: Re: [R-390] D-Hole Punch

Along with filing holes and making lots of metal bits to clean out is to use a router. Pick up a small (< 1/4) bit and use it to do the D hole.The smaller the bit the closer you get to a true D shape. Some duct tape and felt pen will help you get a template to route to.Some lumber cut for filler will get you a level surface on the back or a chassis if you need it.

After you drill a hole large enough for a D punch you already have a lot of metal in the chassis and the extra from the router is not that much more. The router bit will turn a larger chip than a file will. A high speed steel bit will last long enough to work a hole into the chassis. Change the router plunge depth and start the second hole with a fresh bit of bit. If you do not have a router you can use a router bit in a high speed drill. The higher the speed the better. I cannot foresee you using a drill press and sliding the chassis around on the drill table. But then one works with the tools you have.

Date: Fri, 22 Apr 2005 20:20:12 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] D-Hole Punch?

The original radios came out with just one fuse. After a while in the field they found a problem with the fusing. In order to make the radio work properly with all the heaters turned on and high line voltage they had to put in a fairly large line fuse. In a radio with the heaters all turned off and low line voltage this fuse was way over size. In the case of a B+ short deep in the radio you would take out various chunks of the power supply before you blew the fuse. The solution was to add a fuse in the B+ lead out of the power supply. That way it would trip properly regardless of weather the heaters were on or off. When they added the B+ fuse they also added a holder for a spare fuse.

Date: Sat, 23 Apr 2005 09:44:38 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] D-Hole Punch?

One thing I should have added but forgot to before. (Must be a bad brand of Tequila ...) We never ever run the heaters on R390's any more. Even

Nanuck the Eskimo decided to turn off his last year when they put central heat in the igloo. This drops the power consumption of the radio by quite a bit. Less power equals a smaller line fuse. You can cut the size of the line fuse almost in half and get away with it if you are running a slow blow fuse. I normally check the junk box and use what ever is handy. This is a very cheap "conversion" and might save having to fix some major damage to a radio.-

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Date: Wed, 27 Apr 2005 15:50:53 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: Re: [R-390] Power Cords and Bypassing: Roy's Diatribe

Nice essay, Roy! One can not ever be too careful in power input circuitry. Here my note from 1999: "Not all FL101's are the same. One of mine has the terminals mislabeled. Terminal A on the side of the power filter was in continuity with terminal "B" on the bottom, and vice versa. My other filter was labeled correctly. So a word to the wise: do a quick continuity check on the power cord-fuse-switch wires when you install the mandatory three wire grounded line cords". Perhaps the "best" solution is to install the modern AC computer-type chassis connector with filtering as Roy suggests.

A good article on restoration our boatanchors is found at QST August 1995 pp49-52 by Larry Keith KQ4BY

Date: Sat, 30 Apr 2005 14:08:15 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: [R-390] Variacs and solas: additional thoughts.

>I was re-reading an old e-mail of yours, is your advice
>based on the fact that an unmetered Variac could put
>over 125VAC onto the primary of the power transformer? W. Li,

Actually, it can be much worse. Many variacs are wired for overvoltage and would deliver up to 150 volts if they are ment to be run from a 115 volt line. Even if a variac has a meter, it's easy to operate it incorrectly and not notice the meter until after some damage has been done.

I just did two experiments:

1) With a second variac (a GR W5MT3), I powered a STACO Adjust-A-Volt rated for 120 volts input, 7.5 amps output. This thing is both useful and dangerous in that it has a two-position power switch: "120 Volts"and "140 Volts". I fed it 130 volts to simulate a 117 volt variac on a 124 volt line. With it switched to the 140 volt output, the output was 150 volts running a 4+ amp halogen work lamp.

2) I re-arranged things and fed the General Radio W5MT3 with the STACO. The GR unit is rated at 115 volts input, 5 amps output, 0-135 volts. It is set up for overvoltage and has the normal ON-OFF power switch. I ran it with 121 volts input (the house line voltage at the time) and the output at max setting was 142 volts running a 100 watt lamp. I then increased the input voltage to 124, which I get as line voltage from time to time, and the output was 146 volts. If I run it on normal line voltage of 122, it produces something like 147 volts. If I set the dial
to "115", I get whatever is the line voltage at the time, normally 121 to 124.

So, take your pick, 146 to 150 volts input to your 50 year old radio rated at 115 or 117 volts. I'd expect trouble. The danger with the STACO transformer is that you can easily push the switch to "140 volts' instead of "120 volts", and if the knob is set full up, you get 150 volts output.

A further note on variacs in general:

The fusing or circuit breaker arrangements can be important. The GR W5MT3 has a circuit breaker on it and the STACO has a fuse. My guess (without investigating it just now), is that both of them are in the INPUT of the unit. This means that if there is a short cicuit or heavy overload on the ouput, and you start at 0 volt setting and increase the setting slowly, you'll be overloading the windings as to current, and the fuse or circuit breaker will not trip or blow. In my opinion, variacs should be fused or have circuit breakers in BOTH input and output. This will protect the thing wherever an overload would occur. I have had such failures burn the low windings of a small variac in a DC power supply, and recently got a one-amp GR W-200B one-amp variac with evidence of the same thing. Incidentally, if you run into a 400 cycle variac, it can be run on 24 volts AC. (The allowable voltage is proportional to the frequency.) This can lead to a convenient low voltage power supply. If you hook a 400 cycle variac to 60 cycle supply at it's rated voltage, expect smoke in a hurry.

Some notes on constant voltage "sola" transformers:

Some are the "harmonic neutralized" type and some are not. All these things operate on a magnetic circuit basis with non-linearities and very high circulating currents. Part of the current is harmonics of the supply voltage due to the non-linearities. Thus, the output waveform may well be regulated to 115 or 120 volts RMS, but have very high peaks in a distorted waveform. It seems to me that this could create high B+ voltages in rectifier power supplies. Filaments may be very happy at the right RMS voltage but the B+ may rise very high due to peak rectification in the supply. It has been noted on the reflector that "sola" type voltage stabilizers create both noise and a lot of heat, especially when they are lightly loaded. The good advice given was to run them well loaded at all times to avoid trouble. It may be that 20 to 40 percent loading will bring down the waveform peaks to reasonable levels, but some experimentation is in order. Installation instructions advise making sure there is plenty of air circulation to avoid overheating. The Sperior Electric Company makes Sola brand regulators still, and their website has interesting reading.

I have a 230 volt input unit here that runs the photo darkroom to avoid troublesome changes in enlarger lamp brightness due to changes in line voltage. When it is switched on, there are significant overvoltage transients, and I make sure that nothing but light bulbs are on the line when I start it up. A surge supressor outlet strip might help protect the few solid state things I use (timer and enlarging densitometer), but it also might get a whacking big surge each time I start up. The Oscilloscope will tell the truth in the matter.

By the way, two of the three capacitors in this thing failed open at one point. Each was rated at 8 uF and 660 volts ac. The output voltage collapsed to near zero. I was able to locate a fairly high voltage (440vac) motor starting capacitor of the right capacitance that was about one fifth the size of the original three caps. It seems to work fine. The voltage on the capacitor during operation is normally way above 440 volts ac, but it was all I could find, and they normally have breakdown voltages very much in excess of the rating.

I once had a Sola made for 50 cycle operation (for use in Europe). The thing did not work well at all on 60 cycles. It regulated at some 150 volts output, and over a limited range of input voltage. As I understand it, it is not feasible to modify the 50 cycle units to work on 60 cycles. I sent it to someone in a 50-cycle country and he was happy to get it.

If you have a sola transformer that's rated at 120 volts and you want to get 115 volts out of it, add a voltage bucking transformer, or see if there is room to add a few turns of wire in series with the normal output over the existing winding and arrange the connection to reduce the output.   I've not added bucking turns to a sola but it's an attractive possibility.

Normally, voltage regulator transformers will operate well just a bit above their rated output power (they are rated in volt-amps, not current, because of the the way they work and the harmonic content of the output.) Above a certain point, however, they collapse and go into a low-output-voltage condidition. This is good, because they are inherently current limiting. Apparently, there is no harm to the thing and it automatically recovers.

Here are some questions to investigate:

Variacs:

1) What particular makes and models of "variacs" are set up for overvoltage as made?

2) Do small variacs behave differently than bigger ones? (I doubt it.)

3) Are fuses or circuit breakers normally in the input as made?

4) What errors are found in the dial readings due to line voltages being higher than the unit
was made for?
5) Are the voltmeters found on variacs at all accurate?

Constant Voltage Transformers:
1) Do small ones behave in a way similar to large ones? (I have examples from 60 volt-amps up to one Kilowatt.)

2) What peak voltages come out of the harmonic neutralized type, and what from the non-netutralized ones, as a function of loading.

3) Does harmonic content in the output lead to high voltages in rectifier power suppllies? Are choke input plate supplies affected in the same way?

4) What are the overload characteristics of these things? Are they the same for small and bigger units?

5) Where above rated output do these things collapse, and do all such transformers behave this way?

Sooo many projects, sooo little time!

Date: Sat, 30 Apr 2005 15:20:34 -0400
From: "ROBERT YOUNG" <youngbob53@msn.com>
Subject: Re: [R-390] Variacs and solas: additional thoughts.

When I use a variac I always have a voltmeter hooked up to the output at all
times, because mine will also go up to 140 volts with 117 line voltage,
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Date: Sat, 30 Apr 2005 15:42:38 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Variacs and solas: additional thoughts.

A few observations:

Variac's are always fused on the input side - thank the national electric code for this one. Rarely you will see one with dual fuses, but if it only has one fuse you'll see it on the input. Constant voltage transformers have one other oddity. When you check the output voltage with a fairly normal AC voltmeter you never quite know what you will get. A true RMS meter will give you one thing, and a peak reading / calibrated to read RMS meter will give you something very different.

From:Llgpt@aol.com
Date: Sat, 30 Apr 2005 15:50:46 EDT Subject:
Re: [R-390] Variacs and solas: additional thoughts.

Thank you for the engineers at Hammarlund who had the foresight to include many multi tap voltage selections on the SP-600 Power Supply Transformer. Tap # 5 is for 130 volts which more closely matches the voltages of today. Most people who are operating their SP-600 would be wise to remove it from the cabinet or remove the bottom dust cover and look. It probably has the voltage set to the # 4 tap, which is 117 volts. Move it to the # 5 tap for 130 volts, the P.S. Transformer will thank you and it will run cooler and the stability will more than likely improve.
Les Locklear

Date: Sat, 30 Apr 2005 15:53:08 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Variacs

I agree with Roy, I don't own a variac and neither do real men. Put the receiver in question to a smoke test or be a wimp................:-) Seriously, I don't use one, no need to if you know anything about electronics. Les Locklear

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Date: Sat, 30 Apr 2005 13:42:26 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: [R-390] Re: Variacs and solas: additional thoughts.

Excellent thoughts! Fusing the output of a Variac is something that really ought to be a mandatory 'upgrade'.

Many power transformers (Tek ones come to mind too) have multi-input primary taps, and using the highest one is good as Les points out.

The 'factory' Variac voltmeters are often junk.

Date: Sat, 30 Apr 2005 22:54:44 -0400
From: "Harold Hairston" <K4HCA@alltel.net>

Subject: Re: [R-390] Variacs

I agree with Mr. Morgan. Entirely too much bandwidth has been expended on this thread! Any Amateur Radio operator who doesn't knows the difference between an Ohm, a Volt and an Amp ought to take up bird watching.

Date: Sat, 30 Apr 2005 20:43:45 -0700
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] Variacs and solas: last thoughts

The Variacs I have seen and used can ALL be wired so that the output is both higher (140VAC) and lower (110 VAC) than the input voltage (120 VAC), but all such "adjustments" are internal. The Variac has to be partially dismantled in order to do the changes. I have several Variacs which have two-sided dial plates: one side reads from 0 - 100 PERCENT, and the other side reads 0 - 140 VOLTS, so you flip it over to the side you want. I also have one large Variac that has such low impedance that when I turn it on, the breaker feeding that socket blows. Sometimes it takes multiple attempts until I hit it at a valley in the sine wave. Then I leave it on. I haven't turned it off for about the past 5 years. None of mine are fused in the output, but I think they will become so shortly.

Date: Sun, 01 May 2005 00:10:15 -0400
From: "James M. Walker" <chejmw@acsu.buffalo.edu>
Subject: Re: [R-390] Variacs and solas: last thoughts.

Well before the thread goes away, FWIW. I use variacs in the shack, for various rigs and as test devices. I also on occasion repair them at the University, where they are used in abundance. A while back I got a bunch of info about the PROPER use of the devices and also some safety info. I have big rigs that run on 115 VAC and draw close to 30 amps in some cases, less in others. Things I have noted is that you need to maintain the proper wiring per NEC and there is usually not a problem with them. One problem most folks miss is the neutral and hot lines in power distribution, and whether or not there is a ground to the variac from the main circuit breaker. It matters, and can present safety problems, along with voltage instability.

Ken I bet if you check your line back to the breaker box you find the Hot (black) lead is reversed to your variac, that pops the breaker. I never assume that the lines in a house are correct, I always check that the lines go where they should, I have seen as mush as 60 VAC chassis to chassis in units that had the hot and neutral lines reversed to the units. That was with the units turned off, and is NOT a good thing.

I also have a broadcast transmitter that uses 220 VAC and a homebrew KW that uses 230 VAC (refurbed pole pig) for the ac input, I run them each on a separate 0 - 240 VAC variac, they have a 40 amp rating at 240 VAC. I haven't had any heating problems or circuit breaker problems ever. As for fusing, I put circuit breakers two pole type to the input of the big variacs and fuses in the input to the 10 amp variety, for 20 amps and larger I use the fuse cartridge type FN those are about 2 inches long and 3/8 inch in diameter. The units that have a built-in variac also have a metering socket that measures the output volts of the variac. The others all have verified ac voltmeters across the output with a socket for checking accuracy.

Variacs are ok for use as long as they are used properly, they work well and save a lot of headaches later on. Just my 2 centavos!

Date: Sun, 1 May 2005 14:00:45 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Variacs and solas: additional thoughts.

One thing that hasn't been mentioned in this thread about variacs is - can using a variac possibly extend the life of the 3TF7 ballast tube? I notice in many cases when first turning on an R-390A that the ballast tube will glow much more brightly for a few seconds due to the current surge of the cold low-resistance BFO and PTO tube filaments in series with the ballast. If one were to bring up the line voltage slowly using a variac, then this might cushion the initial voltage/current surge into the venerable 3TF7. After all, no thread beating a dead horse is complete without mentioning the 3TF7 ballast tube!

Date: Sun, 1 May 2005 14:07:04 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Variacs and solas: additional thoughts.

If you have a variac without a good voltmeter on its output, throw away the variac.

Date: Sun, 1 May 2005 11:14:11 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: [R-390] Safety

Hi, there's another aspect to safety. Even the most knowledgeable and savvy make mistakes for some reason. I think that's why more enlightened employers have safety meetings, to reduce the incidence by heightening awareness. One of the really practical, experienced and knowledgeable guys that I worked with was badly burned because he made a mistake, defying common sense in what he was doing. Fortunately, he was only burned across his hand by an electrical event. The point is, even he could have used more reminding in this area. I thank Roy for pointing out the hazard of double fused line plugs a while back and also encouraging me to properly fuse the variac that I had used for years as a two wire, ungrounded source forvarious projects. I welcome hearing about these things again occasionally.

Date: Sun, 01 May 2005 14:24:18 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Variacs and solas: additional thoughts.

I agree -- monitoring current is a good idea. My favorite variac "ac supply" is a Staco I picked up a few years ago. I was told it was working and maybe it was. I fired it up and it smoked. That's how I learned about fouled winding contacts -- the hard way. This was rated for 4.5 amps, though it had a standard 5 amp Staco autotransformer in it -- cabinet about 12 inches wide with ammeter and voltmeter.

Has a shunt for the ammeter. I managed to match up the correct raw autotransformer to get it going again. Both meters are pretty accurate and the switching setup makes it very convenient. Yup -- the ol' lightbulb trick. The first I came across that was part of the initial testing instructions for a 3-tube Lafayette KT-135 regenerative radio kit many years ago.

They also advised using a neon bulb tester to manually polarize the ac plug so the front panel wouldn't be hot with full AC. Wonder what the body count was on those -- they were very popular and the cabinet was extra. ;-)

Date: Sun, 01 May 2005 13:51:18 -0700
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] Bucking transformer

> I want to drop my household voltage down to 115 to run the R390A
> continuously. Where can I get a good bucking transformer? Any circuit suggestions?

Go here:http://www.mines.uidaho.edu/~glowbugs/receivers.htm
then go to 8) Line voltage adjustment. down on the page.

<quote from Web page>

Most of our older AC line-voltage powered equipment was designed and built to run on 110 - 115 VAC 60 Hz. voltage. However, there has been a trend in the last 10 or more years for line voltages to be much higher than they were then. Here, our line voltage sometimes reaches 130 VAC, and can spike even higher. So, in the interests of protecting our equipment from these high line voltages, ONE of the easiest ways to reduce this, is via a "bucking" transformer. This is simply a filament transformer whose secondary current capability is at least as high as the current your equipment draws (I would double it, myself), connected as per the accompanying .PDF drawing. The secondary winding is "phased" so that it "bucks", or opposes the line voltage. By reversing the cross-connected secondary winding, or "phasing" it correctly, as shown in this .PDF drawing, this circuit will also "boost" the line voltage, in this case, adding 12.6 VAC to the line voltage. Another way to accomplish this voltage reduction, suggested by Jim Miccolis, N2EY, is shown in this .PDF diagram. It uses the same transformer as above, connected as a tapped "auto-transformer", exactly like a Variac, and will either "buck" or "boost" the line-voltage accordingly. What is written above about sizing the secondary current capability of the transformer applies here also.

Date: Sun, 1 May 2005 16:06:35 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] SAFETY

>>No topic related to safety, yours or the equipments, is a waste of bandwidth.

Indeed Cecil. From before my early teens on, since I first started to play with electronics and radios, all my "elmers" have told me "Always assume that piece of gear in front of you will kill you" Similar words anyway. They still teach such things regularly in the labs where I have worked. Doesn't matter what the equipment is, ALWAYS assume the gear is dangerous. Battery powered gear is no exception -- a battery powered Megger or strobe or what have you can give you enough of a jolt to knock it off a bench, scrape or cut your arm as you yank it away, or jerk you arm into a powered-up piece of equipment. The latter is more common than you'd think. Ask me about the tale of the powered-up 400Hz inverter that was knocked into my lap from the next bench over. (actually DON'T ask.. hehe) At the very least, always practice the "one hand in the pocket" method when servicing gear. If one hand is in your pocket, you have less chance for current to flow across your chest and stop you heart.

When it comes to safety *NEVER EVER EVER ASSUME ANYTHING ANY EQUIPMENT IS SAFE* This counts for both repair and normal day to day use. Always check grounds, always check AC cordage, always double check EVERYTHING. Always make sure gear is not over-fused.If the equipment calls for a 1/2 amp fuse, replace it with a 1/2 amp fuse. I think the power cordage issue was hashed out pretty well the other day, so I'll not fuss about it here. As for the variac, there *are* isolated variacs out there, such as the Standard "Adjust a Volt" supplies, but unless you know it's REALLY isolated, ALWAYS use an isolation transformer with any variac.

Date: Sun, 1 May 2005 18:09:29 -0400

From: "Bill Levy" <levyfiles@att.net>
Subject: Re: [R-390] SAFETY

I agree, one pilot to another, safety is always paramount, and student pilot or new ham there is no difference when danger can harm or kill. Beat safety to death first, last and always,

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Date: Sun, 1 May 2005 15:10:05 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] Bucking transformer

Hi , another source for the circuit, http://www.r-390a.net/ click on Compensation for High Line Voltage. I used a 2amp 12.5 v center-tapped transformer that I got from RS and put a switch in so I could choose from two levels of reduction by using either the full winding or half the winding in the bucking circuit on the output side. Dan

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Date: Sun, 1 May 2005 16:47:55 -0600
From: <CRIPS01@MSN.COM>
Subject: Re: [R-390] Bucking transformer

I have a small device call and "The Up and Down" model LB2 -voltage booster manufactured by Service Instruments Co. of Chigago. It switches the voltage up or down by 10 volts. The input is 100 to 130 volts the output is either 110 or 120 volts at 3 amp's. It is, of course, a service device what exactly is was used for I don't know.

Date: Sun, 01 May 2005 21:23:41 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Variacs and solas: additional thoughts

For a whopping $10 Radio Shack will sell you a three amp 12 volt center tapped filament transformer. The nice thing about the center tap is that it will give you both a 5% and a 10% adjustment off of a nominal 120 volt line. Three amps is enough to run any radio in the R390 size range. Given that the radio works better off of a high line voltage it's not real clear weather you should spend the $10 or not. As mentioned in the previous thread using a fuse or two is probably a good idea.

Date: Sun, 1 May 2005 20:39:53 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Variacs and solas: additional thoughts

I was thinking the amperage rating of the bucking transformer was proportional to the total voltage. In other words, a 3-amp. 12V bucking transformer would be good for approximately 30A total load at 120V. Is

that incorrect?

Date: Sun, 01 May 2005 21:42:21 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Variacs and solas: additional thoughts

A three amp filament transformer will give you a three amp buck or boost transformer. The confusion comes from the fact that the three amp transformer is a 36 VA part. A three amp 120 volt transformer would likely be a 360 VA part.

Date: Mon, 02 May 2005 11:23:32 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Variacs and solas: additional thoughts.

>... - can using a variac possibly extend the life of the 3TF7 ballast tube?

I would think so, depending on how you use the variac.

>... the ballast tube will glow much more brightly for a few seconds due to the current surge of the cold low-resistance BFO and PTO tube filaments in series with the ballast.

Yes. Closely watching the ballast at turn-on may frighten you a bit. Back when they were $8 each, no problem. Note: receiving tubes of certain manufacturers (e.g. 12AX7's from Europe) show a very bright, momentary light from the filament upon startup. These tubes apparently were designed to do that repeatedly and not fail, but it can be alarming.

>If one were to bring up the line voltage slowly using a variac, then this
>might cushion the initial voltage/current surge into the venerable 3TF7.

It may well do that. But what about a more or less fail safe slow-bring-up device you can install and forget: the inrush current limiter? That sounds like an ideal solution to the whole thing.

Date: Mon, 02 May 2005 12:01:12 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Variacs and solas: additional thoughts

<snip>>I want to drop my household voltage down to 115 to run the
R390A
>continuously. Where can I get a good bucking transformer?

That depends on your the depth of your junque boxe (or that of your friends'), and whether you want to build or not. For continuous operation, I suggest a line bucking transformer with a current rating about twice what the radio draws. That will be quite small: the R-390A draws an amp plus some.. so a 2 amp transformer will be enough if you run the radio only on it.

> Any circuit suggestions?

Yes: http://www.r-390a.net/ (read the whole site.) but for the bucking transformer setup in particular, see "Technical" then"<http://209.35.120.129/faq-HiVolt.htm>Compensating for High Line Voltage" or: <http://209.35.120.129/faq-HiVolt.htm>

Also, "Voltage Reducer For BoatAnchor Gear" from Ed Richards, K6UUZ: http://bama.sbc.edu/voltagereducer.htm This page has parts list, instructions and drawings. For a transformer, it suggests "the 120 VAC primary, 12 VAC ct secondary at 3 amperes, Radio Shack #273-1511 or equivalent." This is just fine if your load is going to be 2 amps or less (Radio Shack transformers are known to go into saturation at rated load!) and if the reduction you want to make in the line voltage is either 6 or 12 volts. (You could add a switch to select the voltage change.) The added drawing at the bottom of that page is both left to right reversed and has the connections crossing over each other all up-side-down-like. But it will work. It calls for a 10 amp transformer which is fine if you have one and have need for 10 amps of load current. "Holy Amperes, Batman, we can run the whole shack on that!" The astute and curious worker may note that if the transformer at hand is rated at 115 volts, it can be arranged to be powered by the OUTPUT of the system, with the low voltage winding reducing the line voltage before the transformer. The phase would be arranged backwards from the arrangements shown on the websites above. If you want to buy something and plug it in, see:

http://www.toddsystems.com/newindex.html

You may need to sit down before finding out the prices on these. (There are likely many other sources, too.) A rather elegant solution to this situation is the General Radio Automatic Line Voltage Regulator, which will actively correct line voltage changes for loads up to 60 amperes. However, this thing is both very, very heavy and hard to find since they have not been made for a long time now. It has a few tubes inside, a voltage sensing system, and a small motor that is driven to move a center-tapped variac which runs a boost-buck transformer to correct the output, all within a part of a second. It's pretty quiet, too. "... And the music goes round and round.. and comes out here.."

Date: Mon, 02 May 2005 19:46:47 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: Re: [R-390] Variacs and solas: additional thoughts

One can parallel the secondary to make a 6 amp 6 volt transformer, thus a 6 amp 6 volt buck. I have peeled back the yellow plastic tape at the center tap and discovered the center of the winding had been brought out to the solder tab, revealing two copper wires. Test the polarity before the final soldering!

Date: Fri, 6 May 2005 08:36:32 -0500
From: "Barry" <n4buq@aol.com>
Subject: [R-390] Filter cap temperature

While tinkering with the "new" R390A last night, I noticed that C603 is getting slightly warm. The other cap is cold. Is this possible an indication of low ESR? Do these old caps generally leak a bit or should I be concerned? I hadn't planned on replacing them as they seem to be working, but if they're going to blow, then I'd rather go ahead and replace/rebuild them.

Date: Fri, 6 May 2005 09:29:18 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Filter cap temperature

I think a rebuild is a standard thing with the "A". I have several in the shop and everyone I have checked had excessive leakage. I would do the rebuild. There are several ways to go...caps under the chassis, caps in octal socketed square relay housings or the traditional cap overhaul where you cut the things open and replace the guts. I am about half way through that process with a pair of mine but have had to put it on the back burner for a few weeks while I finish another project up!

Date: Fri, 6 May 2005 09:56:18 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Filter cap temperature

I did "caps in an octal socket" for my Motorola. It works nicely, but I don't really see that much advantage to having them "plug-n-play". I'm thinking of doing what I saw someone else do. Using axial-lead caps, run the positive lead through the appropriate hole in the socket and solder underneath. Gather the negative leads together, solder them to a ground lug and attach the ground lug to the standoff where the original cap clamp attached. I thought that was a pretty neat solution. Digging out ukkumpucky gets old.

Date: Fri, 06 May 2005 11:32:27 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Filter cap temperature

Most likely that cap is leaking more than it should. "ESR" stands for Effective Series Resistance. A capacitor behaves as if it has an ideal capacitor in series with a resistance. A good cap will have low ESR. A cap designed for switching power supply duty where the ac current through the cap is very high, will have an even lower ESR. If C603 is the first one after the rectifiers, then it will have experienced higher ac ripple all it's life and may be tired by now.

> Do these old caps generally leak a bit or should I be concerned?

Many of them leak. If they are leaking, you should be concerned.

> I hadn't planned on replacing them ....

Try rebuilding the one that gets hot first. Measure the leakage on it first.

Date: Fri, 6 May 2005 11:43:30 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Filter cap temperature

There's hot audio output tubes running right next to it. The 2 uF AGC cap in the IF deck runs warm too for same reason, it's surrounded by tubes. If you want to be thorough then rebuild them, it's good messy fun. I found an open crimp connection in the last pair I did. Congrats on fixing the B+ problem!

Date: Fri, 06 May 2005 16:53:09 +0000
From: eldim@att.net
Subject: Re: [R-390] Filter cap temperature

My thoughts on the R-390 Power Supply Filter Electrolytics located on the AF Deck are:
1. If you have a Octal Tube Socket Adapter, you can remove the suspect cap and insert the adapter in between to facilitate making measurement with your VOM, VTVM, or for O'Scope observations. It same the trouble of removing the deck. I normallly take a AC Ripple Reading after making the Voltage Measurement. A scope will give you a nice picture of the ripple. I don't have the figures handy, but we all know that you want minimum AC Ripple on your DC buses. Good Luck. Glen Galati, KA7BOJ Tacoma, WA

Date: Fri, 6 May 2005 11:56:45 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Filter cap temperature

Just a comment on the black goo. Maybe I got lucky but I did no digging at all. I did find if you pull on them before they are heated enough on the outside you will leave a bunch of the stuff up in there to have to get out. I took a propane torch and heated the shell while the base was locked in a soft jawed vice. Once it started smoking a bit from inside I grabbed the outer shell with something that kept me from getting burnt but allowed decent grip and snatched the thing off. All I was left with was a thin film of the goo in the inside of the shell. I wiped it out with a piece of cloth wet with flux remover or lacquer thinner. Worked great. I rushed the next one and ended up with the top half of the goo to get out. More heat and a screwdriver and it popped right out. It's not too hard. It just requires more heat than most expect! A heat shrink gun didn't get it!

Date: Fri, 6 May 2005 14:16:22 -0400
From: "Al Parker" <anchor@ec.rr.com>
Subject: [R-390] Re: R-390 Digest,

I'll second Cecil on can opening heat & minimal ukumpucky. I've done the process on SP-600, R-388, and other smaller caps, it's relatively easy. I haven't done an R-390A yet, but it's closeby and oughta be abt the same. It's not hard to do, and whatever your "male vs female" view on radios is, why not keep it right if it's easy or not costly. I've been taking pix and will, one of these days when I get around tuit, post all the info on a webpage for all to learn from. For a
preview, I've had a small one for a Drake rcvr avaliable for viewing for a yr or 2 at: http://www.thecompendium.net/radio/filtercap.htm
I've been toying with the idea of offering the service for hire.

Date: Fri, 6 May 2005 11:46:07 -0700 (PDT)
From: Jack Sullivan <jsullivan10512000@yahoo.com>
Subject: [R-390] Pulling apart old electrolytic cans, for putting in new caps and resealing, to retain original appearance

For years, I have done this, essentially the same as many of you have described on this site, removing "guts" of electrolytics for inserting new caps inside "can." Some of the oldest ones have black tar interior. On those, I have tried about everything, getting inside foil/paper/tar out, by removing it without heat, with a lot of cold from freezer (it makes tar hard and it breaks easier), heating with small torch, etc., (works but is a mess and often a pain). One day, while working on one of these radio electrolytics, I had wood burning stove heated up, so I thought why not set cap on stove, and try, periodically, to pull it apart, as it heated up, trying to not get it so hot that the tar burns (smokes a lot), but hot enough to pull apart with ease. IT WORKED VERY WELL, SO I NOW DO IT THAT WAY. Works better than torch, as torch often burns tar causing smoke signals all over house. Jack

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Date: Fri, 6 May 2005 15:02:38 -0400

From: "Scott Bauer" <odyslim@comcast.net>
Subject: Re: [R-390] Pulling apart old electrolytic cans, for putting in new caps and resealing, to retain original appearance

DH Distributors will make them up for you if you supply the octal base from your old caps. Price $18.00. Seems like a lot but it is worth it. Zero Time & Zero Effort. The perfect option for the person that does not have a lot of time. They will also put them in FP cans for $14.00. They look great. 1-316-684-0050. Usual Disclamers...

Date: Thu, 12 May 2005 18:43:09 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: [R-390] Re: little things

Over the years, I have made some little additions to my trio of R-390A's that may be of use to you guys. Most are obvious and simple (about my speed nowadays). Most are not original with me, but have been mentioned in earlier posts through the years.

<snip> F101 and old two conductor pwr cord Got rid of both, and filed the rear circular opening a bit to accept a new Corcom EMI power receptacle... grounding it to the chassis, and hooking up the hot lead to the fuse F101. You do have to drill two small holes in the rear panel to secure the Corcom. Any computer grade power cord may now be used.

C603 and C-606
To reform these capacitors I used Roy's circuit, but rather than have everything exposed and take the chance of getting zapped: i dived into my junk box and rescued a 2.5A Variac, TV pwr transformer, 0-500v voltmeter and multirange-milliammeter, and a 1A fuse. Stuck it all into a enclosed case that's grounded and painted it Navy grey. A 3PDT toggle either powers the Variac up or discharges the electrolytic thru a 1000 ohm bleeder. I have a lot of larger BA electrolytics, so this little project saved a lot of 'haywires'. Two General Instruments and one Pyramid electrolytic failed, but the Sangamo's & Cornell-Dubliers reformed nicely with only 0.3mA leakage at 250v.

Date: Fri, 13 May 2005 10:27:52 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Re: little things

>Over the years, I have made some little additions to my trio of R-390A's that >may be of use to you guys.

Bravo! This is the kind of post that helps both the new folks and the experienced-encrusted graybeards. Thanks for the summary of Tips.

<snip>

>F101 and old two conductor pwr cord... a new Corcom <snip>

This is a fine mod. The EMI situations we have are far less demanding than
the miltary had. Most modern EMI filters don't trip ground fault interruptors. The three wire grounded line cord is a VERY good idea.

>C603 and C-606
>To reform these capacitors I used Roy's circuit<snip>...............

This is a fine test fixture.. very handy. Embellishments could be:
- An octal socket for the plug-in caps,
- Series current limiter resistors for each section
- On-discharge switches for each section
- External cap connections
- A panel voltmeter, or terminals to hook up your VTVM or DMM
- A switch to select which cap is being measured.

>...the Sangamo's & Cornell-Dubliers reformed nicely <snip>.........

I use a 100 k series resistor and set the variable supply so it drops about 100 volts. This gives a reforming current of one millamp. If the variable supply is able to reach 550 volts, you can reform most any electrolytic to 1 to 5 ma with little danger to anything.   <snip>   Roy

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Date: Fri, 13 May 2005 10:34:11 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: Re: [R-390] Re: little things

<snip>   2) C603-C606

My unit has a panel mounted voltmeter across the test capacitor, as well as a panel mounted milliammeter. The only ext connections are to the test cap, and you just have to take care not to grab the live connections. ;.) The case is, of course, grounded thu its own 3-wire cord. It would be reasonable to add an isolation transformer before the Variac. The Variac output is fused. Should have mentioned that the same toggle that powers the unit down, also completes the condenser bleed circuit (which is, of course, opened when you power up).

Date: Mon, 30 May 2005 21:39:44 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 POWER SUPPLY

>Hello,I Have A R-390 Power Supply Makes A Humming Sound-Not Ac

Sound, >Is The Power Supply Repairable With This Type Of Problem?

This is an R390. Do not panic. It is repairable. We need some more information from you. Please read the other mail to you. Is this an R390 or R390/A. The R390 power supply is a bit more complex than the R390/A power supply. At worse you may need to simply replace the power supply deck. Likely you can fix the problem.

- Check your fuses and make sure you are not running with any one over fused at this time.
- Make sure the oven heaters are turned off.
- Pull the RF and Audio decks for a visual inspection.
- Tell us what you find.
- Do you have solid state diodes in or are you running tubes?
- If tubes what type? (there are some mods away from the 26Z5's)
- Do you have a transformer hum?
- Do you have a hot transformer? (should at least be able to touch it as
- warm)
- Do you have any arcing noises?
- Do you blow fuses?
- Do you have the 150 volt voltage regulator tube lighting up?
- If it is an R390, how are the series regulator tubes doing.
- Is the noise in the audio output?

The power supply also has a selenium rectifier that operates the antenna relay. These things go bad. They will load the transformer and cause a hum. ground the standby pin on the back terminal board and switch the function switch to standby. The antenna relay should operate. Listen for a change in hum. check the fuses after this test. If you have a bad rectifier stack, it is best to replace it with a modern silicon bridge.

Unplug the IF deck, RF deck and VFO deck harness. Did the Hum quit? If you have an R390/A unplug the audio deck.You cannot do this to an R390 because of the series regulators in the audio deck. Every thing quits in the R390 when you unplug the audio. It does not hurt any thing, its just not a useful test. Take the time and test all the tubes. A shorted or bad tube will pull current and cause the RF deck to hum at strange frequencies. If you find, unplugging a deck stops the hum, do not consider you need to move over to that deck. You may have a filament winding gone bad. When you unplug the deck, you unload the winding and the hum may stop. Grab your schematic and start to unpug tubes to find the filament winding causing problems. If you isolate the problem to a filament winding, test all the tubes on the winding for shorts. Bad tubes will cause a power supply hum. Replacing the tubes will fix the problem.

You need to isolate the exact problem in your receiver before you consider the repair options.

The transformer is sealed into a can. Soldered but openable. Inside the can is a typical transformer with laminations. Some transformers were bolted. Some were welded some were strapped and clamped. The winding lead were soldered to the other end of the feed through lugs on the can. Some times when soldering to the lugs, on the transformer, the solder inside over heats and moves into places it should not have. While you can replace a transformer on the deck, aggravation almost exceeds return. After meeting the cost of a transformer, the cost of a deck and the trouble saved makes it worth cleaning up a new subassembly. You start trading subassembly wiring and harness connector problems for transformer wire problems. A good straight chassis deck, green screws and some desired factory ink, may cause you to want to keep the deck you have. (Read all matching modules in the receiver.) However, transformers have been opened and rewound. You can go the full route if you have the interest. You can open the can and do repairs. You can pull and replace the transformer. Once you find the real problem and consider the "historic value" to you of the bad part, you can select your repair solution.

OK so what goes wrong. After time the laminations come loose in the transformer and eddy currents let the lamination plates oscillated in the magnetic fields. This makes mechanical noise. So why is it not a 60 cycle hum? It may be. But the mounting hardware, mechanical mass, sealing varnish, and other (do not tell OSHA) included goop changes the resonant frequency. Power transformers have been heard with all sorts of sounds. If its not getting hot, blowing fuses, and really annoying loud, you could live with it. Likely its annoying loud and you would like to fix it. Also there are other things like shorted winding that lead to problems. Soon (100 hours of operation) the vibration will wear through some varnish on some windings and things will go from bad to very bad. So you should not just let the problem go. But it will let you operate the receiver long enough to isolate the problem to a bad part. While you may have a power transformer hum, the cause may not be in the transformer. Do some checking, let us know what you find. Watch what some of the other fellows say and ask you to check. Take your time, enjoy your puzzle. Once you get to the problem, report it here. If you need parts ask here first. If you need some more help, warm up the keyboard and ask away.

Date: Mon, 30 May 2005 22:26:30 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re: R-390 POWER SUPPLY

Judging by the tone of his message the humming is pretty loud because he has to shout to be heard over it :o) I "fixed" the transformer in my '67 EAC which had a loud mechanical hum. I loosened the 6 captive green-headed screws holding the transformer to the mainframe each a couple of turns. That reduced the acoustic coupling and provided a marked reduction in noise. The noise was reduced further to an inaudible level when I used the radio sitting on a tabletop. With the power transformer screws loosened I shoved a piece of padding (an old leather glove) under the transformer thus supporting its weight to the table and cushioning it. It did not run hot that way.

Date: Mon, 06 Jun 2005 18:39:36 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: [R-390] Megacycle detents, nominal B+, and bad tube brands

<snip> My 390A has had its power supply solid-stated, and a 100 Ohm dropping resistor put in. The B+ I measure (audio B+) is 227V in AGC or MGC and 252V in Stand-By. This is with 120VAC power in.

This seems to me to be on the high side, although I don't know what the official number is supposed to be. There's real nicely regulated 150V on the regulated supply.

To lower the non-regulated B+, is the answer more dropping resistance (200? 250? Ohms?), a 40V 10W Zener, a bucking transformer, ??? <snip>

Date: Tue, 07 Jun 2005 10:05:02 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Megacycle detents, nominal B+, and bad tube brands

<snip> >... The B+ I measure (audio B+) is 227V in AGC or MGC and 252V in Stand-By.

We hear advice to avoid standby for any but brief periods. The tubes that have no cathode current can develop a dreaded condition called "cathode interface" were in the thing acts as if a resistor has been magically inserted in the cathode lead. The magic is chemistry of the cathode emitter coating, of course.

>... To lower the non-regulated B+, ...

The bucking transformer is a very good idea, in my opinion. Measure the filament voltages in a number of places accurately to see if they are much above 6.3. If so, add a current inrush limiter and then a bucking transformer. <snip>

Date: Mon, 4 Jul 2005 09:12:57 -0500
From: "Barry" <n4buq@aol.com>
Subject: [R-390] Blowing B+ fuse

I finally got a couple of 1/8A B+ fuses (SloBlo) and tried one of them. The radio played for about one minute and blew the fuse. I was running a 1/4A in it before this. I assume the 1/8A fuse should be sufficient and I have something leaking somewhere, right? I replaced all paper caps, but not the electrolytics (yet). I assume leaky bypass caps is the first place to look? Any other suggestions? My other R390A is a "single-fuser" so I don't know if the B+ line is pulling more than 1/8A or not.

Date: Mon, 4 Jul 2005 12:14:05 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Blowing B+ fuse

I'd look at the plug-in electrolytic filter caps on the audio deck, because high leakage is a common failure mode of electrolytic caps, and because it's easy.

Date: Mon, 4 Jul 2005 14:27:05 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Blowing B+ fuse

With the order for the fuses, I included new electrolytics. I originally figured I would replace them, but the radio seems to pretty much hum-less so I thought the old cans were in pretty good shape. I'll probably replace them and do a before-and-after current test to see if that helps. Thanks!

Date: Tue, 05 Jul 2005 04:47:41 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Blowing B+ fuse

> I finally got a couple of 1/8A B+ fuses (SloBlo)

I think that the B+ fuses are supposed to be non-sloblo (fastblow). The idea is that a short/overload on the B+ should break the circuit immediately. Incidentally both my R-390A's came to me with 2 or 3A fuses in the B+ positions. May as well have been a penny...

> [Blowing fuse = bad electrolytic filters]

Probably. Do the electrolytic cans get noticeably hot (hotter than the chassis around them at least?) It's entirely possible for the electrolytics to still have enough capacitance to effectively filter but have so much leakage that they blow the fuse. Also check for burnt resistors on the decks... indication that a tube is drawing way too much current. The Army manual has a good procedure for finding B+ shorts with an ohmmeter but it doesn't always show up too-much-current-when-real-power-applied faults.

Date: Tue, 5 Jul 2005 08:13:55 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Blowing B+ fuse

<snip>....B+ fuses are supposed to be non-sloblo (fastblow)... <snip>

I figured they were all SloBlo, but maybe not. Any other comments here?

> Incidentally both my R-390A's came to me with 2 or 3A fuses in the B+
> positions. May as well have been a penny...

The reason I've been running with the 1/4A is:
1) It's what I had on hand, and
2) The older radios didn't have this fuse at all.

I figured if something catastrophic occurred, the 1/4A *might* protect something, but a "penny" would have been the same as the older radios so I wasn't too worried.

> > [Blowing fuse = bad electrolytic filters]
>
> Probably. Do the electrolytic cans get noticeably hot (hotter than
> the chassis around them at least?)

If I recall, the caps do get a bit warm (at least one of them). I'll do a current check with the cans and the new caps and see what difference it makes.

> It's entirely possible for the electrolytics to still have enough
> capacitance to effectively filter but have so much leakage that
> they blow the fuse.
>
> Also check for burnt resistors on the decks... indication that
> a tube is drawing way too much current.
>

I didn't notice any obviously burned resistors when I recapped the decks. I could have some high values, but none looked obvious.

> The army manual has a good procedure for finding B+ shorts with an
> ohmmeter but it doesn't always show up

too-much-current-when-real-power- applied faults.

I need to do a resistance/voltage check on all tube pins before I call this one complete. Hopefully, I can get things going with the 1/8A fuse with the electrolytic changes, but if not, I have other issues. Thanks, Barry -

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Date: Tue, 05 Jul 2005 09:22:57 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Blowing B+ fuse

I don't recall in your prevous posts whether you have a solid state power supply
or tube rectifiers. The B+ inrush with the silicon diode modification will be huge.

Date: Tue, 5 Jul 2005 08:43:44 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Blowing B+ fuse

Tube (rectifiers).....   The fuses blew after about one minute which would further lead me to believe something like the electrolytics are the problem.

Date: Tue, 05 Jul 2005 09:53:29 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Blowing B+ fuse

> The B+ inrush with the silicon diode modification will be huge.

It's not so bad - the diodes don't drive filter capacitors directly, there's big filter inductors in the way. If a B+ fuse blows, it's not directly because of the solid-state PS mod. (Now it may be indirect if the extra B+ volts causes a capacitor or tube to fail shorted) I've made measurements of AC inrush current with and without inrush-limiting thermistors, I'll see if I can post oscilliscope traces on the web somehow.

Date: Tue, 5 Jul 2005 07:04:48 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Blowing B+ fuse

Won't matter if the SS mod was done according to spec. The official instructions add a series resistor to drop the B+ to tube-equivalent levels. This softens the inrush considerably. Tim's right, the B+ fuses are fast-acting, not slow-blow. And they were added after either some radios burned up, or an engineer realized that they could. It's a worthwhile upgrade, especially in these latter days
when the components are so far past official lifetime design specs.

Date: Tue, 5 Jul 2005 13:12:32 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Blowing B+ fuse

Slo-Blo's are usually used when there is an inductive load and/or to survive the much higher in-rush current that can cause nuisance fuse blowing with standard fast acting fuses. Has the power supply been solid stated or are the tubes still present. If solid stated it may still be in-rush current along with filter leakage current that is opening it up. I would think the turn on current surge would be a good bit greater than 125 ma. in the B+ if solid stated. Much more gradual with the tubes.... Another thing...how did the fuse blow? Was it just opened up at one end of the element or was the inside of the glass plated with discolored metals indicating a sudden spike in current draw.? (should also blow the 1/4 A if that's happening though.) Just some thoughts...

Date: Tue, 5 Jul 2005 13:15:58 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Blowing B+ fuse

Never mind my drivel.....I should have read on down the list. You guys have got it covered as usual.... Sorry for the extra bytes...

Date: Tue, 5 Jul 2005 13:45:32 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Blowing B+ fuse

The fuse was simply opened up at one end - no discolored metal plating. Assuming a slow overdraw of current.

Date: Sat, 9 Jul 2005 13:53:11 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: [R-390] Blown B+ Fuse - Cont'd

Last night, I finally got around to doing some testing. Hooking up a couple of meters in series (to ensure I was getting readings that agreed since neither meter is calibrated) where the 1/8A fuse goes, I observed that the system draws anywhere from 70mA to almost 100mA depending on what's going on at the time (both meters agreed within 5mA). AGC with BFO off gave the least amount of reading whereas MGC gave the most (makes sense). Also switching from SLOW, to MED (or FAST) AGC when the 2uF cap dumps its charge causes the circuit to draw considerably less current until the cap discharges. Again, makes sense.

What I can't figure out is why a 1/8A fuse would have blown under these conditions. A fast-acting fuse might have sensed a very sudden surge that these meters would not have shown, but these are slow-acting fuses.

Has anyone done any tests to see how much current the typical B+ fuse is carrying? As I mentioned, one of the filter cans is getting just a bit warmer than the other one so it could be drawing a bit more than normal. I plan to replace these with modern equivalents and see what effect it has on the current situation (no pun intended), but I was wondering if anyone else has experimented here. Thanks!

Date: Sat, 9 Jul 2005 23:28:34 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Blown B+ Fuse - Cont'd

First thought on this is a tube doing an internal short. Something flaked inside a tube and gives you an over-current. So you bumped the receiver around and now it behaves. The 1/8 amp is out after the filter supply caps. So it looks like a by pass cap in the RF- IF B+ line. And the switched RF-IF B+ Line. If the receiver is still killing 1/8 amp fuses, put the tubes in the tester and smack them around a bit. In the past blown fuses were bad tubes. If you have this receiver all recapped, I would expect a tube is erratic. Second though on this is a poor cap. It looks to have reformed its self for the time being. If you keep the voltage on and carefully watch the critter it looks like it will behave. If you let the receiver cool for a few days, the problem could reappear. But a tube will do the same thing to you. It may not be the cap per se. It could be a left over grim or condensation problem. Two much current leaking off a wire to ground. Just as hard to find as a marginal tube or cap. Roger KC6TRU

Date: Sat, 9 Jul 2005 22:56:03 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Blown B+ Fuse - Cont'd

That is certainly plausible. I turned the radio on its side to get at the fuse so the tubes are in a different gravitational orientation than when the fuse blew. I didn't even check the tubes before cranking this thing up and I really should do that. The leakage/short test may hav some surprises waiting for me. I plan to try this with the fuse inline with the meters. If it blows when the circuit is drawing significantly less than 125mA, then I'm guessing a bad set of fuses.

Date: Sun, 10 Jul 2005 00:13:20 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Blown B+ Fuse - Cont'd

>.............bad set of fuses.............

Do not be amazed, It can happen, and how are we suppose to test fuses. The 2404 should be noted as "no problem found" "likely one time power droop" Placing FM on paper work would not reflect a proper attitude. Roger KC6TRU

Date: Sat, 9 Jul 2005 23:43:48 -0500
From: "Leland Bahr" <pulsarxp@earthlink.net>
Subject: RE: [R-390] Blown B+ Fuse - Cont'd

Fuses wear out and blow for that reason besides protecting a circuit. Surges and vibration also take their toll on a fuse besides just the every day daily current flow throught the fuse. Same thing is also true about circuit breakers. Just like a light bulb, they go bad in time.

Date: Sun, 10 Jul 2005 01:01:52 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Blown B+ Fuse - Cont'd

> Fuses wear out and blow <snip>

Barry mentioned that he had just put in the correct fuse (1/8 instead of 1/4 amp), though slow blow rather than the F/B that's supposed to be used. In addition to wear and tear, defective fuses aren't unheard of. If NOS -- really old -- there could be some deterioration on the shelf, depending on storage conditions. Fuses aren't sealed. I've seen some where the glue had given out and just installing them causes one or both end caps to twist -- also some that looked corroded inside or had an awful lot of rosin showing in the end-caps where the wires are soldered. I suspect a bit of corrosion or a slight twist can affect the actual current "tolerance". And there can be some that were just made wrong/defective. I'd check another one with just one of the meters in series, since they read the same when the current was measured before. May as well put in another order for 1/8th amp fuses -- fast blows -- from another source.

Date: Sun, 10 Jul 2005 13:57:32 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Blown B+ Fuse - Cont'd

Fuses are new. I put the remaining fuse inline with the amp meters. Circuit drew anywhere from 70 to 100mA and the fuse held. Perhaps a bad fuse, perhaps a bad tube. Dunno. I thumped all the tubes (except the 26Z5W's) with my finger and didn't notice any sudden jumps in current. I'm still figuring something is lurking, but if I can't get the fuse to blow, then I suppose I can let it alone. Thanks guys!

Date: Wed, 13 Jul 2005 09:13:01 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] FM'ing with solid-stated PS

I've heard testimony (I think it was first mentioned in an Electric Radio from a decade ago but I've seen it repeated here and elsewhere) that solid-stating the power supply, with a 200-ohm series resistor, can cause FM'ing of various receiver-internal frequencies as the audio output goes up and down with strong signals and modulates the B+. My cursory inspection of the 26Z5W curves (see http://www.mif.pg.gda.pl/homepages/frank/sheets/087/2/26Z5W.pdf) leads me to believe that a 26Z5W has an effective dynamic impedance of 200 ohms. (in particular for 100mA of load current the output drops 20V.) So my gut feeling is that if there is any FM'ing due to a solid-state-with-resistor PS mod, it's pretty much the same FM'ing that a PS with real 26Z5W's has. All my PS's were solid-stated before I ever got them, and I don't have any 26Z5W's in any event. Did I make a mistake in my math? By my reckoning this is a half-wave bridge rectifier so at any moment only one rectifier is conducting, and there's no need to double or half the 200 ohm impedance. Are the tube curves not typical but instead worst-case? I read them as typical.

Date: Wed, 13 Jul 2005 09:06:03 -0500
From: "Barry" <n4buq@aol.com>
Subject: [R-390] Fuse Holders Still Needed

In case anyone knows where I can get them, I'm still looking for a half-dozen fuse holders for my R390As. Specifically, I'd like to have some of the quality that were originally installed in these radios (milspec?). I can find several type from Littelfuse, Bussman, etc., but they generally don't look quite the same as the originals. They generally have plastic nuts and are cheaper-looking in general than the originals. I've searched all the online houses and eBay with no luck. Someone had an auction for some about a month or two ago, but I lost out :-(

Date: Wed, 13 Jul 2005 13:18:42 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Fuse Holders Still Needed

My yellow-striper came from Fair Radio with a busted up fuseholder.... and a little plastic baggie with a pretty decent new fuseholder (and a buncha other things that I'll need as I put it all back together... knob, counter cover/glass, AC input cover, etc.) It's not an exact cosmetic match for the other fuseholders but is close, and it has a metal (not plastic) nut. So call them and ask what they've got. I was surprised when you said that you were having a hard time finding a fuseholder with a metal nut, but then I

look in the Digikey and Mouser catalogs
and they all have plastic nuts. Huh. My other R-390A was retrofitted with the B+ fuses (I'm guessing by a military depot 40+ years ago, it has almost-but-not-quite-original looking legends for the B+ fuses), and has one black "traditional" fuseholder for the AC and two gray very-differently-styled fuseholders for B+.

Date: Wed, 13 Jul 2005 16:15:31 -0400
From: "Jim Miller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] FM'ing with solid-stated PS

I di get about 50 Hz FM with BFO turned on when the AGC increases/decreases, or on a strong carrier when I turn the RF gain up and down. This is with audio set very low. I believe it is caused by AGC changing current drain on some of the tubes in the RF/IF stages which pulls the B+ as the plates draw more or less current. But in particular I find that the AGC control of the 1st mixer tube V207 actually pulls the 17 Mhz crystal oscillator V207. I put frequency measuring equipment on all oscillators as an experiment andmeasured the frequency chage of every oscillator as a function of AGC voltage. V207 appeared to be the only one that was pulled off significantly enough to be audible in the BFO beat note. Evidentally the AGC control on V202 causes some change in impedance or current draw that is "seen" by the V207 oscillator and causes the crystal to be pulled slightly. I have seen this on 2 radios. In one case I was able to reduce the pulling slightly by changing V202 (6C4) for a newer tube. Jim N4BE

Date: Thu, 14 Jul 2005 18:46:58 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] 26z5w cost

The cost of the 26Z5W tube seems to keep going up and up. There is a 12 volt 9 pin tube with similar internal construction, but has different pin-outs. It's time for me to make a mod. I forget the tube number? anyone know? Thanks

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Date: Thu, 14 Jul 2005 15:49:22 -0700
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] 26z5w cost

12BW4. Go here:
http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm

Date: Thu, 14 Jul 2005 20:33:01 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] 26z5w cost

While the cost is indeed going up, you can find them sometimes for a fairly reasonable price on eBay. I think I paid about 6 or 7 bux each plus shipping for my last set. There's a set out there now with a Buy It Now price of $15.95. I also bought some 12BW4s just in case the 26Z5Ws do dry up. It seems to be a very reasonable mod (aside from the evil solid state route).

Date: Fri, 15 Jul 2005 15:39:19 +1000
From: Lionel Sharp <vk4ns599@optusnet.com.au>
Subject: Re: [R-390] 26z5w cost

Alltronics advertise the 26Z5 tubes at $!0.00 each and the 12BW4 Tubes at $2.00 WJ Ford Surplus advertise (but they say the price list is out of date) NOS 26Z5 for $6.25 and Pulls for $2.00 Anyone bought from them lately???

Date: Fri, 15 Jul 2005 08:02:46 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] 26z5w cost

I've seen a lot of people advertise them that didnt' actually have them in stock.
Some didn't even know they had them advertised!------

Date: Fri, 15 Jul 2005 10:07:06 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] 26z5w cost

I'm not sure, but I think the "mrtubz" seller on eBay must have a stash he's selling two at a time. I bought my last set from him. One arrived broken and he promptly sent a replacement. He has another set out there now. They're pulls, but appear to test just fine.

Date: Fri, 15 Jul 2005 23:51:23 EDT
From: RIKKA3TXR@aol.com
Subject: [R-390] Re: C553 etc

<snip>..... I also had problems popping the fuse in the HV after the diode mod (and dropping resistor mod)...put a few ohms x 5W in series with both diodes and it stopped..RIKK...KA3TXR

Date: Mon, 18 Jul 2005 13:35:48 -0600
From: "Kenneth" <crips01@msn.com>
Subject: RE: [R-390] 26Z5's

I ran across this site while looking for the 26Z5. Has anyone done this mod'? http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm

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Date: Mon, 18 Jul 2005 12:58:16 -0700
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: RE: [R-390] 26Z5's to 12BW4 mod

I have. I posted that mod to the web site in question. I had to do it to an R-390 once, which I then sold through Rick Mish. He liked it well enough that when he passed the receiver on after refurbishing it, he left it in. It works as advertised. Most of the things I have posted to that web site have been tried at least once.

Date: Mon, 18 Jul 2005 21:18:04 -0600
From: "Kenneth Arthur Crips" <CRIPS01@MSN.COM>
Subject: Re: [R-390] 26Z5's to 12BW4 mod

Ok I will put this mod's in my list of work arounds. I spotted this site at work and I never have the time to look at them much. At work I have to contend with back stabbing nurses looking for a target for their knives.

Date: Wed, 20 Jul 2005 18:06:15 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] RE: The 26Z5W

>changed out the 26Z5W's with diodes.............

The wording coursing through this list over the years regarding replacement
of the 26Z5w's with silicon has gone something like "...virtually eliminates the possibility of a rectifier-based power supply failure..." . Greater reliability is the military's reason.

>.........mount the full wave rectifiers on the heat sinks..................

I assume you are referring to the full-wave 2 diode rectifiers in a TO-220 like package. A full wave bridge could also be used as a 2-diode type rectifier by simply not connecting the negative lead. (Aside: works well as a replacement for defunct selenium in car battery chargers and can be bolted to the charger's case for heatsinking.) The rectifier current in the R-390( ) B+ supply results in negligible heat production in silicon rectifiers so applied. No need for a heatsink. Regular diodes with leads can be soldered to the terminals of the original rectifier sockets.

>.........solid state voltage regulator mounted ....

A typical linear regulator used as a replacement for the 3TF7 does require a
heatsink.   Some time ago David Wise developed a solid state regulator to replace the 3TF7 that did not require a heatsink. It is a sophisticated microcontroller-based digital design.

Date: Sun, 31 Jul 2005 17:37:10 -0400 (EDT)
From: "Paul H. Anderson" <paul@pdq.com>
Subject: Re: [R-390] Out from the shadows ...

>.. ...the R-390 tends to not have the same problems with caps as the R-390A.....

It is worth noting that the resistors and capacitors underneath the 6082's in the R-389, R-390, and R-391 audio decks also get fried from heat, so check your B+ and consider repairs there. Out of 4 or 5 of these decks that I've worked on, only one looked clean, the others were pretty scorched. The cost of failure can be lower, but since the main failure mode is for B+ to go high - 280-300V on some of mine, it means you can stress a lot of the rest of the components. Again, this is only an issue for the R-389, R-390, and R-391.

Date: Thu, 4 Aug 2005 14:57:23 -0500
From: "Barry" <n4buq@aol.com>
Subject: [R-390] 1/8A and 1/4A fuses

A while ago, I was asking for a source of inexpensive fuses for the R390A and I found it. Dave (davesexp@grics.net) will sell a 5-pack of 1/8A and a five-pack of 1/4A AGC fuses for $6.00 shipped while quantities last. I think that's a pretty good deal for 10 fuses. I asked him if it was okay to post this to the list and he agreed. Contact him directly at davesexp@grics.net. He takes PayPal which makes it pretty painless.
Regards,

Date: Tue, 9 Aug 2005 20:52:17 -0400
From: "Scott Bauer" <odyslim@comcast.net>
Subject: [R-390] multiple outlet strips

Does anybody know of a manufacturer that makes a multiple outlet strip that has an on/ off switch for each outlet? 120 VAC.

Date: Tue, 9 Aug 2005 22:07:14 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: [R-390] multiple outlet strips (fwd)

You might try and look for one of those multi-outlet control boxes they used to seel in computer shops. These were quite common for home computers - most of them were flat boxes with four to eight switches on the front, outlets on the back, that were made to fit under the base of your monitor - then you could control it's power, the printer, computer, fax machine, etc. I see them at ham swaps all the time - have a couple here that I use on the bench to turn test gear on and off.

Date: Tue, 16 Aug 2005 08:18:41 -0500
From: "Barry" <n4buq@aol.com>
Subject: [R-390] Filter cap replacement question

For you guys who are restuffing your R390A's electrolytics, which caps are you using? I ordered some from Mouser with the intent of simply installing them "bare" through the holes in the octal sockets. Sadly, the octal sockets in this AF module, though, don't have through hole style sockets; therefore, I'm planning on using an octal plug. I have some old cans from another set I've gutted, but these caps are just about 0.010" in diameter too large to stuff three of them in the can so I was wondering where you are getting caps small enough to fit three inside the cans. I have some old burned-out octal tubes and their bases are a perfect press fit in the old cans so if I can find small enough caps, this should be a cake-walk.
Thanks in advance,

Date: Tue, 16 Aug 2005 09:44:24 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Filter cap replacement question

For the 33 uF 3-section, I used Nichicon 33uF 400V 105C rated radials. Part number UVZ2G330MHD. I like to be conservative so I went with a 400V rating, 105 degree C rated, and Nichicon is a well-respected lytic maker. (They don't steal electrolyte formulas with missing ingredients!)

> [can't put wire through octal socket]

I've seen the plastic/phenolic socket drilled out to do this.

>.....octal tubes and their bases are a perfect press fit ....

I used the original can base. Drilled holes into the brass pin a little bit, inserted a wire, filled with solder. I needed extension wires to get to the cap "on top". JB-welded the can back together. Others drill/tap a hole and use a screw to attach to the old base. If you press-fit a "new" octal base into the old can I don't think you'll have enough height to do all three caps.

Date: Tue, 16 Aug 2005 09:52:29 -0400
From: <robert.boyd@sdc-dsc.gc.ca>

Subject: RE: [R-390] Filter cap replacement question

I obtained mine from Digikey, but all the 33uf capacitors appear to be a standard" size. I got around the size by expoxying two caps together, then expoxying the third on top of the other two thus creating an assembly which I wired to the base. The base-another nightmare! I didn't waste time attempting to solder aluminum wires, instead I drilled out the original wire and drilled/tapped the pins (2/56), inserted brass screws and soldered the assembly to them!

Date: Tue, 16 Aug 2005 09:17:35 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Filter cap replacement question

Not sure, but I think these are too tall to do that. They are axial lead caps. Maybe if I get radial lead caps, that would work. Thanks for the suggestion.

Date: Tue, 16 Aug 2005 10:23:43 -0400
From: <robert.boyd@sdc-dsc.gc.ca>
Subject: RE: [R-390] Filter cap replacement question

I used radial lead caps.

Date: Tue, 16 Aug 2005 08:29:33 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Filter cap replacement question

I ordered from Mouser, Xicon 140-XRL350V33 and 140-XRL350V47. These are radial lead electrolytics. A dremel tool with a cut-off disk made a quick job of neatly removing the lip on the old cans. Apply some heat with a propane torch to loosen the uckumpucky and pull out the old guts. Clean the inside of the old cans with some type of solvent. Drill and tap the pins of the base. I think I used 4-40 stainless screws with solder lugs. For the can with three 33uF caps, I stacked one on top of two, had to lengthen the leads on the top cap. A little heat shrink on the leads, some RTV to hold things in place, slide the cover back on with a dab of super glue. Looks good, lasts long time.

Date: Tue, 16 Aug 2005 12:48:31 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: RE: [R-390] Filter cap replacement question

A word of caution on the use of RTV. It comes in at least two types. If it smells of acetic acid, do not us it around anything metallic that you do not want to corrode. I learned this the hard way. I potted the VCO in my first GLB synthesizer just as the instructions said. About two years later it quit.

When I troubleshot the problem, I found all the copper leads in the potted area were dissolved. The RTV when it cures, by the moisture in the air, releases acetic acid. This dissolved the copper. There is another type of RTV that is listed as "Oxygen sensor safe". This is available at auto parts stores. This type is also available from industrial supply houses. This cures with an alcohol and does not cause any issues with the electronics.

Date: Tue, 16 Aug 2005 12:44:58 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: [R-390] Filter cap replacement question

Guess I've been lucky with the RTV. In most cases I've used a dab to stick things together, let the RTV harden and move on to the next step. Years ago I had a power transformer fail in an old DX-40. Had to put a steam hose to the beast to soften up the uckumpucky and pull the windings out of the metal can. Found the open/broken wire on the first wrap and potted the transformer with RTV. Didn't have any problems while I owned it. But if someone out there with a DX-40, its transformer potted with white RTV........ Oh well, something to keep in mind.

Date: Wed, 17 Aug 2005 07:58:07 +1000
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: [R-390] Electro s

The octal mounted caps can be easily replaced by axial lead caps that can be soldered under the audio module chassis ,modern caps are much smaller physically ,for the purist I suggest disconnecting the octal socket underneath and retaining the old cans , much simpler and quicker than restuffing the cans.

Date: Tue, 16 Aug 2005 18:12:25 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Electro s Nah relay base/plug!

The simplest way is to solder the new caps to an octal relay base and plug them in! The cover is optional.

Date: Wed, 17 Aug 2005 10:26:52 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Electro s Nah relay base/plug!

Good method. Do you have a source for relay plugs and covers? I found some ideal-looking candidates at <http://www.keyelco.com/pdfs/p102.pdf> but I can't find anyone who stocks them for online retail sales.

Date: Wed, 17 Aug 2005 08:43:48 -0700 (PDT)

From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Electro s Nah relay base/plug!

> Have used octal relay bases. However one problem (or irritant) I ran into
> is that the square relay base always is at the wrong angle to fit..................

Yup, same here, cut the corners off on a bandsaw 'til it's round.

Date: Wed, 17 Aug 2005 10:52:42 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Electro s Nah relay base/plug!

Hmmm, I didn't think about that. I was assuming the housings would be oriented so that they would fit properly, but if I recall correctly, the octal sockets are not mounted at right angles to the sides of the AF deck. Maybe I'd better stick with my tube bases...

Date: Wed, 17 Aug 2005 17:27:08 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Electro s Nah relay base/plug!

One thing to keep in mind about the square-base Octal Relay plugs and covers. If you notice on the R-390A audio chassis the keyways in the octal sockets for the filter caps are offset at a 45 degree angle from the 12 Oclock position. If you plug in the square-base Octal Relay plug the whole thing will be at a cockeyed angle on the audio chassis and the corners of the relay covers will bump into the choke on one side and the bandpass filter on the other side of the octal sockets. Unless you rotate the octal sockets on the chassis I don't see how the square relay housings can fit in-between the choke and bandpass filter on the chassis? It doesn't look like there is enough room on the chassis to drill new mounting holes to rotate the original octal sockets? If someone else has done this how did they get the square relay covers to fit square on the chassis? I suppose someone could replace the octal sockets with ones that have the snap in ring mountings and rotate them so the relay plugs will fit square. Sounds like a lot of work to get them to fit though..

Date: Wed, 17 Aug 2005 16:33:20 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Electro s Nah relay base/plug!

That's right and something I hadn't considered until earlier today. One thing I thought might work is to remove the "spline" from the octal stem. You'd have to be very careful to plug them in with the correct orientation, but given that interference issues are already present, it might not be too much of an issue. They used to make octal adapters that fit on older tubes where the orienting stem had broken off. The adapter has 8 holes which slide over the tube's pins and you can choose from 8 different "orientations". A little epoxy to hold it in place and that might be a workable solution albeit an expensive one considering the cost of the relay holder, replacement stem, and caps. But, hey, it's just money. They'll print more.

Date: Wed, 17 Aug 2005 17:46:38 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Electro s Nah relay base/plug!

That is an option to use the octal keyway repair items - they are still available from Antique Electronic Supply. You would have to take off the entire keyed stem on the relay plug down flush to the base of the pins, then slip the new keyway over the pins with the orientation offset 45 degrees then glue it to the base. Problem would be the best way to get the old keyway stem off the octal relay plug. Might be hard to get it off cleanly if it is made of brittle phenolic. If it is softer thermoplastic you might be able to drill it out from the topside using a drill-press and a step drill or by stepping drill sizes. Don't know how you could cut it off flush at the base - how would you get some kind of a saw down in there between the pins? Would be an interesting project!

Date: Wed, 17 Aug 2005 17:19:47 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] relay base/plug!

If you're going to take the key off from an octal socket to use the spline repair method you should remember that you might want to take off four of the pins, too. You don't need them and it will give you more room to saw out the center pin, hacksaw, bottom to top. Jan Skirrow used to have the nice square relay boxes for this job but I don't know if he has any more, we may need to look for a supplier of those. A 40mm shell casing is the right diameter for this, and is SO appropriate! It just EXUDES mil-surplus class!! If all else fails; rip the bottom off from an old recitifier tube, it can be done, sometimes by hand. The 40mm shell casing should fit nicely over that!

Date: Thu, 18 Aug 2005 02:08:33 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] relay base/plug!

Just took another look at the octal sockets on the R-390A audio chassis. Looks like the easiest way to get the square relay plugs to fit would be to just take a miniature round or square file and carefully **file out a new**

keyway in the audio chassis octal sockets at the 6 Oclock position. Probably wouldn't take ten minutes to do and no drilling, sawing or cutting off the keyway or removing the original octal sockets - just spend a few minutes with a small file! The square relay plug would only fit in the chassis one way so no worry about the plug going in the wrong way and this would safely align the new square plug-in filter cap assembly for the correct wiring to the socket. This would be a "soft" mod and not even visible once the new square relay cap housings are plugged in! Also the original metal cans could still be plugged in if you paid attention to the keyway orientation. I checked the wiring to the sockets and if the new keyway was cut at the 6 Oclock position - if you plugged the original cans in the wrong way all the pins would end up in blank positions on the sockets so no worry about possibly shorting something out if you plugged the original cans back in the wrong way - it just wouldn't work and you would get no filtering probably just lots of hum but no fireworks to worry about! But if the original holder bracket is still on the original cans it would be a no-brainer to plug them back in correctly!

Date: Thu, 18 Aug 2005 17:11:46 EDT
From: RIKKA3TXR@aol.com
Subject: [R-390] Filter can repacking

On the subject of repacking filter cans...I found that when you drill into the pins (used a drill the size of the cap leads) of the filters through the aluminum "rivet" that you will hit brass..tell tale yellow shavings start to show..I just dabbed flux into the small drill holes and filled them with solder..then heated again and inserted the cap leads..it was much easier than tapping the holes and setting brass screws..I like quick and easy stuff.

Date: Thu, 18 Aug 2005 21:12:06 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Filter can repacking

If you cut the can at the right place (immediately above the place where it goes from wide to narrow at the bottom) you see brass right away. It solders to quite nicely (using a Weller 40W temp-controlled iron) after you drill a hole.

Date: Tue, 23 Aug 2005 18:01:54 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] RE: IF module C553

The easiest installation for the added fuses would be to wire pigtail-style leaded fuses on unused terminals on the filter capacitor sockets under the audio deck. Neither hole drilling nor mainframe wiring harness hacks would be necessary. The audio deck would have to be removed to replace those fuses but that should pose little hardship because changing B+ fuses should be a rare event indeed.

Date: Tue, 23 Aug 2005 19:48:33 -0400
From: "Miles B. Anderson" <mbalaw@optonline.net>
Subject: [R-390] R-390A fuse installation

The easiest place to put a B-plus fuse on an single-fuse R-390A is at the cathode of the rectifiers (tube or solid state) underneath the power supply subchassis. In fact, if you clean up the ends of the fuse cartridge with steel wool and are reasonably quick with the soldering iron you can just pigtail the wiring onto the fuse itself without bothering with a fuse post. Just be sure to cover the whole thing with an insulating sleeve -- my choice cambric "spaghetti" tubing but shrink tubing will work fine. That way, you don't have to open the wiring harness or bore a hole in the back panel. The second B-plus fuse, which is on the drop side of the filter capacitors is really unnecessary.

Date: Tue, 23 Aug 2005 21:05:41 -0400
From: "Jon" <jonklinkhamer@comcast.net>
Subject: [R-390] Trouble shooting the R390A

I have been going thru the IF and audio stage with respect to recapping, taking resistance measurements, checking tubes, cleaning, etc, being very careful and taking notes along the way. I recently just received the front panel back from painting it and I decided before I continue to go thru the RF, xtal and PTO stages, I wanted to put it all back together and make sure I didn't break anything. (I really wanted to see how the panel looked.) Well, as of tonight, I fired it up and noticed right away no audio.Immediately, I played around going from 1 to 20Mhz and I also switched in the CAL but noticed again no audio. The lamps however lite up. I turned the receiver off and checked the fuses and notice the 1/8 fuse has blown. My thinking is to first see if it blows again and if so then take out both the Audio and IF stage and power cycle again. I'm hoping to isolate it to one of these stages with the assumption I mess something up. I'm just shooting this out to see if the group has another preferred way of debugging or knows the cause(s) when this particular fuse blows. I would like to thank everyone in advance for their comments. I am as always much indebted.

Date: Tue, 23 Aug 2005 22:03:30 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Trouble shooting the R390A

I had a similar thing happen. After the fuse blew, I hooked up an ammmeter across the fuse and monitored the current, making sure it didn't exceed 125mA while bringing the radio up with a variac. Oddly, the current never went much over 80 or 90mA. I replaced the fuse and it has worked okay ever since. I suspected one or both of the filter caps may have been drawing excess current, but if I remember the circuit correctly, the 1/8A fuse comes "after" the caps so I don't know what was causing the current draw. Maybe the fuse was old? Don't know. Did the radio work before you worked on the front panel?

Date: Tue, 23 Aug 2005 18:25:48 -1000
From: "pete wokoun, sr." <pwokoun@hotmail.com>
Subject: Re: [R-390] Trouble shooting the R390A

If anyone needs a schematic showing the current levels throughout a R390A, I have one on my website in a .pdf format that you can download. Great for troubleshooting. It's at:
http://www.qsl.net/kh6grt/page4/r390aschematics/r390aschematics.ht
m

Date: Wed, 24 Aug 2005 05:35:34 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Trouble shooting the R390A

> the 1/8A fuse comes "after" the caps so I don't know what was causing the
> current draw. Maybe the fuse was old? Don't know.

Was the wire in the fuse just broken or was there vaporized metal deposited inside the glass? If just broken, it could've been an "old" fuse. I put "old" in quotes because if you look at fuse specs, they are allowed to blow occasionally while carrying rated current. If there was vaporized metal deposited inside the glass, I think the most likely cause would be an arc/short inside a tube that cleared itself (mostly...) after the event.
Sometimes you can find a charred
2.2K plate or cathode resistor too. Note that B+ divided by 2.2K is nearly 1/8A itself! Every R-390A I ever worked on had a charred/swollen 2.2K resistor or two.

Date: Wed, 24 Aug 2005 11:01:05 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] More! Trouble shooting the R390A

For folks doing troubleshooting you can narrow down the module where the trouble by which fuse is blown - if you have a chassis with 3 fuses.

If the 1/4 amp fuse is blown, it is most likely a problem with bad capacitors, the audio deck, or very rarely shorted rectifiers. The 1/4 amp fuse protects *all* the B+ in the radio, so if you've checked The Usual Suspects and it still blows (or measures wonky per Pete's chart) you can track it down to each module by disconnecting IF, Crystal, and RF decks first. If it's still a problem, it's in the audio deck most likely, or you overlooked on of The Usual Suspects.

If the 1/8 amp fuse is blown, the problem is either in the IF or RF module. The IF module, crystal deck, and RF deck may all be unplugged independently to help isolate the trouble.

Using that method along with Pete's troubleshooting chart, you can track down the problem almost without taking the radio apart. [note "almost"]

Date: Thu, 25 Aug 2005 11:47:52 +0000
From: jonklinkhamer@comcast.net
Subject: [R-390] Trouble Shooting R390A/Backlash

Just wanted to update the group on my restoration of the R390A. The 1/8amp fuse was replaced and the radio came up singing. It was like an old Toyoto commercial "Oh, what a feeling". Apparently it was a weak fuse, most likely from the mid Sixies. Thank you for all your comments. <snip>

Date: Thu, 25 Aug 2005 08:50:18 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Trouble Shooting R390A/Backlash

>...Apparently it was a weak fuse....

Fuses can be funny things. They aren't fully sealed and subject to wear and tear as well as corrosion. Sometimes they fail where the fuse wire is soldered to the end caps and it will look like the wire is intact. Sometimes the glue fails and the end caps will twist as you open the fuse holder to check the fuse -- or weakened enough to fail shortly after power-up. (On the principle that no good dead goes unpunished.) They also vary in quality. <snip>

Date: Thu, 6 Oct 2005 00:50:51 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] Power Cords on eBay

> cord. Upon turning the radio on I found that it trips the GFI outlet....
<snip>

(I learned this here) If the "ANT TRIM" knob is at the top of the panel, centered over the frequency readout - you have an R-390A. If the "ANT TRIM" knob is beneath the "CARRIER LEVEL" meter, it's a 'non-A'. Also, if the power cord is attached to the back of the radio (under a cover) - it's an "A". If the cord plugs into the back with a right-angled 4-pin plug, it's a 'non-A'. From your description of the power cord, it seems you have an R-390A. If your radio is tripping the GFI with the ground pin active, then I'd hazard a guess that the line filter unit inside has developed a leaky capacitor, or other high-resistance leakage path to ground, which of course will upset and trip your protection circuits - it's actually doing what it was designed to do. Another place to look might be replacing the power cord again, on the off-chance that the cord itself is bad.I would first download the full docs on your set, and then you can do a bit of troubleshooting. Obviously things are bordering on being unsafe as it stands now. I hope this points you in the right direction....   this List is a wonderful resource for keeping the 390s alive and well.

Date: Thu, 6 Oct 2005 00:10:08 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Power Cords on eBay

Ah, yes, the GFI problem is the other ground issue. The old power line filters were designed for worst-case environments. Each side of the line is bypassed to ground by 0.1 mfd capacitor. The reactance at 60 cycles is about 10K ohms.

That's enough to trip a GFI. The ground is important, so either the GFI has to go or you'll need about a 200 watt isolation transformer. IMHO, GFIs make sense around plumbing, where appliances may not be grounded. You are much more likely to get across the line on a workbench. Anybody that remembers to keep one hand in a pocket while working around live equipment doesn't need a GFI.

You have a non-A if the antenna trim is on the right side of the panel, near the rack handle about mid way up. You have an A if the antenna trim is in the center near the top of the panel.

Date: Thu, 06 Oct 2005 09:37:35 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Power Cords on eBay

>If your radio is tripping the GFI with the ground pin active, then I'd
> hazard a guess that the line filter unit inside has developed a leaky
> capacitor,

Not likely (Though they ARE paper caps in there). The line bypass caps are simply acting like capacitors and are not necessarily leaking.

>or other high-resistance leakage path to ground, which of course will
>upset and trip your protection circuits - it's (the GFI device, he means)
>actually doing what it was designed to do.

A leakage path is possible, of course, but unlikely. It normally is the too-large line bypass caps in the line filter. The "cures" are:

1) Don't use a GFI-protected line.

2) Use an isolation transformer.

3) Remove the line filter and:

A) Rebuild it with smaller bypass caps or:

B) Replace it with a modern IEC (computer style) line cord connector, either a filtered one or a non-filtered one. or:

C) Do away with the filter altogether and cobble in an unfiltered, directly connected line cord.

In ANY case, Please do use a grounded three wire line cord for safety.

Date: Thu, 13 Oct 2005 15:47:53 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] Drop-in, GFCI-friendly line filters for R-390A's?

Others here have talked about replacing the existing high-leakage-current R-390A line filter with a GFCI-friendly IEC-plug style power entry module. If I wanted to be less ambitious and simply bolt in a regular line filter unit, are there any that are a "perfect" fit in terms of mounting holes and electrical connections?

Just looking in the catalogs I see a bunch of Qualtek, Schaffner, Schurter units. Mostly one-stage, a few two-stage. Non-medical units seem to have leakages of under 1mA and the medical units seem to have leakage currents of just a few microamps. The number to be under in terms of GFCI-friendly is 5mA, is that the right ballpark?

Date: Thu, 13 Oct 2005 17:06:33 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Drop-in, GFCI-friendly line filters for R-390A's?

The line filters normally do not "leak". The capacitors inside there pass AC current because of the basic nature of capacitors. There happen to be a lot of capacitance (and more in the R-390/URR "non-A" line filter) and the capacitance is larger than other more modern line bypass filters.

>If I wanted to be less ambitious and simply bolt in a regular

>line filter unit, are there any that are a "perfect" fit in terms
>of mounting holes and electrical connections?

I don't think so. The holes in the rear panel for the two small studs exiting the R-390A/URR line filter are small and separate. The R-390/URR has a single hole in the rear panel to allow the entire line cord connector, which is part of the line filter, to go through the panel. This thing is large enough so that an IEC type line cord connector *might* well mount in that hole with only the flange mounting screw holes being needed.

>Non-medical units seem to have leakages of under 1mA and the medical units >seem to have leakage currents of just a few microamps.

Medial applications require far less leakage. There is a specified maximum leakage for normal appliances and household electrical equipment (I don't know what it is.) There also has in the past been a recommended test circuit that allows measurement of such leakage - if I remember correctly, it consists of a capacitor and a resistor. You measure the voltage across the resistor when it is placed in the leakage path. (That would be from the ungrounded chassis of our R-390 radios to the safety ground.) This little circuit may no longer be recommended or allowed under standard testing procedures.

>The number to be under in terms of GFCI-friendly is 5mA, is that the
>right ballpark?

I can't say. You may find more specifications associated with GFI devices than I did: research GFI outlets and circuit breakers to see if this number is specified in catalog or engineering info available on the web.

Here are some references:

Simpson makes an appliance leakage tester called the 229-2. See:
http://www.simpsonelectric.com/pdf/test/229.pdf
That page mentions the applicable standard: ANSI C101.1-1986 "Leakage Current for Appliances"

Unfortunately, ANSI has historically gained much or some of it's income from the sale of standards in paper form that we use to build and run our society. (What's wrong with this picture?) If you search for "C101.1-1986" at www.ansi.org you traverse through a very frustrating series of dead ends and never do find the standard.

In the UK these test devices are known as a "PATs" - Portable Appliance Testers. The tester is portable, not necessarily the appliance, I think. This page indicates that 0.1 ma is the test for "sensitive computers".

http://www.instrotech.com/manual_PATS.pdf

One manufacturer of such devices, the Jinjiang Zhentai Science & Technology Co., Ltd.

lists the specs I partially quote below at:
<http://zhentai.en.alibaba.com/offerdetail/51139649/Sell_Appliance_Leakage_Circuit_Interrupter.html>

" 4) Leakage protection current: when leakage current is 4mA, does not trip; when leakage current>=6mA, do trip

5) Tripping delay: when leakage current is 6mA=<5.6s, 204mA=<36.1ms, 264mA=<25ms, 550mA=<1.68ms"

This tells us that the thing trips at about 5 milliampere and above. Note that in the R-390A/URR, the line filter has in each side of the line a PI-section filter with two capacitors from the ends of the inductor to the chassis:

C-104 and C-105 on either side of the inductor L101 and
C-105 and C-106 on either side of the inductor L102.

Each of these capacitors has the value listed as "Part of FL101, listed for reference only." One email some time ago indicates that they are 0.068 uF paper caps. Thus, the capacitance from the hot line to chassis is 0.136 uF. Let's refer to an capacitance calculator at:
http://www.opamplabs.com/rfc.htm and get a "resistance" of about 19.5 kilohms.
Then the calculator at: http://www.opamplabs.com/eirp.htm
gives some six mA of AC current.

This is above the 4 mA of the ground fault interrupter above.

Date: Thu, 13 Oct 2005 20:53:49 -0400
From: "Albert Morris" <wb8feq@mfr.tzo.com>
Subject: RE: [R-390] Drop-in, GFCI-friendly line filters for R-390A's?

Several years ago I took a nasty lightning strike which in addition to totally wiping out the electrical system (it exploded the glass plug fuses in the fuse box) my R-390 line filter ended up toast (the only component in the R-390 to suffer). I ended up temporarily bolting one of the computer type line filters in place. The 3-prong socket is accessible in the round hole for the original and it was necessary to use a strap to get the second hole of the filter stationary but it does work. I have since opened the original filter box (adventures with a dermal tool 101) and found the capacitors were just paper dust. The coils (toroidal which was a surprise) were in good shape. I have rebuilt the box with HV disc ceramics but I have yet to solder the box back together (hey, I like he original looks). While I never plugged either into a GFI circuit, there are alternatives.

Date: Thu, 13 Oct 2005 20:27:32 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Drop-in, GFCI-friendly line filters for R-390A's?

On the back plate of the cabinet in which my R390A resides, I have a computer-type line filter which then feeds a receptacle that provides the filtered power for the R390A. I gutted a line filter so it looks kind of original from the outside of the R390A. I run this on a GFI circuit with no problems.

Date: Fri, 14 Oct 2005 10:34:09 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Drop-in, GFCI-friendly line filters for R-390A's?

I'm not sure exactly what the filter terminology is when they specify leakage current, but getting to the filter topology.... Yeah, my experience is that the R-390A stock line filter will trip a GFCI even when the unit isn't powered on. The Y2K manual and past posts on this subject have some confusing verbiage ("If the radio continually trips the GFCI check the line filter") that seem to say that only a "bad" line filter will trip a GFCI. But my experience is in agreement with what you write, Roy, in that a "good" stock R-390A line filter will allow enough AC current through that it will trip a functioning GFCI. It would seem to me that the ladder logic should be that if your R-390A has the stock filter and doesn't trip a GFCI, that either the stock filter is bad or your GFCI has failed shorted. We're about a half decade too late to update the Y2K manual, right? Who's the current maintainer?

Date: Mon, 17 Oct 2005 11:31:24 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Odds are?

Blue stripers are fun, huh. :-) I purchased several a few years ago for resale, but with patience, all worked fine. Shame they're such slim pickin's these days at Fair. Unless the hum is loud to distraction, and as long as all the voltages are correct, it's only sorta bad. I have a "like new" '63 Teledyne/Imperial with a mildly hummy supply, and a '67 EAC with moderate hum. They don't seem to run any warmer than the ones that don't mechanically hum, so I figured they were just content. The Imperial has been happily purring for a bunch of years. I figured it was odd for a sealed transformer to hum, but since it worked I didn't   try to fix it. Good thing about that radio is I can tell folks I have a "like new" '63 Imperial

and not be telling a fib! That is, as long as they don't look in my driveway.

Date: Wed, 19 Oct 2005 21:58:33 -0700 (PDT)
From: g kwitka <kc0lwn@yahoo.com>
Subject: [R-390] OA2 replacement

Can the OA2 be replaced by simply putting in a 150 volt 10 watt zenner in the appropriate socket pins?

Date: Thu, 20 Oct 2005 08:00:33 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] OA2 replacement

Pretty much. But a real OA2 has better performance (lower dynamic resistance, less noise) than a high-voltage Zener. (There's a reason they use Zener's in noise generators!) And there's already enough heat on the audio deck - my gut feeling is that it's better to put an OA2 there (which dissipates heat over several square inches) than to put a Zener that'll run mighty warm in the vicinity. Yeah, I know that the total power dissipated is the same, I just think it's better to spread it out. Most of the heat dissipated by a 10W Zener gets conducted out through the leads, which is passable on a PCB with big pads but tube sockets aren't so good at conducting out heat, realistically you'd have to derate a 10W Zener to just a few watts in that environment.

Is there a shortage of OA2's or something? They happen to be a lot more readily available to me than 10W Zeners at the moment... but if you were in a pinch and couldn't find an OA2 I think it'd work OK as a short-term substitute. Better would be to use a low-voltage Zener as a reference for a transistor shunt regulator, it's easier to heat sink the transistor and you'll get a lot lower noise.

Date: Thu, 20 Oct 2005 19:22:19 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] OA2 replacement

Why would you want to? I will be severely corrected if I'm wrong, but the OA2WA regulator is not known for regular failures--the only tube I've lost after 24-7-365 for 7 years is a 26Z5W...I've replaced some weak 12AU7s when doing PM's on the tester... other's experience out there?   Just my 2 cents...Gene,
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Date: Thu, 20 Oct 2005 15:56:33 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] OA2 replacement

I've had several OA2's (not the militarized/ruggedized, just the plain jane ones) go bad in rigs over the years. Generally they intermittently fail to strike a glow and soon after outright fail to glow/regulate. These were not rigs that were on all the time but only a few hours a week. If you never remove power then the glow can't go out, huh? :-)

Date: Thu, 20 Oct 2005 18:26:39 -0500
From: Patrick Jankowiak <recycler@swbell.net>
Subject: Re: [R-390] OA2 replacement

Yes Indeed!

Date: Thu, 20 Oct 2005 20:29:26 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] RE- OA2 replacement

Yes, I have done this on my Super Pro 600, but I replaced the 0D3 with a 150 volt stud mounted zener rated at 10 watts. I bolted it directly to the chassis. It makes just as much heat as the VR tube. Since the heat generated is considerable, an axial style diode wired to the pins will soon fail due to inadequate heat dissipation.

Date: Thu, 20 Oct 2005 21:17:57 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] OA2 replacement

The voltage may be a bit different, but it will work. The OA2 is rated at 144 to 164 volts at a current of 17.5 ma. It's internal resistance is < 240 ohms. It will regulate down to about 5 ma. A silicon diode will have a bit different resistance and a normal 150 volt 10% part would break over at 135 to 165 volts.

Date: Thu, 20 Oct 2005 21:27:17 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] RE- OA2 replacement

If wasting time and effort while learning and good old fashioned danger is just as important as actually achieving good regulation... If you have a junkbox full of old bipolar power transistors TO-3 or TO-220, the actual breakdown voltage of many of these devices can be in the 150 VDC range. I call this a poor mans Zener. How? The maximum reverse bias voltage that can be applied to a transistors p-n junctions is limited by breakdown. Breakdown is characterized by the rapid increase of DC current under reverse bias. The corresponding applied voltage is referred to as the breakdown voltage. Two mechanisms can cause breakdown, namely avalanche or tunneling of carriers through the bandgap. Neither of the two breakdown mechanisms is destructive. However, heating caused by the large breakdown current and high breakdown voltage causes the diode to be destroyed unless sufficient heat sinking is provided. With a TO-3 or TO-220 package, we can heatsink the diode.

We can look at the VCEO, the Collector to Emitter breakdown or the VCBO, the Collector to Base breakdown. We do not consider VEBO which is always a comparatively low voltage. For instance a 2N3055 has collector to base breakdown voltage of around 12 VDC. A Hint: with an NPN transistor, the tab or case can be directly grounded with no insulation needed which is handy, but remember - do not ground the base.

Set up a test stand with a variable high voltage supply capable of at least 100 mA and a series resistor of about 1K at 2 Watts. You will need a series mA meter and a voltmeter across the junction. Use some insulated clips to make contact with the transistors legs. Slowly increase the voltage until the current pops up - Bingo - Avalanche. After going through a few hundred devices you will get the hang of it and eventually find a 150 Volt junction. As usual, the Reflector is not responsible for crazy ideas like this, nor the consequences.

Date: Fri, 21 Oct 2005 09:25:19 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] OA2 replacement

Maybe. Do all OA2's have Krypton-85 in them? The ones that did go bad were generally the ones that came with the Heathkits (mostly from the late 60's/early 70's), and they did have some warning about Krypton-85 on the side of the tube. Looking it up, Krypton-85 has a half-life of 11 years... which is about how old these OA2's were when they died. Maybe the early/mid-70's OA2's have marginal quantities of Krypton-85 in them to begin with and go bad after a decade or two? I have a sizable stock of OA2WA's and none of them say anything about Krypton-85 on them. Does this mean they predate labeling requirements, or maybe they have some other means of ensuring they strike?

Date: Fri, 21 Oct 2005 10:07:07 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] OA2 replacement

No, not all OA2's have any radioactive stuff in them. Only some of them do.

>Looking it up, Krypton-85 has a half-life of 11 years...

That may well explain why these tubes fail to work right.

>Maybe the early/mid-70's OA2's have marginal quantities of
>Krypton-85 in them to begin with and go bad after a decade or two?

Possibly. I'd expect they had just the right amount in them, for the requirements of the time. The purpose of the radioactive stuff (Just a few different materials were used, as I understand it) is to make them fire more reliably. A regulator tube without the radioactive materials and in the dark will strike either less reliably or at a higher voltage than otherwise.

>I have a sizable stock of OA2WA's ....

It most likely means that they don't have any radioactive stuff in them. There may well be other ways employed to make them strike reliably, but that's tube makers craft and art I am not familiar with. Try some in the dark and then in the light. Report the results. I repeat Morgan's Rule about Radioactive Meters and VR Tubes:

DON'T BREAK THEM OPEN AND EAT THE INSIDES.

Date: Fri, 21 Oct 2005 07:14:03 -0700 (PDT)
From: g kwitka <kc0lwn@yahoo.com>
Subject: [R-390] 26Z5W replacement

Has anyone tried rewiring the rectifier scoket and using another rectifier tube in its place instead of going solid state and wiring in a resistor?

Date: Fri, 21 Oct 2005 09:18:22 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] 26Z5W replacement

There used to be an excellent article about using 12BW4's at this link:

http://www.xmission.com/~cwest/Reference/12BW4Mod.pdf

However, that link is now "404". Does anyone have a copy of that article? I bought some 12BW4's with the express purpose of trying that mod, but I don't think I kept a copy of the article :(

Date: Fri, 21 Oct 2005 10:26:50 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 26Z5W replacement

Somewhere on the net is descirbed how to use 12BW4's in place of 26Z5W's. You have to put the filaments in series instead of parallel. 12BW4's are readily available. Ah, here it is:

http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm

Looking in the mailing list archives it is reported that the 12BW4 has slightly higher plate resistance than the stock 26Z5W's.

Date: Fri, 21 Oct 2005 09:31:21 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] 26Z5W replacement

Thanks for the link! I think the one I had is the same article in PDF format. I need to print this one just in case I need to use it.

Date: Fri, 21 Oct 2005 10:43:51 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 26Z5W replacement

You're welcome! One side-thought: Most of the tubes in R-390(A)'s show up semi-regularly in large lots of JAN tubes on the surplus market. I believe (mostly backed up by hamfest rumor and speculation) that the military surplused most of their receiving tubes in the 90's and that a couple of dealers bought extremely large lots of JAN NOS tubes that they sell off in small chunks.

Of course, it's the ones that don't show up in the dealer's cheap stocks that we think about substiuting. Still, there seem to be plenty of sellers with JAN 26Z5W's and ballast tubes out there, it's just that the prices are uncomfortable!

The 12BW4 (and 2*12BA6 in place of ballast tube+2*6BA6 and other semi-common substitutes) do not exist in the military surplus stream and while they aren't exactly rare, you don't see dealers with thousands of new ones all in one place. They seem to be a bit more onesy-twosy from old radio shop stocks.

Date: Fri, 21 Oct 2005 11:44:18 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] OA2 replacement

In my GRC 109 manual they talk about 0B2's having 6.7 nCu of Cobalt 60 and I recall other similar warnings about Nickel 63 and some Uranium isotopes in the same tube family. They were probably part of the plate material.

Date: Sat, 22 Oct 2005 18:17:27 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] 26Z5W replacement

>About 2003 on the list some one put a message about using a two 6V4´s...................

I don't see any poor english, Pedro. You haven't had to put up with my horrible kitchen-Spanish. That sounds like it could be a very nice mod.

Date: Sat, 22 Oct 2005 22:01:51 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] 26Z5W replacement

I know this is probably heresy but Ted Weber at Weber Copper Top will make a nice plug in SS replacement for the 26Z5 complete with voltage dropping resistor. I've used them in my R-390 for some time now.

Date: Sat, 22 Oct 2005 23:49:33 -0600
From: "Kenneth Arthur Crips" <CRIPS01@MSN.COM>
Subject: Re: [R-390] 26Z5W replacement

RE: http://www.webervst.com/ccap.html

Thank you!!!! this will be a big help with my Viking 1 and 2 transmitters anything I can do to take a load off of the filament supply on these transmitters will be of a huge help.

Date: Mon, 24 Oct 2005 18:20:02 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] RE: 26Z5W replacement

The 12BH7 hasn't enough emission (current capability) to use for a 26Z5W replacement. Besides, the 12BH7 has become a high priced audiophile-coveted item, whereas the 12BW4 is desired by almost no one and hence is cheap. The online article about rewiring the power supply rectifier sockets to accept the 12BW4 also mentioned another suitable tube, the 25CT3.

Date: Mon, 24 Oct 2005 19:47:04 -0400
From: "Tom Bridgers" <Tarheel6@msn.com>
Subject: [R-390] Physical Height clearance: 26Z5W vs 12BW4 vs 25CT3

Beyond the rewiring of the R-390A power supply sockets, one other important issue to consider is that the 12BW4 and 25CT3 are each taller than a 26Z5. A 26Z5 tube extends a tad more than 1 3/4" once it is seated in the socket. In a similar comparison, a 12BW4 is 2.3" tall and a 25CT3 is 2.87" tall. I bring this to your attention because after converting one of my power supplies to 12BW4's, I was disappointed to find that the tube extended to just a tad above the horizontal plane normally occupied by the

R-390A's bottom cover. Had I reinstalled the bottom cover, the top of the tube would have been snug up against it. It was easy to see that there could be many unanticipated situations where the bottom cover might be accidentally bent slightly inward and thereby breaking the top of the tube. Clearly the 25CT3 at 2.87" of tube extending above the socket completely eliminates the option of reinstalling the bottom cover. If don't want to reinstall the bottom cover, then the 12BW4 or 25CT3 will work just fine.

Date: Mon, 24 Oct 2005 20:37:53 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] RE: 26Z5W replacement

Yeah Drew, I figured that the current might be the gotcha. Funny how that tube has almost an exact pinout to work though. Gosh I forgot about the audiophiles. Let's start a thread that touts 832's as max headroom push-pull preamplifiers. "That's some sweet hamonically rich crossover distortion baby" (obviously caused by tungsten-starvation after being used in a red hot SCR-522 over North Africa and stored in a hayloft for 60 years).

Date: Tue, 25 Oct 2005 19:28:34 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 26Z5W replacement

Any time we can solid state some rectifiers and get some filament supply relief is likely a good idea. Some glow in the dark things must be left glowing. But when exact authenticity is not at issue, a good rectifier may be in order.Roger KC6TRU

Date: Sat, 29 Oct 2005 22:03:36 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: [R-390] New Electrolytic Capacitors for R390A

A few months ago, I mentioned the idea of building some new capacitors from an octal relay plug and some miscellaneous aluminum pieces. I finally finished the project. See the following link for some brief details and pictures. My goal was to use modern parts that are available and no modifications to the radio. http://members.aol.com/n4buq/r390a/

Date: Sun, 30 Oct 2005 11:28:54 -0500
From: "Tracy Fort" <beerbarrel@cox.net>
Subject: RE: [R-390] New Electrolytic Capacitors for R390A

Did you use a CNC machine Barry?

Date: Sun, 30 Oct 2005 13:14:21 -0600

From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] New Electrolytic Capacitors for R390A

No, just a small manual mill (actually two of them since I didn't quite finish everything the first time around). Truthfully, the internal reliefs could be almost eliminated. The capacitors could be pushed in place, but I didn't want to have any stress on them. If I pull the outer plastic (vinyl?) sleeve off of them, I think they would fit nicely but I wasn't sure if that was a good thing to do to them. The outer relief needs to be there to clear the standoff, though.

One thing I didn't mention is that in order for the relay plug to fit properly, I had to shave the spline off the center thingee so that they would fit parallel and perpendicular to the chassis. The aluminum casings would not clear the other nearby components if you plug them in with the spline properly aligned. Assembling them the thing the way I did makes it obvious which way the things are to be plugged in, but if you ever take them apart, you have to watch to align everything back the way it should go together.

One other thing to note. I think if I got the type of capacitors with radial leads coming out both ends and stack them like others have done to rebuild the round cans, the internal clearances would not be necessary either; however, it would dictate a slightly taller can. Thanks for the comments.

Date: Mon, 31 Oct 2005 01:18:39 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Barry's '390A Cap Replacements

Good looking replacements. Much better than the empty relay cases I used years ago. Powder coat them generic gray, maybe silkscreen a bogus part number on them. Make 'em look spooky. Be sure to put the Rockwell/Collins CAGE code on the fake part. heehee Either that or do 'em up in candy apple red and racing stripes. Maybe STP, Holley, Edelbrock stickers. These caps make it modified stock, so it has to go faster! At any rate, the darned things seem to fit and look good. Helluva job!

Date: Thu, 03 Nov 2005 10:37:05 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] Added the IEC line filter

Background: a couple of weeks ago I added GFCI outlets in the basement, and discovered that indeed the stock R-390A line filter is guaranteed to trip them (leakage current of a properly functioning stock filter is >5mA so it has to trip the GFCI.) After unsuccesfully looking for a "low-leakage" line filter with roughly the same terminal configuration as the stock unit, I took the common wisdom and added an IEC-jack-style line filter.

I got a Qualtek 3 amp filter from Mouser for circa $6. A couple minutes with a nibbler and a file turned the 1" circular hole on the back (where the screw terminals for the original filter came out) into a rectangular hole for mounting the new filter in. The filter I got had a metal kind-of-gasket on the back of the black plastic face that seats nicely against the remnants of the 1" circular hole. I'm not sure that all brands/models of IEC line filters have the nice metal gasket (I saw it on none of the engineering drawing PDF's the manufacturers have.)

Others here report putting the IEC filter inside (and not through) the back panel so they don't have to enlarge the circular hole but that seemed awkward to me. The result is that it works just fine (leakage current under 1mA so no GFCI trips!) and looks great too. Will repeat the process for my other rigs in the near future.

Date: Thu, 3 Nov 2005 11:41:04 -0800 (PST)
From: "W. Li" <wli98122@yahoo.com>
Subject: [R-390] re: added the IEC line filter

I, too, have done the same power input addition on all three of my 390A's. It worked out swell for me, and I am very happy with both the electrical and cosmetic results. Not having a long cord permanently attached to trip over is an added bonus when shifting gear around in the shop or rack.

Can not emphasize the importance of everything properly grounded in a crowded shack!

Date: Thu, 03 Nov 2005 15:08:01 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] added the IEC line filter

Yeah, I remember when I was a kid and my heathkit transceivers always gave me a pretty hefty tingle whenever I touched the chassis :-). I've got a more serious ground system than a skinny wire to a water pipe now! If I look at my non-R390A rigs (mostly dating from the 50's and 60's) I see they often have symmetrical line filters (and a few have symmetrical fusing, that is fusing both "hot" AND "neutral", that was popular for a couple of decades it seems.) But generally the AC hot-to-ground current through the filter cap is circa 1 or 2 mA so they do not trip the GFCI by themselves... but in concert they do!

Date: Thu, 3 Nov 2005 19:21:08 -0500
From: "Dave Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] added the IEC line filter

All: I did the IEC thing when I went through the 390A several years ago. It just made sense; the previous owner had already substituted a garden-variety filter for the original.

Date: Fri, 04 Nov 2005 09:23:24 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] added the IEC line filter

The solution to this is to connect the line bypass caps as follows:
One from hot (black line cord wire) to neutral (white line cord wire)
One from neutral to chassis.

This way,
1) the capacitive current is from line to neutral, and the current from neutral to chassis is *very* small.

2) Failure of any cap will result in a safe situation: a line to netural short will either dis-assemble the cap (POW!), blow the fuse if the cap is after the fuse, or trip the house circuit breaker. A neutral to chassis short will do nearly nothing.

Date: Sun, 6 Nov 2005 11:04:42 -0800 (PST)
From: g kwitka <kc0lwn@yahoo.com>
Subject: [R-390] Tube heaters on DC

A friend of mine told me that if I run my tube heaters on regulated DC instead of AC I have to reduce the voltage by roughly 0.7 becasue of the duty cycle of the AC. He does that on tube amps claiming there is less inherent noise with the filaments being powered by regulated DC. Can any of you give me any advice on this?

Date: Sun, 6 Nov 2005 14:15:46 EST
From: DJED1@aol.com
Subject: Re: [R-390] Tube heaters on DC

No, you don't need to adjust the voltage for filament supplies. AC voltages are normally defined as RMS, which means it provides the same power as DC
for the same voltage. So 12 VDC and 12VACRMS will work the same. However, your 12VACRMS has an instantaneous peak to peak voltage that is 2.8 times the RMS. Ed

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Date: Wed, 9 Nov 2005 20:38:36 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Tube heaters on DC

Once upon a time (1971) I seen some R390's in Korea that were running on the 24 volt DC truck generators. The Trucks were late 50 vintage and still had generators. We also had some stand alone 24 volt DC generators that when with the "Radio Trucks" so you did not have to keep the big truck engines running to power the equipment vans mounted on the truck chassis. The R390 120/240 AC power supplies were replaced with a different module that had a vibrator type B+ transformer that ran off the 24 Volts. The power supply modules were pretty well filtered and there was not a lot of trouble with vibrator hash. The generators were well filtered by the power bus in the "radio van" there were very good filters that trapped every thing in the power source for the vans. Anyway 24 volts is like close to 13.8 x 2 = 27.6 volts. We never tried to adjust the voltage for overrun. AC volts is RMS not peak to peak. So DC volts is OK.

>Is DC volts more quiet than AC volts.

Maybe or maybe not. Depends on your source. The tubes in an R390 or A are indirectly heated cathodes. So as long as the AC or DC is not coupling lots of RF into the tube it makes no difference from that point of view. At 60 cycle or DC the tubes mostly have plenty of filtering for that noise.

Now back to the thermal noise of the tube. The heater heats the cathode.
The cathode emits electrons.
Electron emission is a very noisy process.
This process cares not if it is AC or DC powered.
Heat is heat and that's noise.

So the tubes will have the same thermal noise level from either a DC or AC filament voltage. Once upon a time all tubes were DC filaments. IF AC filaments made tubes more noisy, someone would have retained DC filaments in the RF from end of at least some types of receivers. Aggravation of DC filaments is like to exceed your return on investment. If you were home building a receiver, you might consider a DC filament for the RF stage. But after that, there is no advantage realized from the filament noise aspect. Roger KC6TRU

Date: Tue, 15 Nov 2005 00:17:46 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] OA2 Rectifiers

A few weeks ago I posted one about why you would want to replace the OA2 rectifier; never goes out, never heard of anyone with a problem ,etc;...
---I stand corrected.--- Since that time I have replaced the 26Z5Ws and the OA2 in my R390A with Weber Copper Cap solid state rectifiers. I must say the difference in generated heat and power consumption is astounding.

REALLY reduces heat. Of course I can't say much for the life of these devices. I can say that the Weber rectifiers are a worthwhole investment, considering heat and power savings. They are relatively expensive, but 26Z5W's are expensive too, at least on Ebay. As always, my comments must be judged if you are a "Practical User" vs. "Commited Collector". The collector will find the Weber rectifiers to be a quick and painless way to keep their vintage equipment operating. The practical types know the stock diode conversion is certainly acceptable. The Weber Copper Caps allow you to retain the look and feel of tubes... for SOME this will be a very agreeable modification...

Date: Mon, 14 Nov 2005 19:35:06 EST
From: Bonddaleena@aol.com
Subject: Re: [R-390] R390A/URM25 (*)

Hi, if I'm not mistaken (it been a while...), the rectifier tube had a 9 pin base. RF Parts sells these cool little 9 pin plugs as used on some imported radios. Put a couple of diodes in it, screw on the plastic cover. Perfect!
ron

Date: Mon, 14 Nov 2005 18:10:28 -0800
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] OA2 Rectifiers

I find that pretty interesting...since the 0A2 isn't a rectifier...it is a regulator. Are you perhaps implying that the Copper Cap guy makes a solid-state replacement for the 0A2 REGULATOR, in addition to making solid-state replacements for the 26Z5W RECTIFIER?

Date: Mon, 14 Nov 2005 19:32:31 -0800
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] OA2 Rectifiers

Ken, I thought maybe my mind got SS'ed. It was always my thinking that OA2's etc. were regulators. A big difference.

Date: Tue, 15 Nov 2005 08:11:05 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] OA2 Rectifiers

Well, both regulators and rectifiers are diodes (two-terminal devices). Some people call anything with two terminals a "diode", others call them a "rectifier". Others say "diode rectifier" or "rectifier diode" :-). (You do occasionally see spare triodes turned into rectifiers...) (And real rectifiers often have three pins, funny thing about the way heaters work you have two wires going to the same element, but not the same potential at each end!) Don't get me started about "ATM machines"!

Date: Tue, 15 Nov 2005 17:51:39 +0000
From: DSCC@att.net
Subject: Re: [R-390] OA2 Rectifiers

OA2 is just a zener diode in glass clothing. Don

Date: Tue, 15 Nov 2005 11:04:51 -0700 (MST)
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] OA2 Rectifiers

Yes but it is a quiet zener with a greater tolerance of abuse.

Date: Tue, 15 Nov 2005 15:10:05 -0700
From: DW Holtman <future212@comcast.net>
Subject: [R-390] Selenium Rectifier

Does anyone know where I might buy a Selenium Rectifier for the chassis of a R-390A, CR-102. I have replaced it with a solid state bridge for now, but would very much like to get something more original in the chassis. I could not figure out a clever way to hide the diodes inside the selenium fins.

Date: Tue, 15 Nov 2005 17:28:16 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Selenium Rectifier

All you'll find are NOS or pulls from chassis and it's best not to rely on them. I think most would agree, it's OK if the SS bridge is visible -- you have to peek down the back with the cover off -- and that's downright nosey. Even if seen, it shows you care. ;-) I haven't had any seleniums fail lately, but one did when I was merely a child back in the late 50's -- in a Motorola TV. The smoke and acrid stink left quite an impression. (If I think about it real hard, I could make myself choke.) When my uncle visited, he replaced it with the latest thing -- a tiny, shiney, "top hat" silicon rectifier. It's customary to leave the Se rectifier in place and mount the solid state replacement nearby. SOP around here. They're still pretty, brightly colored and be-finned, yet safe if not in the circuit.

Date: Tue, 15 Nov 2005 17:48:06 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Selenium Rectifier

I agree. Selenium rectifiers are one replacement part we are better off without. As soon as silicon diode rectifier design became available, parts manufacturers dumped selenium rectifiers; and for good reason.

Date: Tue, 15 Nov 2005 16:57:44 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Selenium Rectifier

B-b-but, the bridge is a solid-state device, and, and, and it's noisy, and, and, and it's not a tube, and, and, and....?

Date: Tue, 15 Nov 2005 19:27:56 -0500 (EST)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] Selenium Rectifier

It was common some years back to mount rectifier diodes in a finned assembly like a selenium. The diodes (the stud-mounted kind) were affixed to on of the fins, and the diode body protruded upward through holes in the adjacent fins (for clearance). The top lead of the diode was then attached to whatever fin it was closest to. The fin that the diode mounted on had a solder tab, and the fin the anode lead mounted to had a tab. I have several of these assemblies with 4 and 8 diodes per "stack". You might be able to disassemble the original selenium stack - they were either bolted or riveted - and then using a Whitney hand punch - punch, or drill, holes in the fins sufficient to mount the diodes. Actually if you used samll epoxy radial diodes, the holes could be quite small in the fins - then just bring out leads or make solder tabs, insulated with teflon washers. Just an Idea....

Date: Tue, 15 Nov 2005 19:35:41 -0500 (EST)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] Selenium Rectifier

Actually metallic selenium, or some salts thereof - ain't bad. But: when a selenium rectifier goes casters-up - it emits Hydrogen Sulphide gas - which is very, very much not good for you - and also the main component in what makes rotten eggs smell like rotten eggs. Been there, done that - used to fix old TVs and radios as a kid - had a big one in my room that made 28VDC for my Command Set collection in Jr. High - it let go one evening - we had a swamp cooler then - it was on - I lost most of my Points with the rest of the family...

Date: Tue, 15 Nov 2005 17:34:12 -0700
From: "SAM LETZRING" <sletz@msn.com>
Subject: Re: [R-390] Selenium Rectifier

Actually it emits hydrogene selenide gas which as about 100 times stronger smell than hydrogen sulphide. Hydrogen telluride gas is even 100 times smellier than hydrogen selenide- once these compounds get into your body it can give you VERY BAD B.O. and halitosis- tellerium miners in colorado were know far and wide for their very bad BO!.-

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Date: Tue, 15 Nov 2005 19:53:33 EST
From: Bonddaleena@aol.com
Subject: Re: [R-390] Selenium Rectifier

I bought a huge 6 Meter amp back in the 80s. In the PS, there were 4 of these 'stacks'. Each leg had about 50 diodes! At first, I thought they were selenium, then I realized the previous owner had used metal diodes, fitted to those cooling fins, then he painted the whole thing red. Each diode has an equalizing resistor and cap across it. It must have taken weeks to build it....Looked cool. I later swapped it for 4 of those K2AW potted rectifiers. I don't see any difference.

Date: Tue, 15 Nov 2005 19:16:09 -0700
From: DW Holtman <future212@comcast.net>
Subject: Re: [R-390] Selenium Rectifier

Thanks to all for the very informative answers on the selenium question. I will do as recommended, leave the old fins inplace and hide the solid state bridge as well as possible.

Date: Wed, 16 Nov 2005 12:32:33 -0700 (MST)
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] Selenium Rectifier

I am surprised at the amount of traffic that this subject has inspired. Lessee now, I have an R-390 and my fingers have never come within many yards of a R-390A so my knowledge is limited but... aren't the only seleniums in the R-390 family used to rectify low voltage and low current to drive the antenna relay? There are no seleniums doing anything else in there are there? I will be glad to be corrected if I am wrong. Sneaking a few rectifiers in there should be pretty easy and neither your wife nor Art Collins ever need know. I was surprised to find there were any seleniums at all, I thought they were copper oxide but apparantly not.

Date: Wed, 16 Nov 2005 14:00:07 -0600
From: "Barry" <n4buq@aol.com>
Subject: [R-390] Selenium Rectifier

Anyone know how much current K101A and K101B pull? That specification is not listed in the Y2K manual. If not that, what is the max current the selenuim rectifier is capable of supplying. Looking for a suitable silicon replacement bridge. RatShack has a 50PRV version and I like the mounting/connecting configuration, but would like something with just a tad more than 50PRV (yes, I know that's nearly double the voltage it needs to handle, but I like a large safety factor). They have another model (400PRV), but I don't like it's packaging as well (and I don't think it handles as much current as the other one).

Date: Wed, 16 Nov 2005 16:34:38 -0600
From: "Don Reaves W5OR" <w5or@comcast.net>
Subject: RE: [R-390] Selenium Rectifier

I don't recall anyone ever reporting a catastrophic failure of this rectifier. Anyone? About two years ago listmember K2CBY posted this:

I had the selenium rectifier fail one leg to open on my Motorola Contract 363-PH-54 chassis about 10 years ago. No short, no smoke, no smell. The symptom was a very loud buzz from the antenna relay and a failure to pull in completely when the FUNCTION was switched to CAL. I assume the same symptom would appear if BREAK IN was enabled and the ptt line grounded. The symptoms of a failed selenium rectifier are so obvious and it is so easy to get to that I wouldn't bother with pre-emptive replacement.
Miles, K2CBY, Sag Harbor, NY

Anyway, along with not eating R-390 meters (ala Roy Morgan), you shouldn't be grinding up used selenium rectifiers as dietary supplements (ala Barry Hauser). Don

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Date: Wed, 16 Nov 2005 18:23:29 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Selenium Rectifier

Seems to be general knowledge, perhaps peppered with some urban (plus suburban and rural) legend, that selenium rectifiers often fail. Some of this, no doubt is because the last ones were made sooooo long ago. Failure modes include sudden death with acrid, noxious fumes, or slow deterioration, and I suppose, going open as K2CBY reported. For example, it's SOP to bypass them with an individual rectifier and dropping resistor in tube Transoceanics. In those radios, they tend to develop higher resistance with age and affect performance, well before they go up in smoke. (That said, most of my T/O's are running on the finned wonders, but I don't run them unattended.) There are a couple of non-finned ones in AN/GRR-5's which tend to fail, including the one built into the cabinet, though I think that's a copper oxide rectifier. The thing is -- with so much pre-emptive replacement, it throws the stats off, so we will never know just how many fail in what mode by when. And as far as those that fail in catastrophic noxious gas mode ... have we heard from K2CBY .. lately? ;-)

Only the Shadow knows ...

Date: Wed, 16 Nov 2005 19:51:09 -0500
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: RE: [R-390] Selenium Rectifier

When you remove them from the equipment, disassemble the stack. Place the plates in lacquer thinner. Remove the paint then attach a wire to both sides (one wire per side). Use tape or conductive epoxy. You now have a photo cell.

Date: Wed, 16 Nov 2005 19:10:10 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Selenium Rectifier

Not sure I've seen a catastrophic failure in *most* of the equipment I've had that had selenium rectifiers. When they've died, they've just... opened up or become a resistor. I count myself lucky, I think.

Date: Thu, 17 Nov 2005 06:19:12 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Selenium Rectifier

> Anyone know how much current K101A and K101B pull?

The two windings in parallel are about 100 ohms. They're fed with pulsating 25.6 x 1.4 = 35 VDC peak DC (minus selenium rectifier losses) which would mean maybe 200mA current if driven by pure DC. But I suspect inductive impedance means that actual current draw is much much less when fed with pulsating DC, my gut feeling just looking at the selenium rectifier and size of the relay coils that it's like 40 or 50mA. Yeah, I know, you asked for a real measurement, not a gut feeling :-). If you can wait until this weekend I can put a resistor in series with the selenium bridge and see what the actual current draw is (my blue striper had a smashed-up selenium bridge I gotta replace too!)

Date: Thu, 17 Nov 2005 08:26:09 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Selenium Rectifier

That's close enough. I figured an amp or two would be a sufficient rating for a replacement rectifier. K101A and K101B are all that's powered by the rectifier, right? I'm not looking at the schematic, but does anyone know if the break-in relay is also powered from this rectifier? I don't recall seeing it in this line, but it would seem it needs DC from somewhere...

Date: Thu, 17 Nov 2005 09:41:50 -0500
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] Selenium Rectifier

>....... I'm not looking at the schematic, but does anyone know if the break-in >relay is also powered from this rectifier? <snip> Yes someone knows: Me. The break-in relay is powered by the 6.3 volt filament supply. It's coil carries about 40 ma of ac current if the "Break-in" switch is ON and the rear panel terminal is grounded. The break-in relay in turn grounds the audio input to the audio amplifier and operates the antenna relay. This means that you can't operate the break-in function with a simple transistor switch from the ricebox transmitter or transceiver you have. It needs either a simple contact closure, or some sort of bridge-fed opto-isolated solly state switch.

Date: Thu, 17 Nov 2005 09:51:49 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Selenium Rectifier

> I figured an amp or two would be a sufficient rating for a replacement rectifier.

Oh, yeah, definitely. A 1 Amp selenium stack (even low voltage) would be physically much larger. And the 25.2VAC winding in the transformer is only rated at 1.2A. I see the smallest Radio Shack bridge rectifier is 1.4A 100PIV.

> K101A and K101B are all that's powered by the rectifier, right? I'm..................

The break-in relay coil is 6.3VAC from the filament winding. The ground return of the selenium bridge goes through one set of the break-in relay's contacts, but that's not really "power", just completing the ground return.

> I don't recall seeing it in this line, but it would seem it needs DC from somewhere...

My reading of the schematics is that the break-in relay coil is AC, not DC. I never liked AC coil relays but if the alterniative is a bunch of selenium rectifers...!

Date: Thu, 17 Nov 2005 09:08:14 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Selenium Rectifier

Actually, I was looking at one of the physically larger rectifiers (P/N 276-1185, but it's PIV is "only" 50V. It is larger than needed (25A capacity), but has solder tabs instead of just leads. I suppose I'd opt for P/N 276-1181

(200PIV, 6A), though. It doesn't have solder tabs, but it is easy enough to solder to the large diameter leads.

Date: Thu, 17 Nov 2005 10:23:29 -0500
From: "rdavis7" <rdavis7@comcast.net>
Subject: [R-390] Re: R-390 Digest, Vol 19, Issue 39

Selenium failure---Yep,for sure. I have one right now in my R 390. Antenna relay sounds like a door buzzer. Receiver hasn't been used for 15 years and this happened after I replaced the caps for initial start-up. Anybody want the culprit to play with? First reply gets the prize!

Date: Thu, 17 Nov 2005 09:44:12 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Selenium Rectifier

BTW, my reasoning for getting the large bridges is I plan to unbolt the old rectifier from its bracket and bolt the new on in its place. It should make for a very neat replacement.

Date: Sun, 20 Nov 2005 16:17:19 -0600
From: "Dennis Pharr" <dpharr53@swbell.net>
Subject: RE: [R-390] rebuilding caps

The power supply filter cap rebuild is outlined on KK4DF's web page at:
http://r-390a.us/   Specifically:http://r-390a.us/filter_capacitors.htm
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Date: Wed, 23 Nov 2005 20:52:29 -0600
From: "Barry" <N4BUQ@aol.com>
Subject: [R-390] Selenium Rectifier Redeux

Another question about the selenium rectifiers. Is it possible that the failure rate of the this component is due to the relatively low voltage applied to it? I don't know what these are rated, but I'm thinking they are probably good for 100VAC or more. With only 28VAC applied, perhaps this doesn't stress these very much. Also, with the low voltage in this case, if the rectifier should fail, is it likely to go out in a blaze of glory?

Date: Thu, 24 Nov 2005 02:54:48 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Selenium Rectifier Redeux

My impression with Selenium rectifiers in consumer equipment is that the top causes of selenium-stink-failure were:

1. Audio output stage drawing too much current (usually due to leaky

coupling caps) and

2. Failed-shorted electrolytic filter caps on the outputs of the selenium rectifiers.

In other words, yeah selenium rectifiers burned up, but it was due to the load being higher than their rated current. The burnt-up rectifier isn't the cause of the failure just a symptom. Although they were so stinky that they were often blamed as the cause. The load in the case of a R-390A are some very simple very well defined relay coils. I'm not going to say that they never ever fail shorted and take out the rectifier, but that isn't going to be a real common failure mode. Certainly the low PIV doesn't hurt selenium rectifier life either!

Date: Thu, 24 Nov 2005 21:18:45 -0500
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Selenium Rectifier Redeux

Selenium Rectifiers being in the "dry disk" family of rectifiers do seem to be prone to failure due to contamination by water. They must have been cheaper and more reliable that the device that they replaced, namely the vaccum tube rectifier! Radios and TV's from the 1950's through the 1960's seem to be full of them.

Date: Mon, 12 Dec 2005 15:34:17 -0800 (PST)-----
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] F103/R390a

Do the resistance checks in the manual especially the wiring harness. It may be the input filter, maybe bad caps in there? Then unplug all the modules and see if the fuse still blows with just the wiring harness hooked up. It might be a good idea to put a light bulb in series with the hot line, just so that blows instead of something expensive. Check tubes for shorts. If the wiring harness shows no problems try plugging in each module with no tubes in it, start with the power supply, of course. It could just be too much in-rush current. Is your line voltage a bit too high?

Date: Mon, 12 Dec 2005 15:48:48 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] F103/R390a

I can't see how the electrolytic filter caps C603 and C606 could do it; they're upstream of F103. I'd plug in each module in turn as Joe suggests below, with a milliammeter in place of F103. Due to the charge in the electrolytics, you'd better fuse the meter even though F102 is above it. F103's output goes to the RF, IF, Crystal, and VFO modules. If one makes

the meter peg, you've narrowed it down. In fact, if it pegs without any modules, then you've narrowed it down to
the harness, S101, or S102.

Date: Tue, 13 Dec 2005 19:51:13 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] 26Z5W tubes

>I just ordered a pair of new 26Z5W tubes from Goldcrest Electronics in Rochester, NY for $12.85 each. Don't know the brand.

I don't believe there was ever more than one manufacturer....at least that I have seen.

Date: Tue, 13 Dec 2005 20:33:54 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] 26Z5W tubes

My guess would be Tung-Sol. I've never seen any other brand. YMMV

Date: Wed, 14 Dec 2005 03:10:12 +0000
From: odyslim@comcast.net
Subject: Re: [R-390] 26Z5W tubes

I have some branded Lewis & Kaufman

Date: Wed, 14 Dec 2005 16:58:55 -0500
From: "Jon" <jonklinkhamer@comcast.net>
Subject: [R-390] FW: F103/R390a

Just wanted to say thanks to the group on guiding me in the right direction with respect to finding the problem with popping the fuse. It was a pinched wire (BFO wire) aganist the frame of the IF module. As soon as the front panel was taken off the short went away. A visual inspection solved the mystery. Thanks again!!

Date: Wed, 4 Jan 2006 09:49:01 -0600
From: "Barry" <n4buq@aol.com>
Subject: [R-390] Another (perhaps) silly ballast question

I'm not trying to be silly or attempt any cruelty to a dead horse, but I do have another (perhaps weird) question. What is the effect of running a transformer's primary at less than its rated voltage? If I connect a transformer whose primary is designed to run at 120V to 100V, 75V, 50V, etc, what effect does it have on the secondary? I realize the secondary voltage will drop at the same (or approximately same) ratio as the primary's voltage is dropped, but what about current (or VA) rating? In other words, if I have a 120V-PRI/60V-SEC transformer and connect the primary to a 60V source, the secondary should now be 30V. Is the transformer's efficiency compromised? If the secondary was capable of 1A when the primary is connected to 120V, does the current rating go down as the primary voltage is decreased? I assume these aren't simple questions with simple answers, but I'm wondering about this for a specific reason.

Date: Wed, 4 Jan 2006 09:55:07 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Another ballast question

Yes, I realize how an ohmmeter works (at least the simple, old-style ones) and I realize the tube won't light when connecting the VOM this way. From your original reply, it appeared you were warning me not to test the tube's filament this way because it might damage the filament. I assume that as long as it is a 12V tube, it won't damage the filament, right (again, it would depend on the scale selected for an old-style VOM)? Mine is an auto-ranging DMM and uses a 9V battery as a source so I'm not sure how much voltage is applied when testing like this, but I assume it would not be more than 9VDC.

Date: Wed, 04 Jan 2006 10:58:07 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Another (perhaps) silly ballast question

> If the secondary was capable of 1A when the primary is
> connected to 120V, does the current rating go down as the primary
voltage is decreased?

No. The current rating may indeed go up to some small extent (but don't count on it) because of less core heating.(I-squared-R heating of the secondary winding will remain the same of course at constant amps). Older ARRL handbooks had a good section on cannibalizing/modifying/operating on different voltages of AC transformers, with lots of good seat-of-the-pants estimates as to wire heating vs current and wire size.

Date: Wed, 4 Jan 2006 13:11:57 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Another (perhaps) silly ballast question

Many thanks to all the replies concerning ballasts and transformers. In case it wasn't apparent, my thinking was if I could find a 120V/60V transformer (or some other 2/1 ratio xfmr), then connecting one primary and one secondary lead to ground, connecting the other primary lead to pin 2 of RT501 and the other secondary lead to pin 7 would provide the

12.6VAC necessary for the oscillator tubes. My thinking was that this would be better than a big old resistor out there dissapating all that heat. I have a much better plan now, though. I'm going to implement it and if it works as I think it will, I'll post the results here.

Date: Wed, 04 Jan 2006 15:15:00 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Another (perhaps) silly ballast question

I would expect any transformer run at below rated voltage to work just fine. NOTE: a 400 cycle transformer rated at 120 volts can be run at 60/400 x 120 volts, or around 24 volts. Same for 400 cycle variacs, one of which is now for sale on the e-place. BUT: If you got a 24 volt filament transformer and ran it as an auto transformer, it should work fine. Leave the primary open, run the 24 volts into one end of the secondary and run the 12 volt filaments on the center tap. The power needed is quite small, so the smallest 24 volt filament transformer you can find would work. Another thought: find a TV picture tube brightener. These are auto transformers which boost the filament voltage of TV picture tubes to get a little more life out of them. I assume that picture tubes ran on 6.3 volts (?), and so you might have to re-wind the thing with four times the number of turns total, but that likely would work just fine, too. Rewinding might not be practical - I have never taken one of these things apart.

>I have a much better plan now, though. I'm going to implement it and if it
>works as I think it will, I'll post the results here.

Oh? Well TELL us what the plan is!

Date: Wed, 4 Jan 2006 15:13:39 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Another (perhaps) silly ballast question

Well, I was going to wait until I tried it to make sure there weren't any "gotchas", but it appears someone else (Dan?) has mentioned this recently. I kept trying to think of a clever way to get 12.6VAC to the oscillator tubes -- even to the point of adding a filament transformer somewhere (it would be cheaper than a ballast tube costs these days and last longer) - when it occurred to me that if the 26.2VAC winding were center-tapped, that voltage could be used. That's when I looked at the schematic (and confirmed on the unit) that the 26.2VAC winding is indeed center-tapped. This tap can be run through unused pins from the PS deck to the IF deck. From the IF deck plug, I plan to run the wire to an unused pin on the ballast tube socket and plug in a jumper from that pin to pin 7. This allows the original oscillator tubes to be used and if someone decides they want to use a ballast tube, all that will be necessary is to unplug the jumper and

plug in the ballast tube.

Date: Fri, 6 Jan 2006 19:09:47 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Waking up my non-A

In spite of all that has been written in various reflectors, etc. and conventional wisdom aside, it is not a good idea to "bring up slowly with a variac" a vacuum tube radio. Vacuum tubes will not conduct until the filament temperature reaches design temperature (or close to it). Nothing good can come from letting the tubes try to operate at a low line voltage for any extended period of time. If you want to reform electrolytics in place, risking your power transformer in the process, you can remove all of the tubes and replace the rectifier tubes with ss diodes. Then raise the voltage slowly with a variac. Fortunately the R-390 doesn't use an electrolytic in the power supply.

Date: Fri, 6 Jan 2006 19:29:49 -0500 (EST)
From: John Lawson <jpl15@panix.com>
Subject: RE: [R-390] Waking up my non-A

>it is not a good idea to "bring up slowly with a variac"<snip>

This is advice well-grounded in the physics and dynamics of vacuum tubes - and the point is well-taken. Having done a bit of vacuum tube design myself, and I mean the design of a couple of thermionic devices, as well as many years of involvement with the circuitry of same - I understand the fundamentals of your post. That being said... I am also guilty of 40 years of 'soft-starting' gear that has been dormant for unknown periods of time - and I honestly cannot recall ever having anything sustain damage from that process alone. Now, most certainly I've blown up my share of gear - have various scars and fancy anecdotes of those 'events' - and I have had more than a few devices complain bitterly (and spectacularly) when I *didn't* take my time... however nothing in my experience has ever had a failure that I could atrribute to overall low system voltage, or due to poor space charge formation or low electron flux because of insufficient heater temps...

> If you want to reform electrolytics in place,<snip>

That's what the 0-5 AC Ammeter and the 2A Heinemann QB circuit breaker is for... ;} I certainly don't just crank 'er up and then wander off - I try to pay fairly close attention to the process. So far, I seem to have been pretty lucky.

Date: Sat, 07 Jan 2006 12:49:59 -0500

From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Waking up my non-A

Well, it's not the best thing for the tubes, but they are after all just tubes. I think what you're worried about is stripping or poisoning the cathode, and while that is a worry with big power tubes I don't think I've ever seen it do bad things to little receiver tubes.

The variac approach is for those who don't want to blow up capacitors unnecessarily, but I've got a long personal history of blowing up capacitors (usually with a vengance) and if there are any weak ones I'd rather know sooner than later. This is not exactly conventional radio maintenance philosophy but the process of "margining" (stressing the components to find weak ones at maintenance time rather than at use-time) is well established in other areas of electronics, so if you find me using a variac it's usually to boost line voltage a bit :-). Now there are several components that are not so easily replacable with off-the-shelf parts (e.g. chokes, transformers) but on a radio with fused B+ lines they're mostly safe.

Date: Sun, 8 Jan 2006 10:02:31 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: [R-390] Break In Operation of R-390 & CV-591 Converter

Has anyone had any experience operating break in with the R-390 and & CV-591 converter. My set is not fully muting when the break in relay is activated. I can hear the relay(s) pull in and the audio output from the CV-591 drops but I can still hear the station so I gather there is still RF getting through the antenna relay. Is it just maybe dirty contacts on the antenna relay, or is there something else I need to do?

Date: Sun, 8 Jan 2006 11:56:29 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Break In Operation of R-390 & CV-591 Converter

Yes, you'll need to reduce the RF GAIN on every transmission, that's why so many RF GAIN pots are worn out. This is a common problem with the R-390's.

Date: Sun, 8 Jan 2006 05:59:39 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Regulated Power Supply

I have two similar regulated power supply circuits that provide delayed B+ startup. They can be scaled for use with both R390's, SP 600's and similar receivers. They come from an Audio Express article and Welborne Electronics Mod kits for Dynaco amps. Welbornes catalogs are well worth downloading. The 6 files total about 10 Mbytes. Five files are TIFF Images.

Date: Mon, 09 Jan 2006 10:08:50 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: RE: [R-390] Waking up my non-A

>....it is not a good idea to "bring up slowly with a Variac" a vacuum tube radio.

Hear, hear! I agree. My diatribe against using variacs this way is available upon request. It turns out that the main filter cap in an R-390/URR is an oil-paper cap and is very unlikely to be shorted or leaky. In any case, it won't exhibit the leakage phenomenon that gets you in trouble by "bringing it up slowly on a variac". Still, I urge you to not do that to an R-390 of any sort. There may be other caps in the R-390/URR that will cause trouble.

Morgan's Diatribes available:

Variacs.txt Why your Variac can blow up your radio and what to do about that.

Powercordsandbypassing.txt About fused line cords and how they can make a widow of your wife. How to bypass your line cord for RF and reduce the chances of disaster, AND solve the "hot chassis" phenomenon. Information about the European line cord color code, and about fuses, GFI devices, and outlet testers.

Reform.txt How to reform electrolyitc caps and how to test other caps for leakage (like the Black Beauties)

Date: Wed, 1 Feb 2006 17:54:57 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Thermistor info for soft start?

What is the spec of the thermistor needed for the 390 and 390A to give it soft start? I had ordered a couple of the Keystone things from Digi-Key several years ago, but am going to place a Mouser order the next day or so and would like to get a couple from them for the "new" stuff that just came in. Can anyone assist?

Date: Wed, 01 Feb 2006 19:42:57 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Thermistor info for soft start?

The one I use is a CL-80. Rated at a max current of 3 Amps (and a R-390A with ovens off is about 1.5 Amps, with ovens on is a little over 2 Amps) and cold resistance of 47 ohms. I don't know the official spec for max current of a R-390 but I'm guessing it's similar or maybe just a little more.

Other ones with a similar max current rating will work too. As you go up in max current rating, the cold resistance will drop and the current limiting effect will go down. If you go too low in max current rating you risk burning up something.

The CL-80 gets rather warm in operation - which means it is doing its job. In my radio it gets to the point where it would be uncomfortable for me to touch it more than just momentarily. And of course it is wired in the hot AC lead so you gotta be careful not to touch the leads! Teflon is a good thing for covering the leads. Wow, if you need a couple does that mean you just acquired a couple more 390/390A's? I'm jealous :-). Mouser part # 527-CL80. Digikey part # KC008L-ND. Can't believe I just spent 4 or 5 whole paragraphs characterizing a single part!

Date: Wed, 1 Feb 2006 21:39:43 -0600
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Thermistor info for soft start?

I've used a CL-80 as well.

Date: Tue, 7 Feb 2006 11:10:17 -0800 (PST)
From: ~ Quig ~ <greybeard5150@sbcglobal.net>
Subject: [R-390] "Special" wall plugs for R-390x recvrs

Anything good for the over-the-top audiophools is good for the "certifiable" radio fanatics too, eh? This particular item takes the entire audiophile insanity to a whole new level. This concept is so preposterous that I'm thinking that there may be a possibility that PE has done this as a joke, just to see how far this phenomenon can be taken, and how many fish will actually jump, and take the bait.

"If you are building your own audiophile power cords to improve performance in your audio or home theatre system then you'll definitely want to use the 381. Why build a performance power cable and then plug it into a ordinary receptacle? The WattGate™ 381 is the perfect way to fine tune the power source for your high-end audio or home theatre system. The construction of the 381 is very durable and features glass-filled, nylon-tough front and rear housings for UV and chemical resistance. The mounting strap, rivets and grounding strip are gold plated, solid brass. Installation of the 381 is simple and efficient due to rear wiring and large, #10 brass terminal screws. The terminal clamps are gold plated, solid brass and shaped to better grip the conductors. Like the 330 and 350, the

381 leaves the competition behind with its contacts. They are configured in a triple-wipe design to allow the plug blade to be gripped at three separate points. Additionally, the contacts are made of very heavy-duty material to maximize the clamping spring-rate and ensure conductivity and the three-layer plating process is also completed on the 381: Oxygen free copper plating, electroless nickel, and finally 24k gold plating dramatically improves conductivity and prevents corrosion. Receptacle is 125V, 20 amp. only $147.72"

Date: Tue, 7 Feb 2006 16:18:10 -0600-
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] "Special" wall plugs for R-390x recvrs

We should insist on gold-plated connectors and oxygen-free copper wire all the way back to the power plant.-

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Date: Tue, 07 Feb 2006 18:35:04 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] "Special" wall plugs for R-390x recvrs

Sheesh! The outlets look like the special orange ones required for isolated lines, only white, with a bit of gold plating. I'm afraid it's no joke.... To go with it, they also have a $79 "Edison" plug and a $79 IEC plug (for the other end assuming the gear has an IEC socket).

Date: Wed, 8 Feb 2006 07:23:33 -0800 (GMT-08:00)
From: Tony Angerame <tangerame@earthlink.net>
Subject: [R-390] Re: "Special" wall plugs for R-390x recvrs

Alongside of Radio Row on Vesey St., NYC I remember "Vendors" with push carts selling "Interference Filters" for $1. It was simply a M/F 110VAC plug with an internal .001 cap across the line. They would plug one into the other making an interesting design that stood vertically on the cart. I passed them up saving for that $5 ARC-5. (Smart kid) File this one away with monster cable and antennas with resistors in them.

Date: Wed, 08 Feb 2006 20:55:40 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Re: "Special" wall plugs for R-390x recvrs

Not to mention a variant on that handy item - - those "magic" devices that turned your whole house wiring into a giant TV antenna -- not to mention the entire power grid. Didn't work so great. But then again, maybe it was "before its time" -- and you needed those $150 wall outlets to make 'em work, or oxygen free 300 ohm twinlead.

Date: Fri, 10 Feb 2006 15:35:33 -0800 (PST)
From: Masters Andy <nu5o@yahoo.com>
Subject: [R-390] 0A2 Replacement

Good evening. Has anyone used the 0A2 Solid State replacement at this website:
http://www.webervst.com/ccap.html......If so, were you pleased with the results?

Date: Sat, 25 Feb 2006 20:15:36 -0800 (PST)
From: Masters Andy <nu5o@yahoo.com>
Subject: [R-390] LM117K Mod and other issues

<snip> Tonight I added the Current regulator mod from ER number 70, page 24 using a LM117K regulator. I ended up changing R2 from 4.3 ohms to 4 ohms to raise the actual voltage measured at pin 2 of the 3TF7 socket. Initially, with 4.3 ohms, I measured about 10.2 volts. With 4 ohms, I am measuring 12.1 volts. How close to 12.6 vdc do I need to be on the BFO/VFO tubes? Everything seems quite happy at 12.1 vdc and I am inclined to leave it there unless there is a good reason not to do so. The voltage stays solid as a rock with the AC input being varied from 105 to 128 VAC. <snip>

Date: Wed, 1 Mar 2006 20:22:53 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Tube Shields and Heat follow up

Got a chance last week to verify a suspicion. I have an "original RARE L@@K Collins R390A with famous Collins PTO used in the one off".... Oops, Zap me Igor. Ah thank you. Lessee where wuz me. Oh yes. I have a Collins R390a, a Stewart Warner unit and an EAC. All the power supply transformers list the filament voltage as 6.1 volts. Collins engineers realized that there was a serious heat problem and lowered the filament voltage to extend the tube life.

BTW, I have the edited Feb reflector list in RTF that I will email to anyone. I also found a zener multiplier circuit so one could put a bridge rectifier, caps and
regulator in the space behind the power transformer and run regulated DC filaments. Reply off list. Regards, Perrier

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Date: Sat, 4 Mar 2006 19:43:40 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] R390A micro-switch saver circuit

I’ve come across another circuit that may be useful to R390A’s in

particular and BA receivers in general. When we used the A's in Turkey they were usually on 24/7. Now days it's a completely different story for most of us. It is a gated triac power on circuit from the 2/06 issue of Audio Express magazine. It will greatly reduce the current through the micro-switch which is getting scarcer by the day although Hank Arney still has some NOS. Reply off list and I'll send you a pdf
file.

Date: Sat, 4 Mar 2006 23:45:01 EST
From: DJED1@aol.com
Subject: Re: [R-390] R390A micro-switch saver circuit

Fair Radio still has NOS microswitches also. I bought two- since the first one lasted 40 years, I figure I'm set for life!

Date: Sat, 4 Mar 2006 23:45:52 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390A micro-switch saver circuit

I have found that a simple .01 ufd 1 KV disc cap put across the switch reduces arcing a lot and can extend the life of any AC switch.

Date: Tue, 7 Mar 2006 09:40:16 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] R390A micro-switch saver circuit

Apologies in advance because I haven't seen the triac circuit.

It can't supplant the switch by itself; triacs are hellish RF emitters. It would have to close only for the short periods of time covering the points at which the microswitch opens and closes. You might as well use a relay. (Electromechanical type only.) The cap, especially if enhanced into an RC snubber, is the ticket IMO. There's stuff on the net for computing values, but since we don't know the requisite transformer parameters, just cut-n-try until it's good enough. I don't know why Collins didn't do this; it's a well-known technique.

Date: Tue, 07 Mar 2006 12:45:54 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: RE: [R-390] R390A micro-switch saver circuit

Someone (I forgot who) replied to me personally that adding a 100-500 ohm resistor in series with the cap would absorb the spark energy better. But I have always just used a cap (with no resistor) across the switch contacts. Adding the the resistor is a good idea. Jim

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Date: Wed, 08 Mar 2006 09:59:55 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] R 390 problem

The line filters usually have caps from each side of the line to the chassis. This acts as a voltage divider making the chassis hot either way the plug goes in. I've been zapped a few times by this and have had a computer interface smoke too. Thats also why some trip GFIs. Make sure you have a good ground connected.

Date: Wed, 08 Mar 2006 11:11:00 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] R 390 problem

To prevent tripping the GFI, I use an AC line isolation transformer (1:1), 117 VAC in, 117 VAC out. Radio Shack web page used to have these at low cost, but not any more. Here is a link: http://www.action-electronics.com/phciso.htm

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Date: Fri, 21 Apr 2006 21:59:32 -0400
From: carolew <carolew@bellatlantic.net>
Subject: [R-390] R-390 Rookie Questions

I just picked up my first R-390 (not an A). It's a very impressive receiver. Undoubtedly, I will be peppering you guys with quite a few questions in the coming weeks. Some will be dumb rookie questions but please bear with me.

Here are my first:
1. Where can I get a spare set of fuses? What values would you recommend? <snip>

Date: Sat, 22 Apr 2006 01:08:08 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390 Rookie Questions

They're standard glass fuses. Values should be marked near the fuseholders on the back panel. I'm not sure if the 3 amp is supposed to be slow/blow or not. You should be running with ovens off -- screwdriver switch on the back panel. If so, I think you can try a lower amperage fuse -- 2 or 2 1/2 amp. If they blow, stick with the 3 amp. You can make-do with fuses from Radio Shack in a pinch, though probably not the highest quality. They still stock 2, 2.5 and 3 amp of that size (1 1/4" X 1/4"). The 3/8 amp fuse is not as easy to find. In a pinch you can use a 1/2 amp. Mouser lists all the exact values including the 3/8th amp. The 20 amp DC fuse (28 v.) is not needed. When you turn the bandwidth switch, do you feel the six detents, i.e. does it click into place? If not, first thing to check is if the shaft clamp is slipping. The knob is on a short shaft extension that attaches to the actual switch shaft with a clamp. That clamp might be loose or split. You need a bristol (spline) wrench for it. If it's just slipping, you may also need to pull the IF deck to lube and free up the switch shaft if it's stuck with old lube that has turned to glue. If that's not the case, you've got some other problem there, maybe a short. Sounds like the speaker hookup you've got is pretty good. The speaker setup that was used with some of these was that single or double driver on rack panel affair with matching transformers. Both originals and repro's are kind of pricey. hope this helps, Barry

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Date: Sat, 22 Apr 2006 12:50:41 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] 6C4 versus "W" and "WA"

<snip>....I say 'put up or shut up' - ....

OK, my biggest beef with the Y2K manual is the big bold safety warningcon the first couple pages that says "It should also be connected to a Ground Fault Circuit Interrupter. If the radio continually trips the GFCI check the line filter.". The second sentence is extremely misleading and potentially dangerous. If the radio does not trip the GFCI, then the stock line filter is failed or your GFCI is broken/miswired or no working ground connection is present. The AC leakage current from hot to ground through the stock 390A line filter (if operational) will trip a GFCI. Modern replacement AC line filters have much lower leakage currents (as a result of much smaller capacitors) and will not trip a GFCI. I'm somewhat worried that someone will see the GFCI trip, and start noodling around with the ground until the radio becomes ungrounded and the GFCI stops tripping. Yeah, I know, this violates a different even bolder recommendation in the safety section (and in the military manuals) that says to always have a good ground.

In fact past questions to this list have had people asking "I had to unhook ground from my 390A so that it wouldn't trip the GFCI, I was just trying to follow the Y2K manual, what did I do wrong?" My recommendation: Either remove the sentence "If the radio continually trips the GFCI check the line filter." or replace it with a sentence like "The stock 390A line filter and proper grounding will trip a GFCI if everything is operational and wired correctly." If I am complaining about some old out-of-date Y2K manual and the most current revisions are more accurate, then it's my bad. Don't take my criticism of a sentence or two in some old FAQ or Y2K revision as any sort of criticism of the work as a whole. 99.9% of the information in those documents is correct and good!

Date: Tue, 16 May 2006 11:42:55 -0400 (EDT)
From: "Paul H. Anderson" <paul@pdq.com>

Subject: [R-390] OT - Lambda power supply repair

For whatever reason, I like the mid-80's lambda lab power supplies with the LED volt/amp front meter. I had over the years picked up a few from various places, some NOS, some beat up. I use these for powering various projects, including R-392s, R-391 autotune, and my T-195. A few years ago, I wrote to this list asking about ideas for repair, and really got no useful feedback. I assumed for a long while that repair was not feasible due to internal complexity of the switching design. Here is an example of the type I'm referring to:
<http://login.pdq.com/boatanchors/lambda/lambda_lq-204.jpg>

I recently had some time to spare, so started looking into several common problems they have, such as:
 unlit LED display
 wildly flashing voltage/amp levels
 oscillating voltage output

and so on, not to mention one with a variety of dead shorts. I feared fried major components or ICs. It turns out that besides the primary and secondary electrolytics failing short, that the other main problem is electrolytic axial caps failing in large numbers. I've started rebuilding several units like this, and am finding it to be easier simply to replace all the caps with equal or slightly higher values (and higher voltage ratings) from Mouser, et al. Only after doing that is it worth doing any real in depth testing or repair.So far, I'm 2 for 3, with #3 being a 45 amp 28V unit that I haven't yet replaced the axials in (I plan to do this shortly).

In the two unit I tested and repaired fully, more than half of the axial electrolytic caps tested bad on my ESR meter or ohmmeter, and replacement of all circuit board mounted electrolytic caps (aside from the filtering caps) returned it to normal operation. My approach ended up being **wholesale replacement of axials on the circuit boards, and selective replacement of the large power filtering caps,** which are much more expensive. My suspicion is that wholesale replacement of electrolytic caps in this type of units will tend to return them to as-new condition, or at least to ham hobbyist bench usable condition. I'll try and get some useful inside pictures of original and replacement caps for folks to look at. I think most are failing due to long term heat exposure. I have not had these types of problems with the modular brick style lambdas - I don't know why - possibly better thermal controls or a different style of usage for those.

Anyway, definitely worth a shot if you've got one and been wondering what on earth is wrong with it.

Please remember to be extremely careful with these when opened. The primary side is over 200V, and should be treated with extreme caution. Even when powered off, either normal or failing power supplies may have high voltages present.

Date: Sat, 27 May 2006 16:22:45 +1000
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] Re 26Z5 replacement

1. Thanks to those who referred me to suppliers of roll pins -- One kind soul says he can help.

2, Not having to do it yet, but if one decides to use tubes in lieu of 26Z5's or silicon diodes, is their any reason why 6BW4's could NOT be used instead of the
12BW4 as outlined in a recent post.

Reason for suggesting is that the 12BW4 seems to be non existent at this time - 6BW4 still available . The power xfmr has a 12 V tap unused at terminal #9. Rewiring to put the fils in series may not cause a load problem especially if ovens not used. The seriesed filament current would be 0.9 amp . Any prohibitions ?

Date: Sat, 27 May 2006 03:07:22 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Re 26Z5 replacement

Well, I've done no research, but rectifiers have heater-cathode voltage concerns. These go away if you connect one side of the heater to the cathode, but then you have to worry about the transformer insulation for the heater winding. You could wire the tube heaters up for the glow, and conceal diodes under the tubes. 'Course, nobody's going to see the glow in the normal operating position. No worries, mate, you'll think of something ...

Date: Mon, 31 Jul 2006 11:32:48 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Collins R-390-A Photos sought

Did the Collins produced 390a's have the same power cord
as the non-A? or were they built like the subcontracted versions with
the power cord attached and not using a connector like the R-391?

R390/ A power cords are still different from the R390 power cords. R390/A only operates from 120 or 240 AC. The R390 has an alternate power supply and power cord to operate the receiver from 24 volt DC power. @RARE@. I only seen a couple receivers in a truck mounted van in

Korea about 1971 that operated from a 24 volt generator. They were old then. The power cord was wired into 24 Volts. and the power supply was changed. The power supply bolted in and mated to the existing wire harness. There was a small dynamotor for B+ and the filaments were all arranged in 24-28 volt strings. The power supply chassis mated the dynamotor and wire harness connector to the receiver mounting points. The big series power regulator in the audio deck filtered the B+ from the dynamotor. <snip>

Date: Sat, 19 Aug 2006 18:57:10 -0500
From: "Skip Frolik" <frolik@gulftel.com>
Subject: [R-390] RE:R-390 (Non A) Problems

Great information as always. Have enjoyed your articles regarding the R-390 and R-390A receivers in Electric Radio. Reference the April 2006 article and using an external audio amp with the R-390 I wanted to comment on the power resistor you used in the power supply in series with the HV input capacitor on your "Home Brew" amp. I've been in the electronic racket for years and never have seen that done. Now I think it's pretty cool and I "Assume" it's to lessen
the inrush current to that cap but again I've never seen that before and especially with heater type tube rectifiers. Rather than just sending this mail private to you thought I'd put it to the reflector in case others wanted to comment. Maybe I'm just the last person to see this application .... Hi. Or maybe it's an audio "Thing" .... Hehehe. Skip WB4GMQ <snip>

Date: Sun, 20 Aug 2006 09:13:35 -0700
From: "William G Feldmann" <n6py@qnet.com>
Subject: Re: [R-390] RE:R-390 (Non A) Problems

Thanks Skip for your nice comments. The pay back to me of writing these articles is that they get other hams to start thinking about what is going on in these circuits and get back to what ham radio is about, learning something new. That's the real joy in our hobby. The only purpose of R20 in series with the input cap on the power supply was to set the output voltage of the supply. With the transformer I had available in my junk box for this project the supplies voltage output would be lower than I wanted with choke input and higher with cap input. So I stumbled by experimentation on the idea for using the power resistor to dial in the output voltage I wanted. It has to be a power resistor because there is some energy wasted in the resistor. I used indirectly heated cathode rectifiers to help with a over voltage problem so the rectifiers start conducting after the 6L6 finals warm up.

Date: Thu, 24 Aug 2006 08:37:05 -0400
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] Chuck Rippel incommunicado?

There are other guys who rebuild capacitors. You might get what you need from one of them. Everett Hoard is one guy,

>Frontier Capacitor & Electronics
>Everett Hoard, Owner
>403 S. McIntosh St.
>Box 218
>Lehr, ND 58460
>Phone: (877) 372-2341; Fax (701) 378-2551
>
>"Our business is selling capacitors." Nichicon brand is our main
>electrolytic line. All electrolytics are new. We offer substantial stocks
>of silver mica caps. We also rebuild can type capacitors. We will not
>rebuild any twist-lock type which is available from any supplier. Call or
>write Frontier for brochure.

and another is:

>Date: Wed, 23 Aug 2006 16:49:02 -0400
>From: "Chuck Hurley" <scorebrd@verizon.net>
>Subject: {Collins} Capacitor sets
>To: <collins@listserve.com>
>
>In addition to the cap sets that I have available for purchase for the
>32S-1, 32S-3, 75S-1, 75S-3B/C and KWM-2, I have recently put a
capacitor
>kit together for the 516F-2 including a custom made dual cap to fit in
>place exactly like the original. The kit includes 7 capacitors, 6
>electrolytics and one .05 @ 1600 volt cap.
>Price is $29.90 plus shipping   Chuck K1TLI 508-965-7400

Date: Sat, 30 Sep 2006 21:14:23 -0400
From: Carole White-Connor <carolew@bellatlantic.net>
Subject: [R-390] New Owner

Well, I just joined your fraternity today. I bought an EAC model, serial no.383. I downloaded the Y2K manual and am busy studying. I have a couple of basic questions:

1. This set trips the ground-fault interruptor in my basement. The only other set that does so is an AN/GRR-5. What causes this and what can I do to solve the problem?

2. How do I get onto this list's archives so I can run a word search (e.g.,

"ground fault interruptor"). I know that there used to be a way to do so via the old Hallicrafters Collectors' site. I'm sure this is only the first of many questions from me.

Date: Sat, 30 Sep 2006 20:28:29 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] New Owner

You really, _REALLY_ need to put the RX on an isolation transformer if you can't get it off the GFI. The reason it's tripping the GFI is that the line filter puts the chassis at half the line voltage above ground and that's just the way it is. The chassis needs to be grounded if it isn't powered through a GFI, and it may be worth while to ground it if it _is_ powered through a GFI. But if it isn't powered through a GFI, then it *MUST* be grounded. Welcome; hope it gives you years of good service.

Date: Sat, 30 Sep 2006 21:33:04 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] New Owner

There is a large capacitor on the AC line that was intended to reduce RF interference from the radio going back up the power line, or vice versa. That cap has enough leakage to ground to trip the GFI. You could disconnect the cap probably without a problem. Or as has been suggested, find a 1:1 AC line isolation transformer to run the radio.

Date: Sat, 30 Sep 2006 20:35:12 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] New Owner

Ahhhh, yes. It's the same thing as is in the GRR-5, it's the line filter, but unlike the GRR-5, the R-390A uses a sealed unit. There are a couple of options. The easiest and less destructive way is to procure an isolation transformer. The next step would be to remove the line filter from the radio and set it aside should you decide to sell the radio later. This leakage is considered *normal* as this is a "brute force" AC input filter, but the leakage is such that it will trip a GFI -- and if the radio is not properly grounded on a non-gfi circuit it can raise the chassis to half the AC line voltage, which is not a good thing.

There are several good solutions on how best to attach AC, sans-input filter, I think the most common *SAFE* way is to buy/salvage from old gear a computer-type AC chassis receptacle and mount it in the least destructive way possible where the old filter was mounted. With that sort of receptacle, you can use common computer/electronic gear cords to connect your receiver to power. I have a radio with a VERY LEAKY filter that I need to do the same thing to myself.

The cheap/easy/LEAST SAFE way, is to simply attach the power cord to the wiring where the filter was previously connected, insulate the solder joints well with heat shrink, MAKE SURE the power cord and radio are grounded and MAKE SURE the cord has a strong strain relief so it wont pull itself out of the back of the radio.

With all these options always assure the receiver has a good solid ground.

> 2. How do I get onto this list's archives so I can run a word search (e.g.,
> "ground fault interruptor"). I know that there used to be a way to do so via
> the old Hallicrafters Collectors' site.

There are several versions of the archive, so there will no doubt be lots of advice on that one.....

Date: Sat, 30 Sep 2006 20:37:56 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] New Owner

Welcome to a list that would die out without you. Your GFI trips because that technology came long after the R-390A (must be, if its after 1955) was designed. The filter caps are 0.1 mfd line to ground. The 60 Hz reactance is enough to trip a GFI. Get rid of the GFI (unlikely to save you anyway) and ground the chassis as instructed in the manual. Should you crack into the list's archives, you will find this subject almost as popular as the color to touch up an R390 (A or non A). Let the endless GFI dialog begin...

Date: Mon, 02 Oct 2006 17:50:40 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re: Isolation xfmrs available

The cheaper (low-cost UPS (battery backup computer supply) -ones would not work because they power the load via direct line connection, switching over to an internal inverter only when the line fails. The better units, often called "power conditioners", run the load from the inverter at all times and would work as an isolation device. That said, I'm not sure if you'd want to run a receiver such as the R-39x series from one of those units. Virtually all of them "assemble"
the 60 Hz sinewave from a series of high frequency, high harmonic content squarewaves to allow the use of a cheap, lightweight ferrite transformer. You would likely get the same type of hash as from a computer power supply. However, you may find a "power conditioner" that has good

filtering and shielding. Someone might try one and report back with the results.

Date: Fri, 6 Oct 2006 10:45:43 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] New Owner

And the Soviets aren't listening for oscillator emissions any more these days (to deduce frequencies being monitored).

Date: Fri, 06 Oct 2006 11:37:54 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] New Owner

We like to talk about the low emissions of a R-390[/A] but even with the covers on they are substantially more leaky than a real Tempest-compliant receiver. I'm thinking of my WJ-8716 here. There's a (very technical term) metric buttload of screws spaced about an inch apart at every cover to get it to the Tempest level. The result is a bit eerie, without an antenna on it you cannot hear ANYTHING at all (again thanks to Mr. reciprocity theorem).

Date: Fri, 06 Oct 2006 15:02:59 -0500
From: Rick Brashear <rickbras@airmail.net>
Subject: [R-390] 6082

How hot should the 6082 tubes get in my 390? I just replaced mine with NOS and they get HOT! I know considering their duty they should operate hot, but it feels excessive to me. I have no way of measuring the temperature, but thought maybe someone could offer an idea as to how hot they should get.

Date: Sat, 11 Nov 2006 13:58:39 -0600
From: "Barry" <n4buq@knology.net>
Subject: [R-390] Line Filter Replacement

The subject of leaky line filters has come up on this list several times over the years. Most of us are aware of the danger of the "hot" chassis they present, how they will trip GFIs, etc. The radio can be run on an isoloation transformer, but a good transformer can be expensive.

One solution is to replace the filter with a modern line filter that doesn't have the current leakage problems of the original filters, but finding a replacement that will fit without modifying the chassis seems to be impossible. While it's not as elegant as I'd really like, I think I have a solution. Point your browser to:

http://www.knology.net/~thelanding/LineFilter/ As you can see, the modern filter fits neatly into the custom-machined housing, and the modification is completely reversable. I didn't like having to splice the neutral wire on the right-hand side, but it would have required me to pull some of the wire out of the harness to make it reach the new filter and I didn't want to do that. If you know where I can get some of the old-fashioned solder posts (the round type with #6-32 internal threads), please let me know. I found one place, but they are very expensive and I can't seem to get the guy to respond to my emails.

Date: Sat, 11 Nov 2006 15:33:28 -0500 (GMT-05:00)
From: Bruce MacLellan <brumac@peoplepc.com>
Subject: Re: [R-390] Line Filter Replacement

Nice work! And the price for each unit, ready to install is????

Date: Sat, 11 Nov 2006 14:39:02 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Line Filter Replacement

Very nice Barry!! When will the kits start shipping for the rest of us??? heehee

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Date: Sat, 11 Nov 2006 15:06:49 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Line Filter Replacement

The filters are available through Mouser (and other places):

I used a 3 amp model as the original filter is rated at that (and it happened to be what I had on hand). I did make a couple of extra brackets. If the demand is great enough, I might could make some more. They're going to be a bit high, though, as it takes a while to machine those things by hand and the material itself isn't all that cheap. I bought a foot to make the first prototypes, but the material would be cheaper if I bought 3 feet or more.

Date: Tue, 21 Nov 2006 21:15:12 -0600
From: "Barry" <n4buq@knology.net>
Subject: [R-390] More Power Line Filter Replacements

I'm curious how much interest there might be in having a replacement line filter similar to the ones I made here:

http://www.knology.net/~thelanding/LineFilter/

I'm thinking of having some custom plates manufactured that would accept

a filter like the one in the pictures, but instead of it hanging off the back like these, it would be mounted completely inside the radio where the old filter mounts. The IEC connection would be just inside the hole where the original filter mounts. The original design in the website above has the filter mounted where it sticks out from the back. It's not bad (it's only about 1/8" beyond the edges of the side panels) but it doesn't look all that neat. I have a design, but having the plates manufactured is somewhat expensive unless I have a lot of them made. The tooling/setup charges have to be spread over the entire quantity to bring down the price per piece. The bracket and filter together will probably run in the $30 to $40 range, again depending on quantity pricing. If I get enough interest, I may pursue this, so if you think you would be interested, drop me a line. This will be a substantial "investment" on my part so not entirely sure I can do this, but it would be something I think a lot of folks on and off this list might want so I'm trying to get a feel for interest levels before I try this.
Thanks,

Date: 22 Nov 2006 21:57:50 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] More Power Line Filter Replacements

I've had a few replies so this may be something I'm going to try. If I don't sell them all to this list, then there's always the auction sites and other outlets. There are a lot of R390As out there so I think getting rid of 25 or 30 of these shouldn't be too big of a problem. I want to put together a prototype and will try to do that as soon as possible. I hate to keep asking my friend for time on his milling machine, but maybe if I only make one or two, he won't mind. When I get it finished, I'll post some pictures to the same site. Someone asked about the R390 filter. I'm not familiar with the filter or the mounting arrangement for it. I've found one picture of the inside of an R390 and can't make out much about the way it's mounted or how the connections look. If someone wants to send me some closeup pictures, that may be enough to figure out if these would work. Maybe a different arrangement can be made for the R390.

Date: Wed, 27 Dec 2006 13:58:07 -0500
From: Rbethman <rbethman@comcast.net>
Subject: [R-390] Ancient history BUT need the info to properly replace the selenium rectifier

I've dug through archives and sites to no avail. I wish to replace the selenium rectifier in the power train of the R-390A. I'd rather REMAIN healthy. Would one of our esteemed list members please re-post the information regarding the solid state replacement? I'm STILL going slowly through my 1951 Collins St. Julian's "survivor".

Date: Wed, 27 Dec 2006 13:09:08 -0600
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] Ancient history BUT need the info to properly replace the selenium rectifier

Bob, I have a few NOS units for $17.50 mailed.

Date: Wed, 27 Dec 2006 15:12:46 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Ancient history BUT need the info to properly replace the seleniu...

You just should not eat them when you get them out of the circuit. The real hazard is when they are letting the magic smoke out of them. You can wash the area up with soap and water after one fails. This cleans the mess up well.

As always when working with lead solder, wash your hands before you lick your fingers. The device is a simple bridge rectifier. A four lug terminal strip and a 1Amp 50 volt or more bridge will make up a replacement. Mostly they just fail open then buzz a while as the output is only 1/2 wave instead of full wave. The extra load on the working half then kills that half and its over. Some really do smoke and burn. These are the ones not to watch and breath the fumes from. The selenium is not easily adsorbed through the skin. But a bath on the lawn is likely in order before you install the new part. I like Hank's offer. It will look much nicer in the receiver.

Date: Wed, 27 Dec 2006 15:42:16 -0500
From: Rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Selenium rectifier replacement

The four lug terminal strip and a home brewed bridge is what I will do. Hank's offer is appreciated, and I wrote him directly with my thanks. As I wrote to Hank:

> I am indeed doing a "restoration", but THIS is one part that I'll depart from "pure" restoration activities.
>
> I am not a youngster any longer. Health considerations have become more important. I may not be as old as many others, but I have to take care more than many of my same age. A snoot full of a dying selenium rectifier just won't do.
>
> I'm going to solid state the bugger.

Thanks for the note and offer!

So I will be opting for the SAFE method.

Date: Wed, 27 Dec 2006 15:16:59 -0600
From: Rick Brashear <rickbras@airmail.net>
Subject: Re: [R-390] Selenium rectifier replacement

Smart move, Bob. That's what I did. I'm gettin' old and these things are not gettin' any lighter!

Date: Wed, 27 Dec 2006 17:35:29 -0500
From: Rbethman <rbethman@comcast.net>
Subject: [R-390] Junk box solution

A four lug terminal strip has been located in my misc. parts collection. I also located a number of 1N4004 diodes. Yes, they are overkill. I find no reason to go buy something that one's parts box(es) provides. Thanks to ALL comments, information, and replies!

Date: Fri, 19 Jan 2007 07:56:35 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] AGC Cap Revisited

Very nice approach. I have recently taken to building new multi-section filter capacitor cans not by cutting up the old can and removing the umpucky and glueing back together when done, but by:
1. Using Garolite/Glass Epoxy tube and top/bottom caps.

2. Putting swaged Keystone terminals in the bottom as appropriate. You can get them in turret style, in pin style (as for a socket), in fork style, etc.

3. Building up from scratch. It doesn't look identical to the original but it looks nice. The insulating base and tube is very handy where the original cap was part of a voltage multiplier and the original can had a few hundred volts on it. Yikes, maybe that's why the factory manual shows a cardboard cover on the can!

Date: 19 Jan 2007 14:12:06 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] AGC Cap Revisited

I'd be interested in seeing what you did. I thought about something similar but wasn't able to find the material. My first attempt involved a piece of 1" x 2" x 1/16" wall aluminum tubing with top and bottom plates. Two standoffs (6-32 x 1.75") were to mount through the bottom plate into the

existing holes and solder posts on both sides were going to be used to connect the cap on top and the other leads on bottom. Everything was a snug, just-right fit, but it involved a
visit to a machine shop and I was having trouble scheduling that. When I noticed the hole sizes and thought of the octal socket, it was the easier route, though. I still need to make a cap over that tube base to make it look a little more finished. I really like the idea of reusing the existing hardware, though. If you have pictures and/or material sources, I'd be interested. Oh, by the way, another approach is to use the octal relay enclosures available from Keystone. I may try those too as the octal base is kind of klunky-looking.

Date: Fri, 19 Jan 2007 20:22:38 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] AGC Cap Revisited

> I'd be interested in seeing what you did.

Most of what I've been doing are 50's/60's vintage ham equipment, not necessarily very high end, in fact maybe consciously choosing to be on the low end. Lots of lytics in cans.

> I thought about something similar but wasn't able to find the material.

http://www.mcmaster.com/ has garolite/glass epoxy tube and sheet in an unbelievable variety of forms. I order and they're here the next day. Astounding, and almost everything ships for just $4.00! There used to be a local plastic shop that would sell phenolic and glass epoxy cutoffs but they got bought out by a big national outfit and aren't worthwhile anymore. In any event McMaster-Carr is way better than they were back in the good old days! Mouser has the swage terminals. And of course the lytics too! Nothing I did requires any deep machine tools - hacksaw, snips, hammer, drill, file. I did buy the Keystone terminal swaging tool from Mouser.

Date: Thu, 29 Mar 2007 10:23:48 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Tech Query R-390 power supply

I thought that the A model also has these 47 oohm resistors in the rectifier cathodes, but the schematic in the Y2K manual does not show them. There is a single series resistor feeding the input choke, however with the note: "200-220 ohms See EIB 895". I can't find reference to that EIB with the Adobe Reader search in the Y2K Release 2 manual other than references to it in drawings. Very likely this resistor is added as part of, or after, the solid state mod for the rectifiers (That field change was done with a different EIB number.). This resistor is in the Audio Deck, and goes between P-119 pin 5 (the DC input from the power supply via the B+ fuse) and the input to choke L602. It is likely a 5 watt power resistor mounted with a bolt to the chassis. If what I assume is right, then it would be quite possible to have an audio deck withOUT the series resistor, and a power supply WITH the solid state rectifiers. This would be bad.

> I have mine out of the cabinet to repair The Zero Adjust feature and
> will check these items if need be.

I would get the audio module out and see if that series resistor is in there. If it's a field change, I would add it to increase life of the rectifier tubes. If your power supply uses the diodes, then it might be optional depending on how rugged your diodes are.

Date: Fri, 30 Mar 2007 17:51:36 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: Re: [R-390] Tech Query R-390 power supply

The field change to add a series dropping resistor was prompted, IIRC, by 6AK6 audio output tube failures. The solid state rectifiers give increased B+ voltage. The R-390A power supply's input choke already very nicely reduces the filter capacitor charging pulses. In a unit equipped with tube rectifiers an added series resistor would do little to make life easier for the rectifier tubes. The 12BW4 has lower internal resistance than the 26Z5W. If replacing 26Z5W with 12BW4, an added series resistor might help prolong the life of the other tubes by keeping B+ down.

Date: Sat, 05 May 2007 11:33:03 -0400
From: Gary E Kaufman <gkaufman@the-planet.org>
Subject: [R-390] R390A microswitch

Anyone have a source for the R390A microswitch ? I picked up a nice R390A at a hamfest missing handles, and the microswitch is open. Seems pretty clean otherwise. Did I really need another??

Date: Sat, 5 May 2007 11:54:51 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390A microswitch

If the switch is not does not actually have broken plastic you can work it over with some contact cleaner. The switch sets in the off position for years and gets stuck that way when the lube inside sets up. We use to get then stuck on when operated 24 x 7 for six months at a time.

Date: Sun, 06 May 2007 09:10:48 -0400

From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] R390A microswitch

If you have not taken it apart yet, try this. using a rubber mallet, or a towel and a regular hammer so you don't mar the paint. Tap the front panel with it right where the switch is (about where the words 'STAND BY" is? We often got calls where the radio would not turn off when in the OFF position. The contacts welding together from inductive surge. a good tap always released it, and it was good for another few years.

It may not work for the microswitch being open. But those old microswitches can be taken apart. And while you are in there, put a 0.1uf cap across the contacts to prevent the arcing. Well worth the trouble considering the cost of replacement. May not even make a drop-in replacement any more. In that case, just use a switched power strip

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Date: Mon, 14 May 2007 08:38:32 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] power supply R-390

> What are people using these days to replace
> CR-801 on the bottom of an R-390 power supply?

You're talking about the selenium rectifier used to run the antenna relay? I use a bolt-in 10A bridge rectifier, the type with one hole in the middle. Current-wise it's way overkill but the determining factor in my case was the ease of bolting it in. Others here will fret over not matching the voltage drop of the selenium rectifier, but not me. I'm the guy who would prefer to blow stuff up early rather than worry about it for years :-).

Date: Mon, 14 May 2007 18:11:22 -0400
From: <edw488@earthlink.net>
Subject: [R-390] Re: power supply R-390

I used a small 100V 1A silicon bridge rectifier, with some heat shrink tubing to insulate things. Hated to do it, but wanted to get the antenna relay working again in the R-391.

Date: Mon, 28 May 2007 15:47:25 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] Potting tar in power transformer

I just finished repairing my '63 Imperial. It was blowing the mains fuse. I got a bad megger reading on the dual 120 volt windings. Seems the potting tar carbonized and shorted the power leads just inside the steel box.

Five years ago this happened with the high tension winding. I never thought it would happen on the lower voltages. The repair is a little messy involving a heat gun but straight forward. Just run some good teflon wire through the porcelain bushings and don't use the attached solder lug. The power transformer was marked "Phoenix company". In a nutshell , don't trash your power transformer without first checking for insulation leakage. ..73..Steve..N8YE

Date: Tue, 29 May 2007 08:19:25 -0400
From: "AI2Q" <ai2q@adelphia.net>
Subject: Re: [R-390] Potting tar in power transformer

Absolutely right on Steve. I recently repaired a primary-to-secondary short in a HV xfmr for a Heathklit SB-220 kw amplifier. Removal of the end bells revealed the breakdown in insulation, and that the windings themslves weren't burned open. A thorough cleaniung, followed by an application of galss tape and fish paper did the trick.

Date: Tue, 29 May 2007 08:24:31 -0400
From: "AI2Q" <ai2q@adelphia.net>
Subject: Re: [R-390] Potting tar in power transformer

... make that glass tape.

Date: Mon, 4 Jun 2007 16:40:20 -0400
From: "rbaldwin14" <rbaldwin14@nc.rr.com>
Subject: [R-390] R-390 Grounding Question

I just got my first R-390 (Non A) and it came without a power plug. I was successful at getting one and now want to wire it up, of course. It is plain to see that the AC lines go to pins A & D and it looks like the ground can go to pin C. Does that sound correct? I've heard something about not having the third wire in the supply line so having to ground separately, i.e. my question. Do the line filters in these boxes leak like the A's do? I run my A's through an isolation transformer. Thanks in advance for your counsel!

Date: Mon, 4 Jun 2007 21:10:33 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 Grounding Question

Yes, the R390 filters leak like the A filters do.
The third wire should go to the full metal chassis of the receiver.

My TM figure shows AC to Pins A and D. Pin C is ground. Pin B is a DC line into the power supply.

There is another DC flavor power supply that goes in the R390. With that power supply and a different power cord you can operate the R390 off a 24 / 28 volt DC source. That power supply made up high voltage DC via small motor generator. That thing made lots of hash. That's really why the R390's have the wonderful voltage regulators in the Audio deck.

Make sure Pin C has a good amp capacity to the frame if you are using a mating connector. There is no place in a ground circuit for a weak wire.

I hope you like your R390. We expect yours is wired for 120. But you may want to look see under the power chassis. You may want to look at some 47 ohm resistors while you are looking. You can solid state the 26Z5's in the R390 power supply like its done in the R390/A.

Date: Mon, 4 Jun 2007 21:19:23 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 Grounding Question

We expect yours is wired for 120. But you may want to look see under the power chassis. The other being 240 AC.

Date: Sun, 17 Jun 2007 10:42:23 -0400
From: "rbaldwin14" <rbaldwin14@nc.rr.com>
Subject: [R-390] R-390 Rectifier Stack Replacement

Can any one direct me to a schematic and/or instructions on replacing the rectifier stack in an R-390 Power Module? This would be a NON - A model. Thanks in advance for any of the collective wisdom.

Date: Sun, 17 Jun 2007 14:43:39 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 Rectifier Stack Replacement

CR801 is a selenium stack. Selenium stacks have had a bad rep since the silicon diode has been invented. The magic smoke in these items is known toxic. The stack provides DC for the antenna relay for break-in. If you are not using your receiver with a transmitter then you do not need this feature to work. Thus you can just open the AC leads to the critter and leave it. Its just one option.

New old stock replacement parts are still available if that's your preferred restoration methodology. Ask for one here on the reflector in another posting if you want one.

The preferred replacement is just a 50 volt 1 amp or more silicon bridge. Unsolder the old Selenium stack. Drill a hole in a block of plastic or wood.

Then trim the block down to size.The hole will mount on the original bolt. Glue the new bridge to the block. Orient the pins to stick up. and the bridge top against the chassis. Then you have a part that bolts in. And you can reattach the existing wires to the bridge. Spread the leads out into a fan if needed or offset then it needed. Trim then short to fit into the chassis space. It will take more time to make the block up for the mounting than to do the new part install. Check those 47 OHM resistors while you are in the deck.   Roger AI4NI

Date: Sun, 17 Jun 2007 15:52:31 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] R-390 Rectifier Stack Replacement

I have used a square bridge rectifier...one with a hole in the middle and mounted it to the bracket used to mount the original selenium stack. No worries about the difference in voltage drop. Solder up the wires to the shortened leads and cover them with some heat shrink. Project completed!

The bigger problem are the 4ea. 47 ohm resistors...two under the regulators and two under the audio deck if I remember correctly. Change all of them out with 5 watt wire wounds. May have been more than 4 total...I'd have to go back and look at my pictures...

Date: Mon, 18 Jun 2007 09:18:52 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390 Rectifier Stack Replacement

There are four under the audio module at the 6082 sockets, one for each of the triode series regulators. I've used square shaped "sand" resistors of 7 watt rating, and I like to use Teflon tubing where I can to avoid any shorts.

DO PUT A FAN ON THE SIDE OF THE RADIO TO KEEP IT ALL COOL!

> Change all of them out with 5 watt wire wounds. May have been more than
> 4 total...I'd have to go back and look at my pictures...

Four under the 6082's and more in the power supply module. Buy a bunch.. they are cheap.

Date: Mon, 18 Jun 2007 14:04:59 -0500
From: "Don Reaves" <don@reatek.com>
Subject: [R-390] Rectifier Stack Replacement

Has anyone ever had one of these selenium rectifiers in the R-390 go bad? Yes? Not just hearsay but you had it actually happen to you? If so, report in.

Date: Mon, 18 Jun 2007 15:22:23 -0400
From: "Jim Temple" <jetemp@insightbb.com>
Subject: RE: [R-390] Rectifier Stack Replacement

Both my R-390 and R391 had bad ones when I first got them. The antenna relays would not work. After replacing the rectifiers, they work just fine.

Date: Mon, 18 Jun 2007 14:36:32 -0500
From: "Don Reaves" <don@reatek.com>
Subject: RE: [R-390] Rectifier Stack Replacement

Thanks, Jim. Did they smell funny, or did you otherwise find a nasty mess to clean up?

Date: Mon, 18 Jun 2007 15:39:19 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Rectifier Stack Replacement

I bought an R390A chassis and the wires to the rectifier were cut. The seller explained that he didn't know for sure, but the rectifier might have blown and that's why wires were cut. He supplied a replacement rectifier (selenium) and I'll probably replace it with that.

Date: Mon, 18 Jun 2007 15:52:40 -0400
From: "Miles B. Anderson, K2CBY" <k2cby@optonline.net>
Subject: [R-390] Rectifier Stack Replacement

I bought an early (S/N 1200) Motorola R-390A from Fair 20+ years ago. I used it for a couple of years with the antenna relays as an active part of the system. One fine day when I hit the transmit switch there was an almighty buzzing noise from the R-390A. Turned out that one leg of the bridge went open. No smoke, no smell -- just no work.

Date: Mon, 18 Jun 2007 13:08:11 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Rectifier Stack Replacement

I wouldn't use selenium under any circumstances. Even NOS or NIB have deteriorated to the point where in most cases they are essentially useless. Besides IF they fail catastrophically (i.e. the magic smoke escapes) that stuff is highly toxic in certain quantities. Personally, I wouldn't take the chance. Besides, they were crappy rectifiers anyway.

Date: Mon, 18 Jun 2007 16:12:33 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Rectifier Stack Replacement

YES! And it WAS a catastrophic failure! Had to throw open all windows and turn on some big fans. It was a VERY unpleasant odor - AND - I know the chemical effects on the human body are NOT good for longevity. Get rid of the selenium rectifiers!

Date: Mon, 18 Jun 2007 13:11:57 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Rectifier Stack Replacement

Yes. However, not in an R-390(*). I have had several let the magic smoke out in the past. Most were used in cheap BC receivers, although at least one was used in a GRR-5. Now, I routinely remove and discard any I find. As I said, they are crappy rectifiers anyway.

Date: Mon, 18 Jun 2007 14:36:28 -0700
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: RE: [R-390] Rectifier Stack Replacement

I have always thought that the rectifiers on the relays were copper oxide.

Date: Mon, 18 Jun 2007 17:54:23 -0400
From: "Jim Temple" <jetemp@insightbb.com>
Subject: RE: [R-390] Rectifier Stack Replacement

They just seemed to be open. They were nice and clean, and were open when I got the sets.

Date: Mon, 18 Jun 2007 20:22:06 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Rectifier Stack Replacement

I lost one in a 390A a long time back. I have also blown them in a couple of other types of gear. Each time the failure was more than just obvious. Major stinky smoke. Nasty, clear the room for a day stuff. Not quite as nice as burning sulfur or a sneaker jammed in the dryer. More like a skunk burning .... Absolutely no chance to miss the fact that one has let loose. When they go it's *obvious*.

Date: Tue, 19 Jun 2007 12:49:55 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Rectifier Stack Replacement

I had a lot of R390's at Phu Bia. We were on local power at the Tri Bac Power and Light Company. Every time they swapped a generator on / off line we had a power surge. We would smoke the ops out of a room full of receivers once a month or so when something smoked. I changed a few of the selenium bridges in 69 - 70. More of a problem was running the series regulator tubes into the ground and smoking the 47 ohm resistors. I brought a R390 into the shop once when the selenium bridge was not yet done cooking and out gassed some more it when I turned the receiver on while it set on the bench.

Date: Tue, 19 Jun 2007 12:52:09 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Rectifier Stack Replacement

They did smell funny. We knew from school not to inhale.
They were not messy. Messy is an electrolytic cap that exploded.

Date: Tue, 19 Jun 2007 14:17:54 -0400
From: "Joel Richey" <richey2@mindspring.com>
Subject: [R-390] selenimun

Boy this brings back memorys, can remember coming home from school and wrkg in my fathers radio shope (no TV in Northern NY then) replaced many of em, was a case when all you needed was a nose and boy they did smell, but they worked and didn't need any heater voltage..

Date: Thu, 21 Jun 2007 02:44:32 -0500
From: "Don Reaves" <don@reatek.com>
Subject: [R-390] Selenium rectifiers

Less than a half dozen folks reported actual real-time failures with noxious odors of their antenna relay rectifier stacks. Most who reported broken units indicated they had failed open; no bad stuff. Still, it could happen but its not a foregone conclusion they are going to fail catastrophically. These parts are mil-spec, not the consumer grade stuff we had so many bad experiences with in early tube gear. As to whether they are selenium or copper oxide, the parts list (R-389 manual) specifies: Rectifier, Metallic, 27V, Selenium. I asked this question because I have one of the R-391 matching 28V power supplies, PP-629. It has a beautiful selenium rectifier stack in it about the size of a loaf of bread. I'm going to leave it alone and use it as is. It's job is to run the autotune circuits in the R-391. My elmer used to call these things rectum finders. I suppose there was some double meaning to that term based on their failure modes, but as a kid I knew not. <grin>

Date: Thu, 21 Jun 2007 09:03:50 +0000

From: Sheldon Daitch <sdaitch@mor.ibb.gov>
Subject: Re: [R-390] Selenium rectifiers

I understand the idea of keeping BAs as BAs, but I wonder, what would the military do with the selenium rectifier stacks, if the PP-629 was still in service? My gut feeling is there would have been a modification kit sent out to the field to change out the rectifier.

Date: Thu, 21 Jun 2007 07:26:10 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Selenium rectifiers

Since they switched out the tubes in the high voltage I'm sure you are right. As soon as the selenium's got tough to find they would have stuck in a terminal strip and done something.

Date: Thu, 21 Jun 2007 09:53:56 -0400 (EDT)
From: "Paul H. Anderson" <paul@pdq.com>
Subject: Re: [R-390] Selenium rectifiers

I think the R-389 has a smaller version (one in between the PP-629 and the antenna relay rectifiers on R-390, R-390A and R-391's). I imagine the need to replace it depends on how close to design limits it normally operates at, and how that interacts with the normal failure modes.

Date: Tue, 03 Jul 2007 11:03:53 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] Possible source for isolation transformers?

Knowing the leaky filters won't run on GFI circuits and are probably not all that safe when used on non-GFI or non-isloated circuits, I think some folks may be looking for isolation transformers. While searching for voltage converters for overseas travel, I found these:

http://www.eastwestintl.com/proddetail.asp?pid=2625

They state that they are transformers, not just converters, and that they can be configured to run either 110-220 or 220-110. I wonder if these could also be wired for 120-120 and used as an isolation transformer. If not, if someone has 220V in the shop, it might be a good way to power an R390[A]. If you back up a page, they have a variety of transformers ranging from 100W on up.

Just thought I'd pass this along.

Date: Wed, 04 Jul 2007 08:51:08 -0400

From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] Possible source for isolation transformers?

Transformers for this application are almost always autotransformers. They are smaller for a given wattage because there is only one winding (with tap), and the common part of the winding can be downsized. They will not function for isolation. They can be used either for step-up or step-down.

Date: Wed, 04 Jul 2007 09:04:47 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Possible source for isolation transformers?

I'm curious as just to what's under the hood. I suppose they can get away with calling an autotransformer simply a transformer. If it is truly a transformer, though, I can't see how they can sell them at that price. If they are autotransformers, is this a better solution for 220V-110V conversion than the little voltage converters available? I belong to a list of folks who have (or will) travel overseas and several ask from time to time about what to use to power their various 120V appliances (chargers, etc.) while overseas. While a small converter is fine for charging a battery or running a small device, I keep having to warn folks who want to power their blowdryers, etc., from them. I thought these might be a better alternative; however, they'd certainly need the 1500W or larger unit for such applications. I know blowdryers are available in 220V models and that's probably the best way to go, but most folks aren't going to do that so I keep looking for better options. I've explained the "best" solution is a step-down transformer, but it's unlikely anyone will want to pack one of sufficient size in their luggage. I know its OT, but if anyone has any thoughts on this, I'd appreciate a reply either on or off the list.

Date: Wed, 04 Jul 2007 09:28:22 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Possible source for isolation transformers?

Rather than looking at the price, I looked at the weight. The cheap unit weighs about 1/2 what the tranditional same-watt-rating Hammond/Stancor isolation transformers with a box weigh, so it is easy to believe they're autotransformers. The importers cannot change the law of physics too much (although price may be different!)

Date: Wed, 04 Jul 2007 11:51:43 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: Re: [R-390] Possible source for isolation transformers?

My wife is from Lima, Peru and I bought a huge 220V-110V transformer very cheap there, I used it to power everything I had brought over including 2 bass guitar amplifiers. I think it had a capacity of 1500 watts. (lived there for almost a year). I don't think it was an autotransfomer either, looked (and weighed) like a traditional transformer. They are available everywhere in Lima in hardware stores and other places. I would assume the same is true in most other countries given the amount of Americans who travel.

Date: Wed, 4 Jul 2007 14:42:59 -0500
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Possible source for isolation transformers?

I have purchased from eBay a couple of isolation transformers (CyberCare), apparently for use in hospitals, they are great, very well built. The tag says CyberCare Inc. Atlanta Georgia 30350. Also, in the 80´s I had an assignment in Germany and the company supplied the assignees with 220 to 120 transformers up to 2500 Watts and a switch for 110 or 125 volts output, they weigh a ton, but in my workshop, which I have 220" they work great as isolation transformers, also I you do not have 220, they work backwards as well.... Wouldn´t a variac also serve as an isolation transformer?? they are frequently on eBay, I bought one a few years ago that was used in a tether, it handles 5 KW and only paid $45.00 for it, output goes from 0 to 145 volts.

Date: Wed, 4 Jul 2007 14:54:58 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Possible source for isolation transformers?

Most Variac's are not isolation transformers. Isolation type variable transformer are more expensive than the more common autotransformer types.

Date: Wed, 04 Jul 2007 12:01:43 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Possible source for isolation transformers?

> A VARIAC does not isolate.

No, it most certainly does not.

> ....advertised are an autotransformer (like a VARIAC....................

Again, correct. I bought one of those off Ebay just to see, and it is an autotransformer. Out at work, a "control transformer" showed up in my junk to be surplussed. Needless to say, I "surplussed" it to my shack, WITH the blessings of the powers that be. It has two very heavy winding that can

be wired for either 220 or 440 input or output. As such, it can also be then used as 110/110, 110/220, and vice versa. Trouble is, it weighs a LOT: probably on the order of at least 40 lbs. I also have two 115 to 115 VAC isolation transformers, good for 15 amps each. THOSE little jobs weighs 65 lbs each! So, on that basis, true isolation transformers weigh a LOT more than the cheap autotransformer types.

Date: Wed, 4 Jul 2007 21:35:09 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Possible source for isolation transformers?

If you are going to go looking, the medical grade isolation transformers are by far the best. They are designed and rated for very low leakage currents under a variety of conditions. If you are really trying to isolate an R-390 that's the way to go.

Date: Wed, 4 Jul 2007 21:18:37 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Possible source for isolation transformers?

They do exist, I have an isolated AC supply with only an isolated variac inside - it's made by Stanford and's part of of the "Adjust A Volt" line. Pic is here --
http://imagebase.fernblatt.net/details.php?image_id=21

Date: Thu, 05 Jul 2007 11:48:21 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Isolation transformer question

Same here. This is what I did:
http://www.knology.net/~thelanding/LineFilter/

I have a couple of extra brackets if anyone's interested in doing the same thing.

Date: Sat, 07 Jul 2007 8:21:16 PDT
From: Gary Gitzen <r390a@uwave.com>
Subject: [R-390] Isolation xfmr demand?

There has recently been a lot of mail regarding isolation transformers, with some folks apparently looking for them. I while back I obtained some and made them available to this list at a very reasonable price. I thought I'd filled the demand, but apparently not. I recently found a lot of ten 100/115/200/230V to 115V Signal Transformer isolation transformers available. They are rated at 600VA, and are NIB. If there is sufficient demand, I'll attempt to purchase these. The cost would probably be $20 each. Shipping for 1-2 in a flat rate box would probably be about $9.15 with the new postage rates. This mail is purely to see what current demand for such transformers might be, and is _not_ currently an offer to sell such transformers, because I don't have them. Caveat: if enough people express interest, I will attempt to obtain these units, and consider your positive response a provisional order. If you are interested in 1-2 (or however many may fit in a flat rate box, possibly up to four), please let me know by early Sunday evening.

Please use an address of <r390reader@uwave.com> to reply. Apologies for the bother, but the list remailer strips off "Reply-To:_" header lines. Sigh.

Date: Sun, 8 Jul 2007 21:22:54 +0200
From: "Paul Galpin" <galpinp@absamail.co.za>
Subject: [R-390] Isolation transformer question

Certain assumptions are being made about the secondary of the I.T. In fact, there are several unknowns. What is the secondary live-to-earth resistance, neutral-to-earth impedance? How do these change when a piece of equipment is connected? The secondary is floating and could even be standing up at kVolts of static (very unlikely, but theoretically possible in a very dry climate) IMHO, it would be best to relate the secondary to earth in a known way. My suggestion is to connect small 110V globes from each side to earth, giving visual indication that the supply is now 55-0-55, very safe if you insist on connecting yourself to the power cables! If either lamp goes out and the other goes bright, then you've got a short somewhere between one leg and earth. You might want to put a shorting switch across one leg to earth to create this condition, maybe, for certain tests Of course, down here it would be a 110-0-110 supply, but that's still safer than the full 220. Incidentally, ELT's (GFI to you) also go out on a low impedance neutral-to-earth short.

Date: Sun, 08 Jul 2007 13:54:42 PDT
From: Gary Gitzen <r390a@uwave.com>
Subject: [R-390] Isolation transformer question

Paul: many thanks for your thoughts on the problems using isolation transformers (IT). Please consider extending your thoughts to the following. Paul suggested a few issues and/or problems with using isolation transformers, as well as a possible "solution". His first comment was that in theory the floating secondary could be floating at KV levels above ground due to static electricity. A second, unmentioned but much more dangerous possibility, is a power supply fault in the powered device causing possibly high voltages to appear on the IT secondary. Paul further suggested using small 110V "globes" (presumably light bulbs for us here in the US) from each secondary leg to ground. These would glow dimly under normal operation, and one would glow brightly if either secondary leg shorted to ground. I think this is a Very Bad Idea, and will get to that shortly.

First, let's take the case of static electricity on the secondary. This is easily dealt with by connecting 1-10 meg 2W resistors from each leg to ground. Static problem solved.

Second, Paul's suggestion of a "leg shorted to ground" indicator is an excellent idea, but might I suggest instead two neon bulbs, each in series with say 220K/2W from each leg to ground? Under normal conditions, they would both be dark, and conduct zero current. If either turns on, one leg is shorted to ground. If they both turn on, some fault in the powered equipment is putting high voltage on the secondary.

Paul further claimed that the two "globes" would create a virtual center tap on the secondary, with "safe" voltages of 55-60VAC on each leg. I must respectfully disagree with "safe". My understanding is that under the wrong conditions, as little as 10-20V at 10MA or so can prove fatal. Paul further claims that any fault condition, such as a shorted leg, would cause at least one bulb to glow brightly. That would be true for a shorted-to-ground leg, but what happens if

A: That bulb burns out?

B: A fault puts high voltage on the secondary, blowing both bulb filaments?

In either case, both bulbs would be dark, but that might not be noticed when the "normal" condition is a dull glow. The neon bulbs appear to address both issues. If either/both neons come on, a fault exists. Paul's suggestion of a virtual center tap on the secondary, resulting in 55-0-55 is excellent, but there may be a better way of getting it, and then adding even more protection for us mortal users. If you take a small transformer with a 120/240 split or center tapped primary, connect each end to one of the IT legs, then ground the middle of the winding(s), you have created a 60-0-60 voltage source, ideal for powering an R-390X rcvr. But we're not done yet. For added protection, add a GFI to the secondary. Ground the GFI and we now have a 60-0-60 voltage source with GFI protection in case the user happens to connect him/herself between either leg and ground. If you happen to have a pair of 130-150V varistors and connect them from each leg to ground, you've just added protection in case a power supply fault in the powered equipment ever tries to put high voltage on its AC power feed from the IT.

Does anyone else have any opinions, insights, or suggestions for further improvements?

Aside: a 60-0-60 AC feed is now popular with the professional audio crowd (not to be confused with audiophools) because it reduces hum. Just my $0.02

Date: Mon, 9 Jul 2007 07:48:08 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Isolation transformer question

This is one of the reasons a medical grade isolation transformer is a good idea. The whole thing started with "filter leakage". With a low leakage transformer you can do the static thing with a couple of good resistors in the 10 meg range.

Date: Tue, 24 Jul 2007 12:15:35 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Inrush Current Limiters

> Does anyone know the failure mode of an Inrush Current Limiter (ICL)?

The inrush-limiter failures I've seen were due to a short elsewhere in the circuit. Normally when "warmed up" the current limiter only dissipates a few watts and has a voltage drop of a few AC volts across it. But when the circuit that the limiter is protecting goes dead- short, the E-squared-over-R losses shoot up really really fast (remember R for the inrush limiter drops as it warms up) and the limiter ends up dissipating hundreds of watts for a few seconds and pretty much incinerates itself. If the wires fall off in the incineration process, it can go open like you worry about below.

> .....I really want to install it on the less convenient hot side...................

In retrofitting old radios, I've always installed the ICL in a dangling position between two pre-existing terminals. When the limiter incinerates itself, you might want to think where the dangling leads will end up. But in the incinerated condition, one dangling lead will be hot (or at least transformer shorted primary impedance to hot) and the other will be neutral (or at least transformer shorted primary impedance to neutral), and this will be true whether or not it's on the hot side or the cold side. So I don't think it matters much. Anything in the AC power section would be treated as "hot" anyway (nobody really trusts that those knuckle-dragging electricians never get them mixed up, do they? I've got lots of light sockets in my house with hot on the screw thread... goddamn knuckle-dragging electricians! How did they ever pass the inspection???)

Date: Tue, 24 Jul 2007 20:11:19 -0400

From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Inrush Current Limiters

Inrush limiters are in some ways similar to MOV's. They both can easily fail "open". They crack when they fail in this mode, so the fragments may "migrate" during the failure.

Date: Wed, 25 Jul 2007 08:59:53 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Inrush Current Limiters

If it were me, I would balance the slightly more convenient installation of a component that fails open leaving the chassis hot, as opposed to the slightly more inconvenient option of not being dead. Me, I say screw the 'I Love Pain. It Means I am still Alive" school of thought. Never put anything in the neutral line that can possibly fail open. It is like playing Aggie Roulette. That's like Russian Roulette, except you use your trusty Colt 1911A1 Automatic. (if you don't know what an Aggie is, see http://halife.com/files/aggie.html)

Date: Thu, 9 Aug 2007 14:00:01 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Voltage regulation and vintage equipment

Meant to also state that if you are running your R-390 with the ballast tube you should be just fine.....

Date: Sat, 11 Aug 2007 08:09:12 -0400
From: "Rich Baldwin" <rbaldwin14@nc.rr.com>
Subject: [R-390] Bridge Rectifier Question

I have a sleeve of Bridge Rectifiers with the id on them of 7914 and VS 148. I like to use these in the R 390 and R 390A to replace the selenium units that power the antenna relay. The physical measurements are about 3_4"square, they are quite small and that causes me some concern. Does anyone have access to the specs. On this unit? The manufacturer's logo seems to be a white circle with a script, capital V.

Date: Sat, 11 Aug 2007 08:14:22 -0400
From: "Rich Baldwin" <rbaldwin14@nc.rr.com>
Subject: [R-390] Bridge Rectifier Identification?

Does anyone have the specs. On a bridge rectifier with the following nomenclature: 7914   VS148?

Date: Sat, 11 Aug 2007 08:36:01 EDT

From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Bridge Rectifier Identification?

Practically any bridge rectifier made nowadays would handle the low voltage and current requirements of the R-390 and R-390A antenna relays. Use a DVM to determine the polarity of the diodes in the bridge.

Date: Sat, 11 Aug 2007 08:42:23 -0500
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Bridge Rectifier Identification?

This is a VARO bridge. Rated 100V 2A. This I found from my friend Google. See <http://www.datasheets.org.uk/specsheet.php?part=VS148>

Date: Sat, 11 Aug 2007 13:51:19 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] Bridge Rectifier Identification?

Is this any use? http://www.datasheets.org.uk/specsheet.php?part=VS148

Date: Sat, 11 Aug 2007 09:01:42 -0700
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Bridge Rectifier Question

That *might* be a Vishay device. Try sending those numbers through Google with something like "diode bridge", or "rectifier" or the like and see what happens.

Date: Sun, 19 Aug 2007 21:01:58 -0700
From: "Jim Pruitt" <wa7duy@charter.net>
Subject: [R-390] Need help fixing R390A not to trip GFI breaker

I am looking for some suggestions in repairing my R390A so that it does not trip the GFI breaker (outlet) here in the garage/radio room. I thought I had a power supply problem until I tried the radio in a non GFI outlet and it worked OK.

Date: Mon, 20 Aug 2007 00:18:32 -0500
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

Use an isolation transformer. The AC line bypass capacitors in the AC line filter have enough leakage to trip the GFI. This has been discussed before and the archives should provide a discussion on this.

Date: Tue, 21 Aug 2007 10:13:32 -0400

From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

As was mentioned, the problem is in the leaky line filter capacitors. Here is one way I fixed that: http://www.knology.net/~thelanding/LineFilter

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Date: Tue, 21 Aug 2007 10:32:54 -0700
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

Once more with feeling! Those capacitors ARE NOT LEAKY! They are 0.1mfd
capacitors and Xc=1/2 * pi * f * C and that says:

Xc = 1 / 2 * 3.14 * 60 * (1 x 10-7) = 2 6K ohm

I = E/R
I = 120 / 26000
= 4.6mA

and that will trip any properly working GFCI because they should trip at between 4 and 5 mA. Further, the manual says that the R390(A) must be grounded to protect the operator so the line filter worked properly withing the environment in which the R390 was expected to be used. This diatribe is repeated by one person or another two or three times each year whenever somebody says the capacitors in the line filter ar leaky.

"What DO they teach in those schools?" (courtesy of C.S.Lewis)

Date: Tue, 21 Aug 2007 12:44:33 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

I promised my family and therapists I would not get on this soap box again but:

<Soap box mode ON>

The caps in the line filter may not be LEAKY. They are simply acting like capacitors. They are connected from each side of the line to the chassis. If the chassis is not grounded, this creates a capacitive voltage divider and you get about half the line voltage on the chassis. If the chassis is grounded, the capacitive current through the caps from line to chassis unbalance the currents in the line and neutral enough to trip the GFI device. The possible courses of action include:

1) Remove the offending original line filter and replace it with a modern

one that does not create such ac currents in the chassis (as Barry did).

2) Ensure you have a good electrical ground system in your outlets and avoid Ground Fault Interrupter (GFI) type outlets or circuit breakers.

3) Remove and dissect the line filter. Replace the caps with much smaller ones, preferably from LINE to NEUTRAL and from NEUTRAL TO CHASSIS. Reassemble and reinstall the line filter.

4) Use an isolation transformer.

5) Remove the line filter and discard it altogether. Use a three wire grounded line cord. If you need to, use line filter caps as in 3 above, line to neutral and neutral to chassis.

<Soap box mode OFF>

Some closing notes:

- The filter in the R-390/URR is not the same inside as the filter in the
- R-390A/URR. The R-390/URR line filter (and the ones in the R-389 and R-391) have more capacitors.

- The capacitors may, in fact, be leaking. That is, have a leakage resistance from terminal to terminal. They do seem to be paper-foil capacitors and were in fact made a long time ago. However, purely capacitive currents are enough to account for tripping GFI devices.

- Faulty or incorrectly wired household outlets have been reported and can lead to big trouble.

An outlet tester can be bought for under $10. No shop should be without one.

Amazon's price is $7.75:
<http://www.amazon.com/AEMC-Outlet-Tester-100-125V-Receptacles/dp/B0000WS7M6>
Grainger seems to want $19.83 for the same thing:
http://www.grainger.com/Grainger/items/3T885
But does offer a cheaper one at $5.64:
http://www.grainger.com/Grainger/items/4YE77

- Normal "variacs" are NOT isolation devices. (There ARE some, however. See http://www.elect-spec.com/isovar.htm It's not clear if these are variable transformers with a separate isolation transformer.) Happy leaking to all.

Date: Tue, 21 Aug 2007 13:02:06 -0500
From: "Cecil Acuff" <chacuff@cableone.net>

Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

I think that's the solution....I would open it up and replace the caps with .01mfd disks and put it back together. Solves one problem and one potential problem. No more tripping of the GFCI (used to just call them GFI's) and if by chance the caps were leaky they are no more! Problems solved....

Date: Tue, 21 Aug 2007 13:59:02 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

It is true that the caps may not be leaky; however, if you look at the schematic for the line filter I used in my "conversion", it, too, has caps between both legs and ground. What puzzles me, though, is why these caps do not set up a current path to ground like the ones in the R390A filters do. I assume it is the value of the caps used create enough reactance to minimize the current path, but not sure.
http://www.mouser.com/catalog/631/958.pdf

Date: Tue, 21 Aug 2007 14:31:58 -0400
From: Steve Byan <stevebyan@mac.com>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

I'm not sure which filter you used from this catalog page:
http://www.mouser.com/catalog/631/958.pdf

but I'll assume it was a "GENERALPURPOSE IEC CONNECTOR FILTERS". The Mouser catalog page specifies a maximum leakage current each line to ground at 115VAC 60Hz of 0.2mA. Turning Richard's math around,

R = E/I
R = 115 volts / 0.2 mA
R = 575 Kohms

Actually we're talking reactance, not resistance, so we're really talking about the magnitude of Xc, not R. So I'll switch to using Xc in place of R:

Xc = 1/2 * pi * f * C

We want to find C given Xc = 575 Kohms and f = 60 Hz:

C = Xc / (1/2 * pi * f)
C = 0.575 Megohms / (1/2 * 3.14 * 60)
C = 0.575 Megohms / 94.2
C = 0.0061 uF

So the caps in your filter are less than about 0.006 uF in value.

Date: Tue, 21 Aug 2007 14:05:22 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

There's enough room to install an unfiltered IEC connector where the filter was. Have done it once. It allows you to use a regular computer cord. Be sure to save your filter to put things back to stock if you decide to sell your rx in the future.

Date: Tue, 21 Aug 2007 16:31:27 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

They make new line filters with integral IEC sockets as well. I've seen some that may be small enough to mount in place of the original filter, maybe with a bit of filing for the IEC socket. Larger ones can be mounted on the rear panel with leads routed into the hole in the back panel where the terminals to the original filter stick through.

Date: Wed, 22 Aug 2007 18:13:59 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Need help fixing R390A not to trip GFI breaker

>I think that's the solution....I would open it up and replace the caps with .01mfd >disks and put it back together. Solves one problem and one potential problem. >No more tripping of the GFCI (used to just call them GFI's) and if by chance >the caps were leaky they are no more!

Well, not just any disks, unless you enjoy unexpected fireworks. Dropping from 0.1 to 0.01 does fix the problem, but you have to do it with caps rated for across the power line service, with all its surges. It appears that one man's reactance is another man's leak . . .

Date: Wed, 22 Aug 2007 20:40:17 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

I agree...600V or even better 1kv should do the trick...

Date: Wed, 22 Aug 2007 21:53:42 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Need help fixing R390A not to trip GFI breaker

There are disk ceramic capacitors made especially for AC line filtering.
X Capacitor: Safety capacitor used across AC line for differential mode filtering
Y Capacitor: Safety capacitor connected to ground for common mode filtering

They are available from Mouser, Newark, Digikey, etc.

Date: Wed, 22 Aug 2007 22:30:05 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

Your standard PC power supply is expected to withstand 800 volt spikes from the line to ground. I think I would stick with the 1 KV parts ....

Date: Wed, 22 Aug 2007 22:12:41 -0700
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

I used to use 1kV 0.01 ceramic discs for that purpose but now you can buy UL approved capacitors designed specifically for line bypass use. The issue is something about having a safer failure mode but I forget the specifics.

Date: Thu, 23 Aug 2007 08:18:10 -0600
From: DW Holtman <future212@comcast.net>
Subject: Re: [R-390] Need help fixing R390A not to trip GFI breaker

A good place to get safety caps is www.justradios.com. I have no monetary interest, just know they have very good service, full line of caps and competitive prices. The link below explains what X1/Y2 safety caps are all about and how to use them.

http://www.justradios.com/safetytips.html

Date: Sat, 25 Aug 2007 13:55:54 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] Another Power Line Filter Solution

Just thought I'd post some pictures of my latest attempt to replace that pesky line filter:
http://www.knology.net/~thelanding/LineFilter2/

Date: Wed, 26 Sep 2007 13:40:28 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] R-390A -relay problems.

Recently on start up from off to standby I get a loud buzzing noise for a few seconds then a click and the power goes on which sounds like a bad relay, when I click it to AGC from standby I get another click which sounds like another relay and this one (?) works fine, are there two relays in 390A's? I always assumed there was only the antenna relay. If there are two, which one would close from off to standby as it is going to go kaput very soon. Once the radio has been on for a while it will shut off and on fine from off to standby, it is only from a cold start that i have a problem,

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Date: Wed, 26 Sep 2007 14:49:53 -0400
From: "Miles B. Anderson, K2CBY" <k2cby@optonline.net>
Subject: [R-390] R-390A - Relay problems

What you describe are the classic symptoms of the selenium relay rectifier failing open on one side. It is on the back panel to the left of the antenna relay. Replace it with a low voltage silicon bridge rectifier, and you will be back in business.

Date: Wed, 26 Sep 2007 14:56:36 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A - Relay problems

Curious. Do these rectifiers change as the radio reaches operating temperature or possibly over time? He said it seems to work okay once the radio warms up. Is it possible the relay itself is requiring less power as it warms up? Just seems an odd set of symptoms.

Date: Wed, 26 Sep 2007 15:01:10 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] R-390A -relay problems.

The antenna relay is run by 25VAC that has been rectified to 120Hz approx 20V average pulsating DC by the selenium rectifier CR102. If half of the selenium bridge has failed, you get 60Hz approx 10V average pulsating DC to run the antenna relay coil, and you (no surprise) end up with a buzzing relay.

The breakin relay is run by 6.3VAC.

But... have you possibly (either internally or externally) installed a inrush current limiter? This will cause the buzzing on cold startup symptom you're reporting too, and is perfectly normal with an inrush limiter.

Date: Wed, 26 Sep 2007 16:45:11 -0400
From: "Miles B. Anderson, K2CBY" <k2cby@optonline.net>
Subject: [R-390] R-390A -relay problems

The fact that the antenna relay pulls in after warmup is not unusual even though the selenium bridge recifier is starting to fail in the open mode. The filament current load drops considerably as the tubes warm up. Once the heater current stabilizes, the voltage on all of the power transformer secondaries (including the 26 volt winding that drives the antenna changeover relay) goes up. This is true even without inrush protection.

I use a CL-80 thermistor for inrush current protection and have never had a problem with relay buzz -- but then I've used a silicon diode bridge to rectify the antenna relay AC for the past 15 years -- ever since the selenium rectifier made a loud buzzing noise and failed open.

Date: Wed, 26 Sep 2007 21:28:14 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] break in switch

My manuals are misplaced thanks to my lovely wife who cleans when I'm not around, anyway I'm pretty sure that to get the break in switch on the front working for transmit you just ground the break in lug #9 in the back to the chassis or am I having a pipe dream?

Date: Fri, 28 Sep 2007 01:57:35 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] R-390A -relay problems.

You nailed it Tim, it was the inrush limiter, when plugged into regular house current with no limiter it works fine

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Date: Fri, 28 Sep 2007 09:05:21 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A -relay problems.

Just curious which ICL you're using. I've used the CL-80 and the buzz-before-the-click was very short - on the order of 1/2 second or less.

Date: Sun, 30 Sep 2007 10:41:33 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] RE: 390A relay problems

> >Perhaps it is too big?, it's a 300 watt limiter. I also notice if I
> >switch past standby and go right to AGC, it immediately pulls right in,
> It is certainly too big for a 390 on standby. I found the following
> on the web, which I think is about the particular unit you have:
> "The instant the equipment is turned on, the internal meter will show
> a drop to about 60 VAC, and then it will rise over the next ten

> seconds to a value near 100 VAC. This rise will continue for about
> two minutes where the load voltage will level off and hold for as
> long as the equipment is turned on.

Well, then, whatever's in the box is a lot slower than my inrush limiter (a Keystone CL-80). When I meter I see an initial voltage drop across the limiter of close to 60VAC too, but over just a second or two it's down to 10V, and in like 30 seconds it's leveled off at just 2 or 3V. If I compare my limiter with the quote you found, I see a table like this:

	CL-80	Web description of ?ER unit?
Initial on	60V	60V
2 seconds	110V	-----
10 seconds	115V	100V
30 seconds	118V	-------
120 seconds	------	114V

Of course, different people have different expectations. Some want to protect all the internal circuitry against any hazards from normal line voltages or rapid turn-on, whereas others like me are quite happy to blow out those ancient electrolytics if they aren't up to snuff :-).

Date: Sun, 30 Sep 2007 11:58:48 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] RE: 390A relay problems

They don't run real hot and are well ventilated and I'm not drawing anywhere near 2.5 amps with them (which may be the reason they are not that hot, but will keep that in mind). I think maybe the selenium rectifier may be partly to blame in the 390A as someone pointed out (you?) as the relay in my 390 works fine with them, my 390A is is the one that makes the noise. I think
the 6 volt drop is a good idea as these were designed to run on 115 VAC anyway, the house current here is normally about 121 VAC which makes it just about right. And yes that is the correct blurb for the one's I have.
thanks, Bob KB1OKL

Date: Mon, 1 Oct 2007 12:55:20 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] break in switch

You are correct on ground the break-in pin on the back panel. This lets you open the antenna relay from the front panel switch. Normal operation is to wire that back panel pin through a relay contact in some other equipment like a receive transmit switch unit keyed from the microphone push to talk switch. When you set the R390 front panel switch to break in, then the receiver is muted during transmit. I have my pin grounded and just use it to mute the receiver when someone is trying to talk in the room with the receiver operating.

Date: Tue, 2 Oct 2007 10:20:06 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] RE: 390A relay problems

>........if I switch past standby and go right to AGC, it immediately pulls right in,

This sentence indicates a misunderstanding on the part of the speaker. The R-390A antenna relay grounds/disconnects the input when it's picked, and enables/connects the input when it's dropped. In STANDBY and CAL, it's picked; in AGC and MGC it's dropped. The "pulls right in" is actually the half-picked relay dropping, not a successful pick. Those old rectifiers always go bad; put it out to pasture and install a silicon bridge.

Date: Thu, 04 Oct 2007 20:57:35 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] RE: RE: 390A relay problems

Yes, thanks Dave, I'm used to big tube amps that draw a lot of plate current when standby is switched off or transmitters which do the same thing. I think mine may be doing it though because of the long gradual build up in voltage of the inrush limiter, it doesn't do it if plugged into the wall bypassing the limiter, or it could be a hint of a later problem?

Date: Fri, 5 Oct 2007 10:10:08 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] RE: RE: 390A relay problems

I should have included the standard plug for the Y2K manual, available for free download at www.r-390a.net . The R-390 and R-390A work oppositely with respect to the antenna relay, so getting the sense wrong is a common mistake. The humming partial pull-in is without a doubt due to the slow ramp-up from the inrush limiter, probably combined with the bridge rectifier's aging. Replace it and the symptom will be reduced or eliminated. I have to get into my relay one of these days. Sometimes it hangs up when I go to CAL. I think it's a mechanical issue; it feels as if the armature is hanging up on a burr. It clears if I reach in and jostle it just so. Anybody have a hot tip for this?

Date: Sun, 7 Oct 2007 13:15:02 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] RE: RE: 390A relay problems

You are right on the burr in the antenna relay. Most likely just crud. A good disassembly and cleaning with a no trouble found comment on the 2404 will cure the problem. We may ask for a good lube to use on the fiber pins in the aluminize relay housing block. Fellows, any recommendations for lube after cleaning the antenna relay?

Date: Sun, 07 Oct 2007 13:32:53 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] RE: RE: 390A relay problems

From the start point, I caution those whom remove the relay to * NOT * putz around with the "neon" static discharge "bulb". The bloody thing IS soldered in!! WE, the well meaning types trying to resolve ONE problem, sometimes CREATE another "costly" one!! Yep! Found out the "hard" way!

>Any recommendations for lube after cleaning the antenna relay?

I suggest car wax or bowling alley wax on any fiber parts. That includes the insides of RF and IF coil forms. You can also wax the slugs to get rid of squeeeeks and sticky movements. The TINY-est bit of light oil or even grease on metal to metal pivot points in relays can help a lot. If you can see much of any left over after you put some in there, it's too much.

Date: Mon, 05 Nov 2007 09:22:24 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Cleaning modules

<snip> > BTW, I'll make a note about the power thing.

Make sure you have a three wire line cord while you are at it. Put in an inrush current limiter.

Date: Wed, 05 Dec 2007 04:32:20 -0500
From: n4tua@aol.com
Subject: [R-390] Break In

This may be a stupid question but I sure don't want to let it get away. I am using the diode load terminal and an external audio amp. Sounds great. The thing is that the break in switch does not effect the audio out. How is this? It works fine with the local audio and can be used with transmitting equipment but what do I need to do when using the diode load? Any help would be greatly appreciated. Maybe I can get this off of the bench soon.

Date: Wed, 5 Dec 2007 10:05:46 EST
From: Flowertime01@wmconnect.com

Subject: Re: [R-390] Break In

Break-in opens the antenna input relay and opens a circuit in the audio path somewhere after the diode load.

It depends on how much RF the transmitter radiates around the shack to the receiver and how much RF is radiated across the open relay contacts in the receiver. Also you now have the external amp subject to RF exposure.

You should be able to operate the receiver break-in relay from the transmitter keying circuits. The receiver audio as heard in the speakers should then be reduced to just the noise of the receiver and amplifier. The RF from the transmitter should be at a low level that does not radiate into the receiver and amplifier to cause sonic howls. If the transmitter when keyed is causing more audio output than just the noise level you have if you short the break-in terminal on the receiver to ground then you need to get some shielding between the transmitter and the rest of the equipment.

If you want the audio to mute when you go to break-in, then you will need a relay between the Diode Load output and the external amplifier. You will need to devise your own power source and keying circuit for that extra relay. Once you get that taken care of you then have to consider how badly the audio pops as the relay goes from passing audio, to open circuit, to grounded input as the relay switches. There will be another pop as the relay comes out of break-in. Many audio circuit things to think about as you make improvements to your
station's operation. But then it is winter and time to work on these problems as you hug your warm glowing equipment.

From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Break In

I have found that in addition to operating the break-in relay in my R-390 on transmit I have to open the RF gain terminals on the rear terminal strip to completely mute my receiver.

Date: Wed, 05 Dec 2007 15:48:25 +0000 (GMT)
From: sdaitch@mor.ibb.gov
Subject: Re: [R-390] Break In

Modify the contacts so they are make before break physically, so the input of the external amplifier is transferred to a load or ground. I'd have to go dig out some old broadcast audio console diagrams and see how they did channel switching. Most consoles were high level mixing and fairly low impedance on the mixing bus, and I also can't remember if the channel switching is before or after the level control on the console. I don't remember a lot of problems with audio popping in consoles where channels were switched off and on.

Date: Sat, 16 Feb 2008 11:19:16 -0500
From: "jay golden" <jgolden577@rochester.rr.com>
Subject: [R-390] need source for 26Z5W

Can anyone refer me to a source for 26Z5W tubes?

Date: Sat, 16 Feb 2008 18:22:11 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: [R-390] Arcing in 25Z5Ws

Recently I flipped the power on to my trusty Motorola R-390A, and instead of the comforting sound of HF radio, I hear nothing, and see a couple of blue-white flashes. Because I all the covers were on and where I was standing, I couldn't see just where the flashes came from. When looked at the fuses, the 1/4A B+ fuse was blown.

After a brief detour to replace a cracked fuse holder and a physical inspection, I replaced the B+ fuse and flipped her on again. Nothing. The main 3A fuse went too. Replace that. Now it lighted up, but no sound. All the fuses held too.

Now I pay more attention to what's lit and what's not. I noticed both 25Z5s were dark, and after flipping it off again, cold. Replaced both. Now one is lit, but not the other. Swap tubes...same tube is lit in the other position, and now the tube starts to arc inside. Hear a 60 (120?) cycle buzz now too, but nothing else. Turn power off quickly. Fuses all held.

Anybody have a guess as to what's going on? Do I just have some bad rectifiers, or has something else gone south and taking the rectifiers with it. I'd rather not feed it rectifiers if they're not bad to begin with.

Date: Sat, 16 Feb 2008 22:00:15 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Arcing in 25Z5Ws

My *guess* is that you have a filament to cathode short in the '"bad" tube.

Date: Sat, 16 Feb 2008 23:51:17 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Arcing in 25Z5Ws

First of all...please pardon the typo...I do know they're really 26Z5Ws :)
Both replacement tubes were supposedly NOS...how unusual would it be to find a shorted tube NOS (although they were packed in 6/62).

Date: Sun, 17 Feb 2008 08:38:21 -0500

From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Re- 26Z5w source

I plan to switch over to 12BW4 tubes when my 26Z5W tubes go bad. The 12BW4 is cheap and common. It will be necessary to rewire the tube sockets to series the filaments, also the other elements are probably different. I think the power capability specs will work.

Date: Sun, 17 Feb 2008 08:54:32 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: RE: [R-390] Arcing in 25Z5Ws

Could this be caused by higher than normal line voltages? This happened to me on a newly purchased radio several years ago. I concluded the higher line voltages today was a cause. Radio was designed for 115, today's voltages can go over 120 depending on circumstances, putting added stress on the tubes and other components. I now have diodes and a high wattage dropping resistor in the power supply. J

Date: Sun, 17 Feb 2008 09:46:45 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Arcing in 25Z5Ws

The tubes are *rated* for much higher voltages than they are likely to see with any rational line voltage. That's not to say that 40+ year old tubes aren't a little gassy ...

Date: Sun, 17 Feb 2008 09:19:38 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Arcing in 25Z5Ws

Well it sounds like I just got unlucky with NOS tubes, with the possibility of filter caps going south. In any event, I'm in need of at least 2 good 26Z5Ws. Anybody have any? Looking at the going prices....I'm wondering if it isn't time to convert to solid state. Thank you all for your replies

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Date: Sun, 17 Feb 2008 12:36:37 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Arcing in 25Z5Ws

My vote would be to do the solid state conversion. It reduces the heat in the radio, improves performance, and costs a *lot* less money than the tubes.

Date: Sun, 17 Feb 2008 13:04:50 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Arcing in 25Z5Ws

Now is the time for that trusty old tube checker.
First off you blew a fuse after the B+ 26Z5 rectifiers tubes.
This is not good. Most likely a tube shorted.
Second most likely a cap has shorted.
Then you see you have a dead 26Z5 with no light inside.
So you are only operating with 1/2 wave rectification.
Lots of hum from this state of operation.

As a 26Z5 did not light up in a known good socket (the other tube lit up in that socket) you have at least one bad tube and need a replacement. Run all the 26Z5's through a tube checker for shorts and minimum conducting current. A tube checker will do that for you. It would be good to just push all the tubes in the receiver through a tube checker for shorts at this time. Using the receiver as a test device for shorted tubes is not considered good use of equipment or good service practice.

Once you find a set of tubes that pass the tube tester (I did not say a set of good tubes) and get them back into the receiver, you can apply power again. DO NOT over size the fuses. Watch for smoke and flashes. You could still have a bad cap. Likely a filter cap. Back when this was not a likely problem. For 50 year old caps it is now a common problem. Fuses also just blow. No problem found. Likely once you get a couple good 26Z5 back in the receiver it will work fine.

Have you considered just a couple good 400 Volt 2 Amp or better diodes as substitutes for the 26Z5 until you get the other problems sorted out? You do not have to leave them in the receiver forever. Just something to help you get on with trouble shooting and problem solving until the postman arrives with parts.

Date: Sun, 17 Feb 2008 10:31:36 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] Arcing in 25Z5Ws

My philosophy may be a variance with many (including the DOD) but I favor the 12BW4 sub in place of the 25Z5W's.

a) Obviates deleterious effects of sudden B+ application to cold receiving tubes, which in itself is controversial even among us.

b) Plentiful 12BW4 replacements still available.

c) Simple underchassis rewiring, that's easily reversible. See
http://www.mines.uidaho.edu/~glowbugs/r390_psmod.htm

d) If B+ ends up too high use a bucking transformer or a Variac.

e) That said, the SS subsitution is an *approved* change, whereas the 12BW4 is not.

From: Flowertime01@wmconnect.com
Date: Tue, 19 Feb 2008 10:47:22 EST
Subject: Re: [R-390] Arcing in 25Z5Ws

I think that the diodes got approved, and the 12BW4 did not get approved was a matter of supply logistics. If the diodes go in, then there is no more logistics support needed. You crimped an edge of the tube socket over so a tube could not be inserted. Simple visual inspection showed the modification was installed.

12BW4's need:
   parts manual changes.
   supplies.
   regular maintenance.

If someone wants to keep all tubes in the receiver for any of the many reasons
the 12BW4 is a good choice I do support your point of view.

Date: Tue, 19 Feb 2008 10:37:19 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Arcing in 25Z5Ws

You make a good point.
Two 1KV diodes in series 1Amp rateing or better.
Four total into the power supply.
Most of us will need to shop for the diodes anyway.
We are going to take the time to get them soldered in.
We may as well do it right and not have to revist the problem again.

Finding a blown rectifier after a wimpy diode goes on a power strike is just as anoying as trouble shooting any other problem. The cost and time to prevent is worth the effort.

Date: Sun, 23 Mar 2008 14:27:48 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] RE: Power transformer failure

I have said this before, and I think it is worth reminding again. I have had two power transformer failures. The fix is not too difficult, so don't trash the transformer until you check out the little hi-tension feed-through ceramic tubes in the transformer. The failure was just inside transformer in the tar potting at the entrance to the tube....Steve...N8YE

Date: Mon, 24 Mar 2008 08:40:28 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] RE: Power transformer failure

Last time I checked, 390A transformers (in fact entire power supply modules) were readily available at Fair Radio. I got several not for use in 390A's but just for use as general purpose B+/filament supplies for experimenting because the price was so attractive - way less than new transformers of similar ratings. Of course I had to provide capacitor/chokes for filtering... I compare what Fair Radio charges for a whole power supply module and compare it to what a single much more minor 390A part otherwise goes for on E-bay - Wow!

Date: Mon, 24 Mar 2008 09:09:16 -0400
From: wabate <wabate@verizon.net>
Subject: Re: [R-390] hp 410B VTVM (for working on my R-390A)

Thanks, Barry and David. What I should have said is that the original tube was the 2-01C but HP later modified the probe in the 410-B to accept the EA53. THe filament voltage is different as well but only an adjustment is required to compensate.

Date: Mon, 24 Mar 2008 11:07:50 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] hp 410B VTVM (for working on my R-390A)

The contact spring and tip that go on the anode of the two tubes are different also. I have never seen a probe with a 2-01C so I don't know what the difference is but they are listed as separate part numbers in the manual.

Date: Tue, 22 Apr 2008 15:19:38 -0700
From: Mike Hardie <mike46@shaw.ca>
Subject: [R-390] Crystal Oven Heater Resistance

Page 108 of my photocopied manual has a chart (Not numbered) for some preliminary resistance checks when trouble shooting. Pin J208-F, on the RF deck, to ground is listed at not less than 100 ohms. (Tubes pulled and presumably with HR202, the assembly with the 200 Kc and 17 Mc crystals, not pulled) I measure approximately 5 ohms on this radio. I tracked down the resistance to be the heater in HR202. With HR202 pulled the resistance at J208-F is infinity. Can anyone confirm whether or not the manual figure of 100 ohms figure is correct?

Date: Tue, 22 Apr 2008 21:09:35 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Crystal Oven Heater Resistance

Last time I looked the oven is sitting across the 24 volt winding of the transformer. A 100 ohm resistance would put about six watts into the heater. A five ohm resistance would pull *way* more than the transformer is rated for.

Date: Wed, 23 Apr 2008 12:38:27 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Crystal Oven Heater Resistance

Check your oven. Normally, the heater voltage is on the label. The R-390A uses a 6.3 volt oven, and the R-390/URR (the "non-A") uses a 26.5 volt heater. There may have been a swap. It appears from info I have here that the heater is from pin 3 to 1 and the switch is from pin 1 to 7.

I have four 26.5 volt ones handy: they measure 143, 140, 158, and 316 ohms, pin 3 to pin 7. The first three are Ovenair type RT-2. The last is Bliley typeTCO-1C and is marked 0.3 amps. There may be something amiss with its switch since pin 1 to 7 measures about 100 ohms.

Normally these things use about 5 watts. The Bliley above will use about 8 watts. A Bliley typeTCO-1A marked 6.3 volts 0.85 amps has no continuity to pin 3. Pins 1 and 7 show a couple tenths of an ohm. I'd guess the switch is ok but the heater is open. This one would use about 5.4 watts.

The James Knight unit I just pulled out of an R-390A is type JK09, 6.3 volts, and measures 6.7 ohms pin 3 to 7.

Notes:

- You didn't say which radio you have (maybe the oven is not HR-202 in the "non-A")

- The A radio has two crystals in one oven, 17 mc and 200 kc. The non-A radio has only the 1 mc crystal in the oven, which is mounted below the chassis on the calibrator module.

- These oven units were used in mobile radio service too, and some are meant for 12 volts, while others can be inserted in a two-keyway socket to allow for both 6 volt and 12 volt operation. - The heaters switch on the back of the R-390A does not control HR-202. It only runs the crystal oscillator deck oven and the PTO heater.

Date: Thu, 24 Apr 2008 08:07:46 -0700
From: Mike Hardie <mike46@shaw.ca>
Subject: [R-390] Re: Crystal Oven Heater Resistance

This HR202 unit is made by Blighly with a "TCO-21" designation, it also has "6.3 volts" and "1.0 amp at 75*C" on the tag. Using ohms law the resistance of the element should be 6.3 ohms. I took a look at the Y2K manual and the pinout reads element between pins 3 and 1. The resistance on this unit measures (With the VTVM on 10 ohm scale finally) 6 ohms, close enough for you-know-what. The switch is shown as between pins 1 and 7, and on this unit the resistance measures a fraction of an ohm. The connection from J208-F goes to pin 3 of HR202, throught the element and switch, to ground. So I'm still stuck with why does the TM 11-856A manual state the resistance should a minimum of 100 ohms on J208-F. I'm doing something wrong but what?

Date: Thu, 24 Apr 2008 14:40:06 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: Crystal Oven Heater Resistance

The Y2K manual started from a photo file that was read by a software program and turned from bits back into text. That text was then read by a human and "corrected". There were lots of errors in the original TM's they are all over the place. We do not get amazed when we find one. Examine the schematic and do a correct analysis of the circuit as you really have the circuit under measurement. Think about DC resistance and AC inductance as you are trying to figure out what is going on. What the DC meter reads is not likely what the AC impedance is. Cold DC resistance may be no where near hot DC resistance. So what you read in a cold circuit may not be close to the operating point after the elements warm up for 10 or 15 seconds. We never did put a lot of stock in DC resistance checks as a way to trouble shoot and localize problems. And every thing we read in the TM was suspect.

Date: Mon, 9 Jun 2008 14:54:33 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] OT: Filterfor 9VDC PS

I'm thinking of making a 9VDC, 1A supply from a 6.3VAC transformer, full-wave bridge, and pi (CLC) filter. The hitch is the choke. I can find a reasonably-priced 35mH choke rated at 2A, but not much of anything else that will handle nearly the current I need (unless I'm willing to "invest" a LOT of money for it and I'm not). Will 35mH be worth the effort or will I be just as well off without it? The PS will be asked deliver 510mA or 830mA (depending on the radio's settings).

Date: Mon, 9 Jun 2008 21:12:54 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] OT: Filter for 9VDC PS

That's about what I was figuring. Is there anything better I can do (short of spending bigtime for a really big choke) besides a big ol' capacitor?

Date: Tue, 10 Jun 2008 08:36:54 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] OT: Filter for 9VDC PS

Build just about any of the "transistor DC power supplies" in a 60's or 70's ARRL handbook. Get up to the 70's and use a LM723 if at all possible. Compared to a lot of modern regulators it has surprisngly low noise. You'll need more than 6.3VAC and a bridge to get any headroom over 9VDC. Starting with a 10VAC or 12.6VAC transformer would be a good start.

And, for god's sake, do NOT JUST PUT HONKIN HUGE CAPACITORS IN THE PS. Yeah, it's real popular among amateur high-end audiophiles, which is a good clue you shouldn't do that. The ripple current through big capacitors will stress the transformer unduly and the huge current spikes 120 times a second is a great way to induce buzz into nearby ground loops. Use a reasonable size capacitor (giving maybe 10 or 15% ripple on the unregulated supply) and take the ripple out with a nice regulator.

Date: Wed, 11 Jun 2008 09:26:04 +1200
From: kenny <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] OT: Filter for 9VDC PS

>I had read in an article for a 13.8V @20A power supply that 'a good rule
>of thumb when selecting the filter capacitor is to use about 5000µF per Amp'.
>This article was written by a ham and he also used a regulator with pass transistors.

I have no idea if he is right or wrong but his power supply used 100,000µF! I have just built a 12V regulated (with an LM317) supply to replace the 3TF7 in one of my R-390As and I used 2200µF as the filter capacitor and I'm already starting to think about stress and long term reliablity on the power transformer.

Date: Tue, 10 Jun 2008 17:42:50 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Power supply capacitors

It depends on the voltage droop (ripple) that you can tolerate. 16,666 μF will drop 1 volt in 1/60 sec at 1 amp (half wave rectification) and 8,333 μF will drop 1 volt in 1/120 sec at 1 amp (full wave rectification). You want the smallest capacitor that will give the minimum voltage for the regulator to work. A bigger capacitor gives a higher minimum voltage (less ripple) but the extra energy just shows up as heat in the regulator. Bigger capacity also increases the inrush current - the diodes only conduct for a short time so the instantaneous transformer current is a lot larger than the average DC load current.

Date: Wed, 11 Jun 2008 23:29:33 +1200
From: kenny <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Power supply capacitors

That's really interesting what you say Gord about the extra energy showing itself as heat in the regulator. That didn't even occur to me. My particular circuit uses a 2200uF and LM317 (among other things) to produce a stable and regulated 12.6 volts for the filaments of the BFO and PTO tubes and the regulator DOES run hot...even with a good sized heatsink it will heat up the heatsink quite nicely. I had a nagging feeling 2200uF was too big....so I'm going to start playing with it until I feel I have a good balance between acceptable performance and
long term reliability.

Date: Wed, 11 Jun 2008 09:00:27 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Power supply capacitors

>...... instantaneous transformer current is a lot larger...<snip>

Not just at start-up, but all the time, if a guy puts in too much capacitance. I-squared-R losses in the transformer go up and up and up because the peak current goes up and up as the capacitance goes up and up the conduction angle becomes smaller and smaller. As the peak current goes up and up the RFI generated by the 120Hz switching will go up and up too. Not a problem if good circuit layout with no big loops are used... but a neophyte (e.g. the guys who use filter capactors that are way too big) will often lay out a circuit with enormous loops.

Date: Wed, 11 Jun 2008 08:22:55 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Power supply capacitors - ripple

There is another issue with 3 terminal regulators that is important: TOO MUCH ripple can ALSO cause them to dissipate too much heat.

Date: Wed, 11 Jun 2008 12:08:40 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Capacitor calculation

This is correct. The regulator has a minimum voltage where the transistors drop out and the output voltage also drops. For the 78xx series this is about 2.5 volts. There are newer low drop out chips available. Too much ripple means that the high end of the voltage cycle is too big so that shows up as heat too. The best is to have the minimum slightly above the drop out voltage - allow a bit for brown outs - and the maximum as low as possible. The capacitor calculation goes as follows:

RMS transformer voltage x 1.414 = peak then maximum voltage = peak - 0.7 (half wave) or peak - 1.4 (full wave)

Ripple voltage = maximum voltage - dropout voltage

Capacitor in Farads = (DC load current / Ripple voltage) x 1/60 sec for half wave or 1/120 sec for full wave

I've neglected the conduction angle (time) - it works as a safety factor in this calculation.

Date: Wed, 11 Jun 2008 09:57:02 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Power supply capacitors

When I did my LM317-based current regulator (before starting on the 3DW7), I included a power resistor in series with the rectifier to reduce the peak current and increase the conduction angle. I forget the value. I recommend you include this in your experiments.

Date: Wed, 11 Jun 2008 20:21:49 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: [R-390] Regulator Replacement for R-390 no more 6082's

Using the article in issue number 58 of the "Hollow State News" as a guideline I built a prototype regulator several months ago. After a fair amount operation I decided to repackage it in a form factor that could be installed on the radio and restored to original with little effort. The sub assembly mounts in the position of the remote control connector which is unused on the r-390. The assembly is mounted with 4-4/40 screws and a bit of heat sink compound. Here are a few pictures
http://www.kitparts.com/r390-reg/

Date: Wed, 11 Jun 2008 20:04:42 -0600

From: "DW Holtman" <tubestuff@comcast.net>
Subject: Re: [R-390] Regulator Replacement for R-390 no more 6082's

That really is some quality work. Looks like a military upgrade/mod.

Date: Wed, 11 Jun 2008 22:18:35 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Regulator Replacement for R-390 no more 6082's

I looked at the pictures Nice job for sure. Here's a thought though: It appears that you connect to only one of the 8082 sockets, and possibly to only one of the cathode connections. Do you bypass the 47 ohm equalizing resistor at the cathode? If not, then the whole B+ current for the radio is going through that one resistor. If it's 200 ma, then the two watt resistor is at max rating. Those resistors are often found drifted high from heat from the 6082 tubes and age. Do check them. Suitable replacements are 5 or 7 watt sand resistors of the same or close value if you are going to run the 6082 tubes.

Date: Wed, 11 Jun 2008 22:37:06 -0700
From: Renée Deeter <k6fsb.1@gmail.com>
Subject: Re: [R-390] Power supply capacitors

I think you will find about 680uf will do the job nicely. also why not just use the LM317 as a series current regulator set at 300 ma.......

Date: Thu, 12 Jun 2008 08:42:37 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Power supply capacitors

Isn't this a bizarre amount of effort to remove ripple in a circuit (BFO and PTO filament) that was originally 60Hz AC to begin with? I realize there is a long and deep tradition of discussing ballast tube replacements and am sorry if my observation interferes with the tradition :-).

Date: Thu, 12 Jun 2008 07:52:08 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Capacitor calculation

For those for whom this may be unclear, what Gord is saying is that the voltage input to the LM-78XX should be at least 2.5 volts above the desired regulated voltage. I.e., 11.5 V for a 9 V regulator. This is sometimes, and perhaps a bit inaccurately, called "overhead".

Date: Thu, 09 May 2002 20:10:01 -0500
Subject: Re: [R-390] 3TF7 Failed in service

From: blw <ba.williams@charter.net>

It's in the -10 manual somewhere. It cautions about prolonged operation in the standby position as component life can be shortened. I think 30 minutes is the max recommended, but I could be wrong. Okay, I paused and looked it up. Page 24 of the -10. It says that the life of certain tubes will be shortened if left in the standby mode for longer than 30 minutes.

From: "Francesco Ledda" <frledda@attbi.com>
Subject: RE: [R-390] 3TF7 Failed in service
Date: Thu, 9 May 2002 20:27:01 -0500

StdBy operation will not impact the life of the 3TF7. It will impact the rest .....

Date: Thu, 9 May 2002 21:01:11 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: RE: [R-390] 3TF7 Failed in service

But he said he left it in the "BREAK IN" mode which would only ground the antenna input and the audio amp inputs/outputs, which shouldn't hurt anything, right?   Except the break in relay coil.

Date: Fri, 10 May 2002 01:08:26 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: [R-390] To Standby or Not to Standby...

It's true. In STANDBY the B+ is switched off to the RF and IF circuits. Their tubes still emit electrons, but without plate voltage they have no place to go and mill around the cathodes. Dr. Jerry, K0CQ, explained that, over time, cathodes degrade under this condition. Leaving in STANDBY for brief periods is OK. Wish he were around to explain this better than I'm doing. Way back in the archive one can find his authoritative postings on this and other issues.
Where the heck is he these days? The guy really knows his stuff. And Nolan! List is dull without these fellows.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] 3TF7 Failed in service
Date: Fri, 10 May 2002 11:41:11 -0700

Not at all. STANDBY cuts B+ from everything but the oscillators. BREAK IN grounds the audio signal. Both disconnect and ground the RF input.

Date: Fri, 10 May 2002 15:26:37 -0400
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] 3TF7 Failed in service

No not at all. The standby position of the Function switch removes B+ from a number of tubes, including the RF and IF amplifier stages and operates the antenna relay to disconnect the antenna from the radio and ground it.

The Standby function shorts out the audio signal at the first audio amplifier. I don't know if it operates the antenna relay also. The standby relay is operated by having the Standby switch on and connecting the two terminals (tags) at the rear of the set. The relay operates on 6.3 volts AC filament current supplied from the radio at a current of about 40 mA.

Date: Sat, 11 May 2002 00:13:01 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: [R-390] Break-In Switch function (was 3TF7 Failed in service)

>Just what does the BREAK IN switch turn off?

Ok I now have a schematic handy.... (pause)... In short, during normal receive operation, the Break-In switch in the ON position a connection to ground at TB103-9 will shut off both audio channels and short the antenna connectors to ground. (With no connection to TB103-9, nothing will happen.) Here are the details:

One side of the break-in relay coil is connected to the 6.3 volt filament line (AF SubChassis connector P619-10)

The other side of the break-in relay coil is connected to the Break-In Switch S-103 terminal 2 through P619-1. When the Beak-in Switch is in the ON position, terminal 2 is connected to terminal 1, which goes to the Break-In terminal on the rear terminal strip TB103 -9.

If the Break In switch is in the ON position and terminal TB103-9 is grounded (with a wire to a ground terminal, or through relay contacts on a transmitter) the Break-In Relay will be energized.

When the Break-In Relay is energized it does two things:

1) It grounds the AF Line which is the cathode output of the audio cathode follower (V601B) and the top end of both the Line Gain and Local Gain pots. This shuts down all audio output from the receiver.

2) The antenna relay is energized and causes the both the balanced antenna and the Unbalanced antenna connector pins to be grounded. This disconnects the rf signal input.

Note: If the Function switch is in either the Standby or CAL position, and the Break-In Relay is de-energized, the Antenna Relay is energized which causes the both the balanced antenna and the Unbalanced antenna connector pins to be grounded.   Roy

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Date: Tue, 14 Oct 2008 19:18:52 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] OT: Pass Transistor Question

A few weeks ago, I mentioned I wanted to build a regulated, low-voltage power supply that uses an LM317 with some pass transistors to enable it to handle a larger current than the LM317 can handle. The circuit uses a 2N2905 to drive a 2N3055 in a "pass transistor" configuration around the LM317 and the circuit description states it's capable of delivering up to 3 amps in this configuration.

I have a transformer with a 6-amp capacity and I would like the power supply to deliver up to 5 (maybe all 6 amps) if I want. Is it possible to put another 2N3055 in parallel with the one in the circuit allowing thus allowing the pass transistors to deliver the extra amperage. Will this work? I ran across something like it here:

http://ourworld.compuserve.com/homepages/Bill_Bowden/page12.htm

(Scroll down to the middle of the page). The two 2N3055s are paralled and have 0.1-ohm resistors in the emitter lines. Not sure what these equalizing resistors do, but perhaps that's all I need to add? By the way, the original circuit is on page 127 of the 1978 ARRL handbook. Thanks guys for the OT help.

Date: Tue, 14 Oct 2008 19:39:15 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] OT: Pass Transistor Question

Hmmm. I backed up a page or two (p. 124) in the ARRL Handbook and it discusses parallel pass transistors, specifically 2N3055's. I'm still wondering what the equalizing resistors do. Anyone care to explain?

Date: Tue, 14 Oct 2008 21:07:35 -0400
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] OT: Pass Transistor Question

Barry, the problem is that the voltage from the base to the emitter varies a lot from transistor to transistor, even when they are all 3055's. The collector current depends exponentially on this VBE, so tiny changes in VBE make big changes in collector current. The end result is that one transistor often gets all the current and the others get little - this is called "current hogging". The resistors can either be in the base circuit or the emmitter circuit. If they are in the base circuit, they have to be larger by a factor of beta (maybe 100 or so). The resistor has the effect of equalizing the base currents, and thus the collector currents.

Date: Tue, 14 Oct 2008 21:19:28 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] OT: Pass Transistor Question

Thanks for all the replies, guys. I knew you all would be a big help. The supply will normally coast along at 600mA to 800mA, but since I found such a nice tranny and a set of stud-mount rectifier diodes to boot, I thought I'd make it capable of at least what the tranny can supply. I really appreciate the help (transistors are just weird to me...)!

Date: Wed, 15 Oct 2008 12:07:10 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] OT: Pass Transistor Question

The equalizing resistor use is the result of broader mfr tolerance in days of yore. You pointed out a reference to a 1978 handbook. Remember in that time when we built ridiculous bridge rectifiers for HB Amplifiers? Same philosophy! If you are using more modern components, don't need the equalizing! If using "OLD" saved parts, equalize! I built a power supply about 1980 - 1981. used 5 2N3055s on one BIG heatsink. Go for it!

Date: Wed, 15 Oct 2008 15:33:49 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

Here are some thoughts that fit in with Don's.

I would probably still go with emitter degeneration resistors as it's considered "good engineering practice". Also noteworthy, I just replaced the output transistors on an old Crown Audio stereo amplifier. Parts list calls for a matched set of two transistors for each channel. I purchased 10 new transistors and after sorting ended up with a measured Beta (current gain) RANGE of about 2:1. I now have two well matched sets installed and two lesser well matched sets as spares. The two unused outliers have the 2:1 Beta ratio

As a result, if you happened to install the two outliers of my group as parallel pass transistors, you would most likely want some emitter degeneration resistance to minimize the effect of the Beta variation. Another issue beyond possible Beta variation is in regard to what Andy

Moorer pointed out regarding Vbe (Voltage, base to emitter) and it's effect on collector current. Regardless of the transistor heatsinking arrangement used, it would be difficult to guarantee that the transistors will see exactly the same temperature over the power supply's entire operating range. Turns out that Vbe is quite sensitive to temperature so in regard to Andy's remarks, collector currents over the power supply's operating range could differ solely to the transistors' temperature difference. Emitter degeneration also tends to help out these effects.

Date: Wed, 15 Oct 2008 16:19:06 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] OT: Pass Transistor Question

Okay - Mea Culpa! I haven't fiddled with pass transistors since 1980 to 1981. The same time frame I did all the bypassing of 1N270s to build a HB pair of 813s Since then THAT power supply has been long ago replaced. Bridge rectifiers no longer need the equalizing resistor AND capacitor. I've also gone over to radios on the "dark side" - hollow state. Back to R-390s, HT-32, BC-610, and SP-600. So I haven't done any solid state in a L-O-N-G time!

Date: Wed, 15 Oct 2008 16:47:57 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] OT: Pass Transistor Question
>
> Was the transformer designed for rectifier service?
> If it's a filament transformer, be sure to use diodes with significantly
> higher voltage ratings than "needed". Filaments don't much care about a
> voltage spike as you turn off the switch. In fact the inductive flyback
> doesn't generate a voltage spike on a filament. Rectifier diodes *do*
> care about voltage spikes.... Bob

Well, that's a good question. The transformer is a pull from (I believe) a medical application that was apparently never used. It has dual primaries for 120/240V input, a single output winding at 19V @ 7.2A, a tap at 11.4V @6A and another tap at 13.8V @6A. Just for the fun of it, I happened across a great deal on 4 stud-mount rectifiers that can handle 12A, 300V. While I didn't really need that much "rectifier", I wanted to make it hefty.

Date: Wed, 15 Oct 2008 17:54:00 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] OT: Pass Transistor Question

With just ONE of those rectifiers, you don't need pass transistors for the power level you want. You just need ONE decent 15VDC computer grade cap on the output! You "may" want to put a multi-meg ohm resistor across the big smoothing cap so IF you reach in to work on it you don't get either a tool or yourself bit!

Date: Wed, 15 Oct 2008 16:54:19 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] OT: Pass Transistor Question

> Andy said what the resistors are for. I would typically use more than 0.1
> ohm for 2N3055s, say 0.22 or 0.33 ohms. <snip>

I was wondering what an optimal value would be. In the handbook, it shows two 2N3055's in parallel with 0.3-ohm resistors. In the second example, it shows three 2N3055's with 0.45-ohm resistors. I assume the effective total extra resistance stay constant this way (0.15-ohms). I'm not sure why the author of that article used 0.1-ohm resistors and was wondering what an optimal value might be. I assume a bit more is better to a point. BTW, all this talk about higher current draw got me to thinking about the main filter cap (I happened across a discussion of this on another page). It is only 5,000uF in the original design, but I figure that if I do ever use this for a lot more current draw, it will need quite a bit more than this so am looking for something a bit more substantial in this area as well (30,000uF to 50,000uF or more).

Date: Wed, 15 Oct 2008 16:56:29 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] OT: Pass Transistor Question

>With just ONE of those rectifiers   <snip>

Unfortunately, the output voltage wouldn't be correct. I need the regulator to set the final output voltage (in this case, 9V).

Date: Wed, 15 Oct 2008 18:34:57 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

Can you fill me in by what you mean when you say "build a HB pair of 813s"? Sounds like something to do with silicon diode stacks to replace mercury vapor rectifiers but not really sure.

Date: Wed, 15 Oct 2008 19:04:22 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

Wow. Collector current vs. Base Emitter voltage. That would be difficult to measure and more so to characterize. Crown of course doesn't specify what should be matched. The expectation is that you buy THEIR kit of matched parts. My supposition was that for an "equal" drive top and bottom, the output circuit should supply equal currents to the load, top and bottom so that at max output, the output stage both top and bottom would go into current limit at the same time. Given all that, I put the curve tracer in pulse mode, cranked it up as high as I dare and matched for Hfe. BTW, the unit is a Crown D150A. I'd say this post is off-topic at this point. should we go off list?

Date: Wed, 15 Oct 2008 19:23:14 -0400
From: "Dave Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] OT: Pass Transistor Question

Bob: I may be behind here, but the equalizing resistors in the emitter leads of the pass transistors are really there to keep one transistor from hogging a lot of current, failing, and then allowing the failure to cascade through the other transistors. I just scrapped a modern import power supply because it omitted the resistors, and half the pass transistors were nuked. It wasn't worth it to me to redesign it with the proper stuff. As far as bypass resistors and caps across diode strings, that's a different story, I believe.

Date: Thu, 16 Oct 2008 00:49:42 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

This is an old beast that I just happened upon that has one bad channel. Right now I'm resisting working on it just for the mechanical reasons you describe. Sounds like I don't need to worry about matched/selected parts and your comments do explain the parasitic suppression components. Also sounds like the older transistors may have had a lot of phase shift at their upper limits with the potential for creating havoc with the amp's feedback loop.

The mechanical packaging really is pretty bad. I was unpleasantly surprised. Documentation's nothing to write home about either. Digging in to the docs still leaves ??? Anyway I'll be sure to sweep the output for any signs of life after I get it back together. Any special conditions that's apt to make it go into flight; level, freq etc?   Jon

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Date: Fri, 17 Oct 2008 19:00:58 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

Thanks for the info on the MJ15003s. I've already purchased a handful or 2N3773s since they were cheap and available so I'll give them a shot first.

They are Brand X by the way. Could be one of the thousands of processes Motorala must of spun off to the 2nd line fab houses. If I end up with flight at/near current limit I won't be too concerned since I don't plan to run the amp anywhere near there anyway. And yes I am the curious type. Sounds like this could turn into an interesting exercise. So how did Crown Audio get the kind of recognition they received? Given the parts available at the time, dealing with basic design problems is one thing. The packaging however is such a disappointment. I think I could have done better in my garage.

Date: Fri, 17 Oct 2008 19:32:22 -0400
From: "Ian Gallimore" <iangallimore@rogers.com>
Subject: Re: [R-390] OT: Pass Transistor Question

Has anyone had experience using power mosfets as pass elements? From what I've read, equalizing resistors are not needed, but I wonder, being REALLY CONSERVATIVE, if a small resistor, say .1 ohm, in each source lead might be a good idea. I have a plan germinating to re-do a big old GRC PSU putting out 28V at 50 A as a variable voltage PSU using a multiturn pot, a three-terminal Voltage regulator and mANY parallelled power fets as an improvement on an SCR pass element.

Date: Fri, 17 Oct 2008 20:33:18 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] OT: Pass Transistor Question

Power mosfets are often recommended because they "equalize" the power load. More heat = less current. The problem is that this only occurs above a specific current level. Below that current level (actually a Vg level) then work the other way around. You need to size the parts carefully to get the balancing to work.

Date: Sat, 18 Oct 2008 23:25:48 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

What's the Ft of the original parts? Also go ahead and laugh. I don't really care.

Date: Sat, 18 Oct 2008 23:42:19 -0400
From: ews265 <ews265@rochester.rr.com>
Subject: Re: [R-390] OT: Pass Transistor Question

I see what you mean. The MJ15003 has an Ft of 2 MHz whereas a listing in an old Motorola catalog shows 200 kHz to the 2N3773 plus the MJ15003 has another 100 watts of dissipation, I think. Looks like it IS the "Hot" setup.

Date: Mon, 20 Oct 2008 09:26:08 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] OT: Pass Transistor Question

I'm sorry to keep asking OT questions and if someone could suggest a better forum for this (and if Don would rather me take this elsewhere), then please do so; however, I think this one should be an easy answer. I want to mount the TO-3 pass transistor(s) and TO-3 regulator on heatsinks that are open to the backside of the cabinet. The problem is that the cases of the various devices are not common and they are at something other than ground potential so I'd like to insulate them from the back panel.

I think the traditional way to do this is to use a mica insulator under the device (between the case and the heatsink) with insulating sleeves around the screws and possibly mica washers on the other surface (to insulate the mounting screw from the back plate in my case). The thing I'm not sure of is whether mica is thermally conductive. I assume it is since this seems to be the way this is done but I haven't built like this before so I wanted to ask. The heat-sink "kits" I've seen have the mica to go under the TO-3, insulating sleeves for the screws, but I don't see what insulates the screw from whatever it is mounted to. I assume another mica washer would work but they don't seen to include them. Was this the way it's done? I got the stud-mounted rectifiers and they have two mica washers along with an insulating sleeve for the stud so mounting them so that they are electrically floating is no problem. I'm just having trouble figuring out how to do the same for the TO-3 devices. I bought some nice threaded ceramic standoffs that I can use to mount small aluminum plates which would work, but it seems cumbersome and I think there are better methods I could use. Looking at the back of my Astron RS-35M, it appears the transistors are mounted this way, but without digging in to it, I can't see exactly how they're mounted. Thanks and, again, if this needs to be taken off-list, please just let me know.

Date: Mon, 20 Oct 2008 10:06:24 -0400
From: Barry <n4buq@knology.net>
Subject: Re: Re: [R-390] OT: Pass Transistor Question

Ahh, I see what's going on now. If I use a transistor socket, it solves the issue for me. Without that, I'd need some shouldered, insulating washers, but a socket makes a lot more sense. Thanks! I understand it now.

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from the Collins list

Date: Fri, 31 Oct 2008 08:49:19 -0600

From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>
Subject: Re: [Collins] PM-2 help

I'm not sure about the PM-2, but some early Collins supplies were wired with the fuse in the neutral which is contrary to safety codes. The fuse and switch should be in the hot side, so that when open, voltage is removed from the wiring beyond them.

Basically the line cord neutral wire (usually white insulation) should go to the transformer primary (and there will be a wire from the 120/240 switch). The line cord hot wire (generally black in color) should go to the radio connector to go to the power switch. The wire from the power switch goes to fuse and the other side of the fuse goes to the other side of the transformer primary (and there will be another wire from the 120/240 volt switch there). That way all the wiring beyond the switch will be at ground potential with the switch off. A safer condition for poking fingers.

I suspect early supplies didn't have three wire cords or polarized plugs so there was no way to enforce the switch in the hot side and when a draftsman changed the assembly drawings to connect up the three wire polarized cord, he didn't realize which way was safer. I KNOW I had to argue with draftsmen at Collins about RF symmetry details that was beyond their comprehension of circuits.

Date: Fri, 31 Oct 2008 15:27:12 -0400
From: "Bob Spooner" <rls19@psu.edu>
Subject: RE: [Collins] PM-2 help

Another thing to remember when rewiring AC circuits is that the hot wire from the cord should go to the terminal on the fuse holder that is furthest from the end of the fuse holder where the fuse is removed. That way if someone pulls out the fuse without unplugging the equipment, once the fuse is part way out it can no longer make contact with the hot end of the fuse holder and cause shock.

Date: Wed, 05 Nov 2008 08:17:16 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] Off switch Doesn't

I understand the AC micro switch is a common failure point. The micro switch in my 67 EAC is welded in the ON position. Is there a replacement/fix for this problem?

Date: Wed, 5 Nov 2008 07:28:14 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Off switch Doesn't

Sometimes you can "work" the switch actuator a bit with a small instrument
and sometimes it will free itself. I fixed one that way one time.

Date: Thu, 6 Nov 2008 07:26:00 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Off switch Doesn't

I think in my case, it was just excess grease that had gotten down around the plunger and was keeping it from popping fully back up. Working it a few times freed it up and it worked fine for years. Yeah, welded, corroded contacts, etc., are a different problem.

Date: Thu, 06 Nov 2008 09:32:58 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Off switch Doesn't

Thanks for all the input on the switch. Does anyone have a part number? Are the micro switches available from Mouser or other sources?

Date: Thu, 6 Nov 2008 09:06:26 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Off switch Doesn't

NOS switches are available from Dan (Hank) Arney. Contact him at: hankarn@pacbell.net

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Date: Thu, 06 Nov 2008 17:57:52 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Off switch Doesn't

The standard fix when I was in the Army was to replace them. Not hard, though the down-time waiting for a replacement was a while. Often long enough we would just go ahead and disassemble the micro switch and burnish the contacts. After they were pulled mostly from the field and used for training purposes, we just took a rubber mallet and gave the front panel a whack where the micro switch was. It invariably fixed it. Never had to do the same receiver twice.

Date: Sun, 22 Feb 2009 03:15:09 +0000 (UTC)
From: odyslim@comcast.net
Subject: [R-390] EAC power supply transformers

I have noticed most EAC power supply transformers and a buzz/ hum to them. It seems to me that it is not a problem. Actually, I think it is the casing that encloses the actual transformer vibrating. Any thoughts?

Date: Sat, 21 Feb 2009 22:23:17 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] EAC power supply transformers

I seem to remember this being mentioned before. I think you just ignore the buzz.

Date: Sat, 21 Feb 2009 21:48:38 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] EAC power supply transformers

Try shimming the power supply transformer away from the chassis with some washers.

Date: Fri, 20 Mar 2009 09:55:10 -0700 (PDT)
From: wli98122@yahoo.com
Subject: Re: [R-390] C603 and C606

There are two schools of thought on these large electrolytics.

School 1 wants to preserve the *look* so they either reform the old ones or re-stuff the cans with new small electrolytics. Both procedures have been discussed at length on this reflector past posts.

School 2 wants functionality and are not so concerned about looks. They throw out the old cans and either install new electrolytics below the deck... or install a pair of surplus octal based relay cases containing new caps.

Me, I took out the old cans and discarded them. Installed the two relay cases with new caps inside. Just did not want to deal with the risk of a 60 year old can leaking or exploding. The octal cases did not *line* up correctly, so I merely rotated the octal plug 45 degrees so it looked good to my eye.

Your choice

Date: Fri, 20 Mar 2009 14:01:16 -0400
From: "Al Parker" <anchor@ec.rr.com>
Subject: Re: [R-390] C603 and C606

I've been restuffing cans for several yrs, have done several sets for the R-390A lately, for $54/ set, incl postage, you send me your old "cores". They're very similar to the ones for the R-388, and you can see them at http://www.boatanchors.org/filtercap.htm I think W. Li has one in his R-

388. None of those pix show the crimping that I now usually do on the lathe to resecure the can to the base, I need to get a pic or that. (I'd be glad to pay postage + a bit for any old plug-ins that anyone is ready to discard.)

I agree, it depends upon just what your outlook is. For the plug-ins, it's so easy to keep it looking original and have new components in there. When it comes to restuffing wired in cans, or bathtubs, I do it either way, depends on "how I feel" at the time. It's a bit quicker to just remove the bathtubs and put new parts in on terminal posts or strips. Can't tell the difference from above, and doesn't look terrible underneath, if done nicely.

Reforming is usually a temporary fix, not worth the risk, as noted.

Date: Sat, 21 Mar 2009 08:12:55 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: Re: [R-390] C603 and C606

To relate an experience I just went through with electrolytic capacitors. My Johnson Invader 2000 would not work in the SSB mode and had only about 50W output in the CW mode on 80/20M only. After some investigation, I found the LV supply in the exciter section was running about 240V instead of its normal 330V. The cause was the dual 40/40uF 450V FP electrolytic in the filter.

Testing this capacitor with my old Solar capacitor tester, it showed only about .1mA leakage leading me to believe it was OK. But upon checking its capacitance, I got no reading. I guess it was acting as a big resistor but not leaking any current to ground.

I happened to have a new 60/40uF 475V capacitor made by DH Distributors in Wichita that was to be used in an HT-37 restoration and used it for the replacement. DH makes FP type electrolytics by putting electrolytics inside chrome plated brass plumbing tubing with the proper base and a snap plug on the top. I don't know if they make any plug in types.

Date: Sat, 21 Mar 2009 08:12:55 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: Re: [R-390] C603 and C606

To relate an experience I just went through with electrolytic capacitors. My Johnson Invader 2000 would not work in the SSB mode and had only about 50W output in the CW mode on 80/20M only. After some investigation, I found the LV supply in the exciter section was running about 240V instead of its normal 330V. The cause was the dual 40/40uF 450V FP electrolytic in the filter. Testing this capacitor with my old Solar capacitor tester, it showed only about .1mA leakage leading me to believe it was OK. But upon checking its capacitance, I got no reading. I guess it was

acting as a big resistor but not leaking any current to ground. I happened to have a new 60/40uF 475V capacitor made by DH Distributors in Wichita that was to be used in an HT-37 restoration and used it for the replacement. DH makes FP type electrolytics by putting electrolytics inside chrome plated brass plumbing tubing with the proper base and a snap plug on the top. I don't know if they make any plug in types.

Date: Tue, 24 Mar 2009 07:26:39 -0400
From: frankshughes@aim.com
Subject: [R-390] C603 C606 plan "B"

Thanks for all the replies & ideas about what to do about the missing C603 an C606 from the spare 1967 EAC AF deck which I am trying to make functional.

So I will go ahead and put in some new electrolytics, give up on finding any originals to rebuild. However, obtaining the bases might not be an issue. I was advised that Potter & Brumfield (among others) uses the same base for some of their relays. There is a giant electronics & other "junque" place near me, http://www.skycraftsurplus.com/ and they have piles'o pulled relays from decades past, so this week's mission is to locate some donor bases.

The last problem to resolve is: what the heck is pin 5 on the socket for C603 connected to? It does not show up (or possibly I just can't seem to look in the correct place) in the "Y2k-REL-1" or the "cookbook" or any other schematics that Google can locate. In the "Y2K-REL-1" book, page 213 photo shows the red/white/blue wire on pin 5 of socket C603. (directly above the arrow line for label "R620"). I don't want to mix up the polarity of the new electrolytics, my elmer says it would be "bad" I can see what all the other pin-outs function and polarity are, but this one is a mystery. Any ideas ? Thanks, Frank

---

Date: Tue, 24 Mar 2009 10:44:08 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] C603 C606 plan "B"

> I was advised that Potter & Brumfield (among others) uses the same base for >some of their relays.

Or any dead octal tube with the old shell-style base.

> The last problem to resolve is: what the heck is pin 5 on the socket for C603 >connected to? It does not show up (or possibly I just can't seem to look in the >correct place) in the "Y2k-REL-1" or

In Y2KR1, it's in Figure 5-24, page 5-50, filtering the B+ going to the 0A2, V605 on the AF deck. C603 is 30/30/30 at 300V with plus on pins 3/5/7 and minus on pin 1, and C606 is 45/45 at 300V with plus on pins 3/5 and minus on pin 1. They can also be found by "searching" the PDF, where you will also find a location chart, Table 5-8, on page 5-55. 300V is an odd size today. The modern replacement is 3 of 33@350 and 2 of 47@350. Note that Y2KR1 has been superseded by Y2KR2, and Y2KR3 is in the works. Y2KR2, TM 11-856A, and an ENORMOUS pile of other material can be had at http://www.r-390a.net/ .

Date: Sat, 18 Apr 2009 20:30:42 -0400
From: "Don Heywood" <wc4g@knology.net>
Subject: Re: [R-390] Black Tube Shields, IERC and cooling fans

Another important item to keep in mind is the household AC voltage level. I use bucking transformers on all my old equipment. I have one large one that drops the input to my receiver(s) and S-line(s) to 113VAC. It makes a definite difference, and the tubes love it...

Date: Sat, 18 Apr 2009 21:06:34 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] Question about VARIAC

I bought a General Radio 200CU VARIAC. It is designed for 115VAC input and produces 0-135VAC. It is designed with 292 turns with taps on both ends at 43 turns. The input circuit is shown to connect to one end and the other at the 43 turns tap. Since the power here runs about 120V, this causes the output to run closer to 145VAC instead of 135VAC. I would like it to swing just the line voltage and no more.

Would it be advisable to connect the input across the entire 292 turns instead of 249 (292-43)? I know this would give me no more on the output than the intput voltage, but am wondering if this would be harmful to the VARIAC. The little plate on the side doesn't show this as an alternate wiring, and I assume the other tap would be used so that the direction of the knob can be changed (e.g. CCW would increase the output voltage instead of decreasing it).

Date: Sun, 19 Apr 2009 20:17:06 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Question about VARIAC

> I guess what I was getting at was impedances. ....

It would let the smoke out instantly. (Assuming you are suggesting to hook the line supply across just a few turns of the variac.)

> ... If there were double, triple, etc., the amount of turns, this,
> too, would affect the input impedence, would it not?

Maybe what you have in mind is the impedance with no load on the thing. Yes, you have the right idea. If you hook 120volts 60 cycles to the 120volt winding of a 400 cycle transformer, it will overheat fast. A bit of algebra will show that you CAN run such a transformer on 24 or 28 volts 60 cycles. Secondary voltages will be lower in proportion. This can be handy at times.

> I guess what I was trying to say is that I figure there's a point where the
> number of turns matters but just wasn't sure where that point is. Is that
> incorrect?

That is correct, but short of a batch of variacs you don't mind burning up, don't try it.. HOWever.. if you really want to, hook the line to the WIPER, set the wiper on one end and hook the other side of the line to the other end of the winding. Hook an ammeter in the line. Move the wiper to fewer and fewer turns until the ammeter begins to climb rapidly. Do report your results.

Date: Sun, 19 Apr 2009 20:38:29 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Question about VARIAC

A different angle: If the variac is hooked up normally, for overvoltage or line voltage only, and you put a short or very heavy load on the thing at a very low output setting, the first few turns will overheat. For years I had a little bud box with a on amp variac, low voltage transformer and a rectifier/filter. Made a fine variable DC supply. Unfortunately, the caps or the diodes shorted and burned the variac's first 5 or 10 turns. Sigh. This is a good reason to put a FUSE in the wiper line. Then if the load draws more than the variac is rated for (they'll do two times rating briefly and stay happy) the fuse will blow and you'll be temporarily inconvenienced only.

A further oddity: there is a General Radio device called the Automatic Line Regulator. Basically, it has a center tapped variac, buck/boost transformer and error detection circuit with a thyrotron controlled motor. For plus or minus 10 volts, it will regulate 30 amps, for half that voltage range it will regulate 60 amps. I plan to run lots of stuff on mine. Beware of any for auction: they weigh some 85 pounds and shipping will kill you!

Date: Sun, 19 Apr 2009 22:21:28 -0700
From: "Chris Kepus" <ckepus@comcast.net>

Subject: Re: [R-390] Question about VARIAC

" It is not hard at all to rewind variacs --"

Would you please be so kind as to elaborate on your repair and rewind process? I have two Variacs in need of rewinding. One that has windings fried as you described and another that has the problem at the other end of the winding (just occurred to me that someone probably wired it "backwards"). Do you have pictures of your efforts or a write up that you could share? There are a *lot* of windings so I am interested in the whole story as well as the materials, how and where you spliced the new wire in (e.g., the inside of the core), the wire you used (mine look like they are wound with enameled wire and, of course, the enamel is removed from the portion contacted by the wiper. Thanks for anything you might like to pass along.

Date: Mon, 20 Apr 2009 10:59:41 +0300
From: Sheldon Daitch <sdaitch@kuw.ibb.gov>
Subject: Re: [R-390] Question about VARIAC

OK, thanks for the clarification. As others have pointed out, yes, there is absolutely nothing wrong with putting the line voltage across the entire winding of the variable transformer. As you note, by doing so, the output of the variable transformer will never be any higher than the line voltage. Thanks for the interesting discussion.

Date: Mon, 20 Apr 2009 09:04:45 -0700
From: "Chris Kepus" <ckepus@comcast.net>
Subject: Re: [R-390] Question about VARIAC

Oops...sorry for extending this thread further away from its starting point. It's been of great interest to me but I meant to reply to Don directly and not take list bandwidth for this particular question. Please excuse the bandwidth.

Date: Mon, 20 Apr 2009 12:07:13 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Question about VARIAC

DON'T take it off-list! Please! Others want to know. I've got one or two with a broken winding too. Would LOVE to have insight as to how to go about this!!!

Date: Mon, 20 Apr 2009 14:25:58 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Question about VARIAC

An AC magnetic device is designed for a specified Volts/frequency ratio, like 120/60 Hz = 2.

120/400 Hz is 0.3, so the core is lighter, but it will only support 60 *0.3 = 18 volts at 60 Hz.

If you keep the magnetic core of the Variac, you must keep the same number of turns. The size of the wire depends on the room available for that many turns. A Variac winding can't be layered. The power you can draw depends on the material and weight of the core. You should use the same size wire for rewinding. You can't get more power with heavier wire. Rewind the core first, then flatten the top of the turns with a small hammer, if necessary. Use a fine file to remove enamel where the brush will contact the wire. Polish the exposed wire with 600 grit and crocus cloth to reduce brush wear. Your winding should be tight so the wire doesn't move as the brush moves. Maybe you'll need transformer varnish to hold it in place. If there's no fuse in the circuit, the brush is most vulnerable. The rest is best learned by experience.

Date: Mon, 20 Apr 2009 15:45:53 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Question about VARIAC

I know that I was interested in "repairing" a variac. I wasn't interested in a COMPLETE re-winding. By the time I get the wire size, go out and buy the right size wire, re-wind it, and re-assemble it, I could have less expensively simply bid on one off THAT place, or just go to the next nearest hamfest to get another. There "should" be a method to replace JUST those windings that are fouled up, and NOT make an extensive costly project out of it.

Date: Mon, 20 Apr 2009 20:05:20 -0700
From: "Chris Kepus" <ckepus@comcast.net>
Subject: [R-390] How to repair your Variac;

Don, thanks for the clear directions. You make it sound like a walk in the park.) Maybe it is and I will soon find out. After the enameled wire is measured and a visit to your junque box (or personal wire warehouse) fails to produce the correct wire size, where do you shop for magnet wire? I see enameled magnet wire available at places like Small Parts, MCM electronics, Surplus Sales, etc., so maybe it doesn't matter...or does it? Thanks, Don, I (we) really appreciate the guidance.

Date: Mon, 20 Apr 2009 23:15:18 -0400
From: K3DX <k3dxLab@comcast.net>
Subject: [R-390] Powerstat

I have a nice little 1.75A Powerstat autotransformer, still in the box. I'd like to use it to drop the line voltage to 115 for my R-390A. If I turn off the ovens in my R-390A, the powerstat should handle the load, don't you think?

Date: Mon, 20 Apr 2009 23:16:05 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] How to repair your Variac

Yes the info was very good. Thanks Don! As to a location for finding the wire, I know that *I* have an automotive electrical shop tha rebuilds starters, alternators and such. I suspect that they would indeed have what's needed, and NOT require an entire spool to be purchased.

Date: Mon, 20 Apr 2009 23:33:37 -0400 (EDT)
From: "Richard W. Solomon" <w1ksz@earthlink.net>
Subject: Re: [R-390] How to repair your Variac

The last time I needed Magnet wire I located it on the "evil empire":.

Date: Tue, 21 Apr 2009 00:07:48 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] How to repair your Variac

Coupl'a things - The wire diameter doesn't have to be exact, like to .001", if you're not rewinding the whole thing. What it needs to do is fit in the space occupied by the burnt and removed wire. You don't want the brush dropping into an empty space. If you have to add or subtract a few turns, that's no big deal. When you fuse it, put the fuse in series with the brush. You can put another fuse in series with the hot like for electrical safety (something shorts to case ground - you do have a three wire cord, right?).

Say you have a 1 amp line fuse. If the dial is set to 10% of line, you can draw 10 amps (by transformer action) through the brush without blowing the line fuse. Perhaps this explains why the low end of the variac gets burned. That, or there's no fuse at all. If the winding can get hot, because it isn't fused, then don't depend on solder to hold the splice together. Make a mechanical connection first. Use some transformer paper to keep the splice from rubbing on the insulated turns of wire. The brush has to short turns as it moves, so it's made of carbon. You don't want a copper shorted turn from the splice.

Date: Tue, 21 Apr 2009 01:35:35 -0400 (EDT)
From: "Richard W. Solomon" <w1ksz@earthlink.net>
Subject: Re: [R-390] How to repair your Variac

It should be as close as possible to the original size or the brush will have a step down then a step up (or vice-versa), that could cause arcing. Not good for the brush or the wire.

Date: Tue, 21 Apr 2009 02:44:01 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Powerstat

Yes, it would, but find instead a little 12 volt transformer at 2+ amps. Run the transformer in bucking mode against the line and feed IT from the little variac. If you find a 10 or 15 amp 12 volt transformer, you'll have a nifty line adjuster that will bring down your 122 to 125 volt line to 113 volts and never get even warm. This is basically what General Radio did in their automatic line regulator that would handle 30 amps over plus or minus 10 volts from line input.

Date: Tue, 21 Apr 2009 21:27:31 -0400
From: K3DX <k3dxLab@comcast.net>
Subject: Re: [R-390] Powerstat

I think I'll start with Roy's variac-and-low-voltage-tranformer idea. I have a few used low voltage transformers I removed from old solid-state gear. I never would have thought to use them together to make a variable bucking transformer. Sweet!

Date: Mon, 4 May 2009 10:52:54 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] Buck/Boost Transformer

I'm curious about wiring a buck/boost transformer. There are, apparently, at least a couple of different ways to do this. I would have thought this to be the way to do this: http://johnjeanantiqueradio.com/buck-boost.jpg

However, according to the R390A compendium, there's another way to do this:
http://www.r-390a.net/faq-HiVolt.htm

Are there advantages/disadvantages to one over the other (or are they essentially the same thing)? Although I understand (at least on a functional level) how both work, the second one seems "backwards" (although I know it isn't). I assume both require the secondary of the transformer to be able to handle the anticipated load and I don't see anything else that would change the requirements on the transformer. I seem to recall a former list member (Dr. Gerald Johnson) talking about a scheme where the bucking transformer only has to be rated in proportion to the amount of voltage it is dropping. In other words, if it's bucking 5 volts from 125, then it only has to be rated at 5/125 of the load. (That wording may not be exactly correct, but I seem to recall the bucking transformer did not have to be rated for the full current load). Am I wrong to assume that the bucking transformer in the above schematics have to handle the full load (in amps) or does either one allow the transformer to only be rated at an appropriately smaller VA rating (I hope I'm making sense...).

Date: Mon, 4 May 2009 08:33:27 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Buck/Boost Transformer

I made one of these several years ago and packaged it in a blue wall box with power cord and a regular 120VAC receptacle (and a label on the front as to what it does, preparing me for old age so I don't use it as an extension cord for my welding machine). I also have a fuse installed inside it. I believe the secondary has to carry the full load. Using a filamant transformer, should be ample capacity for a 390A. I used a 12V transformer.

Date: Mon, 4 May 2009 13:12:02 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Buck/Boost Transformer

The two connection methods are not quite equivalent. You will buck or boost by the voltage of the secondary winding. The first method puts full line voltage on the primary, for max secondary volts. The second method lowers the primary voltage (bucking) for less drop. The second method will give you more boost if you are boosting, say from 95 VAC. The secondary has to carry the full load current. The VA rating is less than the full load VA because it is the secondary volts times amps. A 12 volt secondary carrying 5 amps needs a 60 VA rating.
A 120 volt secondary in an isolation transformer needs a 600 VA rating. So yes, a bucking transformer has a lower VA rating than a full voltage transformer. Size and weight are proportional to VA rating.

Date: Thu, 21 May 2009 20:41:54 -0400 (EDT)
From: larrys@teamlarry.com (Larry Snyder)
Subject: [R-390] Filter caps

I'm going through Walter's rebuild procedure for my 1956 filter caps. I have a nice cut just above the crimp ring, but they don't want to come out of the cans. Would a hot water bath on the stove be a viable assist?

Date: Thu, 21 May 2009 20:04:30 -0500

From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] Filter caps

Put the top of the can in a vise or better yet a pipe vice. Hold it lightly taking care not to smash the can. Take a propane touch and slowly heat the can. Hold the base with a pair of channel locks it will slip right out ... tom, N3LLL

Date: Fri, 22 May 2009 01:48:03 +0000 (UTC)
From: odyslim@comcast.net
Subject: Re: [R-390] Filter caps

I had to use a propane torch to get the muko hot enough to come out. Wear your respirator. Once it gets hot & ooozzzyy, hold onto it with your pliers real good and swing it like a baseball bat. It will all come out. Oh, dont do it in the kitchen. Go outside and fling it toward your best neighbors house. If that dosent work, AES sells new, fresh stock.

Date: Thu, 21 May 2009 20:29:08 -0700
From: Brian Vietri <bvietri@msn.com>
Subject: Re: [R-390] Filter caps

I use a 6"x6" Aluminum plate 1/8 " thick (prevents warping), and heat it up on the gas stove with the filter can in the center of the plate with the cut open end up. (prevents direct flame from the can and pins) I am guessing the smoke is probably toxic, and the black goooo is a real mess, so do it outside. Using gloves I carefully pull it apart when hot, finally I reheat with the can opening down towards the plate on a piece of aluminum foil several times until most of the black gooo is out of the can. Wash it out and move on, to the next step.

Date: Fri, 22 May 2009 08:48:54 -0400
From: Jim <jbrannig@optonline.net>
Subject: Re: [R-390] Filter caps

Heat will do it. I "restuffed" the filter capacitors because it was there and I had time on my hands, but truly guys it is not worth the effort!!! Solder the replacements to an Octal socket or under the chassis.

Date: Fri, 22 May 2009 08:08:51 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Filter caps

The octal socket idea is not bad and even under the chassis but always remember if you do the under the chassis replacement, do not plug in the originals if you have used the socket bases for your connection point for the under the chassis caps. You will make it look original but will also throw the leakage of the old caps in the circuit with the replacements. On removing the old caps it takes more heat than hot water. I had to resort to the propane torch to get enough heat. I did find that the cans can be cleaned out with lacquer thinner once the majority of the black goo is removed. The last ones I rebuilt I didn't reattach the cans. I just floated them over the rebuilt bases with the brackets holding them in place. Makes re-entry a snap.

Date: Fri, 22 May 2009 09:29:28 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Filter caps

I saw one version where the guy ran the positive leads down through the appropriate pins in the octal socket from the top side and soldered them to the pins underneath, bunched the negative leads together to a lug and attached the lug to the post that functions as the capacitor clamp. Pretty clean method, but it requires there to be a hole in the octal socket's pin (not sure if all the octal sockets are made that way). Of course this requires axial-leaded caps. <snip>

Date: Fri, 22 May 2009 11:44:16 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Filter caps

Have rebuilt plenty of them, the way I do it is first build a jig of wood with a hole of the outside diameter of the cap, cut it in half and clamp the capacitor in it after having cut oll pins and the center guide. Then on your drill press, carefully centered and with a wood bit a little smaller than the inside diameter and with the stop a little higher than the bottom of the cap, slowly drill (moderate speed) enough of the capacitor innards will came out to insert new smaller cap or caps as needed. You may need to extend with new color coded the cap wires for ease of later connecting them to the pins. Then I fill the cap with wax to add weight to about 3/4 full, when solidified y get a new or good used octal base that may have to be grinded to the proper diameter, solder the conections to it as short as posible to use a glue gun to fill the rest of the can to the top. With the glue still hot inset the new base, the extra length of wires will fold in the hot glue and some glue should come out in the perimeter, do not worry, it can be removed easily with a knife after. Now you have a replacement that looks the same as the old one and weighs about the same. Do not forget to label the cap. Hope that this makes sense. It does not take a long time. (The drill press does make a little mess, but it does not smell and can be swept easily)   Hope this helps....... Pat

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Date: Sat, 23 May 2009 18:57:14 EDT

From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Filter caps

I am still recycling old used DPTD 8 pin octal relays into new filter caps. You remove the top off the relay and remove the relay from the octal socket by de soldering the relay wires from the octal socket pins. Two 47 or three 33 will fit back in the socket covers nicely. If you want to go under the deck, then rewire and solder the new caps to the even number pins on the socket. Then plug the original back into its odd number pins. This looks original and solves the leakage problem. NOS from AES also sound good.

Date: Wed, 17 Jun 2009 08:55:19 +0200
From: "Henry Meils" <meils@get2net.dk>
Subject: [R-390] Choke coil L601 runs warm

I calculate a current of about 110ma (voltage-drop/internal-R) through PS choke L601. The choke warms up and is presumably the reason filter cap XC602, directly flush to it, also heats up. I haven't tried lifting the cap (& connecting leads into its socket) to check if it heats up on its own. L602 & XC603 do not warm up.

Do others experience this component warm up & is 110 mA excessive ? (Don't have complete manual - but could dowload missing sections.)

Date: Fri, 19 Jun 2009 20:27:19 +0200
From: "Henry Meils" <meils@get2net.dk>
Subject: [R-390] R-390A total current drain ?

Hi again The PS filter cap is NOT defective.

1st: I unplugged dual filter cap XC606 connected to choke L601and reconnected by alligator leads : the choke still warms up (the cap does not).

2nd: I replaced XC606 with 2 separate caps. L601 choke still heats up -- in fact after about 10 minutes the entire audio modul subachasis warms up.

3rd: I removed both 6AK6 AF output tubes . The choke warms up to a much more moderate degree. The two 6AK6s run quite warm/hot when in operation. And since there is more AF output available then I will ever need, I intend to reduce SG voltage by increasing value of the SG series resistors or just solid-state the audio stage(s). Of course the professional thing to do is to stick a mA meter in series with the main B+ and measure current changes when removing or unplugging tubes and/or modules.

Can any one tell me the specified rated total PS current be (Max RF, BFO on, moderate LF out) ?

I suppose I could check Google for this info. Thanks in advance for any good tips. 73s de Henry, OZ1UF - Copenhagen (ex Brooklyn)

Message: 3
Date: Fri, 19 Jun 2009 14:41:02 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] R-390A toal current drain ?

Audio output tubes running too hot is almost always caused by either gassy tubes, or leaky capacitors putting DC on the tube grid. The two 6AK6's should have 0V DC on their grids. If not, they may be gassy, or likely the capacitor driving their grids may be leaky. C605 and C608, 0.01uF capacitors. Recapping the audio deck is quite easy, lots of room to work, lots of the parts on the turret board. Leakage through the multitude of bypass caps in the rig could itself be warming things up too much. 6AK6 plate current should be like 15 or 20 mA each.

Date: Sun, 21 Jun 2009 07:04:03 +0200
From: "Henry Meils" <meils@get2net.dk>
Subject: [R-390] R-390A B+ current drain

I inserted a mA meter into the B+ line at L106: the only item I could find via Google states that the R-390A draws about 100 ma - my own test show a max. of about 180 mA (Calibrate Mode, BFO on, RF on max. and a min. of about 59 mA in Standby mode (80 mA in Stdby with BFO on)- but with both output AF tubes removed). Normal operation, BFO on, runs from 130mA to 160mA: RF gain resp. min & max.(all tubes in place)

The two 6AK6 AF output tubes draw resp. 20 & 30 mA: I haven't measured grid bias V yet but plate current indicates normal operation. The two 1st stage AF tubes do not warm up noticeably. I checked to see if L106 might have shorted turns - inserted a 2nd outboard choke in series with L106 also warms up to roughly the same temp as L106. I don't like the fact that the entire AF module chassis warms up but it is not due to excessive plate/SG current drain - there are no overheated components (R) in the module so I suppose this is how it is supposed to be but what do others here experience ? I intend to remove all modules and individual tubes, one by one, in order to make a complete current-drain chart. It's just simple arithmatic, measuring B+ current drains at all stages.

Has any one on this thread made similar measurements, particularly total B+ current drain, max/min ?

Date: Sun, 21 Jun 2009 09:23:46 -0400
From: K2CBY <k2cby@optonline.net>

Subject: [R-390] R-390A B+ current drain

Before jumping to conclusions about the condition of the power supply choke you should note that the AF chassis also contains the voltage regulator tubes. More to the point, it contains the voltage dropping resistors connected to the voltage regulators. Those resistors are firmly bolted (read heat sinked) to the AF chassis. I am not surprised that the chassis runs warm.

Date: Sun, 21 Jun 2009 21:13:18 +0200
From: "Henry Meils" <meils@get2net.dk>
Subject: [R-390] voltage regulator, dropping resistors

Well, as I mentioned, I take into account the resistors mounted on this chassis & the VR-tube runs cooler than than the AF output tubes. Heating seems to be concentrated immediately adjacent to L106 and not so much directly adjacent to the regulator R-s. Oddly enough L602, same distance from the power resistors runs cool. Of course, with the AF module dismounted, its heat cannot dissipate to the main chassis - thereby warming up more than otherwise. As for the choke, I exactly did NOT jump to any conclusions by checking current drain and substituting another choke in its place. I still would like to know what others here have experienced as typical current drain in different modes. My main concern is do others experience the same warm-up in choke L106 and the same B+ current drain as I do? I just measured actual temperature of the chassis after 45 minutes running time: 34 dgrs, C /abt 93 dgrs, F (ambient room temp is abt 24 dgrs, C. (On L602, only that side flush with L106 warms up). Now we have some hard numbers for comparison. You should be able to tell if your module runs warm, too - surprised or not. Let me add that the previous owner has made mods (without indicating them on the diagrams), there was no audio before I wired the missing a cathode R in the Line AF output tube. Also, extensive mods have been made to the AGC system. Therefore I am concerned about heat-up and current drain because my very first R-390A (unmodified) did not warm up at this module to the same degree.

Date: Sat, 18 Jul 2009 12:56:26 -0500
From: "ka5den" <ka5den@argontech.net>
Subject: [R-390] My R-390

My R-390 let a puff of smoke out of it's right, back, rear. Any suggestions as to what is back there?

Date: Sat, 18 Jul 2009 16:26:30 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] My R-390

Top side is of right rear is the RF module. Bottom side is the Power Supply module and the Rectifier Stack for the relays. A reasonable candidate for RF module might be a shorted bypass cap that woofs a resistor and some exit hole to let out the smoke. Almost anything in the PS is a candidate.

Date: Sat, 18 Jul 2009 14:02:03 -0400
From: Physicist <physicist@cox.net>
Subject: Re: [R-390] My R-390

I think in generalities, so my first guess would be a cap, followed by a resistor. If either went, you might be able to see damage to the part. Also, put your nose up to the unit and see if you can isolate it (UNPOWERED!).

Date: Sat, 18 Jul 2009 17:42:03 -0400
From: K2CBY <k2cby@optonline.net>
Subject: [R-390] My R-390

If it were an R-390A I would suspect the selenium rectifier for the antenna relay.

Date: Sun, 19 Jul 2009 19:18:31 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] My R-390

When R390's smoke on the bottom side you go looking for some 47 ohm 2 watt resistors.

There are four in the power supply under the 26Z5's and four more in the audio deck under the 6082 regulator tubes. There intent is to balance the current through the two haves of each tube. They cascade in failure. Likely once upon a time a 1/2 of a tube went to failure. The 1/2 bad tube smoked one 47 ohm resistor just as little bit not enough to discolor the marking. So the tube was changed and the receiver returned to service.

Now the other 1/2 the tube gets more current and always fails first. Eventually the 47 ohm resistors go up in smoke as the tube is run to the end of its useful life. If you need to change one, then change them both. Mostly you do all four in the module.

Time to run all the tubes through a tube tester. Pull the power supply deck and audio deck and do an eye ball. Resistors go quietly. Caps pop. Selenium stacks leave you with signal from the antenna when you go to calibrate. Find a PDF copy of TM 11-5820-357-35 for your R390. Think of it as a bad movie and memorize it.

Date: Fri, 24 Jul 2009 23:40:24 -0400
From: "Natan Huffman" <w6xr@frontiernet.net>
Subject: [R-390] hum

I'm a very new subscriber and just received my first R390A today although I became very familiar with this receiver during the 60's courtesy of Uncle Sam. After checking tube seats I applied 120 VAC to the radio for the first time today and was greeted by a nasty audible hum as soon as it was turned on and before the tubes had emission. The hum is heard even with no speaker attached and turning controls do not change the amplitude or frequency of the hum. Tomorrow, I'll look at the output of the power supply board with my scope to verify any presence of ripple. Have I made an old beginner's mistake? I do not remember this design having a pronounced electro mechanical hum that is persistent after being turned on. My R390A is a late model 1967/68 contract EAC model.

Date: Fri, 24 Jul 2009 22:47:22 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] hum

No, the radio should not hum. Probably cause is filter capacitors in the AF deck, but it could be a lot of things. The output of the power supply board should show nothing but rectified AC. You need to get to the "other side" of the filter capacitors to see if they're not doing their job.

Date: Fri, 24 Jul 2009 22:49:38 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] hum

Hmmm (no pun intended), I re-read your post. If you're hearing electro-mechanical hum without the speaker, then it's probably not the filters. These radios will hum just a bit like that, but it shouldn't be all that noticeable. You could have a bad power supply transformer?

Date: Sat, 25 Jul 2009 05:42:13 +0000 (UTC)
From: odyslim@comcast.net
Subject: Re: [R-390] hum

Get a screwdriver and put the tip on the power supply case put your ear on the plastic end. It would not hurt to insulate the tip of the screwdriver. Do you hear the hum? It could be the casing of the transformer. EAC transformers are very noisy.

Date: Sat, 25 Jul 2009 02:01:41 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] hum

If you get hum immediately, before the tubes warm up and not from the speaker, then the power transformer and anything influenced by its magnetic fields are the only possible causes. The transformer may be overloaded by an internal short or something fed by a winding. Have you checked the AC fuse? Does it have the right rating? Should be about 3 amps, not 20 amps. Perhaps your beginner's mistake was not checking the fuse first, before looking for an outlet to plug it in. If the fuse is wrong, or shorted inside at the holder, then use your troubleshooting skills to see if a winding is overloaded. Then again, it could be something completely different.

Date: Sat, 25 Jul 2009 06:51:36 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] hum

The power in EAC's have a tendency to hum. Maybe you will just need new filter electrolytics.

Date: Sat, 25 Jul 2009 06:53:11 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] hum

Should have said "Power Supplies" in EAC's tend to hum.

Date: Sat, 25 Jul 2009 19:06:36 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Humming Transformer

I have a '67 EAC whose power transformer mechanically hummed to the point of distraction. My solution was to loosen the 6 captive screws which hold the transformer/power supply unit to the mainframe, each about 3 turns.

Then, between the surface of the hanging transformer and the table top upon which the radio sits, I shoved an old glove for padding such that the weight of the transformer rests on the "padding" and the table top. This made the transformer nearly silent.

Date: Sun, 26 Jul 2009 10:33:47 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] line filter for EAC R390A

I would not recommend using the original line filter. Either bypass it and use an external line filter, or mount an IEC computer line filter inside.

The rationale is well documented within this group re the inherent shortcomings of the original line filter.

Date: Sun, 26 Jul 2009 11:01:12 -0700 (GMT-07:00)
From: "Richard W. Solomon" <w1ksz@earthlink.net>
Subject: Re: [R-390] line filter for EAC R390A

What folks are alluding to is the nasty habit of the Line Filter popping the GFI.
That's why I pulled mine.

Date: Sun, 26 Jul 2009 14:08:03 -0400
From: "Natan Huffman" <W6XR@Frontiernet.net>
Subject: [R-390] thanks

I want to thank all who had ideas about the nasty hum I had on my 1967 EAC.
The problem was in the line filter, so I'll replace it and all should be well.
The give away was the 60 volts on the chassis!

Date: Sun, 9 Aug 2009 04:32:36 +0000 (UTC)
From: odyslim@comcast.net
Subject: [R-390] micro switch, NOT

OK, I have had it with this radio (R-390A). I was using it the other night. when turning it off, I noticed the dial lamps were still lit. OK, I will install a new micro-switch tomorrow. After dropping the front panel, I changed out the micro-switch. Just for grins, I ohmmed it out and it was still good. Uh-ohh. You got it. Changing out the micro-switch was not the cure. I check the alignment and verified it is working with my ohm meter. I have been wiggling prodding and ohming the entire radio and cant seem to find any shorts, broken wires, nothing. I have traced the wires using a 1972 manual and schematic. I even un-soldered the switch and ohmed it out. It is good. I then plugged it in with the switch un-wired and the lamps and tube filaments still come on. I did notice the line filter is wired different than most. I reversed the wires and blew a fuse so I am guessing the the two orange/ white wires on the micro-switch are also reversed. I have radios wired both ways. Has anybody run across this one yet? Any help will be greatly appreciated.

Date: Sun, 09 Aug 2009 12:37:35 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] micro switch, NOT, need help

Some where you are getting the power turned on WITHOUT the microswitch. You said it comes on with the switch out of the circuit. A very BIG clue! I would suggest tracing THOSE two wires through the harness VERY carefully! You've got a short in there somewhere. Keep the faith brother!

Date: Sun, 19 Apr 2009 13:23:56 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Question about VARIAC

I guess what I was getting at was impedences. If I were to tap the input at one turn (or two or three), then I assume this would appear as a very low impedence and wouldn't work very well (most likely incurring a very heavy current draw and hopefully trip the circuit breaker before burning out the transformer. If there were double, triple, etc., the amount of turns, this, too, would affect the input impedence, would it not? I guess what I was trying to say is that I figure there's a point where the number of turns matters but just wasn't sure where that point is. Is that incorrect?

Date: Sun, 19 Apr 2009 14:37:15 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Question about VARIAC

The impedance of a transformer "usually" does NOT come into play UNTIL there is a short-circuit condition. Variacs/autotransformers, have a current rating based on conductor size, "primarily", and can be run throughout the variable range that they are built for. The number of turns used, determines the voltage out. You are not matching an impedance as we are accustomed to with RF. Power transformers are really a different animal.

Date: Sun, 19 Apr 2009 22:48:21 +0300
From: sdaitch@kuw.ibb.gov
Subject: Re: [R-390] Question about VARIAC

I am almost thinking Barry is looking at running the INPUT to the variable transformer in the first few turns, making it a quite large step-up transformer. Short (and pun intended) of either modify the unit to do so, or feeding the input into the variable contact (not normally recommended, I beleive) there isn't enough winding in the transformer to make it operate as a transformer, but more like a very low inductance coil. Certainly that isn't the way the variable transformer is designed to operate, but when Barry discusses a few turns, "very low impedance" and high current draw, it is almost like the discussion is on the theoretical, "if you used only a few turns" on the variable transformer as the primary. Barry, correct me if that is not where you were thinking.

Date: Sun, 19 Apr 2009 15:29:14 -0500

From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Question about VARIAC

No, that really isn't where I was going with it. I just wanted to confirm that connecting the entire set of windings to the input and forcing the variac to stay within 0V to input voltage wouldn't be the wrong thing to do.

WIth my current house voltage running about 121V, this causes the high end of the variac (as wired per the side panel) to run to something over 145V and I don't want that (too much chance of setting the output voltage too high). Of course, the variac (wired as per the panel) can provide up to 135V which is far too high for these older radios to run comfortably; I'm just trying hoping to avoid this situation too easily. I think I'm going to simply go with a bucking transformer (6.3V will bring things down quite nicely) and still be able to use the variac with its standard dial plate of 0V too 135V. I'm just weighing my options.

Date: Sun, 19 Apr 2009 16:30:16 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Question about VARIAC

IF that was what Barry had in mind, then I would agree that it is a REAL concern. I CERTAINLY would NOT wire one up THAT way! My view was based on the thought that the INPUT would be connected to the intended locations. If you then turn the wiper to one or two turns, the you just get whatever voltage you see. The current is limited by wire size and load applied. I was primarily addressing the issue of "impedance". At 60 cycles, impedance doesn't "usually" get into the act unless a short-circuit situation is calculated and/or actually occurs. That is why circuit breakers are tested and built to do what they do.

Date: Sun, 19 Apr 2009 16:55:59 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Question about VARIAC

Connecting the entire set of windings to the input and dialing it down the the desired output voltage is "just" what it was built for. You WON'T go wrong that way. I've got a MONSTER Superior Variac that will run at LEAST thirty Amps.

Use it to dial down the line voltage to the BC-610 or the T-213. I get it back down to the "original" 110V that they want. Its wheel is as big as my lawn tractor's! It is also capable of going 240V hookup, with a somewhat reduced current load.

Date: Sun, 19 Apr 2009 17:00:31 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Question about VARIAC

If you connect the 120 VAC line across the complete, full winding of the Variac rather than the usual specified tap, the no-load impedance presented to the line by the Variac will be greater than if the Variac were connected to the line via the its tap. The higher impedance means less no-load line current (excitation current). No problem with that at all. Now as long as the current draw out of the Variac by the load is LESS than the general current rating for the Variac, all will be well. You may well be able to show that the whole package is more efficient because of the lower excitation current but that could be splitting hairs.

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and from the Collins refLector

Date: Tue, 25 Aug 2009 09:57:53 -0600
From: "Dr. Gerald N. Johnson" <geraldj@weather.net>
Subject: Re: [Collins] 516f-2 relay mod

> I used to put in that relay mod in power supplies, then I just went back to
> stock and plugged the p/s into a power strip and I use that to switch the
> rig on (leave switch on the KWM-2 on of course) and whatever else I want to
> come on with my vintage station. I have a wall wart connected to a small
> computer fan to cool the rig that comes on at the same time. Power strips
> are a dime a dozen. vs messing with a rewire of the 516F-2. Bob WA0VRC

Good point. Also in the last year, little single outlet switches that fit neatly between a two wire plug and receptacle have appeared on the market. One is made by Leviton. I've not yet seen that for three wire so the outlet strip is a better option. Outlet strips with totally flat faced receptacles tend to be poorly made inside using thin brass strip for the power conductors, while those with sculptured receptacle faces tend to be assembled from standard outlets connected by copper wires. At least for those in metal cases. The molded all plastic ones may not be as high a quality. Unfortunately the UL label is easily forged. I use outlet strips for my cordless phone base station, my computers, my cell phone charger, kitchen appliances, and my DVD player. So I can switch them completely off. My work benches were wired with master switches decades before outlet strips were made small but often use Wiremold outlet strips 6 or 8 feet long.

-- 73, Jerry, K0CQ, Technical Advisor to the CRA

Date: Sun, 30 Aug 2009 13:57:08 -0500
From: "Barry" <n4buq@knology.net>

Subject: [R-390] Transformer Rewinding

Anyone know anyone who does transformer rewinding? I bought a PACO cap checker with a bad power transformer. I may try it myself as I think it only needs two of the output windings replaced, but would prefer someone do this who has some experience.

Date: Sun, 30 Aug 2009 16:57:55 -0400
From: "Al Parker" <anchor@ec.rr.com>
Subject: Re: [R-390] Transformer Rewinding

Gary Brown, WZ1M, xfrmrs@roadrunner.com does a very good job, and has been resaonably priced. He's done at least 2 for me in the past.
http://tubes_tubes_tubes.tripod.com/tubestubestubes/index.html (usual disclaimer)

Date: Sun, 30 Aug 2009 16:20:29 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Transformer Rewinding

Yes, I've already emailed with Gary, but I can't justify that kind of cost for this inexpensive little capacitor checker. I bought it non-working for just under $15 not knowing what was wrong with it. It's in excellent physical shape, but the transformer is charred and I assume one or more of the large electrolytic caps are leaking badly which eventually burned up the transformer. There's room for individual transformers so if I can't rewind this one myself, I may try to find individual transformers.

Date: Mon, 31 Aug 2009 21:26:36 -0400
From: "Richard Spargur" <k3ui@comcast.net>
Subject: Re: [R-390] Transformer Rewinding

I had a power transformer built to spec to look just like one I had go bad. Phil at Heyboer did it for me quickly and fairly inexpensively. I will use them again if the need arises. There are others that can do good work. Phil at Heyboer simply did good work for me.

Heyboer Transformers
17382 Hayes St., Grand Haven, Michigan 49417
Phone: (616) 842-5830 Fax: (616) 842-3731

htovvp@charterinternet.com
http://heyboertransformers.com/

Date: Fri, 11 Sep 2009 20:58:26 -0500
From: <wb5uom@hughes.net>

Subject: Re: [R-390] Restoring my '390

I have not been in the R-390 arena as long as most of the rest of the group here, but I would like to say that I took Rick Mish's advice when I got my 390 back from him and it has not been off since. Now, I think that a player in this is the quality of AC going to the radio. Surges, spikes and what not can not be good on the rig. And out here in the country where I am, I have some interesting ac swings. Several years ago, before the R-390, I put in a inverter/charger with a good sized battery and have all of my radios and PC going thru it. I believe that good, stable power is a plus for the 390 and after 11,500 hours as I just calculated it, it is doing as well as the day I got it. Just my .01cents worth (as adjusted for todays economic times)

Date: Tue, 15 Sep 2009 15:47:42 -0500
From: <ka9egw@britewerkz.com>
Subject: Re: [R-390] [KA9EGW] s/n 4214 ANT RELAY

The selenium rectifier [less some of it's magic smoke, judging by the color of the paint on it] is under the audio chassis. Two wires going to it match the color of the two up by the ANT relay.

So...consensus, please? sand-state bridge, or fuhgeddaboudit? I can live with the noise from a silicon bridge, seeing as how it only has power when the radio is in STANDBY or CAL...in my case it would be useful to put it in CAL with WWV tuned in, and standby is not indicated due to B+ spiking in STANDBY if I understand correctly... <snip>

Date: Tue, 15 Sep 2009 19:35:44 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] [KA9EGW] s/n 4214 ANT RELAY

The choice here is a small old fashion terminal strip with 4 points. A 100 volt 1 amp solid state bridge being neater than 4 diodes. (or higher rating). A strip with a lug on the end and that stands up looks better. And may make the rewire cleaner. Put the bridge to the terminal strip first. Mount the strip to the old bolt hole used by the original stack. Move the wires from the stack to the new bridge. Reorder as needed. Add a Cap across the bridge if you feel the need.

Replacement stacks are available as NOS (not overly safe). These items do not last on the shelf like tubes do. Or more modern production near look alike and equivalent or higher rating.

Date: Sun, 18 Oct 2009 12:36:12 +0200
From: "Henry Meils" <meils@get2net.dk>
Subject: [R-390] QSK; standby reduced fil. voltage; separate B+ on/off

1. Does anyone have experience with an alternative idea for full QSK R-390A operation; ie. to avoid the clacking relay noise.

2. Was thinking of running always-on reduced standby filament voltage, especially on VFO - (full voltage when operating) for frequency stabilty and prolonged tube life. I understand that commercial broadcast stations run never-off full filament voltage on their PA tubes to prolong life time.

3. Adding a separate HV/B+ switch, maybe resistance stepped, so first reduced then full HV/B+ after filalment warm up (at full rated voltage). (would have to consider effect on tube contra CR rectifiers C when switching HV/B+ current load).

4. Just using an AC-line Variac without a HV disconnect can be detrimental when plate/sceen current flows before filaments hav reached proper temperature.

Date: Sun, 18 Oct 2009 07:03:57 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: Re: [R-390] QSK; standby reduced fil. voltage; separate B+ on/off

Get an old fashion TR switch like Johnson or B&W made, no modifications or changes to anything needed.

Date: Sun, 18 Oct 2009 22:19:59 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] QSK; standby reduced fil. voltage; separate B+ on/off

If you have an adjustable negative supply you can switch that onto the AGC line at the rear of the radio and it will quiet the receiver to the degree you want during your CW characters.

> 2. Was thinking of running always-on reduced standby filament
....

Do you mean during the times you are not using the receiver at all? (not reducing the filament voltage during on and off transmitter keying.) I would say that large transmitting tubes, at $1000 to $15000 each are very different things than your receiving tubes.

There is a phenomenon called "cathode interface" that occurs in tubes that stay in cutoff condition for long periods of time. "Computer rated" tubes such as the 5963 (like the 12AU7) were developed with special cathode coating composition to reduce this effect.

I am not sure if low filament voltage would cause this difficulty or not, BUT: I ran my Novice days ARC-5 receiver for some years on about half filament voltage all the time when it was not running. The radio came alive quite quickly when I turned it on, but I could not see any glow in the one tube that was glass. There seemed to be no harm. If you run your radio a lot (such as 3-4 hours each day) you may be better off running it all the time.

If you run it only some times, I suggest you put in in-rush current limiters, and use a bucking transformer to get 115 (or 230) volts.

Date: Mon, 19 Oct 2009 09:40:56 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] QSK; standby reduced fil. voltage; separate B+ on/off

My conclusion is that break-in or QSK meant something different to the military than it does to hams. Or maybe that relay is just a relic of some spec written early on but which could never have done a CW op any good. The clacking of the relays on every dit is just insane. The full break in solution for the 390A should be just the same as for any good ham QSK setup in the 50's or 60's: a tube or fast relay T/R switch outside the receiver with muting of the receiver by injecting AGC voltage on the back panel. I would never ever trust that clanky old relay in the 390A's antenna fitting to stop 100W or 1kW from getting into the 390A's front end.

>.........and prolonged tube life.....................

I honestly don't think you have to do anything to protect any of the tubes. These are not fragile tubes, they are mostly ARINC-rated tubes with robust filaments and support structures designed for aircraft or mobile operation. Perhaps the most fragile would be the 12AU7A, but you will note that the ARINC 5814A was used by the military instead. It is possible to measure VFO drift on warmup but I don't think that reduced standby filament voltage is any kind of solution to that.
As Roy pointed out, cathode poisoning could be possible if you had HV applied but no or low filament voltage. I think in-rush limiting has some value for the one component in the radio far more fragile than any of the tubes: the front panel power microswitch :-). If you want to do anything, just leave it in "on" all the time and switch power on/off externally via any means you have handy.

Date: Mon, 19 Oct 2009 17:45:09 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] QSK; standby reduced fil. voltage; separate B+ on/off

I use a sequencer for PTT lines - key the microphone and the sequencer pulls in the T/R relays which connect the TX to the antenna, ground the RX input, mute the RX using its break in relay, THEN, 200 milliseconds later, it keys the transmitter (my Viking II is the civil defense version which has PTT). Letting the mic go reverses the process with the same 200 msec delay. I use an inrush limiter but its in a second box with the stereo product detectors. The 390A plugs into this box and uses its power switch.

Date: Mon, 26 Oct 2009 13:46:41 +0300
From: Sheldon Daitch <sdaitch@kuw.ibb.gov>
Subject: Re: [R-390] QSK; standby reduced fil. voltage; separate B+ on/off

There are two aspects involved with either full or partial filament voltage operation for high power broadcast transmitters which come into play. Very high power tubes, 100kW plate dissipation and larger, have quite high cold filament inrush currents, sometimes limited only by the impedance of the filament power supply. Those high currents may cause movement of the filament strands of large tubes. The second issue involves the expansion and contraction differentials of the filament structure in very high power tubes, differences in the expansion of the filament structure and the filament support structure. With repeated filament on-off cycles this can cause the filament structure to stretch and then the filament strands can break, causing grid to filament shorts.

Some newer transmitters do have ramp up filament voltage control systems, and some also have provisions for reduced filament voltage during standby periods, called black heat. See: http://www.contelec.com/pdf%5Camfmaint.pdf Reduced filament voltage operation should be used for thoriated tungsten emitters only and does not apply to oxide cathode-type tubes. With the very large and expensive tubes, it is simply a tradeoff of power consumption during off times vs the reduction in tube life.

Date: Sat, 7 Nov 2009 15:51:13 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: [R-390] re; R211

I am in the process of going through the RF deck on my 1952 Collins R390A. The first thing that struck me was the chassis darkening in the subcompartment under HR202. As we know the heater is *on* all the time, cooking the Xtals. All the small components there showed the effects of lots heat with runny wax on the micas and darkened ceramic disc bypasses. <snip>

Date: Sat, 7 Nov 2009 16:15:05 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>

Subject: Re: [R-390] re; R211

Don't think the signs of overheating are cause by high VAC to the heating element, other circuits would also be screaming. Have you put a thermocouple between the hold down strap and HR202. Could be a stuck thermostat, I believe looking at the drawing there is one built into HR202.......... <snip>

Date: Sun, 08 Nov 2009 00:28:50 +0000
From: 22hornet@gmail.com
Subject: Re: [R-390] re; R211

I always though in order to prevent frying the crystal you have to turn the heater off. That was one of the first things I learned when I got my R390A

Date: Sat, 7 Nov 2009 17:20:38 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] re; R211

At least for the R-390A, turning the heater switch off, located on the back panel; only turns off the heater for the PTO & crystal oscillator deck.

HR202 should control at about 75 degrees C the entire time which the receiver is on.

Date: Sat, 7 Nov 2009 19:21:26 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] re; R211

Naa.. it's the PTO heater we turn off to keep from further shrinking important stuff in there...it's not needed. I think most are still running the crystal Osc. heaters though...

Date: Sat, 7 Nov 2009 17:24:14 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] re; R211

Forgot to add the two crystals in HR202 are meant to operated at or near 75 degrees C. Some have used the 17MHz crystal from the crystal oscillator decks, but I believe there are different specs for each.

Date: Sat, 7 Nov 2009 20:26:56 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] re; R211

> I am in the process of going through the RF deck on my 1952 Collins

> R390A. The first thing that struck me was the chassis darkening in
> the subcompartment under HR202. As we know the heater is *on* all
> the time,

That heater is running all the time, but should not be engaged by the thermostat all the time. It should cycle on and off. A clever fellow would dope out the oven contacts, and/or devise a little indicator circuit to monitor that thing. If the thermostat fails stuck on, the crystal will get too hot. Most/all ovens of that size take 6 to 7 watts of power, so at 6.3 volts an amp is running the heater when it's on. I'd like a little LED to be nearby telling me if the thing is actually cyclling.

Date: Sat, 7 Nov 2009 17:50:36 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] re; R211

Since the unit currently lives in a benign environment, I decided just to disable the 6.3VAC line to HR202. It could always be hooked up again by another owner. Good idea of an LED indicator though.

Date: Sat, 7 Nov 2009 18:11:53 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] re; R211

You should be able to hear the thermostat on HR202 cycling on and off during operation, it might be loud enough to be annoying. It should make a clink or ping near the right-rear corner. I'm not saying they are all audible but most probably are.

Date: Sat, 7 Nov 2009 18:21:43 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] re; R211

Good point. However, I think that I have the correct R211 since it lives in the same sub-compartment as the stuff around HR202, V207 etc and connects to T207 The Y2K maual shows a single 8.2K in the RF deck, and a single 82K as well. R203 is indeed 82K and goes to pin6 of V201, and is another subcompartment. My RF performance is below par... and now this may have been the problem (low plate voltage to V207, the first Xtal osc).

Insofar as measuring cycling of HR202 and its temperature, I confess to not being strictly scientific by NOT measuring cycling times and temperatures before I pulled the deck out.

Frankly, I did not expect to see signs of overheating anywhere when I pulled the deck. I do know that can was very hot during operation. Just did not make the connection......

Date: Sun, 8 Nov 2009 05:16:21 +0000 (UTC)
From: odyslim@comcast.net
Subject: [R-390] another crystal question

I have a couple of radios that seem to have a problem with the crystal oscillator overheating. I have reason to believe the switch is not good and keeping the ovens on 24/7. Has anyone experienced a very hot cover on the crystal oscillator even with the oven in the off position? Is it ok to snip the wire going to the switch or will that cause other problems. The cover is not just warm. It is almost hot enough to burn the skin.

Date: Sun, 8 Nov 2009 00:32:11 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] another crystal question

I suggest you usolder one or both of the wires going to the crystal oscillator heater. It sure sounds to me that the thermostat is stuck shut. It should be simple enough to see if the OVENS switch is working or if it is stuck in the on position, too. Most folks turn that switch OFF (it's on the back of the radio.) That should remove power from the PTO and the crystal oscillator oven heaters.

Date: Sat, 7 Nov 2009 20:35:51 EST
From: DJED1@aol.com
Subject: Re: [R-390] re; R211

<snip>.............. As others have noted, the oven for the calibrator and 17 Mc oscillator runs continuously. Maybe it is overheating though. Let us know what you find out.

Date: Sat, 7 Nov 2009 17:44:25 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] R211

I think that you may very well be correct, the local effects of overheating belie another mechanism, since all the other compartments look pristine. Maybe the HR202 *ran* away some time in the past. Anyway, all the functionality was there before... have to check out that particular area meticulously. I disabled that oven seeing as how my operating environment is very benign: being between 65 and 85 degrees with 40% humidity. ..... <snip>

Date: Sun, 8 Nov 2009 12:46:28 EST
From: Flowertime01@wmconnect.com

Subject: Re: [R-390] another crystal question

After 50 years we could expect a thermostat switch to go bad and fuse shut. The covers should not be hotter than you would want to touch. The cover should run cooler than the 6AK5 tubes. More like a 5814 tube temp. Just a 40 year old subjective memory. For sure you can clip the wire and run with the oven off. The crystals may be off a few 100 hertz after not warming up to full temp. But the receiver will work and can be aligned to operate with what ever frequency you do get from them.
Roger Ruszkowski AI4NI

Date: Sun, 8 Nov 2009 13:03:58 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] re; R211

The oven may have stuck on some where in life and toasted things in that corner of the deck.

Running the 2 crystal oven without heat would be OK. Not as great as with heat but the receiver will stabilize at some temperature and operate well. You can then align the receiver to whatever the crystals want to operate at without extra heat.

R211 is a plate resistor for V207 first crystal osc. Figure 5 page 21 shows the resistor as 8.2 K. You could be looking at a paint color change on an old resistor. Or a cooked resistor. Or a receiver that was built wrong and you are the first person to ever look at the real problem for its weak performance.

I would go with a 8.2K resistor in the circuit as shown at least twice in the R390A TM and the Y2K manual as derived from the Navy publication. 8.2K is more in line with the mixer resistors than 82K.

I think all the R390A's will show the deck under the crystal heaters to be somewhat toasted.

Other areas that show toasting are likely from a tube that went bad and caused excess current to flow. I would examine the resistors in all the toasted areas to see if any are out of specification. Heaters toasting areas can mask other problems that may have occurred.   Roger Ruszkowski AI4NI

Date: Fri, 8 Jan 2010 10:24:45 -0800 (PST)
From: Steve Toth <stoth47@yahoo.com>
Subject: [R-390] EAC power hum

Just powered up a late model EAC I purchased and it has a loud mechanical hum when cold. It's a complete EAC with all EAC decks. I compared it with my Collins and Motorola and it is much louder than either one.

I looked through the "Pearls" and used an insulated screwdriver to listen to components and the hum seems to be coming from the transformer (to a lesser extent) and the line power filter (to a greater extent). The 25Z5's both check good on the TV-7 with no shorts. I haven't checked the rest of the tubes yet. I also haven't swapped the power deck from either of the other receivers yet.

I loosened up the six power supply mounting screws and that did seem to decrease the hum level to an almost acceptable level by apparently reducing the sound conduction from the power supply to the chassis, but I'm not real keen on the idea of leaving the mounting screws loose.

What has been found to be an acceptable way of decreasing the sound conductivity and retaining the mounting and grounding integrity on the power supply?

I would like to keep all the decks EAC. What has the group decided is the best cure?? IEC approved line filter? (don't flame me on that one) Different power supply module Replace the power transformer?

Or, just live with it - Hey!, it's an EAC!?.

Date: Fri, 8 Jan 2010 10:54:32 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] EAC power hum

First thought which comes to mind, the filter caps in the power supply are old, dried out, need replaced, etc. Which leads to the issue of to replace, reform and that stuff. Nuff said there. Could be issues with the line filter, but it is easy to bypass or remove it from the receiver and see if the hum is less or goes away.

Date: Fri, 8 Jan 2010 14:57:57 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] EAC power hum

EAC Power Supplies (bot all of them) have a well documented mechanical hum. Insulate the hold down screws, or leave them loose. Short of anything else, replace it.

Date: Fri, 8 Jan 2010 16:13:55 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>

Subject: Re: [R-390] EAC power hum

Put washers under the transformer at the green screw locations. That will lift the transformer away from the chassis. As per Nolan Lee.

Date: Sat, 9 Jan 2010 13:50:23 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] EAC power hum

You can keep the radio EAC, just replace the transformer with one off of a different deck. The transformers all come from the same place. For all intents and purposes the deck will still be EAC, just with a transformer off of another deck. Keep the old transformer in case the new(er) one fails. You can buy a R-390A power supply deck off of Ebay for around $30-50. I will not go into the folks who just part-out R-390A's because their value as parts is greater than their value as a radio but it does happen. Through this method I have picked up enough spare parts to build a new radio (except for the chassis).

I assume we are speaking about a mechanical hum that is coming from the transformer core/windings being loose in the hermetically sealed case. If the sound is really pronounced then I would expect that there is some sort of looseness within the transformer where the laminations are coming apart or the bobbin is loose on the laminations or the entire transformer is loose in the case. These are supposed to be potted but the potting may have dried out over the years or just deteriorated from the heat. This transformer will probably fail (eventually) when a winding breaks or the eddy currents from the loose laminations cause an increase in heating. In the long run, all components fail so this is a very subjective thing when we are talking about radios that are 40-60 years old.

As far as changing out the line filter, I replaced mine with a hospital grade Corcom line filter with much better isolation characteristics than anything that can be in the radio. With all of the computers, cheap fluorescent light fixtures and other electronic-noise-generating devices in our modern world you can do the radio a favor by eliminating some of that coming in on the power line. While you are at it, put a good MOV on the incoming AC, a CL90 to lower the line voltage a bit and to give the radio a "soft start" and if the radio does not have it yet, put a B+ fuse in. All of the work is in the same part of the radio. I have not added an IEC compliant plug on the back of my radio. I just really do not want to take a chassis nibbler to the back of the radio.

Date: Sat, 9 Jan 2010 14:46:10 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] EAC power hum

This can be done without hacking the rear panel (at least on an R390A). I made some simple aluminum adapter plates that allowed a Corcom (or equiv.) filter to be mounted inside the rear panel. It helped to extend the rounding on the edges of the IEC end of the cable beyond the factory-made length because it lets the plug enter the filter just a bit further, but that was not a big deal (and would work okay even without doing that). Having a 90-degree IEC plug on the rear of the radio was kind of nice.

Date: Sun, 10 Jan 2010 09:51:48 -0500
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] EAC power hum

My 63 Imperial had hum coming from the power transformer. It was vibrating the PTO slug causing a low hum on received signals. The fix was to very loosely mount the power supply. I don't know this for a fact, but there is probably a chassis ground wire within the power supply cable. This same transformer also had the tar potting short out at the high tension winding ceramic feed-thru bushings.

Date: Mon, 11 Jan 2010 08:24:49 -0800 (PST)
From: Steve Toth <stoth47@yahoo.com>
Subject: [R-390] EAC Power hum

Thanks for all the replies on how to resolve this - both on the reflector and off list. Great input and pointers from past experience!

Date: Mon, 11 Jan 2010 10:47:37 -0800 (PST)
From: Steve Toth <stoth47@yahoo.com>
Subject: [R-390] EAC Power hum - resolved

Turned out to be the power transformer. I swapped in the power deck from my "yet to be restored" Imperial/Stewart Warner and the EAC was dead quiet. Anybody have a good non-EAC power transformer they want to part with If not, it looks like Fair Radio is going to get some business in the near future. Note of interest:? when I swapped in the other power deck, I noticed it an older style rectifier diodes installed (possibly a field mod/upgrade) but it still had the 26Z5's mounted in the sockets. Has anybody seen this before. Seems redundant, but apparently still works OK. I didn't check the diodes to see if they were OK.

Date: Mon, 11 Jan 2010 13:54:12 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] EAC Power hum - resolved

The diode mod is one of the modifications that was put out prior to the radios going surplus. However, part of the mod was to "squeeze" the stub of the tube cover that is part of the socket so that the tubes could not be put in. Someone did a "half" job.

Date: Tue, 12 Jan 2010 03:05:36 -0600
From: "Don Reaves" <don@reatek.com>
Subject: [R-390] Power Cable Hack

I use $2 computer pigtail extensions - female to male IEC cables, short as I can get 'em to attach to the back of my receivers. These pigtails are usually 1, 4.5 or 6 ft in length and were designed for computer and monitor power cable extensions(IEC-320-C14 to IEC-320-C13). I cut the cable and use about 6 inches of cable on the male end wired directly to the terminal strip of the R-390A, or to the appropriate screw on connector for the R-390/391/389. This works for other older gear too, especially military gear. This allows quick power line disconnects for moving or maintenance, I don't have to deal with dangling power cables or unscrewing clumsy connectors, and I can use a standard, ubiquitous business machine power cable of appropriate length to suit my rack, cabinet, or desktop. No hacksaw, drills, or nibblers required.

Here's one prepared for my R-389:
http://militaryradio.com/Images/Cable/R390-IEC.jpg

Here is one extension cable source:
http://www.mpja.com/prodinfo.asp?number=18042+CB
There must be thousands of places to buy these.

Date: Tue, 12 Jan 2010 09:21:14 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Power Cable Hack

That's a good idea, but it doesn't solve the problem with the leaky line filters. The solution I used replaced the old filter with a modern, IEC-based line filter that uses the existing bolt/screws with no hacking required (just soldering).

Date: Tue, 12 Jan 2010 10:35:59 -0600
From: "Don Reaves" <don@reatek.com>
Subject: Re: [R-390] Power Cable Hack

Agreed, it's not a fix for anything other than my convenience. <grin>

Date: Wed, 17 Feb 2010 11:56:06 -0600
From: Gary Harmon <k5jwkgary@gmail.com>
Subject: [R-390] R-390 Problem

My Collins R-390 (non A) has a strange problem. If the line voltage drop below 120 volts, the signal goes away but audio rush remains. Kick the line voltage back up to 121 and the signals return. The 180 volts does not change in either situation. All tubes in the power supply and audio modules have been replaced with tested tubes. Additionally, when you turn on the radio from a cold start, it take about a minute for the signals to apprear. Thoughts anyone?

Date: Wed, 17 Feb 2010 12:34:41 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] R-390 Problem

Oscillator(s) quitting when the voltage drops? Hinky 3TF7? Try shooting the voltages out of the power supply to the PTO, for a start. I think. Someone else may have a better idea; I won't be surprised. Does this happen on all bands, or just some? At both ends of the PTO range and in the middle, or only in certain spots?

Date: Wed, 17 Feb 2010 19:30:29 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 Problem

Easy one first, Young man having a tube receiver warm up in about a minute is normal. It ain't a transistor you know. Warm up use to be part of all receiver and transmitter operation. I do not think the 120 volts is the magic point. Things that come to mind: In all of these, you reach a strike point where the power will flash across the open and the circuit then goes into conduction and the receiver "appears" to work.

Tube filaments open filament eye ball all the tubes in the dark.
Crud in a connector or tube socket
Cold solder joint
Failing cap.

Turn the radio on and just leave it on. At some point the problem will fall apart and make it easy to find the problem. Thump the receiver on the bench a couple times. Pick it up 4 inches and let it free fall back to the bench squarely. If you know your receiver knobology sequence, you should be able to front panel the problem down to a specific tube stage or two tubes. I believe that sequence is in the Pearls Of Wisdom. But you need to learn it before your receiver goes south so you have some idea of what your trying to hear when you spin a front panel knob from stop to stop. As a memory aid you can read the sequence off the schematic from head phones back to antenna.

Stick with it. these are in fact common problems. Do not let the way you stumbled onto the problem miss lead you into thinking you have some real exotic problem.

Interesting as it may be, It is just another receiver problem. Yesterday it worked, Today it does not work. Someone thing has gone wrong. While locating the problem, do no harm. Find and fix the problem.

Date: Fri, 19 Feb 2010 10:26:56 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R-390 Problem

Antenna relay dropping out due to tired rectifier?

Date: Sun, 04 Apr 2010 10:31:10 -0400
From: k2cby <k2cby@optonline.net>
Subject: [R-390] Need AC power cords with round chassis

I've bought these in the recent past from Mouser.
Hewlett Packard used these a lot.

Mouser Part #: 686-17952
Manufacturer Part #: 17952 8 B1
Manufacturer: Volex
Description: AC Power Cords 8' 18AWG 7A NON-STD

They are presently not stocked with a 2-week backorder time. NOTE! Be careful to check the pinout. Two versions were made with the ground on different pins. It may be necessary to rewire the receptacle.

Date: Sun, 4 Apr 2010 09:31:59 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] Need AC power cords with round chassis...

Good point. You just can not trust that any AC cord will be wired correctly. IMHO the ubiquitous *computer cords* are OK. I suggest that one should *ohm-out* any AC input cables from the male AC input spades. The smaller one is *hot* and the wider spade is *neutral*.In the past, I remarked on how you must check on how F101 is wired on the R390A chassis. In one case, the previous owner got confused when he installed a 3-wire AC cord. I found that the neutral went to the microswitch and the hot lead went straight to T801. This may seem elementary to most, but nothing takes the place of safety. Oops! I erred in my last post... what I meant to say was that the *hot* AC from F101 should go to F101 (3A fuse) before it goes onto S102. Sorry.

Date: Sun, 4 Apr 2010 11:41:36 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Need AC power cords with round chassis

This is the rectangular (flat) connector with 3 round pins for line power that has rounded ends, predating the connector that is standard for computers. The safety ground is always the middle pin. Hot and neutral may be swapped. This usually didn't make any difference to the equipment. It depends on how power was routed to the power switch and the sensitivity of the instrument to power line hum. At least, that's been my experience.

Date: Sun, 4 Apr 2010 13:33:43 -0400
From: "Al Parker" <anchor@ec.rr.com>
Subject: Re: [R-390] Need AC power cords with round chassis

IIRC, there are 2 similar but non-compatible "3 round pin" connectors, I think I've got one type on some older test eqt, like Boonton, plus the other on later HP stuff. Not sure if HP may have used both at different times. As usual, I can't find the proper one when I need it, don't have enuf for every piece of equipment.

Date: Sun, 04 Apr 2010 15:14:57 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] Need AC power cords with round chassis

I bought the test equipment style at ACE here in Houston. Here is a link to their store, mostly new stuff but they have a large selection of new old stock as well ...

http://www.ace4parts.com/Default.aspx

Date: Fri, 4 Jun 2010 20:02:00 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Line Filter

I use a Corcom 6EHQ1 medical grade line filter. You can find them on eBay for about $20 each.

The insertion loss looks like;

Line-Ground:

24 dB 10 KHz	29 dB 20 KHz	39 dB 50 KHz	42 dB 150 KHz
28 dB 500 KHz	35 dB 1 MHz	36 dB 2 MHz	30 dB 5 MHz
24 dB 10 MHz	16 dB 20 MHz	15 dB 30 MHz	

Line-Line:

6 dB 10 KHz	10 dB 20 KHz	43 dB 50 KHz	70 dB 150 KHz
75 dB 500 KHz - 2 MHz			
65 dB 5 MHz	55 dB 10 MHz	50 dB 20 MHz	40 dB 30 MHz

The data sheet is at http://www.corcom.com/Series/Medical/HQ/ Getting an old line filter means that the caps in the filter are also old and probably leaky. You will end up with an inferior filter that may have the same problems as what you are replacing. I had a problem with the radio tripping out the GFCI, after I replaced the line filter that problem went away.

Date: Fri, 4 Jun 2010 20:11:46 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Line Filter

What Tisha said...........works well for the SP-600 too!

Date: Tue, 3 Aug 2010 14:01:50 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] OT: Humbug transformer

I've been working on a low-voltage power supply for a while now and am getting to the final assembly stages.

When I bought the transformer for the project, I noticed it had a bit of 60-cycle vibration (hum). I wanted to avoid the cabinet from becoming a sounding board for the hum so I isolated the transformer on a series of neoprene cushions (sink washers) to both provide a little shock mouting and to minimize the contact area the transformer mounts make with the cabinet. The cabinet, by the way, is constructed from solid 3/4" red oak. Last night was the first time I was able to test the mounted transformer and sadly there's still a considerable amount of hum. It doesn't appear its a sympathetic vibration carried through the mounts to the cabinet but simply the transformer itself sitting there free to vibrate. Is there any sage advice to cutting down on the hum? Perhaps since the cabinet is very solid, I should have gone the other way and clamped it tightly to the cabinet and the cabinet would absorb the vibrations? I realize it's a long shot and I'm either stuck with the hum or replacing the transformer but just thought I'd ask.

BTW, this is an open-frame style transformer.

Date: Tue, 3 Aug 2010 14:47:43 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] OT: Humbug transformer

Back in my transformer-rewinding youth, hum of this kind was supposed to cured by varnishing everything into place.

If you have the pumps and equipment, vacuum impregnation is the best way to make sure the varnish gets into every nook and cranny. I never had anything that fancy! Second best was "dip and bake". If you know someone at a local motor rewinding shop, they can probably help you dip and bake. Simply brushing on varnish is unlikely to do any good IME. Meaning I tried it and it didn't work.

Date: Tue, 3 Aug 2010 13:36:00 -0500
From: "LEE BAHR" <pulsarxp@embarqmail.com>
Subject: Re: [R-390] OT: Humbug transformer

1. Shim the core from the laminations with an oak shim if the vibration is there.

2. Remove end bells and hi-pot the transformer (take it to a rewinder. Hi-potting is like using a pressure cooker). Or just submerge the transformer in a bucket of polyurethane for a few days so the poly gets into all the cracks. Hopefully it will attach the loose wires to the paper above and below it. It will also attach the core to the laminations. Then dry out and reassemble.

If the transformer is buzzing and there are loose windings, they eventually will act as a saw and eat up the paper insulation and eventually short out from turn to turn and or from winding layer to winding layer.

Date: Tue, 03 Aug 2010 15:17:45 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] OT: Humbug transformer

I'd get a replacement from Fair Radio, or one of the list members.

All the ideas of soaking it in varnish, shimming it, and the like will NOT work with a "sealed" transformer. Those of which go into R-390s and R-390As ARE indeed sealed.

Date: Tue, 3 Aug 2010 14:26:53 -0500
From: "LEE BAHR" <pulsarxp@embarqmail.com>
Subject: Re: [R-390] OT: Humbug transformer

Yes, sorry vacuum impregnating. Thanks.

Date: Tue, 3 Aug 2010 14:39:17 -0500

From: "LEE BAHR" <pulsarxp@embarqmail.com>
Subject: Re: [R-390] OT: Humbug transformer

This doesn't sound like a transformer for a R-390 to me I think it's a plain transformer. Have no idea how big it is.

Date: Tue, 03 Aug 2010 15:44:34 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] OT: Humbug transformer

My mistake! I'm so used to Barry and R-39Xs that I didn't read down to where it is an open frame transformer. Ah, let's call it a "senior" moment?

Date: Tue, 3 Aug 2010 12:54:35 -0700 (PDT)
From: Terrence Harvey <terrencelharvey@yahoo.com>
Subject: [R-390] AC power supply to retrofit noisy dynamotor in ARR-41

Haven't posted in some time and hope this query isn' too far off the R390A track. I just acquired subject receiver and would like to do a quality?retrofit of an AC line powered HV?supply in place of the onboard 28vdc dynamotor supply. Does any one have such to sell or can you provide? plans for same?? I see sets on epay occasionally that claim AC powered instead of the dynamotor unit. Any help or suggestions will be much appreciated.

Date: Tue, 3 Aug 2010 15:54:16 -0500
From: "LEE BAHR" <pulsarxp@embarqmail.com>
Subject: Re: [R-390] OT: Humbug transformer

I guess we need to wait and see. He really didn't say. So anyone could be correct.

Date: Tue, 3 Aug 2010 17:06:29 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] OT: Humbug transformer

No, this is not a transformer for an R390A. It is an open-frame style made by Signal Transformer Company. It has dual primaries and 3 low-voltage outputs (approximately 12v, 15v, and 20v - I forget the exact voltages). It sounds like it can be fixed via a proper varnishing. It is about 1/2 the size of an R-390A transformer. The construction and mounting are similar to the ones shown in the following link (except the windings are not exposed and there are lead wires coming from underneath the tape):
http://www.signaltransformer.com/sites/all/pdf/A41.pdf
Thanks again guys,

Date: Tue, 03 Aug 2010 17:51:47 -0400

From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] OT: Humbug transformer

Try an electrical supply house. Try and get the 3M's (or its GE's), Formvar Varnish. It is a high voltage varnish for transformers and generators.

Date: Tue, 3 Aug 2010 21:39:40 -0400 (EDT)
From: L L bahr <pulsarxp@embarqmail.com>
Subject: Re: [R-390] OT: Humbug transformer

I would buy a gallon of marine grade polyurethane,open the can and drop the whole thing in there and put the can lid back on. Let it sit in there for a few days. Maybe even shake the can from time to time to help shake the bubbles out of it. This is not as good as having it in a vacuum, but I bet it solves your problem. Then, a few days later remove it from the can and let it bake in the sun for a few days. An oven would work if you don't have a high temp, but the fumes may not be acceptable to the XYL. An oven would speed up the process. Then when you want to use the transformer, you will have to scrape the poly off the solder terminals. I usually hang the transformer outside on an old coat hanger and let the poly just drip off of it at an angle the drip will look good once hard. If it is just a loose bobbin in the iron core and not vibrating windings, then all you would have to do is drive a small wood wedge in between the bobbin and the iron core stack. Sometimes a wedge is needed on both sides and sometimes just on one side. You will have to determine what is causing the buzz. Is it the core and bobbin, or wires within the bobbin?

Date: Tue, 03 Aug 2010 21:13:02 -0500
From: Gary Pewitt <garypewitt@centurytel.net>
Subject: Re: [R-390] OT: Humbug transformer

Before you do anything else try tightening the screws. 73 Gary N9ZSV

Date: Wed, 4 Aug 2010 11:35:25 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Polyurethane

While you are at it, use the polyurethane on the deck... It may get you out of hot water with your XYL for bending up a coat-hangar.

Date: Thu, 12 Nov 2009 11:21:12 +0000 (GMT)
From: Robin Filby <robin.filby@yahoo.co.uk>
Subject: [R-390] Weber copper cap rectifiers

I know this is slightly off the R-390 thread. I am thinking of purchasing a couple of WZ34 Weber copper cap rectifiers for the Racal RA17 receiver

orders@weberorders.com
Has anybody had any experience of using these copper cap rectifiers??
,snip>

Date: Thu, 12 Nov 2009 08:18:10 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: Re: [R-390] Weber copper cap rectifiers

I have used the Weber Copper Top rectifiers in my R-390 for several years with no problems.

Date: Thu, 12 Nov 2009 07:43:10 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Weber copper cap rectifiers

Installed one in an HQ-180 several years ago. Does what it's supposed to.

Date: Sun, 12 Sep 2010 12:23:39 -0400
From: Jim Sorenson <kjsorenson@gmail.com>
Subject: [R-390] R-390a AC Power Switch

Could someone kindly point me toward a current source for the replacement of the R390A AC power switch. My version has the following printed on it:

ACRO Switch   224 1624-00 IMD1 1A

I see that the previous owner replaced this switch, one of the only fixes or mods in the unit. The power supply had been converted to solid state though.

Date: Sun, 12 Sep 2010 10:07:35 -0700
From: "Craig C Heaton" <wd8kdg@att.net>
Subject: Re: [R-390] R-390a AC Power Switch

Fair Radio...........

Date: Sun, 12 Sep 2010 13:57:42 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Micro Switch

The switch is available on ePain, Item # 200498924064

The price is a premium. I have a spare switch already and think that there are probably other micro-switches available that would fit into that form-factor with a higher current rating. If I had the time I would find a better replacement as I have a collection of similar devices that are used as limit switches on industrial automation systems (even screwdriver antennas).

If you add a CL-90 inrush current limiter in series between the switch and the power transformer you will significantly increase the life-expectancy of that switch as the big spike while switching the rig on will be attenuated.

Date: Mon, 13 Sep 2010 18:33:48 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390a AC Power Switch

The micro switch in the R390 and R390/A have been problems since day two. Your switch has likely been replaced more than once. You can give them a bath and clean them out. This may or may not fix it. The switch is a fairly standard design and size and still in production. Someone may have already sent you a source for the part.

Date: Sat, 18 Dec 2010 11:20:43 -0500
From: "Jim" <jbrannig@verizon.net>
Subject: [R-390] ON/off switch

My on/off switch is ON. This happened a while ago, but it "got better" Does anyone know the part number of the microswitch? or a source?

Date: Sat, 18 Dec 2010 10:40:18 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] ON/off switch

I hate to sound like a "shill" for Hank Arney, but he has NOS switches. hankarn@pacbell.net

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Date: Sat, 18 Dec 2010 10:52:56 -0600 (CST)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] ON/off switch

I got a couple of them from Fair Radio a while back. When replacing the switch it would be a good idea to put a spark suppressor across the contacts so it doesn't weld them again.

Date: Thu, 20 Jan 2011 17:52:52 -0500
From: "mako26" <mako26@shentel.net>
Subject: [R-390] R-390a Question

I have a 1967 EAC R-390a that the A/C line transformer (FL-101) has failed and i was wondering if anyone might know where i could find a

replacement.

Date: Thu, 20 Jan 2011 18:04:28 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R-390a Question

I believe you mean T-801?
FL-xxx is a filter designation.

Date: Thu, 20 Jan 2011 18:15:18 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R-390a Question

If it is indeed T-801, try Fair Radio:

<https://www.fairradio.com/catalog.php?mode=viewitem&item=286:1892:-:5448:-:297:298:295:296:299:-:287:289:5428:290:291:5697:-:292:293:294:-:300:301:302:305:306:307:308:5410:315:309:310:5621:-:311:312:-:313:314:-:4725:4688:4692>

Date: Thu, 20 Jan 2011 19:00:45 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390a Question

Well, he might have been referring to FL-101 and simply called it a transformer. The inductors do resemble a transformer on the schematic...

Date: Sun, 20 Feb 2011 15:27:06 -0600
From: Don Reaves <donreaves@gmail.com>
Subject: [R-390] Plug in caps

Has anyone tried the replacement plug in electrolytics from Hayseed?
http://www.hayseedhamfest.com/capkit.htm

Date: Sun, 20 Feb 2011 17:09:59 -0500
From: Al Parker <anchor@ec.rr.com>
Subject: Re: [R-390] Plug in caps

A lot of Drake guys are getting his twistlock cans for their stuff. Have only heard good things.

Date: Sun, 20 Feb 2011 19:03:44 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Voltage Reduction Scheme

Quote: "The addition of an external bucking transformer comes to mind as

a
wise thing with the power companies pushing line voltages up into the near
130VAC range to keep from replacing all that wire to carry the load."

You will see in the immediate future, electrical utilities being pressured to optimize their systems and to place their tap-changers on an active control system for voltage reduction. Many of the utilities that I am working with today are trying to actively manage their voltage distribution schemes. The thought once was to figure out the maximum sag that would be present on a distribution line and to set the substation tap changers to a semi-fixed position to avoid a brownout condition. Now the emphasis is on finer control of distribution voltages so you will see less of a min/max change in line voltages.

The same thing is true of capacitor banks to manage reactive power. Many were on a TOD (time of day) setting, now they are being moved to active control tied into the power factor at the distribution substation. Transmission and generation facilities want the distribution (your local electric utility) to fit into a narrower range of power-factor values with penalties if it is too far off.

I have been involved in a few analyses of distribution system losses. In some cases they can be as high as 8-12%. For a utility to reduce it down to 4-6% can save them millions of dollars in a year. Moving to active control ends up being something that has a ROI (return on investment) of 2-3 years. That also goes back to feeder monitoring so when they do need to make line change-outs on the distribution system they are working on circuits with the greatest % of losses and the utility can see the greatest bang for the buck.

That is where the communications part of my job comes in. Something that they once were happy to monitor once or twice a day they now want updated every few minutes. It requires fiber-optic communications networks, IEC61850 substation networks and Ethernet speed radio systems.

Date: Tue, 22 Feb 2011 13:32:10 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Voltage Reduction Scheme

With hybrid or battery-only vehicles becoming more common, loads from charging them are now beginning to be examined by utilities, and they don't like what they see. There's an article on p. 23 of the latest ECN (http://www.ecnmag.com/) titled "Challenges of charging plug-in hybrid electric vehicles" that is worth reading. The author says that every vehicle being charged at Level-2 specs adds a load equivalent to 1 to 3 houses for the duration of the charge. That's going to heat up a pole pig PDQ.

> The same thing is true of capacitor banks to manage reactive power.
<snp>

I've seen the effects of our local powerco changing transformer taps and/or doing power-factor correction changes during the day. That was a major reason for our getting a 100 KW UPS for our datacenter at work. Before the UPS, every little glitch would knock the mainframe and some number of servers right down. After the UPS, I get an E-mail message when the powerco decides to do the nasty, but things stay up.

> I have been involved in a few analyses of distribution system losses.<snip>

Car charging is going to make for some really interesting copper losses. All of this, of course, will make for interesting voltage excursions at the wall socket if it isn't kept well under control. Maybe a 3TF7 or other voltage regulator will turn out to be useful. ;=)

Date: Tue, 8 Mar 2011 12:11:44 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R-390 Digest, Vol 83, Issue 19

*Always a nice idea to put a fuse on the B+ so a bad cap does not roast a choke or the power transformer. Good idea to go through and look at those can electrolytics on the audio deck as well. <snip>

> Diode mod to replace the 26Z5's.

Just remember what happens to the B+ with a solid stated replacement of the 26Z5 tubes. You probably do not want to leave the radio in the standby mode unless you like to stress test the B+ caps and a bunch of tubes with high B+ voltages. Had an idea to use a MOV and load resistor to limit the B+ excursions with a shunt type regulator.

Date: Tue, 30 Jul 2002 19:11:33 -0500
Subject: Re: [R-390] R-390 Power-on micro switch
From: blw <ba.williams@charter.net>

> I leave my FUNCTION switch on MGC and turn it on and off with the switch on the power panel that has a metered variac on the back,....... YES, I use a variac
> and I don't care who knows it!!> Joe

Same here until I take it out of the rack and drop the front panel. I've thought of using the stick method to tap the switch but using the variac is okay for now. I'm running it at 110 volts.

Date: Tue, 30 Jul 2002 20:47:20 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] R-390 Power-on micro switch

Way to go! My procedure exactly. I leave the R-390A's Function on all the time and power the rig up or down with the Variac as needed. In the rack, below the receiver, is a homebrew AC power supply consisting of the Variac, AC voltmeter, and elapsed time meter, pilot light and AC power switch. It looks cool and the ritual is so automatic, it would feel odd to power up otherwise-- like not automatically buckling up when getting in the car. Since there is no AC surge, I've changed the main AC fuse from 3 amp to 2 amp so as to obtain tighter protection. I've had no fuse failure to date after three years. BTW, the ovens are left "off." None of us runs the receiver with the ovens "on" anyway, right? OK, Joe, we've kicked the beehive again! :-)

Date: Sat, 14 Jan 2006 20:31:08 +0000
From: odyslim@comcast.net
Subject: [R-390] What I did on my winter vacation

So far, I re-built 14 multi-section capacitors. I did my project pretty much the usual method everybody uses with only a couple of changes. I used a large tubing cutter and made precise cuts along the bottom of the can. After removing the can from the base, I screwed in a 3 1/4" long eye-hook with 1/4 thread diameter all the way into the center of the muck. I then made a loop out of 1/4" parachute cord about 3 1/2 ft diameter.I Put the can in my vise with just enough overlap on the jaws of the vise to keep the can from slipping through. After that, I attached the loop of cord to the eye-hook, put my foot into the loop and pushed down. Like starting an old Harley. The entire contents of every can popped right out. I then drilled the pins out in the usual way. This was a good excuse to buy a nice bench top drill press since I had 14 to re-build. I then did the standard 4-40 tap job and installed the brass screws and finally soldered in the caps. I did try a new (to me) item I discovered called alu-weld with poor results. The heat from the torch melted the base of the caps before the alu-weld would solder the cans. Therefore I used JB Weld. I was installing quad 20 FP type cans to replace the older caps but decided I would like to return the radios back to the original appearance. It made a good winter project but did not last long enough. Now I guess it's shack cleaning time :-)

Date: Sun, 15 Jan 2006 09:14:03 +0100
From: "paolo gramigna" <paolo.gramigna@controllo.it>

Subject: [R-390] Rebuilding canned multi-section capacitors

I'm very lucky, becose i can make use of a lathe. It is then very easy to turn away the aluminum of the can just above the crimp on the base; then I heat gently the can, and the whole content drops off. Sometimes i was able to drill a very tiny hole in the pins, insert the capacitor's leads in the tiny hole and finally crimp it with a crimping tool; then i sealed the joints with a drop of thermo-glue, against oxidation. Very fast, since i spared the tapping job, and so far no problems; the original leads were in fact crimped as well, in most of my cans.

Date: Sun, 15 Jan 2006 10:46:51 EST
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Rebuilding canned multi-section capacitors

Al, thanks for the link to all the great info and close-up pics you have presented on your website on rebuilding multi-section caps. Everything needed for anyone who hasn't tried it yet. Lots of great info on repair work to other radios you have done in your website also.

Date: Sat, 4 Jun 2011 17:22:14 -0400 (EDT)
From: frankshughes@aim.com
Subject: [R-390] OT: 30L-1 transformer question

Hi, this is a little off topic, however, the amplifier is used w/ the Collins 32S-3 transmitter, which is connected via a relay to the "break-in" on my R-390A. (Close as I can get to forum content.) Hoping someone here might know about obscure Collins technology. (I'll try the Collins forum with this question too). Anyway, I have a spare transformer for my Collins 30L-1. The transformer is a custom winding done by PETER W. DAHL, now being sold by HARBACH ELECTRONICS. The Harbach guys have no idea what the thing I have is wound for; "That was something Pete made years ago" Any guesses as to what situation is the lower voltage/current unit designed to solve?

COLLINS 30L-1 ADVERTISED UNIT (standard transformer, for comparison)
CORE) EI-175 X 3" 29GA M6X STYLE #) 02 E-I LAMINATED CORE
PR) 115/230 VAC 50/60 HZ 1 PH
S1) 650 VAC 0.7A CCS
S2) 120 VAC @ 0.020A CCS
S3) 6.3 VCT @ 16A CCS
DM) HT = 4.375 WT = 5.250 DT = 5.205 MD = 4.125 MW = 4.375 WEIGHT) 19 LBS

COLLINS 30L-1-1 MODIFIED SEC 1 VOLTS & SEC 2 CURRENT (this is the

custom wound unit)
CORE) EI-175 X 3" 29GA M6X STYLE #) 02 E-I LAMINATED CORE
PR) 115/230 VAC 50/60 HZ 1 PH
S1) 550 VAC 0.7A CCS
S2) 120 VAC @ 0.100A CCS
S3) 6.3 VCT @ 16A CCS
DM) HT = 4.375 WT = 5.250 DT = 5.205 MD = 4.125 MW = 4.375 WEIGHT) 19 LBS

Date: Sun, 5 Jun 2011 12:28:33 -0400
From: "KR4HV" <kr4hv@numail.org>
Subject: Re: [R-390] OT: 30L-1 transformer question

Have you actually measured the high voltage winding? It may be a misprint/typo. Even if is not, it would probably work fine in the 30L1 (I have one also) The line voltage at my house is 245 not 230 so that is ~9.4% higher. Transformer would probably work Ok and you most likely wouldn't notice the difference unless you were trying to squeeze out the last possible watt.

Date: Sun, 5 Jun 2011 13:46:46 -0500
From: Don Reaves <donreaves@gmail.com>
Subject: Re: [R-390] OT: 30L-1 transformer question

That transformer was built to use with more efficient solid state power supply components and more current for bias to allow use of 572Bs instead of 811 finals.

Date: Sat, 29 Oct 2011 21:20:55 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Line Voltage Survey

When checking the voltages on a SP 600 I discovered a problem primarily with my filament voltages. The basic problem is that in my semi-rural Tennessee area my line voltage consistently is 124 to 125 volts. This was also true of my rural Colorado house. Both also suffer from small surges and very short drop-outs. With the transformer tap set to 117 volts the filament voltage is:

Line Voltage	B+ Volts	Filament Volts	Bias (S/B -51V)	Tap Setting
117 (Variac)	244	6.3	-52	117
124	252	6.7	-55.2	117
124	227	5.87	-48.3	130

Tube manuals rate receiving tube voltages as plus or minus 5 percent. So the acceptable value is 5.985 to 6.615. So from a filament standpoint, the 130 volt setting is the lessor of two evils, while not considering the effects of the lower B+ and Bias voltages.

This poses several questions:
1. What do others have for their line voltage? Please reply off list. I'll report the results to the list.

2. Has anyone been able to test a SP 600 with a signal generator to see what, if any performance difference this might make. (My signal generator is packed away for the moment.)

The R390A largely avoids this filament problem as the power transformers I have are marked as 6.1 volts for the filaments.

Date: Sun, 30 Oct 2011 10:15:09 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Line Voltage Survey

The line voltage here in Northern Virginia is pretty consistent at 127VAC. The SP-600 is very happy with the 130 tap. Since I went that route, I've had no problems. The R-390A gets the buck/boost treatment. Therefore it is happy.

Date: Sun, 30 Oct 2011 11:32:39 -0400
From: Ron Hunsicker <ronhunsi@ptd.net>
Subject: Re: [R-390] Line Voltage Survey

Wyomissing is near Reading, Pennsylvania. My WV-120A shows 125V this morning. My experience is that this is a little low. It usually indicates 127.

Date: Sun, 30 Oct 2011 10:54:13 -0500
From: "KA9EGW" <ka9egw@britewerkz.com>
Subject: Re: [R-390] Line Voltage Survey

127-128 is typical here just east of Beloit too. <snip> I have a variac dedicated to my boatanchors, end of problem...

Date: Sun, 30 Oct 2011 13:16:33 -0400 (EDT)
From: Glenn <wa4aos@aol.com>
Subject: Re: [R-390] R-390 Digest, Vol 90, Issue 11

Aren't we all pretty much on the national power grid. I know it is broken up by regions and distance from a transformer is a factor However, unless someone is on a Co-Op shouldn't our AC feeds be close? Can't we all just get along? I can say that and R 390A working RIGHT looking at 125VAC compared to 115VAC has no significant increase in sensitivity. I do hear a little more IF noise when testing at the higher voltage compared to 112VAC on the shop Variacs. Open framed Variacs are cheap and I often find them at Ham Fest for under $10. I run my 390, 390A, 391 and 389 receivers at 112VAC and do alignments at that voltage.

Date: Sun, 30 Oct 2011 16:51:12 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] Line Voltage Survey

126 volts here is Southeastern Ohio. Ebay sells "buck/boost" transformers in the business and industrial catagory. The prices are reasonable except for the shipping. They are similar to a hefty filament transformer. Most are either 10 v buck or 10v boost. You can -set them up either way. A ten amp unit will run a lot of stuff.

Date: Mon, 31 Oct 2011 12:14:59 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Line Voltage Survey

Hillsboro, Oregon (town west of Portland): 120 +/- 2.

Date: Mon, 31 Oct 2011 15:25:11 -0700
From: Pete Lancashire <pete@petelancashire.com>
Subject: Re: [R-390] Line Voltage Survey

There are also motor driven units. I have one of the little newer Chinese ones. There are the older GR's, and the one I use to use about 20 years ago. I use to live i a rural area where at the end of the line was a farm. I would get some pretty nasty voltage fluctuations and the the sine wave shape was at times a memory. I had a servo motor driven 30/30/30 AM Superior 3 ph'er ganged together plus a 100A OneAC filter transformer. When the farm was not doing anything voltage would be up to 128V and the wave was pretty much a sine wave. Voltage would drop to as low as 120V.

Date: Mon, 31 Oct 2011 18:18:57 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Line Voltage Survey

Worked at a blasting cap plant in the early sixties. The plant had a 13.7 KV feed that was transformed to 440 V ungrounded delta. That way a ground fault couldn't make something hot and cause an explosion. Easy to see that you had a ground fault, too. Three low wattage bulbs in a Y to ground controlled static build-up and indicated a fault.

Things were spread out, as you might imagine. There are tables for the distance separating buildings depending on the explosive, to prevent propagation of an explosion in one building to others.

So the lab where government ordnance was developed and tested was over 1500 feet from the feed point, and 400 feet from the last 440 to 110/220 transformer. I learned that the number for good line regulation was one foot per volt. The voltage at the lab ran 100 to 130, which was not good for test equipment or environmental chambers.

It fell to me as the junior engineer to do something about it. I found that GR made a motor-driven Variac regulator that would do the job, and designed a shed for it (keeping sparks away from powders) and the feed lines to the lab. Somebody else decided that we couldn't run 440 to the shed.

Voltage here in Bloomington, MN, now runs 120, was closer to 125 ten years ago. Higher voltage allows motors to draw less current (less drop in the distribution system), but resistive lamps draw more current - that's why power companies like CFLs.

The thing that messes up the wave shape is overloaded transformers that saturate at the peaks.

Date: Thu, 10 Nov 2011 20:16:22 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Line Voltage Survey Results

Thanks to all who answered about their voltages, problems and solutions both on and off list. What I found out.

1. Line voltage varies considerably from 120 to 130 at different locations, but seems to be relatively stable at the delivered value. So most will be able to use the 117 or 130 volt tap on the SP 600 and keep the filament voltages within spec.

2. Variacs seem to be a popular solution for some, either manual or some motor driven. Personally I have never found them nearly as cheap as others on the list. Bucking transformers don?t seem very popular.

3. The 124 to 125 volt line voltage is a PITA to deal with. The 117 tap is too high, the 130 is too low. The simplest solution was sent to me by Bernie W8RPW.

He uses a 10 ohm 10W resister in series with the input as well as an

Ametherm SL10300001 which is 30 Ohms Cold, 1 Amp Max Hot or SL10500002 50 Ohms Cold 1.6 Amps Hot.SL10300001.

The Ameritherm units he uses are available from Newark or Digikey. Both are less than a buck.

I tried just using a 10 Ohm 10 W Wire-wound sandbar and my filament voltage was a smidgen lower than my 5.99 target. I haven?t decided yet if I want to construct a 9.75 ohm resistor. I?ll wait until I get a surge limiter and see what I need to fine tune the value. Maybe with a surge limiter all I?ll need is 9 ohms. TBC. YMMV.

Date: Mon, 02 Jan 2012 18:47:46 -0600
From: Dave Mayfield W9WRL <wrl@gwltd.com>
Subject: [R-390] Troubles.

I have an R-390a that has not been turned on in a year or two. Yesterday I turned it on, and after about 30 seconds the fuse blew, I noticed when it was warming up that there was no audio hiss, or any other normal sounds. I did also notice that just a split second before the fuse let loose, that the slight hum from the power supply got louder then the fuse went.

I replaced the fuse and same thing happened.

I then pulled the power supply and replaced it with a know good one, same thing fuse popped after about 30 seconds.

I checked all tubes, and found a few weak ones, I was hoping to find one that was shorted after warm up.

I then unplugged the IF deck, replaced the fuse and turned it on, same thing 30 seconds and pop.

Any ideas, seems like a cap somewhere to me, but I'm no expert, any ideas????

Date: Mon, 2 Jan 2012 20:01:57 -0500
From: Walter Wilson <wewilsonjr@gmail.com>
Subject: Re: [R-390] Troubles.

Perhaps one of the two large caps in the Audio Deck.

Date: Mon, 2 Jan 2012 20:35:39 -0500 (EST)
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Troubles.

I have run into several R-390A's blowing fuses at turn on. It always turned out to be the large metal plug-in filter caps C-603, C-606 located on the audio module. Once I replaced those with new capacitors, the problem stopped.

Date: Mon, 02 Jan 2012 19:45:45 -0600
From: Dave Mayfield W9WRL <wrl@gwltd.com>
Subject: Re: [R-390] Troubles.

Found it, C606 is all junked and looks as it has been leaking. Must be it. Thanks guys.

Date: Mon, 02 Jan 2012 17:47:34 -0800
From: Greg Rainwater <w7acm@comcast.net>
Subject: Re: [R-390] Troubles.

On my R-390A the blowing fuse was a bypass cap in the B plus line in the Audio module.

Date: Tue, 3 Jan 2012 11:36:57 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Re Troubles, B+ capacitors

That is exactly the same opinion I share. You really do not want to to that very many times as you can toast the chokes on the B+ supply. When you replace those two plug in caps you may want to check your B+ voltage and also add the B+ fuse mod if you do not have it in place already. It is pretty hard on the tube based or diode rectifiers as well.

I would suggest either purchasing a set of restuffed plug in capacitors or going under the deck and adding capacitors and leaving the sockets empty. Try to use something like a 400 volt capacitor if you can manage to squeeze it into the same place.

Old, NOS capacitors will need to be reformed, even if they were never plugged into a radio before. Electrolytic capacitors of that vintage will dry out just from sitting on a shelf. They age even faster in storage than they would under light duty service. Anything you are buying that is NOS/NIB is probably at least 15 years old. There has been a great deal of evolution in modern capacitor design (better films, better foils, better electrolytes). I am sort of a fan of Sprague but I do not know if they still manufacture in the octal based plug in caps of those values. Sometimes the capacitors you can find are too tall and you would not be able to put the bottom cover plate on. Watch the dimensions carefully.

There are plenty of YouTube videos on how to restuff the capacitor cases

with newer capacitors and how to drill out the pins or solder the capacitor leads onto the octal plug in base. Usually the only thing that gets ugly is if you saw the bottom off and leave an ugly, jagged edge that you just jam onto the octal base plug. I have seen some very good work done where people take the time to clean up the edges of the capacitor cans and roll their own crimp onto the aluminum base or they are artists with JB Weld. Note: taking apart an old
capacitor will probably require you to work with boiling hot water to loosen up the paraffin that holds the guts in the old cap or maybe even a torch to soften things up. Wear gloves, work in a ventilated space, use teflon spagetti on the new leads and take your time if doing this on your own.

Date: Tue, 03 Jan 2012 19:54:55 -0500
From: Al Parker <anchor@ec.rr.com>
Subject: Re: [R-390] Caps

Buying from Mouser is quick. Choose what you want, probably cheaper. No minimum charge. And they don't add handling chgs, just the actual shipping cost. You're not necessarily saving $ by getting a "kit", and probably spending more $. Order this evening & it'll be on the way tomorrow. I'm just a satisfied customer.

Date: Tue, 3 Jan 2012 20:22:09 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Caps

Very ditto here.

Date: Tue, 3 Jan 2012 19:45:42 -0600 (CST)
From: nryan@mchsi.com
Subject: Re: [R-390] Re Troubles, B+ capacitors

Some time ago, Jan Skirrow offered square plug-in cans, fitted with capacitors, ready to plug and play. I haven't found them anywhere else. To work right, the locating pin must be oriented properly, and the cans I've come across don't have that feature. Alternatively, use bases from discarded 6080 or 6082 tubes. Metal skirts surrounding the bases protect against contact with the hot leads from the capacitors and look kinda cool. They fit fine and you don't have to discard the clamp. I'll send a picture on request.

Date: Tue, 3 Jan 2012 20:12:59 -0600
From: "Don Cunningham" <donc@martineer.net>
Subject: Re: [R-390] Caps

At one time, I remember a "Dave in Birmingham" that offered some kits, but haven't seen them in years. I can only echo comments about Mouser. If you
order by 8 pm CST, they ship the same day, not even next day!! Super fast, however watch shipping on small orders. It can equal or surpass the parts themselves. Don't ask me how I found that out, hi.

Date: Tue, 3 Jan 2012 20:15:00 -0600
From: "Don Cunningham" <donc@martineer.net>
Subject: Re: [R-390] Re Troubles, B+ capacitors

The R-390A and R-388 (51J) plug in caps are easy. See www.hayseedhamfest.com and look them up. Fair prices, quick shipment, plug and play!!! Don't own stock in Tom's stuff, just buy a lot as he is a good guy too.

Date: Tue, 3 Jan 2012 20:31:17 -0600
From: "Don Cunningham" <donc@martineer.net>
Subject: [R-390] R-388 Can Caps

I just remembered, the can capacitor in my R-388 was 1" longer than the "stock" one that Tom sells. Be sure to give him the length of yours when you order, as there are at least two different lengths!! I don't that that happens with the
R-390A caps.

Date: Tue, 3 Jan 2012 18:54:36 -0800 (PST)
From: Joe Connor <joeconnor53@yahoo.com>
Subject: Re: [R-390] R-388 Can Caps

I agree that Tom's merchandise is excellent. With the SP-600 cans, the can is a tad bit thicker than the stock one. This means that you need to get a longer screw to secure the hold-down strap. Not a big deal. Any hardware store will have the correct screw for a few cents.

Date: Tue, 3 Jan 2012 22:43:58 -0500
From: "Dana Cobb" <objoyful@tampabay.rr.com>
Subject: Re: [R-390] Caps

The kit seller was Dave Holder of Biological Instruments, Inc. 820 South 29th Street Birmingham, Alabama 35205-1004.   I bought an R 390A kit from him a few years ago. He said at the end of the parts list I received (and still have) with the order that if this gets to be a "pain in the butt", he reserved the right to withdraw his kit offering.

Date: Tue, 3 Jan 2012 23:30:14 -0500

From: "Todd, KA1KAQ" <ka1kaq@gmail.com>
Subject: Re: [R-390] Re Troubles, B+ capacitors

I remember those, Norman. That was a looong time ago! IIRC, they were actually octal plug-in relays that were gutted and reused for caps. They worked well, but he had a very limited supply of donor relays. Seems Walt Wilson was rebuilding the originals at one point, but has long since moved on to other things. Haven't seen anything from him in ages.

Tom's offerings from Hayseed are extremely attractive from both a price and quality perspective. He offers a discount price if you buy the pair vs one at a time. You couldn't gut out and rebuild the originals for that cost unless your time is dirt cheap. For the price, it would be easy and wise to get an extra set and simply rotate them through the receiver once a year or so.

Date: Wed, 04 Jan 2012 09:47:39 -0600
From: Barry Williams <ba.williams@charter.net>
Subject: Re: [R-390] Caps

He worked on UAB campus for that company. He had approval to order extra
caps when making company orders, and the extras went into the recap kits.

I agree that Mouser is the best place to order from. The people you reach are always extremely knowledgeable. I don't even look up parts from their website or CD anymore. I just tell them and know what to put in the order. No way I could do it as fast as the sales staff.

Date: Wed, 04 Jan 2012 11:26:36 -0500
From: rbethman <rbethman@comcast.net>
Subject: [R-390] R-390 Caps

My suggestion would be to go look at N0JMY, Tom.
<www.hayseedhamfest.com.>
Wholly family owned and run. One of are own.
Everyone whom deals with him are very satisfied.
He and his family make the C603 and C606, and when bought as a set, gives a price break.

Date: Wed, 4 Jan 2012 16:58:16 +0000
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] R-390 Caps

I bought a kit from Tom for an HQ-129x. He makes drop-in replacement electrolytic cans and also includes replacements for the old tubular caps.

Good service, good quality, I'd go to him again.

Date: Wed, 04 Jan 2012 13:42:46 -0600
From: Barry Williams <ba.williams@charter.net>
Subject: Re: [R-390] R-390 Caps

I think that Chuck Rippel did the same thing for replacements. I think his prices were better, but I could be wrong. The good thing about ordering thru Dave in Birmingham was that he was an active contributor to the list. I don't if it's true, but he claimed to not make money on the kits. Kinda miss Dave right now. <snip>

Date: Wed, 4 Jan 2012 12:33:46 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] R-390 Caps

I have been replacing my own for quite some time, it really only takes a few minutes.

First I cut the can just above the crimp, I use a band saw but a hack saw works fine. I the cut the aluminum wires at the top of the pin where they are crimped. Setting the socket aside,

I put the top of the capacitor in a vise, slowly heating it with a propane tourch, once the binder is soft I remove the guts by grabbing the remaining wires with a pair of pliers. I then file the top of the pins flat and drill holes, slightly larger than the tap size for a 2-56 screw in the top of the pins, Once the holes are drilled I screw 2-56 brass screws in to the socket until they are bound tightly.

The rest is easy, solder the replacement caps to the brass screws and replace the cover. I then run a bead of gray epoxy around the seam.

I have purchased replacement cap's from Mouser and Digikey both supply a small form factor version that fits easily back into the original can. I have been doing the same for about 20 years and I don't know of one ever failing ... 73, tom, N3LLL

Date: Wed, 04 Jan 2012 16:17:31 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R-390 Caps

Tom, N0JMY asks $59.95 for the pair, brand new manufactured caps. They are NOT re-stuffed!

Date: Wed, 18 Jan 2012 08:52:36 -0800 (PST)

From: Terrence Harvey <terrencelharvey@yahoo.com>
Subject: [R-390] R-390 won't power up...

First let me preface this post by saying I am not and elex tech. or engineer and so not a lot of expertise in the field.

The foregoing having been said... I am trying to get my Phila-51 contract R-390 back on line. Went down?some time ago in failure to power on mode when function switch turned to any position. Seemed likely to me the panel mounted micro-switch had failed (replaced it about 5 yrs ago with similar failure mode), so took receiver off operating table and put aside for future repair.

Recently I got around to taking front panel down and testing switch with an ohmmeter.Testing revealed switch functioning properly, so re-assembled and re-applied power, thru Staco variable transformer, with same result. No tube filaments, dial lights or audio. Next checked continuity of 3 conductors of power cord with all ok. Power present at chassis side of AC input receptacle. Checked 26Z5s and they checked good on Simpson tube tester. This is where I stand at this juncture. What are next most logical checks I need to perform??? Thanks for any/all help.

Date: Wed, 18 Jan 2012 12:02:28 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390 won't power up...

Did you check the fuse?

Date: Wed, 18 Jan 2012 12:28:32 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390 won't power up...

With no filaments or lamps, it sounds like the power transformer isn't working. Have you verified line voltage is getting to the transformer? You might be able to hear it hum and that would at least tell you if it's getting power. If not, then you could pull the power plug and verify whether it's getting voltage by measuring across the appropriate pins. I don't have a schematic in front of me so I don't know the pin numbers but you might have that info.

If you're not sure about doing this are uncomfortable/inexperienced measuring that, then it might be better not to do this and get someone else involved as line voltage can be lethal. Listening for transformer hum should be safe enough, though. Be careful!

Date: Wed, 18 Jan 2012 17:12:55 -0500 (EST)

From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390 won't power up...

You should be able to use an ohm meter and check the 120 volt power circuit
to the primary of the transformer and power supply. As the receiver has been setting for some time you can expect some oxidation in the chassis connectors that may need looking into. Unplug and replug the connectors a time or two to clean off the pins and plugs in the connectors. Do check the fuse and fuse holder silly little things break inside and bigger things then do not work. Other than the micro switch on the function switch there is not much in the primary circuit. If it is good then at least one of the secondary circuits should be good and give you some filament lights. Go off to R390.net and get the R390 schematics from the Y2K manual. You can down load parts of the Y2K manual. This is nice if like me you are doing very low speed dial up. Look into a broken wire on a pin in the wire harness under a connector hood. No reason to just shot gun the eye ball. Get the schematics and ohm meter out and systematically trouble shoot the problem to the point of failure. Roger Ruszkowski AI4NI

DC resistance across the unplugged AC power cord with the receiver turned **"on"** should be around 1.5 ohms........... editor

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Date: Wed, 07 Mar 2012 12:20:12 -0500
From: rbethman <rbethman@comcast.net>
Subject: [R-390] Power Supply Module caps

Many of us have taken the old cans/caps and opened them, cleaned the dreaded black garbage from within, and then restuffed them. It's okay, but there is also another way to get these up to snuff. It is through Tom - N0JMY. He and his family have quite a number of capacitor kits, and especially manufacture the C-603 and C-606 for the Power Supply Module. These are excellently made with all new components. I have no interest in their business! I am simply a very satisfied customer.

You can go to <www.hayseedhamfest.com> and see what is offered.

Date: Wed, 07 Mar 2012 12:20:12 -0500
From: rbethman <rbethman@comcast.net>
Subject: [R-390] Power Supply Module caps

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Date: Wed, 7 Mar 2012 20:21:19 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Power Supply Module caps

I have cleaned out a number of octal relays and stuffed new caps into the relay
cases. These then want to set off with a 1 pin rotation 1/8 turn. So I get out the
demeral tool and grind off the key. Then build then to set square into the sockets and look better. It is a plug and play mod that can go back if you find some plugin cans of get your old ones restuffed. Case size does matter when you try to stuff the triple but cases are available. I have removed the plastic wrapper off a set once just to get the three of the caps packed into the case.

Date: Wed, 7 Mar 2012 20:41:36 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Power Supply Module caps

I saw one example where a fellow just ran the + ends down through the octal socket pins and soldered them underneath. The - ends were drawn up together to a solder lug and secured to the top of the threaded standoff that's used to secure the original caps. It requires the octal sockets to have holes through those pins and I think some of them do anyway. All-in-all, a pretty simple job with minimal expenditure.

I went to the trouble of building square aluminum housings for a couple of pairs of them with aluminum tops and octal relay plugs. Neat job but more trouble than was necessary without a machine shop handy.

Date: Wed, 7 Mar 2012 21:07:04 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Power Supply Module caps

Yes but if you have the tools and the time thats what it is for.
You enjoyed doing it and they stand as an example of your skiil.

Date: Thu, 08 Mar 2012 07:52:19 -0500

From: "Jim" <jbrannig@verizon.net>
Subject: Re: [R-390] Power Supply Module caps

I did the capacitor "re-stuff" for the R-390A .
What a PAIN!
Cut them open and clean out the gunk..
Drill and tap the aluminum..
Find small brass screws and screw them in....
Tin, solder and install the new capacitors....
JB Weld the whole mess back together....

Date: Thu, 8 Mar 2012 09:06:19 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Power Supply Module caps

Agreed. The GR1617A had some bad filter caps and I rebuilt all 7 of them while I was in there. Not fun. I think I would have been better off (in this case at least) designing a small circuit board with all the caps on that and wiring it in in place of the twist-locks.

BTW, I opened these by removing the crimp at the bottom end and pulling the guts out, fiber plates and all. I relieved the insulating plates just a bit (making them effectively thinner), reinserted them with the new caps installed, and recrimped the end. Makes for no need to glue them back together.

One caveat if you try this: be careful to get the end plates back in at the same depth all around. If not, the cap will sit crooked. I have a couple that did that so the row of 7 caps looks a bit snaggletoothed in places. It works, though.

Date: Thu, 08 Mar 2012 09:18:11 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Power Supply Module caps

I did this at least three different times over a period of time. Since the particular R-390A happens to be a "Blue-Striper", I have more than enough to do than to spend the extra time to prove that I can do this again. I've got to move modules from the original chassis, it has the finger stock corroded off, and move it into a different chassis. There is a LOT more care required to get this radio back up to snuff. So I'll pass on spending my efforts in re-stuffing those caps! (It is not my first dance.)

Date: Thu, 08 Mar 2012 11:03:12 -0700 (MST)
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] Power Supply Module caps

Do what I did, take the easy way out and get an R-390! No nasty octal capacitors, no black beauties, no fussy mechanical filters.

Date: Fri, 9 Mar 2012 13:01:42 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Another Filter Capacitor Alternative

Mentioned on the reflector list many, many moons ago. Relocate the power resistors R617, R618, and R619 to the area between the sockets for C603 and C606. Then mount the appropriate values needed in the vacated space. The radial style of Nichicon or similar 105C rated capacitors will last far longer and the power resistors will get more favorable heat dissipation conditions.

Date: Fri, 9 Mar 2012 13:01:42 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Another Filter Capacitor Alternative

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Date: Tue, 13 Mar 2012 07:42:05 -0500
From: "chacuff" <chacuff@cableone.net>
Subject: Re: [R-390] Power Supply Module caps

I did that on my last rebuild with the exception of taking the ground back through a tube socket pin to below chassis. I cut the bottoms of the cans off...cleaned out the gook, slipped the cans over the caps and reattached them to the standoffs. The cans were hovering over the caps and all appearances were that things were original but it allowed the caps to be replaced in the future if needed. I thought came out quite cool and will probably do it again.

Date: Tue, 13 Mar 2012 10:13:11 -0400
From: John Wendler <wendlerjrv@gmail.com>
Subject: [R-390] R-390A B+ Current?

Does anyone know the approximate DC current on the R-390A B+ line during
operation and standby? Has anyone looked at the DC / RMS voltage drop and/or waveform across the 26Z5W? (The measurement I'm wondering

about would most likely be differential if you were using an oscilloscope.)
Crispy Critter has been rebuilt and I am trying to understand the operating point of the 26Z5W's without having any on hand.

Date: Wed, 14 Mar 2012 17:42:51 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R-390A B+ Current?

Way to much science. These are tube radios and need no where this much exactness. Remember these receivers were designed to run on generators and very sorry power sources. At power on B+ does not surge to 1/4 amp and thus blow the B+ fuse.

Rather than drop B+ as heat in a resistor, better to run a bit more current / voltage / power in each tube and thus spread that 3 -4 watts across all the tubes.

The idea of changing a filter cap can in the audio deck out for a series limiting transistor voltage regulator comes to mind as improving the B+ ripple. Some rewiring on the cap socket to get the transistor in series would be needed.

Date: Wed, 14 Mar 2012 23:12:35 -0400
From: John Wendler <wendlerjrv@gmail.com>
Subject: [R-390] B+ current

I understand your point about way too much science and from a "do it and move on" point, you are absolutely correct. This is a proven tolerant design with an approved field mod. From a reliability standpoint, however, I would rather take the heat in some cheap, hyper-margin (25 W is about as
cheap as 7.5 W) power resistors by the supply than elevate the temperature
of the older stuff? (Your mileage may vary, and from a practical point, it may only be a few degrees difference spread out over the rest)

I have not been getting enough circuit design activity at work recently, so it will come out in the darndest places. I learn a ton by modeling and reverse engineering something. If I can get several independent pieces of data to correlate, then I have reason to believe that I am approaching some
measure of truth.

The voltage concern comes from reading the Pearls - there is an emphasis on
the 115 VAC vs. 120 VAC and using a variac to reduce the modern voltage.

I
was lucky that the filter killer cap was not leaky; it was the first thing I replaced.

The series regulator idea was suggested by someone else in an off-list e-mail to me. The voltage limiting aspect was something that I picked up from a white paper on Dr. Schmid's website. I think he was selling solid state replacements for the rectifier tubes at one point.
(http://www.schmid-mainz.de/26Z5W.pdf)
As you note, a regulator would help reduce ripple; I do not have enough of my radio up and running to know if hum is an issue, or what my major sources might be. BTW, did you do the checklists? I printed those things out in a flash and they are part of what is guiding me in my restoration. I am writing the
manufacturer and serial number of each module on the relevant checklist as
I hit them. I also write restoration notes, and may yet stick photos on the back. (I have been taking before and after pictures as I have been going along, but I am not sure of the best way to share them with the group. They are running between 3 and 4 MB each.) Thanks to the several people who have sent me the diagram from the Y2K manual too, that has been very helpful!

Date: Thu, 15 Mar 2012 11:22:41 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] R-390A B+ Current?

Well said, John. Way too much science and a lot of work toward no result.

In video #2, I demonstrated the difference between using the 2X 26Z5W's as rectifiers and 1.5A 1KV diodes. The result was a 9V increase in B+ voltage. The demo on video was very graphic and well documented. IMHO, its not worth worrying about. I've see radios come in with a thermistor in series with the A/C line to lower the voltage/mitigate surge. Those are not designed dissipate 300+ watts of heat and I cut every one of them out and restore it to factory original. R390A's are not linear amplifiers which require 40 amps at 6V AC to achieve proper filament voltage. The receiver does not have 80-100 amps of cold filament inrush to protect against. While mitigating inrush is interesting, it brings little to the performance table but may help increase the life of R390A power transformers.

The way to properly mitigate inrush in Linear Amplifiers is to have something like an 50 ohm, 40W wire-wound resistor and a 115VAC relay in series with the A/C power input. The relay coil is tied between neutral and the radio side of the
resistor. The Resistor absorbs the inrush. When the inrush is absorbed

and the voltage drop agross the resistor decreases the voltage on the radio side of the resistor will rise to 115VAC, causing the relay to close. The relay contacts are wired to short the resistor, taking it out of the circuit. This whole process lasts something around 1 second.

Date: Thu, 15 Mar 2012 11:46:07 -0500
From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: Re: [R-390] R-390A B+ Current?

Hi Chuck! Great to see you back! Harris calls this "step-start" - and is found in many of their older transmitters. I certainly agree that inrush isn't that big a deal with 390s - as noted - they were designed to be forgiving of some pretty nasty power sources. The area that I think almost all vintage radios have in common - is that they were designed for mains that were somewhat lower than we see today – so their HV runs a bit high. In the case of the R-390A - 115V. That coupled with replacing the rectifiers with solid state diodes - and the increased HV can stress some of the parts - and overall heat be increased due to higher dissipation. An easy solution - and one that requires no modification of the radio at all - is a buck-box. A buck box contains nothing more than an adequate capacity (current) filament transformer wired so that it's secondary is in series – but bucking the 120 - 125V mains common today. The "reduced" voltage is then passed on to the radio. By choosing a secondary (filament) voltage appropriate to the nominal Mains "over-voltage" (but not considering the solid state issue) - then the radio is spared that stress / heat. Note that you don't want to also try to compensate for the extra HV of "solid state" here - that's because the tube filaments are going to also be effected by any "reduction" as well - and while it's good to run them closer to "design" than high - it's also desirable to not run them too cool either – as conductance of a weak tube falls off much faster under reduced filament conditions (which is how tube testers perform "life tests" - reducing the filament a "notch" will cause a weak tube to drop off quick - while a good/strong tube will remain near steady). A "buck-box" can be made in a handy box - add a cord for the supply - and a standard outlet socket for the radio to plug into - and you're done. No modification to the radio at all. Since the HV is lower on "correct" input voltage – the small "increase" with solid state rectifiers becomes far less a problem.

Date: Fri, 16 Mar 2012 09:56:18 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] B+ current

That was a great technical write-up of choke input filters. You should write that section up for a university book as many EE's have a problem understanding the concepts you detailed out. It also speaks to one of the reasons on why not to use the standby mode on the radio as the B+ voltage

rises into risky areas. Radios that still have the "killer cap" on the IF filters should be particularly aware of that
risk as well.

Tubes are forgiving of minor excursions but the idea that the input windings of an IF filter could handle the several hundred mA of B+ current from a shorted coupling capacitor can cause you to lose sleep. As the radio sits in standby for hour or days all of those B+ caps pick up a nice charge that is probably well in excess of the 250 mA or so normally supplied by B+. Even if you have the B+ 250 mA fuse retrofit I bet that the IF filter wire will burn out before the fuse wire even gets slightly soft.

You could imagine some sort of current limited zener diode scheme to regulate the B+ to prevent it from floating upwards into danger-land (even in standby mode) for the caps but normally the radio does not care too much about normal variations (within reason) on the B+ voltage. I do not plan on going that far as 99.5% of the original engineering on the radio is optimal (except for the AGC and audio response).

To me the CL-80 is more of a transformer and microswitch inrush current limiter and to be a little nice on the tube filaments and the ballast tube. Chronic high line voltages are something that I believe we will see becoming less of an issue over the next few years as more electric utilities implement voltage reduction schemes on distribution power. If someone is adverse to adding one to the internals of the radio there are ways of putting one into a tiny project-box that exists outside of the radio.

Date: Fri, 16 Mar 2012 11:45:36 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] B+ current

Long-term Standby is also rough on the cathodes. The Supertex LND150 is a small, 500V depletion-mode mosfet that's made for current limiting. It's in stock at Mouser for 69 cents. Connect it in series with C553, with drain facing V601 and source+gate facing the filters. Normally it looks like a 1K resistor (negligible compared to V601's plate resistance), but if the cap shorts, it will limit the current to a couple mA. I used these to protect the photo-fet chopper I retrofitted into my HP 740B Voltage Standard/Differential Voltmeter.

Date: Sat, 17 Mar 2012 11:09:36 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] B+ current

So, if I am reading Don's post re B+ current correctly, one important concept is that cathodic vacuum rectifiers, such as the expensive 26Z5, does add a small delay until they pass current, thus allowing the receiver tubes to warm up, and allows the choke input filter to *see* a load.... unlike the behavior seen with silicon diodes.

So the substitution of a cheaper 12BW4 for the expensive 26Z5 makes sense. My R390A's have this tube substitution in the PS modules, and it works swell for me. With a line input of 120VAC, my B+ at the plate of V603 is 215v.

Date: Tue, 20 Mar 2012 10:10:32 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] B+current

One thing, 12BW4's do clear in my particular PS.
One should do a dry run before rewiring anything of course.

Date: Thu, 29 Mar 2012 08:35:33 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: [R-390] Coming: Real In-rush Protection / Step Start

Was having an off-list conversation with one of the folks whose radio will be here fairly soon for a restoration about the question of current in-rush.

Is it a "real" issue ? If so, how to mitigate the problem safely

In the last few years, I've seen a trend of open and shorted transformers. At first, that was chalked up to a shorted 26Z5W with the answer being to install a new supply, pull the tubes and solid-state the supply. The transformer failures have escallated to the point where they are nearly on par with Mechanical Filter
failures. Last October, I attended a DX'pedition with servera long time friends. One of them had an R390A that I completed within the last 2 years that was intermittently blowing the 3A fuse. The problem was elusive but at the end of the day, we swapped out the transformer, added a 3A slo-blow fuse and it look like the issue has been conquered. I forget exactly what I was doing at the time but he has pictures of me laying on the floor with his radio working on the failure. What to do?

I've seen a number of radios come in with a thermistor between the size of a nickel or quarter installed in series with the AC input, after the line filter. These always end up getting pulled out and returned to the owner with the rest of the replaced parts. They run very hot and, IHMO are a fire hazard. Not an acceptable fix.

The proper way to address the matter of inrush is with a proper limiter, or in this case, a step-start. That discussion went on right here not long ago.

The owner of the radio I'm currently working on has given his permission for an inrush limiter to be installed. The "rules" for a modification are that it be 100% reversible, which will be the case here. We're only talking a couple of parts, a relay and power resistor. As soon as I find the correct combination, I'll share the design, installation pictures and parts sourcing right here. You may install it in your own radios if you wish.

Have a great week ! I'm having fun with this current radio; its really going to turn out nicely !

Date: Thu, 29 Mar 2012 12:01:52 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Coming: Real In-rush Protection / Step Start

One of my 'yobs was in analyzing transformer failures on really large industrial devices and in substations. What we found was that when the internal supporting structures in a transformer began to fail the transformer core would try to rotate like a motor winding whenever a load was switched across it at any point in the AC sine wave except where it was at 0 volts.

In really large substation grade transformers much of the internal support structure is made out of wood. If the transformer was exposed to an un-limited short the entire core tries to rotate itself like a top and tears out the wood supports, destroying the transformer.

Smaller transformers like what we have in much of our radio gear are held together with paraffin or wax. With age and heat the paraffin dries out, cracks and becomes loose. That "thunk" sound is the transformer winding and laminated core trying to become a motor and to spin. Eventually this weakens the leads, attachment points and laminates until something breaks off or the laminates become loose and circulating currents go through the roof, burning up the transformer.

Sometimes you can extend the life of a transformer by re-insulating the core, vacuum epoxy bonding or refreshing/replacing the core supporting materials (paraffin and waxes). If this is done (if it can be done), there is no reason on why a transformer cannot last for another 50 years. Usually by the time we find out that the transformer is shorted or opened up it is too late.

If you have a sealed transformer that makes rattling noises when you shake it, then it is just a matter of time until it fails unexpectedly unless you do something to mechanically stabilize the core. Also, re-flooding the transformer case with some sort of thermally conductive epoxy will improve the heat transfer characteristics. Find out what types of epoxies are rated for transformer duty before trying to homebrew something that may just end up being a source of fuel for a big transformer fire.

The same is true when browsing at a hamfest through a box of old transformers. If the windings are loose or the laminates are not securely attached you need to something about that before you make that a permanent addition to your equipment. Always test out transformers with a variac, line fuse and load before putting them in service. If you have the means of hi-pot testing the windings do that too.

Seeing a half million dollar transformer that has failed in a "bad" way and has moved three or four feet on the concrete pad will make you a believer. I am glad that I was not there at the time, the noise and light show would of taken eight years off of my life expectancy.

Date: Thu, 29 Mar 2012 10:47:17 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Coming: Real In-rush Protection / Step Start

Combine the approaches.

Thermistor as delay element, and the relay shorts it out.

A CL90 and a 120VAC relay, that's it.
Three connections, all at the power inlet.

Or they can go in a box along with your bucking transformer for the ultimate in
non-intrusion.

On the other hand, it makes me laugh to hear the CL90 called a fire hazard when the R-390 came with two 6082's.

Date: Thu, 29 Mar 2012 13:07:28 -0500
From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: Re: [R-390] Coming: Real In-rush Protection / Step Start

Which begs the question: Chuck - you mentioned that you're seeing quite a few power transformer failures lately – any idea how they are failing? I.e. opens - or going up in flames? Being sealed - might be hard to determine, then again - might be interesting to open a few up and see if failure mode can be determined...

If - as Tisha has noted - it might be simple mechanical fatigue - it might not be a bad idea to see if there is a way to head off disaster before it strikes. I have a 390A transformer from a radio parted out back in Guam (1975?)

which has run as a 28V supply 24/7 for almost 35 years - maybe I better re-think that use! (it's the only "spare" 390A transformer I have). I guess like a lot of people – I had the idea they were bloody near indestructible as long as protected from shorts... Hmmmm... something new to worry about.

Date: Thu, 29 Mar 2012 17:43:39 -0400
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: Re: [R-390] In-rush Protection

I have used the thermo in rush protectors for years without any issues whatso ever. The concept of a fire hazard completly baffles me, certainly they get hot, that is how they work. They disapate only a few watts. I think someone on here mentioned hundreds of watts. Nope, try Ohms law!!! Simply mount them where the are an inch or so away from other objects. No hotter than some vacuum tubes.

Date: Thu, 29 Mar 2012 18:24:05 -0400
From: John Wendler <wendlerjrv@gmail.com>
Subject: Re: [R-390] Coming: Real In-rush Protection / Step Start

Real In-rush protection / Step Start sounds interesting! I am flashing on the old Tek 530/540 series of scopes with the time delay relay.... What is the experience of people on the list with shorted / open transformers? Is there a particular winding that fails in a particular way?

Date: Fri, 30 Mar 2012 08:00:24 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] Transformer Failure

I've had two transformer failures. In both cases, it was the tar potting at the high tension terminals. The fix was straight forward. Pry off the bottom plate with a sturdy knife by tapping knife along the solder seam using a hammer. Apply a heat gun and scrape away the tar near the terminals. Install insulated wire through the porcelain feed-through tubes.

Date: Fri, 30 Mar 2012 11:32:23 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] NTC Thermistors, sizing, measure twice, add once

If you opt to insert an NTC Thermistor in series on the incoming AC it should be sized to have a minimal impact when the radio is running "steady state". If it is undersized (underrated) they will run hot and dissipate some electrical and thermal watts. There is a complete data sheet on the NTC Thermistors at;
http://www.thermometrics.com/assets/images/cl.pdf

A CL-90 might be a little "light duty" for a R-390/A, maybe you should have a CL-80 or CL-70 in there instead.

The advantages;

1) catch the high inrush current to spare the transformer, micro-switch and maybe the tube filaments a bit of abuse.

2) drop a few volts on the line input due to chronic high voltage from the electrical utility.

Look at the resistance at 25c and then at the approx resistance at 25. 50, 75 and 100% of load (in the table).

If the NTC thermistor is running hot all the time then either your line voltage is way higher than you expected it to be or your current it way higher. There is a happy medium where the thermistor may be a little hot to the touch but not glowing and smoking. They also suggest not soldering this into a circuit as they can run hot enough to melt the solder off of the leads. Use crimp connections into a screw block and plenty of room for air to circulate around this miniature "space heater".

Date: Fri, 30 Mar 2012 10:01:20 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] NTC Thermistors, sizing, measure twice, add once

I don't run the ovens. With ovens off, the R-390A uses about 140W or 1.2A, well below the CL-90's 2A max. The spec says that at 1A it's 3 ohms; at 1.5A, 1.75 ohms. At 1.2A it will be in between, and will dissipate an intermediate power, maybe 3.5W . It's hot enough to burn fingers, but so are power resistors and 26Z5W's. I soldered the leads and have seen no evidence of melting, but I also
kept them as long as possible without compromising safety. It wouldn't pass a shake test, but I'm not losing sleep over it.

Date: Sat, 31 Mar 2012 12:01:56 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Coming: Real In-rush Protection / > Step Start

It would seem that the same might be accomplished through "reflowing" potting compounds where used. I tried just that in order to quiet the loudly humming transformer in my '67 EAC. I removed the small "chassis" and connectors from the transformer and then baked the transformer at a couple hundred degrees for a few hours. A very small amount of tar leakage, post baking, that had not been present before baking confirmed that the tar potting had reflowed. However, upon reassembly and retest, the transformer hummed as loudly as it had before.

Maybe my transformer is low on tar and needs topping up.

Date: Sat, 31 Mar 2012 12:38:47 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Coming: Real In-rush Protection / Step Start

A "Wise" man wrote: "Combine the approaches. Thermistor as delay element, and the relay shorts it out."

This approach makes the most sense. This would give you the advantages of the NTC thermistor, a gentler start, and remove the heat disadvantage. Something obtusely similar, but with a different purpose, is done in the degassing circuit of CRT computer monitors. Here, in the degaussing coil, a large initial current is allowed, which then decays as the series posistor heats up. A series relay then disconnects power to the degaussing circuit entirely. Yes, I know it is accomplished differently from that which we are advocating here, but there are similarities.

Dave went on to comment:

"On the other hand, it makes me laugh to hear the CL90 called a fire hazard when the R-390 came with two 6082's."

Installing a CL-70 in my '67 EAC, I left the leads long, sleeved with teflon tubing, and soldered it in. Gets somewhat hot, but works. Before the ICL installation, powerup produced a loud "Click-Tuuuuuuunnnnnnnggg!!, but now there is a just a quiet "ZZhhink-click" as the antenna relay pulls in gradually. The new sound is much more satisfying and appealing, especially as compared to the previous sound which implied that the transformer had wanted to bust at the seams.

On those horrendously hot 6082's used as pass elements in the R-390/URR regulated power supply, I know someone whose R-390's 6082's set fire to some schematic prints that the radio was sitting on atop his workbench.

Date: Sat, 31 Mar 2012 17:51:34 -0400
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: [R-390] Fw: in rush

> This is what I have been doing for years on all of the old gear, a
> properly selected thermistor followed by a ten watt wire wound resistor,
> Ohm value selected to drop the high line voltages to a bit about the

> minimum voltage as measured at the tube filaments, usually around five
to
> ten Ohms, then following the resister is an MOV. The incoming service to
> the home also has a huge MOV on the line to a ground that is less than
one
> Ohm. This has worked very well for years and to me the concept of a
> fire hazard is absurd. The only time that a thermistor is not the proper
> choice is where the item is turned on and off frequently without giving
> the thermistor a long enough time to cool off, and even this would have
no
> effect on a receiver as the tubes would also still be warm and under the
> worst case would be no worse than the operation without the thermistor.
> Dumping power on a large plate transformer "might" benefit from a step
> start, that is what I use on the Gates BC1G. I think large thermistors
> would work better there, and get rid of extra plate relays, large
> resistors, and the time time delay relay. And again these are my
> additions, Gates did not install any step start originally. If you are
> running a high power solid state rig with huge capacitor input filtering,
> then probably step start or switching between two thermistors would be
> likely necessary. These critters are very inexpensive and can be
> connected in series or parallel as needed. What is not like?

Date: Mon, 2 Apr 2012 13:20:00 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Coming: Real In-rush Protection / Step Start

I love the low-stress way the dial comes up. No buzz. And the room lights don't dip anymore. You could use a variety of coil voltages, including DC, but 120VAC is the simplest to wire up. Arbitrarily setting a price ceiling of $10, I found six interesting part numbers at Mouser.

The cheapest was the Magnecraft 9AS1A52-120 at $5.
Only 12 left, but there are plenty of the others:

Omron LY1F-AC110/120
Omron LY2F-AC110/120
Omron G2R-1-T-AC120
Omron G2R-1A-T-AC120
Omron G7L-2A-TUBJ-CB-AC100/120

All of these have a mounting flange on top. I will probably not be doing this, but if you can benefit from my research, great.

Date: Fri, 6 Apr 2012 17:21:48 -0700
From: Mark VandeWettering <kf6kyi@gmail.com>
Subject: [R-390] My First Boat Anchor...

I've just acquired my first true boat anchor: a Collins R-390A bearing the Motorola serial number 519, and by the order number on the back, appears to have been manfuctured in 1956. I acquired from my boss as he's retiring and downsizing. It appears to be in very good condition: front panel is immaculate. The inside is a bit dusty and grimy, but all the mechanicals seem good upon inspection. A couple of things worry me about the radio though: the power cord seems very light weight, and is a two prong connector. My primary concern above everything is to make sure that it is safe to operate. Beyond that, I've got very little experience in cleaning and maintenance of this kind of vintage equipment.

Can anyone recommend some resources? Initially, I'm looking for a "best practices" modifications to improve the electrical safety, but beyond that, I'd like to to get some guidance on how to proceed to clean and tune this radio. Any links/information helpful to the beginning boat anchor enthusiast would be helpful. Anybody in the SF Bay Area who might be willing to act as an Elmer would be even more helpful. I've never tackled a project quite like this before, and I'd like to benefit from the experience of those who do it right.

Date: Fri, 6 Apr 2012 19:38:31 -0700 (PDT)
From: Joe Connor <joeconnor53@yahoo.com>
Subject: Re: [R-390] My First Boat Anchor...

Congratulations, Mark!

Here are some resources:

1. Chuck Rippel's R-390a page (archived):

http://web.archive.org/web/20070630132300/http://www.r390a.com/

2. The very comprehensive Y2K manual:

http://www.r-390a.net/Y2K-R3/index.htm

3.? There are several DVDs available that show how to work on and overhaul an R-390A:

http://www.ermag.com/index.cfm?v_link=catalog&v_product_type_id=26

Date: Fri, 6 Apr 2012 21:38:35 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] My First Boat Anchor...

Congratulations on becoming the owner of the finest in vacuum tube receiver technology. You may want to look at others in the series. Let me be the first to kick over the grounding can, so to speak.

The grounded three prong line connector was invented in 1927, but it didn't catch on right away. Europe made it required by law in 1965. Three prong outlets were not common in 1955, hence the 390 has a two prong plug. The sets were expected to be installed in grounded enclosures, common since the beginning of commercial electricity. This took care of RF grounding as well as safety grounding.

The original line filters have 0.1 mfd capacitors from line to ground. The reactance at 60 Hz is about 10,000 Ohms. This is enough to lift the case to a tingling 60 volts above ground if you fail to ground the case properly.

The sets were not designed for outlets with ground fault interrupters. If you plug a properly grounded set into a GFI outlet, it will trip. The only way around this is to use an isolation transformer, so the GFI doesn't see the reactance (not "leakage") current from the line filter.

However, the set is not being used in a military environment, where 0.1 mfd caps were required. For home use, 0.01 mfd is adequate, if you need a filter at all. This modifies the set from its original design, which is not always acceptable. Same goes for the plug.

The other thing you can do is to eliminate the GFI outlet.

In any event, ground the set to a metal water pipe. #14 copper is adequate. If you have transmitters, use that ground. Or, you can connect the ground wire to the ground pin in an otherwise empty plug. Plug that into a three prong receptacle that you know is grounded. Let the discussion begin . . .

Date: Sun, 22 Apr 2012 16:56:00 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] I've been reading the Y2K

I've been reading the Y2K Beta version and have so many questions I can't remember them all. However, here are a few: 1st. In chapter 9 there is this statement: "Ok so you have run all the subassemblies through the dishwasher."

This whole section is written in a rather tongue in cheek style. Is the author serious? Is it really a good idea to run the sub-assemblies through a dishwasher? If so, any recommendations concerning temperature settings & detergent? My XYL is away for a week. Now would be a good time to strike if this is an approved procedure.

2nd, Figure 5-9 Page 5-21 shows a rather sparse drawing of the power supply module. Below the drawing there is a note:

Note: FC6 REPLACES V801 AND V802 WITH CR801 AND CR802

What is FC6? What is CR? (as in CR801) Is this a tube? Is it a SS Diode? (SS = Solid State)

The Y2K seems to be a very scholarly attempt at being a control document. However, I think it would be a good idea to add a list of definitions. It would be great to have one place to go to find the definition for all the acronyms & unusual nomenclature. After all, How many of you can tell me what a REMF is? Here is a hint. My former boss was a REMF! LOL (Lot's Of Laughs). All for now, I will post as I remember more questions.

Date: Sun, 22 Apr 2012 17:07:17 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Power supply MOD

Naturally I am not the first to have worked on this R-390. I found a MOD (Modification) in the Power Supply.

V801 is missing from it's socket. A wire is coming out of the center hole leading to a big 30 Ohm 18 Watt wire wound ceramic resistor. The big 30 Ohm is in the circuit between pin 6 of V801 and pin 8 of V801. I can see no other changes. It looks like this big resistor just drops the 285V Pin 6 voltage down to the 240V Pin 8 voltage. All the operational pins on the V801 socket are common to the same pins on V802.This doesn't seem like a very good idea for some reason. Can someone give me a clue what the tech was thinking?

Date: Sun, 22 Apr 2012 18:14:44 -0500 (CDT)
From: nryan@mchsi.com
Subject: Re: [R-390] Power supply MOD

That indeed is part of a mod to the PS. The resistor's purpose is to drop B+ voltage to the correct level. Reason it's there is because the two 25Z5W tubes were removed and diodes installed in their place. Voltage off of diodes is higher than that off of rectifier tubes, thus the addition of the resistor.

I think this was a commonly applied mod in Navy rigs. Personally I favor retaining 26Z5Ws. If you feel similarly, ensure that the filter caps are not leaky so that they do not shorten the rectifier tubes' working life. The tubes are very rugged and will last long under normal conditions.

Date: Thu, 26 Apr 2012 15:09:42 -0700 (PDT)
From: Mike Jones <dustoff4@sbcglobal.net>
Subject: [R-390] R390

Thought I'd throw an email out for a question. I'm new to the Collins line, I do own several boat anchors,? and wonder what is considered the best way to run an R390? I have heard, leave it on 24/7, ovens off, don't let it sit on one set of coils, frequency, when I'm not listening to it, shut it off........etc. What kinds of experience have any of you had that works?

Date: Thu, 26 Apr 2012 19:02:25 -0500 (CDT)
From: nryan@mchsi.com
Subject: Re: [R-390] R390

1. Turn off the ovens and reduce the 3 amp fuse to 2 amps. Reason being that PTO's thermostat can stick and totally cook the innards. Reduced size fuse will enhance protection in case of, say, a filter capacitor failure.

2. Consider soft-starting the receiver with a Variac and setting it no higher than 115 volts but no lower than 110 volts.

3. If a Variac is not an option, wire up a buck-boost arrangement by means of a 12 volt filament transformer so as to lower line voltage input. See the "Pearls of Wisdom" in the R-390A Y2K online manual.

4. If it's a "non-A" in a rack with room for hanging an AC powered muffin fan off the receiver's left side, set its voltage by way of an AC capacitor wired in series to lower its speed and run silently. Orient fan to draw heat AWAY from power supply module. You won't need much air movement.

5. No need to run 24/7 unless you are sitting in front of the rig all that time.

6. Not heard anything about leaving receiver sitting on the same coils. Keep it tuned to any frequency you like for as long as you like.

Date: Thu, 26 Apr 2012 19:05:00 -0500
From: "chacuff" <chacuff@cableone.net>
Subject: Re: [R-390] R390

I've heard of all of those except the one about letting it sit on one set of coils. Still trying to figure that one out and how it might be a bad thing.

You will find that everyone does it differently...some leave them on 24/7 (which they were designed to cope with) and some turn them on and off.

Probably the only thing I can think of that is a no no is do not leave the radio on and in the "STANDBY" position. Our line voltage is high enough these days to add a bit of stress but unloading the power supply pushes some of the components beyond their voltage limits.

I think the best thing you can do with the radio is use it often. There is a case for thermal cycling being harmful to electronic gear and just leaving it on 24/7 might be better for it...but really it's personal preference.

Date: Thu, 26 Apr 2012 20:23:06 -0500
From: "Ba.Williams" <ba.williams@charter.net>
Subject: Re: [R-390] R390

The operators manual mentions a recommended time limit for using the standby function. I've heard something about coils years and years ago. Don't remember why it was said to not so that. A former member, Nolan Lee, left his on 24/7 and kept testing tubes along the way.

Date: Fri, 27 Apr 2012 06:41:47 -0400
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: Re: [R-390] R390

I believe the reason for not leaving it sit on one range is this, switch it ocasionally to keep the contacts clean. once every few months or perhaps longer.

Date: Fri, 27 Apr 2012 07:31:36 -0500
From: "chacuff" <chacuff@cableone.net>
Subject: Re: [R-390] R390

Only thing I can think of is that in some of the tropical climates during it's military service, there might have been a concern of the slugs sticking to the coil forms if things didn't get moved around from time to time. Just a thought...

Date: Fri, 27 Apr 2012 16:07:31 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: [R-390] R390A on 24/7

Strongly suggest you NOT leave the RX on 24/7 and as Cecil noted, never in "STANDBY." The only "advantage" of 24/7 operation is to mitigate cold start drift. On an R390A, that drift fairly minimal as compared to other tube equipment. In "STANDBY," the plate B+ voltage is on but has no load. As a result, it "creeps" up and can damage a radio.

Date: Sun, 20 May 2012 16:30:35 -0400
From: Nick England <navy.radio@gmail.com>
Subject: Re: [R-390] CV591 power connector

Clarification - the 3-wire grounded-type twist-lock female plug will NOT work in the 2-wire male receptacle. The 3-wire plug is larger than the 2-wire. The 2-wire female twist-lock plug should be a NEMA ML-1R (Hubbell HBL7464V) - the back shell and strain relief don't look like the old kind, but should be much better. I have not tried these since I still have enough of the old brown style.

The 3-wire female twist-lock plug should be a NEMA ML-2R (Hubbell HBL7593 or HBL7593V) - I am NOT sure about that since two Hubbell data sheets seem to contradict each other!

See http://www.hubbellcatalog.com/wiring/catalogpages/Page-B05.pdf

And a warning - the 3-wire MS connector on earlier CV-591A (TMC MSR) is wired differently from those on later ones and on all other military gear I have come across! The standard is ground on pin B, but TMC didn't do it that way on early CV-591A for some reason. I have changed all my CV-591A connectors to conform to the standard.

Date: Sun, 20 May 2012 18:26:57 -0500 (CDT)
From: nryan@mchsi.com
Subject: Re: [R-390] CV591 power connector

Thanks for that tip on ground connection for MS series. I've noticed that the three wire connection varies from one type of equipment to another.

Is there a standard hook-up convention for the other terminals, A and C? (Neutral and hot wires?) If not, it would be helpful to adopt a standard so one can switch power cords among other units, be they CV-591, R-1051*, etc., without worry. Perhaps our group can work out a standard.

I suspect, but do not know for sure, that when the the R-1051 series receivers came along, the Navy had their power connectors identically wired. (Any R-1051* mavens out there who can confirm this?) My hunch is that at some time prior, there was no standard connection pattern, but with subsequent wider use of the MS series, some consistency was required. We might use the R-1051* as our starting point.

From: nryan@mchsi.com
Subject: Re: [R-390] Starting R-390 restoration - My $.02

Nice thought-provoking comments from both of you. Anyone care to comment on inrush limiting devices such as those for sale on Electric Radio's website?

Here, have a look:
http://www.ermag.com/index.cfm?v_link=product_detail&v_key=325
http://www.ermag.com/index.cfm?v_link=product_detail&v_key=347

Date: Mon, 3 Dec 2012 22:23:13 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] Current Inrush

Their description "reads" like another varesistor and for $44 at that. Gimme a couple days and I'll give you a real inrush dampener. Parts are largely from Radio Shack, cost..... maybe $20 or a just a tad less.

Date: Tue, 4 Dec 2012 04:01:43 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] Is your R390A Power Cord Connected Correctly ?

Been running into radios where people (quite correctly) add a 3 wire cord in place of the 2 wire. In some casese, the connections for the neutral and hot side of the line at the back of the radio. under the removable protective cover have been reversed. The result has been, the hot side of the input was not fused and did not switch off. Rather it was the neutral which was fused and switchesd 1 short to chassis ground, no fuse would blow and...... Also, the transformer always had 115V on the primary as measured to chassis ground. Not a good situation at all.

Is yours so configured? To check, unplug the radio and remove the 2 nuts securing the rear panel A/C line input cover. !! Make a 2nd check that the R390A A/C line has been unplugged !!! Pull the fuse and with an ohm meter, check continuity from the line side of the fuse to the rear panel connection where the black wire on the line cord is connected. It should read 0 ohms. If there is no black wire, ohm from the line side of the fuse to that prong on the line cord which would plug into the narrow side of your A/C outlet.

0 ohms from the line side of the fuse to the black wire or to the prong which plugs into the narrow side of the outlet is correct. If not, reverse the A/C connection on the back of the radio attaching the black, hot wire to the terminal which is connected to the line side of the fuse. Do not make this check and subsequent countermeasure unless you fully understand the process and end result.

Date: Mon, 3 Dec 2012 22:50:51 -0600 (CST)
From: nryan@mchsi.com
Subject: Re: [R-390] Is your R390A Power Cord Connected Correctly ?

This is good advice because the terminal where the line cord's hot lead should connect can be either on the left or right. Chuck's continuity test safely determines which terminal is which. Once the hot terminal is pinpointed, mark or label it as such so that if the line cord ever is disconnected from the power input terminals, it can be reconnected properly.

Date: Tue, 4 Dec 2012 11:58:55 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Is your R390A Power Cord Connected Correctly ?

Thanks to Chuck for this alert. I plan to add it to my "diatribe" on line cords and bypassing (copy to any who request it). Two additional points:

1) The "line side of the fuse" (on a chassis mounted fuse holder as found in these radios) should be the terminal at the end of the fuse holder farthest from the chassis, on the center tip of the holder. This reduces the chance you will come in contact with line voltage as
you install or remove a fuse. (I suggest a bit of heat shrink tubing on that terminal.)

2) On the chance you find a European color coded line cord installed, here are the colors:

LINE (US) Black = (EU) Brown
COMMON (US) White = (EU) Blue
GROUND (US) Green = (EU) Green/Yellow

(If there are other color schemes found overseas, someone let me know, please.)

> ... 0 ohms from the line side of the fuse to the black wire or to
> the prong which plugs into the narrow side of the outlet is correct.

I think of it this way: the wide, broad flat blade of the plug (and wall outlet) are most like "Ground" and need to be most reliable.

Date: Tue, 4 Dec 2012 12:09:52 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Is your R390A Power Cord Connected Correctly ?

A little off topic, but that same methodology applies to wiring lamp bases.

The hot wire should connect to the "tip" connection - not the shell. When replacing a burned out bulb, the switch might be in the ON position and when you unscrew the bulb, you might not realize the circuit is ON (more likely to occur on multi-switch circuits). If the shell is hot, you're more likely to get a shock if the shell is hot in that case.

Date: Tue, 04 Dec 2012 11:39:23 -0600
From: Robert Nickels <ranickel@comcast.net>
Subject: Re: [R-390] Current Inrush

The NTC thermistor method of limiting inrush current was used in millions of TV sets but these were well-engineered applications where the part was properly sized.   As is common in the internet age, semi-truths and incomplete solutions become propagated and archived for the naive to find and assume to be correct.

NTC thermistors that are inserted full-time in series with the load need to be properly sized - the manufacturers provide datasheets and calculators for this purpose, there's no "one size fits all" solution. For example, a CL-90 is designed to run at a stable temperature with approx. 1A, with a minimum of .5 and a maximum of 2A current.   If you use one on a load drawing say, 100ma, its resistance will vary quite a lot with ambient temperature (after all, thermistors are widely used as temperature sensors). You don't want the voltages in your radio varying with the season ;-)

Instead, many boatanchor applications would be better served with a soft-start circuit.   Again, these are widely used in industry and not rocket-science, and are easily home-constructed.   A simple approach uses an NTC to limit inrush current (or just a power resistor) for a short period of time after AC power is applied, but this device is then
bypassed by contacts of a relay to provide full line voltage to the protected device.   All that's required is a slow-rising voltage (usually just an R-C time delay) to provide a delay before the relay contacts pull in.   The soft-start may be harder to fit inside the radio, but building it in an external enclosure makes it easy to use with different radios.   Since the NTC is only in the circuit for a short period of time (from 1/4 second to several seconds, typically), sizing of the NTC is less critical and there is no heating issue because the device is bypassed nearly all the time. Both the voltage and time can easily be determined by the builder.

I'm not familiar with what's in the box sold through ER but I'd guess it's just a full-time NTC with a cute little meter to show you the rising voltage.
I think it makes more sense to put full-time NTC limiters inside small devices that present consistent loads, and provide a true soft-start to help pamper the big iron.

Date: Tue, 4 Dec 2012 13:27:38 -0500
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: Re: [R-390] Current Inrush

I had no idea that the people on this site were so ignorant that they can not read a simple graph!!! I have used these critters for years and find nothing works better or simplier, and yes the CL90 does fit most of the old receivers quite well. I have not seen any old receivers that draw 100 ma.

Date: Tue, 04 Dec 2012 13:49:16 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Current Inrush

Obviously some aren't aware of the size of the R-390A B+ fuse.
R-390As CERTAINLY draw MORE than 100mA! That is simple fact.
One needs to read the manual and use an appropriate method to deal with inrush.
The transformers are failing at a greater rate than we've been accustomed.

Date: Wed, 5 Dec 2012 17:57:56 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Is your R390A Power Cord Connected Correctly ?

Yes there is at least one other that I know of, prior to the introduction of the EU colour code here in Australia and New Zealand there was or is this (and I say is because I've found the older colour codes on some equipment that's relatively modern)...
LINE = PHASE (AU/NZ) Red
COMMON = NEUTRAL (AU/NZ) Black
GROUND = EARTH (AU/NZ) Green

Also, we don't use the terms Line, Common and Ground...we generally refer to them as Phase, Neutral and Earth.

Date: Wed, 5 Dec 2012 22:06:47 -0800 (PST)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Current Inrush

[snipped] "Instead, many boatanchor applications would be better served with a
soft-start circuit. Again, these are widely used in industry and not rocket-science, and are easily home-constructed. A simple approach uses an NTC to limit inrush current (or just a power resistor) for a short period of time after AC power is applied, but this device is then bypassed by contacts of a relay to provide full line voltage to the protected device. All that's

required is a slow-rising voltage (usually just an R-C time delay) to provide a delay before the relay contacts pull in. The soft-start may be harder to fit inside the radio, but building it in an external enclosure makes it easy to use with different radios. Since the NTC is only in the circuit for a short period of time (from 1/4 second to several seconds, typically), sizing of the NTC is less critical and there is no heating issue because the device is bypassed nearly all the time. Both the voltage and time can easily be determined by the builder."

And, IIRC, Dave Wise implicated an NTC thermistor in an R-390A in frequency instability in one or more of the crystal oscillators, due to degraded power supply regulation.

Both concerns, inrush and undesirable series resistance may be addressed with a simple, classic circuit. The NTC thermistor (or fixed resistor) is inserted in series with the transformer primary supply (hot lead). Then, relay's coil (appropriately voltage rated) is connected across the primary. The relay's normally open contacts are strapped across the resistor, that's it. Upon application of power, the resistor limits the surge, and the primary voltage stays low until the surge has largely passed. With reduced current comes less voltage drop across the resistor, the primary (and relay coil) voltage rises, and the relay pulls in, bypassing the resistor and applying full voltage. Some experimentation with the resistor and with relay pull-in characteristics is in order. A resistor can be inserted in series with the relay's coil and/or the armature spring tension can be varied.

Date: Thu, 6 Dec 2012 17:03:51 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] Current Inrush

Drew outlines exactly my approach; have done this on a couple Henry amplifiers. Ended up using a 47 ohm, 5W cement resistor and a 120V relay from Radio Shack all enclosed in a small, plastic "project box" from same. On the bottom of the shelf where the tubes mount on power supply, there is a terminal block. The terminals are labled 1-6 or something linke that. If the A/C feed for the radio is properly wired, the outboard screw on terminal #1 has a white wire with black tracer which is the feed point for the switched A/C feed. I disconnected that wire and lug from the terminal and removed the lug. Connected an insulated pair, one of the wires had a white tracer and ran those between the power transformer to the relatively open area in front of the transformer. Wire with the white traced was spliced to the white wire with black tracer and on the other wire, I installed a spade lug and connected it to terminal #1 on the transformer, where the stock wire had been removed from.

The wire with the white tracer goes to the resistor which is connected to one side of the relay coil. A 3rd wire goes from the relay coil, routed next wiring harness to the left of the PTO, around the back, inside of the radio to the A/C neutral connection on the mains filter.

The relay is configured such that when it pulls in, the 47 ohm resistor is shorted.

You will need to drill a couple holes in the plastic "Project Box" for the wires to pass; I affixed the box to the vertical chassis between the MC change shaft and seperator between the power transformer compartment and PTO.

Turn the radio on cold, the relay takes approx 1/4 to 1/2 second to pull in, shorting the resistor. It becomes >slightly< warm to the touch. There is a bit of relay chatter @ 60 CPS as the relay pulls in but not much. The choice of employing a 47 ohm resistor was a balance between pull in time, heat and relay chatter.

This approach is not as elegant as perhaps a 10-30 second timer relay and larger, say... 100 or 150 ohm, 20W resistor to dampen the inrush but it certainly takes the "edge" off. Unlike the thermistor, (which in light of failing power transformers, is admittidly better than nothing if sized properly 3A X 120V or 360W) there is no resistive load in series with the A/C to heat up and wonder about. If for some reason the "Heater" switch is accidentally turned on and the current load subsequently increased, (no one here is in an arctic climate, yes?) the relay/resistor approach is ambivilent to the increased load.

Date: Thu, 6 Dec 2012 09:31:28 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Current Inrush

Do I take it that thermistor + relay was inferior to resistor + relay?
That's not what I expected.   Dave Wise

The instability I observed is not a good real-world data point. Back when I was breadboarding the 3DW7D, I put the weakest tube I could find into the PTO, in order to magnify instability to where I could observe it. It's the emission reserve. A normal tube has so much to spare that cathode temperature doesn't play a significant role.

> Date: Fri, 21 Dec 2012 20:48:02 -0500 (EST)
> From: lasavidge@aol.com
> Subject: [R-390] RF Noise
>
> Evening: Has anyone ever experienced RF noise being generated from the

neon lamp used in a AC Outlet strips. Non Surge type. Just a simple switch --lite by an internal neon lamp when power is applied? Tnx Lee

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Date: Sat, 22 Dec 2012 14:35:06 -0500
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] RF Noise

Yes, it's usually caused by a crimp/loosened connection; there is a series resistor that can change value.

Date: Sat, 22 Dec 2012 15:24:55 -0500
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] RF Noise

The neon lamp is a good RFI generator. The crimps can be eliminated by solder, but, this is most likely not the source of the interference. The glow in the neon lamp is an ionization of the gas between the two electrodes. This ionization is the source of wide band RFI. In 1998 a patent was issued to OSRAM Sylvania for a RFI shield for a neon lamp to be used in an automobile. You might can reduce the interference by bypassing the neon lamp with capacitors on either side to ground.

Date: Mon, 31 Dec 2012 12:22:27 -0500
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] Dead R-390A power supplies

For me, building power supplies is fun. All it takes is a basic knowledge of electronics (if that). Substitute transformers can be found at reasonable cost. An outboard HB supply might be a good thing. The rx will run cooler, and there would be no acoustic coupling of hum into the pto shaft. I have done this with other receivers that could have gone to the grave yard. Big improvement, especially stability.

I may have posted this before. R390a power supplies have been chucked into the can because of an apparent shorted transformer. The short might be a carbon track in the potting tar right at the high tension winding porcelain insulator. Its a fairly easy fix. Look for it.

Date: Tue, 1 Jan 2013 18:37:02 +0100
From: sigmapert <sigmapert@gmx.de>
Subject: Re: [R-390] Parts from Germany

Reply to concerns of Chuck Rippel regarding a large amount of heat generated by the 3TF7 replacement. My 3TF7 replacement is based on a SWITCHING voltage regulator (12.6 Volts). Power dissipation is less than 1 Watt. Therefore the device remains cool. BTW, I've built a similar

regulator (6.3 Volts) for the hard to find 4H4C ballast tube as found e.g. in the National NC-300, NC-303, NC-400, HRO-60, and in the Hallicrafters SX-88. http://schmidmainz.de/4H4C/4H4C_Replacement_const-6.3V+Box.jpg
http://schmid-mainz.de/4H4C/4H4C_Replacement_const-volt_ACDC_Relationship.JPG

This is a totally different regulator than the constant current regulator published in ER 264 that gets really hot.
http://schmid-mainz.de/4H4C/4H4C_Replacement_const-cur_ER264.pdf
SigmaPert - DH3PJ sigmapert@gmx.de

Date: Wed, 2 Jan 2013 12:07:29 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R391 Audio Deck Question

I have not had much experience with the R391. But the general procedures are in order to trouble shoot (... the fault pulling the HT down.....) any problem. If you are not blowing fuses off the top check that what's in the holder is not largely over size, before you burn some thing out. Likely a tube went bad and is pulling the B+ line down. Once you pull a tube and try to measure B+ on the socket, the bad tube is out and you do not see the low B+. It is likely that running all the tubes through a tube tester is in order.

Next choice is a cap has gone leaky or a short, and is pulling the line low.

If you still have tube rectifier in the power supply, check these in the tester. The tubes can reach and end of life and have low emission thus being the source of the problem.

A real good eye ball from end to end may be in order.

Unplug a many modules as possible (IF RF Osc) then unplug as many tubes in the audio deck as possible. See if you can unload the B+ line to where it comes back to a good value. Then start adding things back in. This is not sure fire. You can get the bad section powered up but because every thing else is not on line, there is sufficient power to leave things looking OK at that stage of investigation.

So get the audio deck and IF deck back together and run a signal through the IF and Audio to do stock signal to noise and gain test. This is to make sure these decks really work.

Then you can add back in the RF deck.

Yesterday this receiver worked.

Today it does not work.
One and only one thing changed overnight.
The repair will be a single part.
This receiver does not need to be re engineered.
This problem does not need deep thought.
This problem does need good logical problem solving troubleshooting behavior.

This does not mean you will not find lots of things that should be fixed along the way that are bad and should have been identified and repaired prior to this point. Past prior problems from just old age still needs attention. So as long as you are in it fix as many of the problems as you have time and parts to resolve. Please do stay with this R391 and get it operational again.

Date: Thu, 3 Jan 2013 16:55:28 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390A Audio Solution

I kept the 3DW7 quiet by not generating hash in the first place.
The German guy who was (is?) selling another SS 3TF7, I think he's doing what you say.

Date: Fri, 4 Jan 2013 13:00:24 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: [R-390] R-390A Power Transformer, going SS and turn on surge (was R390A Audio Solution)

I am thinking seriously about solid stating the power supply on my R-390A, adding a B+ dropping resistor and a slow turn-on circuit. I've been thinking about the long-term preservation of my radios and I'm still young enough to get another 40 or so years of use out of them. Up until this point I had been reluctant to touch the power supply...I figured the rectifier tubes would give a good enough slow turn-on or 'soft start' for the equipment.

But...browsing through the archives has led me on a different train of thought. About the stresses on the transformer (and other components for that matter) at turn-on...about a faulty rectifier tube taking out a transformer winding...about people that solid state the power supply without adding the B+ dropping resistor therefore the increased B+ generating more stress and heat...etc. A lot of it I already a little about, but the reading gave me a good refresher on the subject. Also the recent conversations here regarding soft start circuits, well...it all got my gears turning.

The 26Z5W tubes in my radio do get very hot...to the point of charring the nearby chassis wall. This can be removed very easily with a good cleaner but it shows that a lot of heat is being generated in this area. Then I started to become concerned for the safety of the Power Transformer...I've already had one 26Z5W fail taking out a winding in the past - rather foolishly, I threw that Transformer away. Anyway after seeing the visual evidence of heat in this area that's where my first thoughts of going solid state came from. The recent discussions here about soft start circuits planted another seed in my mind and got me out and about in Google...I stumbled across a circuit that I really like the look of...it uses 24V from the secondary of the PT to power the relay and a small timing circuit. The relay's contacts are across a resistor in series with the PT primary and when the timing circuit operates the relay the resistor in the primary is shorted out allowing full line voltage to the PT. There is no circuit diagram or description for the circuit other than a PCB layout but it looks very simple and easy to reverse-engineer to fit one's needs.

So the more I think about all this the more it's making good sense to go ahead and do it...as far as long-term reliability goes. Getting some heat out must be a bonus too. Well, OK the B+ dropping resistor would put some heat back in but I guess a lot less than the 26Z5W's.

Date: Fri, 4 Jan 2013 07:22:21 -0500
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: Re: [R-390] R-390A Power Transformer, going SS and turn on surge (was R390A Audio Solution)

Hi Ken: The only thing wrong with this idea is that the transformer is still hit with the current inrush when first turned on. IE before the relay pulls in. I still am amazed that the current inrush limiters are met with any objection. They are simply the best solution, Based on performance, cost, and size. Perhaps that is the problem, many may think that any design must have esoteric qualities and great cost to be effective. The only place where time delay circuits become necessary are those that are turned on and off frequently(the inrush limiters must cool for a minute or so) and other special circuitry that probably already has time delays built in.

Just try the stupid things and see for your self. Watch the voltage start low and rise to the applied voltage and I bet you will say, why did I not do this earlier! Usually takes a second or two depending on the selected limiter. Properly selected they will stabilize at a voltage drop of about a volt or so in the typical 100 to 200 watt equipment range, less in high power stuff. They do get hot, and have to be, to be functional, the cold resistance is many times the hot resistance. They do not get as hot as many vacuum tubes. However, they should mounted as one would mount any resistor that dissipates a modest amount of power. Just position them away from the chassis enough to allow movement of air around them. The

concept that they cause poor voltage regulation based on ambient room temperature also baffles me. Properly selected as indicated their normal device temperature in the range of a few hundred degrees, enclosed inside a box that does not reach a stable temperature for hours, you are going to tell me that a small change
in room temperature is going to have an discernable impact?

Now if you select an inrush limiter designed for a several ampere load and set up a test feeding a load of say 250 millamperes and stand there with a fan turned on and off, the load voltage will jump all over the chart!! Guess what, you just discovered a thermister! This is a case where "safety factor" does not apply, they must operate at their design range of current flow. For most equipment one can simply use the rated watts and voltage to calculate the amperes, for those that are fussy use a power factor meter or guess at a power factor of .8 to .9. For a transmitter that uses a common transformer for all power there will be a change in line current between standby and transmit. Likely not much more that two to one, should not be a problem, just select the inrush limiter that has a maximum rating for the current drawn on transmit. They are designed for a small range of current that and selection should not be too difficult. If there is a separate plate transformer then use one for the plate transformer primary and another in the B+/ filament transformer.

These discussions rather remind me of the concerns about all sorts of exotic replacements for the non off the shelf current regulator tube for the two oscillators. Just remove the regulator, save it, place a jumper in the socket, and replace both oscillator tubes with their twelve volt equivalent. Then when you sell it, change it back and extol the virtue of this fantastic design that even regulated the filament power! Never mention that it was designed that way to operate from sources of power with poor regulation.

How do these changes impact performance? My 390A has all of these modest changes plus (horrors) even a series ten watt dropping resistor to operate the tubes at their minimum rated filament voltage,and a MOV following the dropping resistor. I have turned on my gear in the garage on days that are far too cold for me to stay there very long, Does it drift? certainly it drifts, usable within a minute,and for my purposes fully stable enough for me to operate in the time it takes for the transmitter warm up and look around the band/bands. I do keep a light on in the room during cold weather when there is a chance of condensation under warming conditions. Now suppose you say, well I demand that it is totally stable immediately and able to read the frequency to one cycle because I operate only SSB on one exact channel for my round table, also my line current jumps from ten ampers to seventy ampers when I yell at the parallel 3CX5000s. Then I would say you might have several issues, and perhaps stick with Jap stuff, and hopefully on the high end of 80 and away from me.

This is way too long and I apologize for boring any one to death. I will not do it again. I have never done this before, but I will say that this is based on my opinion as an amateur with nearly 60 years of experience (1954) and also my Professional opinion.

Date: Fri, 04 Jan 2013 10:15:57 -0500
From: Curt Nixon <cptcurt@flash.net>
Subject: Re: [R-390] R-390A Power Transformer, going SS and turn on surge (was R390A Audio Solution)

Lots going on in that message ;) I agree with pretty much all you said regarding the inrush limiters. I cannot imagine an application that would be adversely affected thru their use---especially an Rx like the 390A. One thing tho....the relay-based limiters I have used have the relay activate to bypass the resistor. So when it comes on, there is no wait for the relay to activate. the resistor is in place at all times and gets bypassed AFTER the waiting time--- But the surge limiters are SOOOO much simpler to use...and especially when you typically need to drop a few volts of line voltage anyway. Nobody that cares about frequency stability would be silly enough to expect stability prior to warm-up anyway...most leave them run 24/7 if that is their game. If it isn't stable after warm-up, the inrush limiter is not the issue.

Date: Fri, 4 Jan 2013 11:54:44 -0600
From: "Bill Breeden" <breedenwb@cableone.net>
Subject: Re: [R-390] R-390A Power Transformer, going SS and turn on

I have been running a solid stated power supply in my R-390A for a number of years. Given that I solid stated a second power supply so that I could retain my original power supply with tubes, I mounted the B+ dropping resistor on the power supply chassis instead of the audio module to keep the rest of the radio compatible with a tube type power supply. The dropping resistor produces a lot less heat than the 26Z5W tubes and I didn't have to modify my working or spare audio module.

I also have a CL-80 inrush current limiter installed between the AC fuse holder and the AC line filter in place of the original wire between those two points. It's visually obvious when the radio is turned on that the inrush current limiter is functioning as intended.

Date: Fri, 4 Jan 2013 17:06:37 -0500 (EST)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: [R-390] R-390A Stability

<snip> If it isn't stable after warm-up, the inrush limiter is not the

issue.<snip>

This is indeed the case. I use a thermistor inrush limiter and 12 volt oscillator tubes and have used the 390A to listen to crystal oscillators to see what they were doing. Of course these crystals were run in liquids and I was listening for compression wave resonances as the liquid evaporated. The 390A stability was certainly adequate.

Date: Sat, 5 Jan 2013 10:45:53 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] R-390A Power Transformer, going SS and turn on

That's what I was thinking of doing too...mounting the B+ dropping resistor on the Power Supply unit. That way I can swap Power Supply modules between solid state and tubed at will. The main issue for me was getting rid of some heat and being a little bit nicer to the PT at switch-on.

I have to be honest...I don't like the idea of a CL-80 inside my radio. If I go down this road I'll put one inside it's own box and have it external to the radio. I know a lot of guys like them though. Maybe I'll try that approach also.

Date: Sat, 5 Jan 2013 11:31:53 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] R-390A Power Transformer, going SS and turn on surge (was R390A Audio Solution)

Hmm...some food for thought there. Yes as mentioned the series dropping resistor that's in the transformer primary is in circuit at switch-on, so the transformer sees a reduced line voltage initially then after a few seconds (or long enough that the initial surge has dissipated) the relay shorts out the resistor allowing full line voltage to the primary. My understanding is that this delay doesn't need to be very long, maybe 2 to 5 seconds perhaps...

Admittedly the ramp-up to full line voltage isn't as smooth as with a CL-80. With voltage going up in two steps as opposed to a gradual increase.

Next time I place an order for components I'll get a couple of the CL-80s and do some experiments. This whole idea came about with me trying to get some heat away from the transformer...then it evolved into reducing the turn-on surge. If I keep thinking about this it will further evolve into me having the radio suspended in the wind-tunnel things skydivers use for training...now THAT is forced air cooling! hihi...

Date: Mon, 11 Feb 2013 19:37:30 -0700

From: "Robb Urie" <rurie@bajabb.com>
Subject: [R-390] Source for R-390A Power Switch

Any information on a source for the micro switch is greatly appreciated. Mine has failed to the point that I removed it and connected the wires together, easier to use a power strip to turn the radio on. I have found several variations, but each one is too big to work. I tried to repair the existing one, but the contacts are long gone. I?ve checked all the normal places and read most of the reflectors to no avail. I?d like to get a new one since I?m about to strip my front panel for a re-spray.

Date: Mon, 11 Feb 2013 21:11:48 -0600 (CST)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] Source for R-390A Power Switch

I got a couple of them from Fair Radio a few years ago. When you replace one of those switches you should put a spark suppressor across the contacts. Maybe 47 ohms in series with 0.1 uf.

Date: Fri, 15 Mar 2013 15:37:10 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] R-390A Power Supply

I've been looking at a power supply that I have here, and really do not intend to use. (It is a corroded Blue Striper Module.) Looking at the method used to "seal" these, you can most likelyanticipate destruction attempting to open it. It is WELL sealed by soldering the lid on it. There is a spot on the side where you can see that solder was applied to flow by capillary action around the entire top. I was curious to consider opening it up. However, after seeing this sealing method, destructive dis-assembly really doesn't make me enthusiastic about this.

Date: Fri, 15 Mar 2013 16:19:47 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] R-390A Power Supply

I assume we're talking about the power transformer on the power supply module in the R-390A here?

There's not a lot of use opening up the transformer. Once you get the thing open, you find that it's potted with a wonderful black tar. I suppose you could dig the tar out, but then you have the transformer siting there loose with no way to mount it.

If the transformer is shot, it's relatively unlikely to be an easy fix. Most common failure is either an open winding or a short. They tend to happen where the heat is high, so deep in the transformer. Repair involves knocking the laminates apart, pulling the windings, unwinding to the point of failure, rewinding and re-wrapping. Then you are off to re-doing the laminates, re-potting, and re-sealing the enclosure. Been there, done all that, no fun at all.

If it's still ok (but ugly) I'd leave it. Eventually power transformers will become a scarce item.

Date: Fri, 15 Mar 2013 16:26:17 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R-390A Power Supply

It really is only a bit of rust on the top. So it may well be good. I've got another one on its way from another list member. The terminals are allk clean and look good under the chassis/terminal strip area. I may just check it for bad readings with a VTVM. Who knows? It may really be in good shape!

Date: Fri, 15 Mar 2013 16:48:03 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] R-390A Power Supply

I'd clean up the rust, patch it up with some body putty, re-spray it and move on. There is probably a half inch of tar between the casing and any part of the transformer. Of course you *may* have the magic one with an air bubble in the wrong place. Normally the air gap is on the terminal side of the casing.

If it ohms out ok, I'd apply power and see what happens with it running into no load. If it pulls significant current no load, that's not a good sign. Smoke, fire, explosions, blown main breakers, and zombie attack are also not a good sign.

Date: Sun, 17 Mar 2013 10:45:33 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Opening The Power Transformer

I have posted this message before, sorry. The power transformer can be easily opened by hammer tapping a putty knife through the solder seam.

The failure of the winding will most likely occur where the high tension winding enters the small porcelain bushings as it exits the metal casing.

The tar potting material will carbon track to case ground here. The tar can be removed in this area with a heat gun and screwdriver.

Date: Sun, 17 Mar 2013 15:23:26 +0000 (GMT)
From: g4gjl@btopenworld.com
Subject: Re: [R-390] Opening The Power Transformer
Message-ID:

Does this failure mode apply to R390A and R390/ 391 transformers also?

Date: Sun, 17 Mar 2013 11:35:24 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Opening The Power Transformer

I suspect it depends very much on what caused the transformer to fail. If a lightning hit / line over voltage caused an arc then you will get a carbon track somewhere. If a short on the secondary plus shoddy line fuse caused an over temperature situation, you will get a very different failure.

Date: Tue, 19 Mar 2013 13:21:28 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] GFCI issues

This house that I'm in, was built in '79. The GFCIs installed appear to be installed sometime afterward. I've just now started having issues. While NOT related to an R-390A or other such piece of equipment, it is still driving me insane! I have replaced receptacles, AND have replaced the GFCI receptacle. The crazy thing is that the "appliance" that is causing this to trip is a hair dryer that has it OWN GFCI in the power cord. These never trip, yet every time we try to use it, (Even a brand new one right out of the package.), it trips even the NEW GFCI. I'm beginning to wonder if there are issues in the house wiring. The one thing that REALLY puzzles me, is that a 450Deg F heat gun, does NOT trip it. It happens to be an old one that I used to use for covering the airframes of R/C aircraft. Anyone have any useful ideas or suggestions?

Date: Tue, 19 Mar 2013 12:49:20 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] GFCI issues

I'm having a somewhat similar problem. Older house, but new outlet with a GFCI breaker installed for the washing machine. About once a week the GFCI trips in the middle of the night. Even with the washing machine unplugged. And I replaced the (ordinary) outlet at the machine. At first that seemed to help, but then the GFCI tripped again.

What I plan to do next is get an AC milliammeter and see how much current flows from the breaker to the Romex with nothing plugged in. And also use a variable resistor to see how much current it takes to trip the GFCI. An ohmmeter shows no leakage on the Romex itself. A friend suggests using a Megger (an ohmmeter that uses a high voltage source). I did try an improvised megger, in the form of a capacitor tester that applies a high DC voltage across the capacitor under test.

Date: Tue, 19 Mar 2013 14:02:25 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] [Glowbugs] GFCI issues

It is more weird than I thought. These are two prong devices. They have a GFCI as part of their own plug. If I use them in a non GFCI protected, they work - AND - do NOT trip their OWN GFCI. That's why I asked this group and another.

I am going to add MORE testing information. I took BOTH hair Dryers out on the front step. The circuit there is the "other" GFCI one in the house. The Hair Dryers work WITHOUT tripping the GFCI. I think I'm losing my mind!!!!!!!!!!!
The next step is to open the breaker panel and start tightening connectors!

Date: Tue, 19 Mar 2013 12:50:42 -0700
From: "Chris Kepus" <ckepus@comcast.net>
Subject: Re: [R-390] GFCI issues

Why not replace the GFCI that seems to be acting up? That would be slightly
safer than tweaking connectors in the breaker box.

Date: Tue, 19 Mar 2013 14:55:28 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] [Glowbugs] GFCI issues

You might also want to (carefully) cause a ground fault on that hair dryer that has the builtin GFCI and make sure it does work. Some of this Chinese made stuff we are getting these days...

Date: Tue, 19 Mar 2013 15:58:44 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI issues

I already did that. That was this morning. I picked it up yesterday.
I even replaced the receptacle on that circuit.
I've already done ALL the simple and easy things.
That is why I'm headed to the panel box.

Date: Tue, 19 Mar 2013 13:02:13 -0700
From: "Chris Kepus" <ckepus@comcast.net>
Subject: Re: [R-390] GFCI issues

Sorry for taking additional bandwidth. After reading my post on this subject, I realized it needed further work.....sigh. Here are my revised comments.
Why not replace the GFCI that seems to be acting up? After fighting a "new"
GFCI that was popping off for no good reason, I replaced the rascal... problem solved. One bad one out of ten new GFCI protected circuits that I wired up in a new garage.

Date: Tue, 19 Mar 2013 12:58:53 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] GFCI issues

Oh, Boy!! Isn't this fun??

First it is possible to have an "almost" ground if there is a wet staple on the romex, or maybe a wet or partially shorted metal connector on the panel.? More milli-amps on the rest of the circuit will cause it to trip the GFCI.? The rust from the wet staple will make rust migrate through the coating and inside insulation on the wires and make a resistor, only on the older style romex though thermo-plastic, not nylon coated.

We have no idea what the circuitry inside the GFCI on the cord is, especially on the two-wire cord, it could be that there is some component wired form hot to neutral that draws some small current that may contribute to the tripping value.

If you read the paperwork that comes with a new GFCI you will see that the distance from the device to the load is critical to operation.

Then again your house wiring could be crap, too.

Tightening the screws on the neutral bar and ALL ground connections is a great first step.

Surges caused by something in the house will cause the GFCI to trrip, too.? This COULD be caused by something in the NEIGHBOR'S house IF you are on the same pole transformer.

I have a fluorescent light in one part of my house that will 'sometimes' trip the GFCI in the bathroom WHEN I TURN IT OFF! And more,...

Date: Tue, 19 Mar 2013 16:10:01 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI issues

First it was the old one.
I played with replacing simply the receptacles on that circuit.
I then DID install a NEW GFCI.
I still have the same problem.
That is why I'm going into the panel.

It could be as simple as a corroded neutral or ground in the back wall of the panel. Tightening them all "should" resolve the issue. I read Joe's comments, and I don't have rusty staples anywhere that I can see. Lord knows, most of all the wiring is visible in the utility room.

Date: Tue, 19 Mar 2013 15:32:55 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] GFCI issues

A GFCI detects the differential current flow between hot and neutral paths TO THE LOAD. A problem in the house wiring or distribution panel can not trip a GFCI because it is on the wrong side of the detector. Please read this Wikipedia link http://en.wikipedia.org/wiki/Residual-current_device

The article explains how a wire GFCI with no ground connection can trip on a fault. When both the hot and the neutral pass through the same toroid core in the same direction, no magnetic field will be generated in the core if the currents are balanced, as they must be if there is no fault. Faults before the core can not be detected. The fault must be after the core. Since the thing trips on about a 0.01 amp difference out of about 10 amps, it is pretty sensitive. Toroids are supposed to be self- shielding, but a strong local field could be a problem. For those who stubbornly insist that it is due to Chinese hackers sending signals to your GFCI, I have a few rolls of audiophile- quality tinfoil for shielding at $199 each.

Date: Tue, 19 Mar 2013 16:53:27 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI issues

1) I am well aware that the GFCI functions at the mA level of differential current. REMEMBER: their own built-in GFCIs DO NOT TRIP.

A THIRD HAIR DRYER WAS ALSO USED - IT DID NOT TRIP THE GFCI>

2) Considering the overall construction quality of THIS house and the

others built within the very same time period, There is no telling WHAT is wrong.

3) The dumb foundation is 8" wider in the middle than it is on the ends. (Which are within a 1/4 " of each other. It has been the family joke that this house was built by a West Virginia maried couple, brother and sister. The pre-built rafter assemblies are even made of 2" X 3" boards. So I am NOT surprised to now suddenly have some weird electrical issue!

Date: Tue, 19 Mar 2013 17:44:20 -0400
From: "KR4HV" <kr4hv@numail.org>
Subject: Re: [R-390] GFCI issues

Check the grounds in your system. GFCI (Ground Fault Current Interrupter)
detect ground faults and require very good grounds for the green and white wires all the way back to the panel and including the neutral/ground connections in the panel and meter socket/ground rod. Some will trip with a
very small current flowing to ground from the phase conductor or from the neutral conductor if it is not at "ground" potential. Make sure the grounds and neutral conductors are tight in the panel and in j-boxes in the circuit in between the GFCI and the panel.

If the device being used is rated at no more than 80% of the circuit overload protective device, i.e. the panel breaker (or fuse for that matter), the circuit conductor rating and the GFCI rating, the GFCI should work when all conductors are properly installed. (It may work at more than 80% when "otherwise" properly installed but 80% is a good target for loads on circuits.

Date: Tue, 19 Mar 2013 16:19:34 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] GFCI issues

Yes, but a GFCI breaker was mentioned in the discussion, that would mean that the wires from the panel would be in the circuit.

Try un-hooking the receptacles after the GFCI and see if you still have the problem.

Date: Tue, 19 Mar 2013 18:36:21 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] GFCI tester

This is waaay outside of most price ranges but it is in my tool bag

(inherited it);
http://www.drillspot.com/products/152578/Hubbell_GFT2G_Gfci_Tester
A 15 K resistor will usually cause sufficient current to trip a GFCI.

Date: Tue, 19 Mar 2013 19:00:17 -0500
From: Les Locklear <leslocklear@hotmail.com>
Subject: Re: [R-390] GFCI tester

I had one of those in one of my tool bags when I retired, they never asked for it. Besides it said US on it..................there wasn't a period after each letter.

Date: Tue, 19 Mar 2013 20:13:00 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] GFCI tester

How much pain and suffering are you willing to put up with? Assuming you are into this:

1) Pull the wires to the circuit at the panel. Unplug everything from the outlets. Ban all traffic from the area.
2) Energize one of each pair (white/black, white/ground, black/ground) and ground the other. Measure the current into the energized wire. Should be zero.
3) Check the current from each un-energized wire to ground (should be zero).

Grab a current source (DC lab supply):

1) short everything together at the far end of the circuit.
2) Source current (a couple amps) between the white and black.
3) The ground should read 1/2 the voltage on the source end.
If not, there's a fault.
4) Source current between white and ground.
5) Voltage on black will be closer to the white than the black. The ratio of the ground wire resistance to the power leads will let you calculate what's "right". If it's not right, you have a fault.

Let's hope you have found the problem and don't try the next step.

1) combine all three wires at the panel.
2) energize the set of them and measure current. Should be zero. If not, you have a fault.

At each "energize it" step, check things with an ohm meter first..

Once you are done with the tests, put the ground and neutral back where they belong. Remove any short at the far end of the circuit before attaching the hot wire to the panel. Once you are done, allow traffic back into the area.

Assuming that turns up nothing, start pulling apart each and every box and looking for bugs / water / debris and "extra" circuits in the box.
If you still have no joy, it's time to start pulling new wire.

Date: Tue, 19 Mar 2013 21:54:36 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] GFCI issues

>Yes, but a GFCI breaker was mentioned in the discussion, that would mean
>that the wires from the panel would be in the circuit. Joe

Thanks, Joe. Missed that, after so much discussion of GFCI outlets and R390 filters.

It is still all about unbalance in the power circuit of line to neutral. A 15 K or 0.1 mfd from hot line to anything besides neutral should trip the breaker. Perhaps a mouse or squirrel fits those parameters. It takes a lot lower resistance from neutral to ground to unbalance the power circuit, but it can be done. Only the line and neutral wires go through the detector toroid. The ground wire is just a safety ground. It plays no part in fault detection unless it happens to carry all or part of the fault current. A fault to a conductive water pipe can also
unbalance the circuit. A megger from disconnected and shorted line and neutral to a ground that can carry current would be a good thing to try if a new GFCI breaker doesn't fix it.

Date: Wed, 20 Mar 2013 09:34:31 -0400 (EDT)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: [R-390] GCFI

I've even seen a spider web in an outlet box trip a GFI.

Date: Wed, 20 Mar 2013 11:01:09 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] GFCI Travails

Well, this zoo continues. I'm going to pull the GFCI and go through the multitude of wires and wire nuts to try and resolve this. As one individual explained to me, GFCIs don't always play well together. One solution would be to replace the hair dryer GFCI with a plain old plug. I believe that this is worth trying on the old one. It indeed make a good test, and I already know that the Heat Gun doesn't have on, and it sure blows just as hard as a hair dryer AND much hotter! (450Deg F.)

Date: Wed, 20 Mar 2013 10:15:30 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] GFCI Travails

I assume the built-in GFCI in the hair dryer is because hair dryers are often used in bathrooms where there is water and bare skin making it easy for electrocution accidents to take place. It wouldn't be in the heat gun because that is more of an industrial tool.

Date: Wed, 20 Mar 2013 11:23:43 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] GFCI Travails - Surprise

I did the following: as one individual explained to me, GFCIs don't always play well together. **One solution would be to replace the hair dryer GFCI with a plain old plug.** I believe that this is worth trying on the old one. It indeed make a good test, and I already know that the Heat Gun doesn't have one, and it sure blows just as hard as a hair dryer AND much hotter! (450Deg F.)

Date: Wed, 20 Mar 2013 11:30:59 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI Travails

I agree! The interesting thing is - I took the oldest hair dryer and removed its
GFCI. I replaced it with a simple two prong plug. While this does not follow NEC, it brings up the interaction of two GFCIs back to back. Technically, it is STILL protected by the GFCI outlet. Interesting results!

Date: Wed, 20 Mar 2013 14:31:40 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI Travails

Yep! The one in the wall would trip when a hair dryer WITH its own GFCI was plugged in AND turned on. So removing the back to back GFCI issue - STOPPED the problem. So I'm STILL plugging in to a GFCI receptacle.

Date: Wed, 20 Mar 2013 12:08:36 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] GFCI issues

Well, yeah, but meggars come in 500 and 1kV flavors.? One may show the fault but not the other. All depends on good wiring and insulation. Therein lies the rub.? Details, details, details, it could be anything, or several together.

Date: Wed, 20 Mar 2013 12:13:59 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] GFCI Travails

You would NOT believe how many I've fixed that were installed wrong!? And some people just can not be made to understand how they work. Back to back GFCI's will cause problems. And don't put the load receptacles in another room, or extend them to another? part of the building,.... or another building!? It just causes me to use bad language.

Date: Wed, 20 Mar 2013 12:18:00 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] GFCI Travails

ARGH! Some hair dryers pull 1875 watts, too. Too much by itself for a 15 amp breaker.? Then the customer can' t figure out why everything on that circuit dies.

Date: Wed, 20 Mar 2013 15:35:19 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI Travails

Yes sir! However this is a 20A circuit. It has STILL been a royal PIA!

Date: Wed, 20 Mar 2013 16:04:48 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI issues

I used Mr. Hacksaw. I can now look at the circuit inside. The Hot and Neutral are wound through a toroid. There are a pair of wires coming out of the middle of the toroid. They go to a solenoid. That solenoid, when it moves, trips the mechanical switch inside the GFCI and opens the circuit! It is definitely a Rube Goldberg thing to look at - but it DOES work! This is the GFCI that I removed from the Old Hair Dryer. It has NO ground! It is a two prong device.

Date: Wed, 20 Mar 2013 20:22:50 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] GFCI issues

Keep in mind that there is no way a two wire device can trip a working GFCI all by it's self. It simply can't generate an imbalance between the hot and the neutral. There's no place else for the current to go. In order for it to trip a GFCI, there *must* be a third path, generally to ground. Assuming you are holding the two wire device up in the air (and not underwater) the only place for the current to go is through you. It's not going through the air. If it's going through you, you *would* notice it.

Date: Thu, 21 Mar 2013 09:18:27 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] GFCI issues

Actually, the "toroid" structure that the hot and neutral are wound through is a toroidal transformer. There are wires wound inside the toroid. These windings under normal conditions, only see the field as balanced. Thereby cancelling out any flow. Yet, should there be an imbalance, these windings would develop a flow and indeed send their output to the little solenoid and cause the trip. You would really have to have one open and in your hand to see how ingenious, elegant, yet simple design and device that it is. The test button puts a 15K ohm resistor in the circuit to one leg. This causes the imbalance to cause it to trip.
The reason for the distinctive snap from pressing the reset button, is that it re-latches the solenoid assembly and locks it back open. I'm glad I did open it just to satisfy my curiosity! It also now makes MUCH more sense as to why two of them back to back would/could be problematic. <snip>

Go to the following link to get a PDF on the GFCI circuitry and functionality.
<http://www.nema.org/Products/Pages/*GFCI*.aspx>
Specifically: NEMA-GFCI-2012-Field-Representative-Presentation.pdf
This makes it very clear.

Date: Thu, 21 Mar 2013 12:31:06 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] GFCI info

That's excellent, Bob. Much clearer than the Wikipedia article.
The link works better without the asterisks:
    http://www.nema.org/Products/Pages/GFCI.aspx
That link takes you to a GFCI Products page. Select "Understanding GFCIs" with a PDF icon in front of it. Or enter GFCI in the upper right Search field and
get a list of presentations. The third one down is
    NEMA-GFCI-2012-Field-Representative-Presentation.pdf
Wonder what they meant by noise test on page 32, test 8?

Date: Thu, 21 Mar 2013 15:40:37 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: [R-390] While we're on the subject of GFCIs

An article in the April QST by Jerry Paquette clued me that the reason my GFCI in the washing machine circuit keeps tripping at odd hours is that it happens when I tune up the antenna on my KW rig. It was only recently that I learned of the existence of AFCIs - arc fault circuit interrupters. These detect arcing in the load, which could generate a lot of heat and start a fire. That was a big problem when aluminum wire was being substituted for copper in house wiring. I suppose it could still be a problem in case of a bad outlet or bad plug or any
number of other things. I had a light socket that arced because a rivet was a little loose. These days receptacles and switches are marked that they are good for Cu-Al or for Cu-only. Apparently the latest code requires using AFCIs on, basically, all the kinds of circuits which don't require GFCIs.

One of my friends who is in the business of investigating electrical accidents and fires had a case fairly recently where a woman in a bathroom somehow touched a live circuit and got a shock with some severe consequences. My guess is that one of her slender fingers touched a blade of a plug while she was plugging it into an outlet. The landlord almost immediately had the GFCI replaced. Which means there is no telling if the GFCI might have been installed backwards, or if it was defective.

Date: Thu, 21 Mar 2013 17:02:08 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] While we're on the subject of GFCIs

If you go to the link put up earlier, you will find that if a GFCI is installed "backwards", no power would come out of the GFCI. They have a "Line" side and a "Load" side. If these are wired in reverse, no power will come out. (Guess how I know!) So I had to go back and change the hookup. The "old" one wasn't marked. So I took a 50/50 chance and got it wrong the first time.

Date: Sat, 27 Apr 2013 19:01:20 +1000
From: "Pete Williams" <jupete@internode.on.net>
Subject: [R-390] REF xfmr for SSB converter

Per my post... thanks to those who responded ... pending further checks by the helpers ! It is of interest to note that after removal and checking the secondaries . I was surprised to find that resistance to frame seemed to vary .
Where one might expect to read megohms readings around the 25 -290 K

mark were noted on both DVM and analog meters . Further checks with the meter reading Volts , the eyebrows went further up !--- secondaries and line input to frame were measuring 0.090 mV. Maybe there is corrosion within (the Xfmr is potted) and some electrolysis taking place.... it made the ohms readings somewhat meaningless .

Other xfmrs behaved sensibly as a cross check. Probably par for the course
for 1956 production... No wonder the AC input -line was contributing to the fire works. Comments appreciated .

From: Barry <n4buq@knology.net>
Subject: [R-390] Fuse Holders

I seem to recall these being a bit hard to find. These seem a bit pricey, but they are the better kind. Anyway, just happened to see them this morning and thought I'd pass it along. http://tubedepot.com/p-fh-fender-nos.html

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Date: Thu, 16 May 2013 08:32:22 -0500
From: "Don Cunningham" <donc@martineer.net>
Subject: Re: [R-390] Fuse Holders

If you search for tr7dude, you will find a link to John Kriner's Ebay Store. John still works for R.L. Drake and sells off some of their old stock. He has some of those nice Littlefuse holders for $1 each until they are gone.

Date: Thu, 16 May 2013 10:42:19 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Fuse Holders

I didn't know John had them. Good to know. I don't need any but I seem to recall someone else asking about them not too long ago and I got rid of just about all I had. Is Drake still in business? I thought they closed permanently about a year or so ago.

Date: Thu, 16 May 2013 09:48:59 -0500
From: "Don Cunningham" <donc@martineer.net>
Subject: Re: [R-390] Fuse Holders

I don't have personal knowledge about Drake, just that they still show a web
presence and it is mostly Cable TV stuff now. Last I knew, John still works in their service department and sells off mostly Drake Radio pieces left on Ebay. John is good to work with, and has helped me with many Drake

repairs.
I found these fuseholders while looking his website over for some Drake parts.

Date: Thu, 16 May 2013 15:53:51 +0000
From: "FISCH, MICHAEL" <mfisch@kent.edu>
Subject: Re: [R-390] Fuse Holders

I think Radio Shack still has them. No idea of quality.

Date: Thu, 16 May 2013 13:16:13 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Fuse Holders

The ones from RS, Mouser, etc., are not typically as well made as the old LittleFuse holders. A lot of BA gear used the LittleFuse holders (or equivalent).

Date: Mon, 20 May 2013 06:32:25 -0700 (PDT)
From: Dave Sampson <challanger13041@yahoo.com>
Subject: [R-390] R-390A   LINE VOLTAGE REDUCING QUESTION?

I have an idea for reducing high line voltage but my electronics knowledge is not up to the level of most of you guys... Instead of using a bucking transformer... could you use a choke, By determining the dc resistance necessary to drop the desired amount of line voltage and as an extra bonus, the reactance of the choke would smooth out the a/c waveform. Would this work?

From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] R-390A   LINE VOLTAGE REDUCING QUESTION?

The reactance of the coil would work the same way as the resistance of the resistor. There are a few if's though:

1) The coil would need to be rated for 60 Hz and the current involved on a continuous basis.
2) The power factor would not be as good as with the resistor.
3) The coil would not "smooth out" the AC, it might take out a bit of 120 Hz (which would not bother the radio at all), it could boost 20 and 30 Hz which would bother the radio.
4) Like the resistor the line voltage stability (and thus the radio's stability) would be degraded

The right way to drop the voltage is with an auto transformer. By far cheap / simple approach is to use a 12 volt filament transformer with wires going to the proper places.

Date: Mon, 20 May 2013 21:24:04 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] line voltage reducing question

Agree with Bob. An in-line choke would introduce unintended consequences as he has outlined. For my collection, I use a 5A metered Variac. By having a transformer-type line coniditioner, and a computer-type AC switch selector, each of my three receivers can be easily powered up individually. Furthermore, the Variac is isolated from the shack's AC line. A bucking transformer has one big advantage other than cost... it can be mounted inside the R390A, obviating another external *box*.

Date: Tue, 21 May 2013 01:03:41 -0400
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] line voltage reducing question

One thing about variac-type autoformers: Most 120 volt units come from the factory wired for 120 in and 0-140 out. This creates the possibility that the accidental nudge of an elbow could readjust it for an overvoltage condition rather than the intended undervoltage operation. They can easily be re-wired internally for 0-120 operation, in which case it is not possible to have a voltage output higher than your line input. For powering BAs, this can be a worthwhile modification. With the General Radio-type variacs, it is a simple task of moving a wire from one screw terminal to another. With the "Powerstat"-type units (Superior/Staco and others), it generally requires unsoldering a wire from one location on the winding and soldering it to another location. Some of them even have a 0-120 scale printed on the flip side of the 0-140 scale.

Date: Tue, 21 May 2013 13:53:50 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] Variacs

Good point, I did rewire mine so that at max it is only 120VAC. That said, what I did was install both an accurate AC voltmeter and an AC ammeter in my Variac box.... fused of course.

Date: Tue, 21 May 2013 19:11:50 -0400
From: "David C. Hallam" <dhallam@knology.net>
Subject: Re: [R-390] Variacs

I operate my 75-S3 on a small 250VA Sola constant voltage transformer. The only drawback is I have to have it on a switched outlet strip as it draws about 2A whether the receiver is turned on or not.

Date: Sun, 15 Sep 2013 15:33:29 -0400
From: John Wendler <wendlerjrv@gmail.com>
Subject: [R-390] 26Z5W replacement

Rationale for replacing the 26Z5W:
1) Cost
2) Lifetime
3) Excess heat (filament + plate resistance)

Rationale for getting rid of the 1N561 diodes:
1) The power supply on hand had the solid-state mod done with a butane torch instead of a soldering iron and the diodes were damaged. The 1N561 is no longer manufactured.
2) The voltage drop across the diode is small, leading to greater output voltage and potentially stressing the other components in the receiver.

A pair of vernier calipers and interpolation were used to pull points off the IV-curve on the Tung-Sol 26Z5W data sheet. The model was fitted using Matlab. The best fit was: Ip = (1.1e-3)*Vp^1.47 where Ip and Vp are the plate current (A) and voltage (V), respectively. (Plates in parallel, as in the R-390A) The residual error was 9.7e-6 over Vp = 0-40 V.

A SPICE-like simulator (Agilent Advanced Design System, ADS) was used to evaluate various options to match the curve in the 100 mA - 200 mA range that in which the R-390A runs. (Standby / Operational) I looked at the variation over temperature, as well.

The first option was to replace the tube with a 1N4007G diode. The 1N4007G is probably a good modern replacement for the 1N561. Like the 1N561, it has an extended temperature range. This voltage drop is somewhere under 1 V and the equivalent series resistance is negligible. The consequence of any single diode replacement is that the output voltage is greater than the circuitry was originally designed for.

The second option was to cascade 8 1N5007G diodes in series with an 80 ohm resistor. This moved the knee voltage out to the 4-6 V range (over temperature) so that the linear portion of the solid-state and tube I-V curves would coincide. The problem was that the voltage drop is somewhat sensitive to temperature, changing 1.3 V over the range -40 to +85 C. Many people might be fine with this as most are not running over an extended temperature range.

The third option was to cascade a 1N4007G with a 1N5337B Zener and an 82 ohm resistor. The drop across the zener moved the knee out to the right region so that the series resistance would overlay the linear part of the curve. This simulation gave very close agreement with the tube curve over the critical 100 mA to 200 mA range, with minimal variation over temperature. This was the option that was built.

Construction was on perfboard. The resistors were 82 Ohm Dale RH-10 10 W 1% resistors. I used 1 mm diameter brass rod for the tube pins; the nearest english-unit rods will be too thick or too thin.

A Keithly pulsed Stimulus-Measurement unit was used to evaluate the I-V curves. Unfortunately, this is a 100 mA maximum compliance instrument. The knee ends up outside the tube's knee, as expected. At 100 mA, the solid-state version is approaching the tube curve (within 0.1 V or so) and is on a slope to intersect. Note that the series resistance will likely increase under continuous duty, because the series resistance of diodes will increase with temperature.

Overall, this is a pretty good replacement to a 26Z5W, and a much better replacement that a single solid-state diode, regardless of part number. The filament heat was removed but the heat due to the plate resistance still remains - this is what drops the voltage to the original design.

Modeling or measuring the zener in series with the 1N561 and 82 Ohm resistor was not tried; it would probably to do a reasonable job, as well.

No attempt was made to do a gradual turn on to emulate the warming of the heater. The 82 ohm resistor will provide some current limiting at turn on.

References and notes:

1) Any such project must reference Dr. Kurt Schmid's (Sigmapert) beautiful replacement diodes. His results are works of art and are designed to fit in the same physical envelope as a tube. I have never touched one and so cannot comment on the circuit.
2) Perugini, Stefano, "Vacuum diode Models & PSpice Simulations. (Article originally appeared in Glass Audio, V. 10, No 4., but can be found on web)
3) Leach, W. Marshall, "SPICE Models for Vacuum Tube Amplifiers," J. AudiooEng. Soc., V 43, No. 3, March 1995.
4) http://www.excem.fr/download/usergui5.pdf (Excem Vacuum Tube Modeling Package User's Guide)
5) Koren, Norman, "Improved Vacuum Tube Models for Spice Simulations," http://www.normankoren.com/Audio/Tubemodspice_article.html
6) Standby and Operational current estimates from The R-390 - Y2K Manual: http://www.r-390a.net/Y2K-R3/index.htm

As always, thanks to the members of the R-390 list for encouragement and

answers to questions!   73 de N5CQU   John (JP) Wendler

Date: Sun, 15 Sep 2013 21:37:54 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] 26Z5W replacement

Very nice analysis, John, although I think you brought nuclear weapons to a fistfight! Showing your work was useful, and is something the rest of us should do more often.

As you concluded, there is nothing magical about 1N561s. The 1N4007 has 4x the current rating. They are both just silicon rectifier diodes.

>2) The voltage drop across the diode is small, leading to greater
>output voltage and potentially stressing the other components in the receiver.

Correct. In 1966, the Navy ordered all shipboard 390As to be converted to 1N561 diodes per Field Change No. 6. The higher B+ voltage was blamed (rightly or wrongly) for failures of 6AK6s at V603 and V604 (I'm inclined to believe that the Navy bought a bad batch of 6AK6s -- I have not observed 6AK6 failures in 390As with SS rectifiers in the 35+ years I've been working on them). Accordingly, in Electronic Information Bulletin EIB-895, they published an
optional procedure for adding a 220 or 200 ohm series resistor after the SS diodes to drop the B+ by 20 or 30 volts.

However, many thousands of 390As have been modified to use SS rectifiers by the Navy and by hobbyists, some with the dropping resistor and some without. I've worked on several hundred 390As and of these, about 30% have been modified for SS diodes, and about 2/3 of those do not have a dropping resistor (that is, about 20% of all the 390As I've seen have SS diodes with no dropping resistor, and about 10% of all the 390As I've seen have SS diodes with a dropping resistor). I have not seen statistically significant evidence that even the worst case -- SS diodes with no dropping resistor -- reduces reliability compared to 26Z5s or to SS diodes with a dropping resistor. This anecdotal evidence doesn't mean there is no decreased reliability with SS diodes -- just that if there is, it isn't a huge difference.

I once built a 390A for a friend with regulated B+. The test mule had a pot that could dial the B+ from 180v to 300v. I could not measure any difference in receiver performance regardless of where the B+ was set. So, I concluded that the actual value of B+ in a 390A is monumentally non-critical. Accordingly, while curve-fitting the impedance of the 26Z5s was an interesting exercise, it was, IME, wholly unnecessary. More than a few tens of volts of B+ variation make no difference in the operation of the receiver. A few volts over temperature is way, way below the threshold of detection. (Also, note that a 1v change in the line voltage will produce a B+ change greater than the variation with temperature that you found.)

>No attempt was made to do a gradual turn on to emulate the warming of the >heater. The 82 ohm resistor will provide some current limiting at turn on.

As we have discussed here before, the choke-input filter of the 390A is particularly subject to high B+ at turn-on (for 5-10 seconds before the receiver circuitry starts drawing significant B+ current, or during "standby" operation). For many other reasons, choke-input filters are to be preferred over capacitor-input filters, so I do not mean that as a criticism.

All in all, this is an instructive look at the engineering that is often necessary to implement a "simple" modification to an existing design. One can either: (i) leave the 26Z5s in, and let their warmup characteristic solve the "high B+ at turn-on"; (ii) change to SS diodes and don't worry about the high B+ at turn-on; or (iii) change to SS diodes and figure out how to prevent the high B+ at turn-on [note that adding a dropping resistor does NOT prevent high B+ at turn-on, because no current = no voltage drop -- E = I x R].

Frankly, I generally prefer to leave the 26Z5s in. However, I've seen plenty of radios operating for decades with SS rectifiers with no problems, so option (ii) is fully viable, IMO.

If one opts for (iii), things get messy fast. One could use a time-delay relay in any of several ways to delay the B+. If I went that way, I think I'd be most inclined to have it switch a shunt load resistor across C606A, the first filter capacitor, that was switched out after warmup. However, it would need to be switched back in during "standby" operation. It would also need to draw well over 100 mA, so it would need to dissipate some real power (>30 watts) for 10 seconds during turn-on or during standby operation (which could be of indefinite duration). Solid-state switching could do the same thing, with the same caveats. Alternatively, one could try series switching, but series switching at high voltage is problematic -- particularly with an inductive load (the choke-input filter). These are all really kludgey solutions. A power zener may be the best of the "simple" choices, but that has its own problems.

One then graduates to less simple solutions. Some of these are not kludgey, but they are complex (generally, far more complex than is warranted for retrofitting what is, after all, an old tube radio), would require VERY careful design, and would probably be more expensive than hams/SWLs

would be willing to pay.

Date: Mon, 16 Sep 2013 07:15:41 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] 26Z5W replacement

>There is of course at least one other option: Change the rectifier
>tubes to another type, the 12BW4. Roy

I was discussing the problem of voltage rise at turn-on or during standby operation if the 26Z5s are replaced with SS diodes. The 12BW4 is no different from the 26Z5 in this regard, so in this context it is not another option -- it is the same option.

Note that some people have reported clearance problems using 12BW4s, which are about 1/2" taller than 26Z5s.

Date: Mon, 16 Sep 2013 12:16:16 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] 26Z5W replacement

Actually, a pair of 12BW4's are a less expensive option to a pair of 26Z5W's. I prefer to keep the warm-up characteristics of B+ application; for those of us (including me) that do not leave our units powered up. Of course, all this is moot if one leaves the unit powered 24/7, in which case the heat savings and long-term reliability of SS rectifiers is good.

Date: Mon, 16 Sep 2013 17:43:44 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] 26Z5W replacement

If you want to "improve" things - put a couple of 1N4007's in series in each leg. The voltage rating will go up and you *might* improve the reliability. The modest voltage drop will be in the "right" direction. Total cost - diodes are cheap ?.

Is it worth it? Well, first diodes in series don't always add, but mostly they do. Second, you already are "good" for 1KV (1N4007). A line spike at 2X is pretty common. At 4X not quite so common. At 8X fairly rare for something wide enough to get through the line filter and transformer inductance. How many radios with solid state diodes show up with blown diodes?

Date: Mon, 16 Sep 2013 18:05:29 -0400
From: John Wendler <wendlerjrv@gmail.com>
Subject: [R-390] 26Z5W replacement

As always, thank you for your insight and thoughtful comments. I really liked your past analysis of the choke input power supply.

It looks like you have thought a bit about the problem of ramp up, certainly more than I have. I could not see an easy way to do it from the power supply end, which would be part of the point. If I were going to do a lot of work, it would probably be to design a switching power supply, and I'm not ready to tackle that one today.

I decided to move onto the main point, which is getting a working radio.

Date: Mon, 16 Sep 2013 20:11:17 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] 26Z5W replacement

What if we added a thermistor in with the diode?
It would limit inrush current.
Offer a bit of voltage drop.
Not be overly hot.

The few extra volts of B+ we get from solid stating the rectifiers does not run the receivers out of their design range. I have no idea what a good part number or spec for the thermistor should be.

Date: Mon, 16 Sep 2013 21:00:13 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] 26Z5W replacement

>What if we added a thermistor in with the diode?
>It would limit inrush current.

Unfortunately, it's not an inrush current problem -- it's the opposite. With a choke-input power supply filter, the DC voltage when NO B+ current is being drawn is much higher than when normal B+ current is flowing (about 1.6--1.8 times more). So, if the diodes are rectifying before the rest of the radio wakes up (which is the case if they are SS rectifiers in a tube radio), the B+ soars until the radio circuitry is drawing normal operating current. There is no problem with a tube rectifier with an indirectly-heated cathode, because the rectifiers warm up slowly just like the rest of the circuitry (typically a little slower -- they are designed that way for just this reason).

Note that this is NOT just the normal B+ sag from resistive losses, which you also see with capacitor-input filters -- it is a fundamental characteristic of choke-input filters.

So, what we need is a dummy load on the power supply while the radio circuitry warms up, or some way not to have the SS diodes rectifying until the radio circuitry warms up. Neither of these is a trivial design challenge.

Further, whatever solution we adopt for turn-on should also be activated when the radio is switched to "Standby," because the B+ current drain goes down and the voltage goes up in standby mode. Note that the original design does not address this -- if you switch a stock 390A to standby, the B+ voltage goes up.

Date: Mon, 16 Sep 2013 21:05:46 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] 26Z5W replacement

The radios were designed in an era of 110V power. A typical wall outlet would read 110 +0/-5 volts in most areas most of the time. Yes, that's pretty low. These days a wall outlet may well read above 120V (as in 120 +5/-0 volts. That plus the solid state rectifiers pushes the B+ a bit higher than the designers would have thought.

That said, I agree with Charles, I've never seen a problem in an R-390A that was related to "high B+".

Oops. I thought Rich was asking about the 26Z5's.
Here s a Google link about Sigmapert (Parentheses contents mine):
(This fellow, Dr Schmid, was a member of our list some time ago, and has tested and written about replacements of the 3TF7 extensively.? See the Google search results, or this Pearls article for more:
http://www.r-390a.net/Pearls/ballast_tube.pdf)
edoqs.com/kurt-sigmapert
1 A direct plug-in solid state replacement module for the 26Z5W rectifier tube of the R-390 and R-390A receiver Dr. Kurt Schmid, DH3PJ, sigmapert@gmx.de. (A description, no internal details or source information.) Roy

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Date: Tue, 17 Sep 2013 06:55:59 -0400
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: Re: [R-390] 26Z5W replacement

If there really is a problem with the SS rectifiers, just use a time delay relay after the rectifiers to hold the circuit open for a minute or so Fuji ST7P and Magnecraft TDR782 series relays are very small and available in 120 AC and assorted DC voltages. At the same time add in a pair of 200 to 250 Ohm 5 watt resistors to simulate the forward drop of the 26Z5s . The tube curves I looked at indicate a foreword drop of about 22V at 100MA.

The relays would likely be somewhat over spec with the B+ voltage, but I doubt if that would be an issue, for those that think the entire receiver would explode, then just add a tiny 600 V rated relay after the time delay. Total cost is probably under $60, probably about the same as NIB 26Z5s. This would also be a good time to add in a small fuse in the B+ line, might save a transformer if/ when the filter caps fail. Not sure what size, but easy to find the actual current drain by measuring the voltage across a low value resistor or a miliampere meter,wild guess would suggest that a 200 MA fuse could be about right.

Date: Tue, 17 Sep 2013 18:46:26 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] 26Z5W replacement

The relay would be looking into a big honking choke (2-12 H swinging). It would take a very specialized relay to interrupt that circuit (which would happen at each power-down, power outage, and when switching into Standby if one did it right and included Standby in the scheme). Not impossible, but not trivial, either. And a bit of a kludge, IMO.

Date: Wed, 18 Sep 2013 08:48:16 -0400
From: "Bernie Doran" <qedconsultants@embarqmail.com>
Subject: Re: [R-390] 26Z5W replacement

Normal arc suppression circuitry consisting of a cap and series resistor or just a MOV or both across the contacts should take care of any back EMF from the choke. Assuming that is an issue and it could be. A similar back EMF would appear across the SS diodes when turned off or to standby. Yes, as long as someone is in there messing around including the standby would be interesting idea. I have not looked at the schematic, but it could be as simple as opening the time delay relay ground with the standby switch. Of course the other factor is, is any of this really necessary, or is it simply a matter of thinking we can do a better job of engineering than Collins did. When I say we, I mean everyone else, because I can always improve things I have!!! I even have the dead stuff around that I improved. HI HI. excuse the HI Hi, just want to be sure everyone knows I am joking.

I have open relays on my plate transformers and while that is AC there is a lot more current there, and I do not bother with any arc supression. If opened at the right, or perhaps wrong time, there is a significient flash. Arc supression should also be across mod transformers, and that is one of my IMPROVEMENTS that I have yet to do on my Gates BC1G. I have a few surge arrestors from the local power co, 15 KV and hundreds of amps. the construction certainly suggests that they have number of MOV disks in there and it should be easly to sort out the appropriate number of disks and clamp them between Lexan for a monster MOV. only been waiting six years to do it.

Date: Wed, 18 Sep 2013 15:40:50 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] 26Z5's

After trying a pair, the most elegant modification which eliminates the 26Z5's is using the Sigmapert replacements. There are many good reasons to remove the 26Z5 firebottles, most are covered in the R390A video.

I'm installing an owner procured set of the Sigmapert replacements in the present radio I'm working on and took the opportunity to read the theory of operation and design objectives. He addresses the shortcomings of both the original tubes and their diode du jour replacements. I'm going to strongly recommend the Sigmapert from here out.

A second item which, IMHO would benefit from being addressed is that of the lack of a "real" STANDBY" condition when the radio is set to that mode. I thought I had a solution which was to pull a voltage from the antenna relay and use that to switch another relay which opened both B+ lines but that path is not to be. The logic is such that the B+ is turned off when the radio is set to CALIBRATE.

There is more likely another path; gotta look harder at the mode switch.

Date: Fri, 20 Sep 2013 05:11:28 +0200
From: Heinz Breuer DH2FA <dh2fa@darc.de>
Subject: [R-390] Fwd: Re: 26Z5's

Just email Kurt at:
sigmapert@r-390a.eu

Here is the pdf file for thge replacements:
http://www.schmid-mainz.de/Flyer.pdf

Date: Fri, 20 Sep 2013 07:15:40 -0400
From: frank hughes <fsh396ss@gmail.com>
Subject: [R-390] Sigmapert parts info

Hi, yes, just buy them directly from Kurt, here is my recent order as an example.

1x 3TF7 Replacement $58.00
1 x Pair 26Z5W Replacement $58.00
1 x R-390A Balanced input antenna adapter with BALUN $38.50

Date: Fri, 20 Sep 2013 18:17:04 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] Sigmapert 26Z5W's and otherness

Hi Rich et al. Glad the radio is doing well; that's my goal. Long term reliability ! Sigmapert sells his items on Evil-Bay. Here is a list of items he offers along with their current (09/20/13) links; sort of a mini-Signapert "Catalogue" of sorts:

26Z5W replacements: http://tinyurl.com/nr4a7f2
R-390A replacement for 3TF7 current regulator
http://tinyurl.com/phfl93u

R-390A multi-section electrolytic capacitor kit (C603 + C606)
http://www.ebay.com/itm/331028138133

I've installed each of these items and tested their effectiveness. All are excellent ! His 26Z5W replacements are nothing short of elegant and is the cure of choice for all the 26Z5W issues !

Some of you may remember that I made a current regulated, solid state 3TF7 replacement. Frankly, Kurts is easier to install and works as well. However, for those who may wish to use it, I would opt to ground either pin 9 or pin 1 on the 3TF7 tube SOCKET v/s connecting a wire to the body of the insert.

Finally, his electrolytic filter cap/audio output cap (C603 and C606) are first quality. I'll say that my cap rebuilds are as good and look original but either are just fine.

Date: Fri, 20 Sep 2013 11:42:27 -0700 (PDT)
From: Rich Yost <n2ry@yahoo.com>
Subject: Re: [R-390] 26Z5 replacements

A thank you all for the responses, and info, Garry had sent a link on E***, apparently when I looked the other day, there was none, and now they are back, and there is a pair on their way to me.

Date: Sat, 21 Sep 2013 07:30:54 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Sigmapert 26Z5W's and otherness

I just had a look for the 26Z5W replacements and they are all sold already. Hopefully he'll have some more soon.

Currently I have his C603 and C606 capacitor replacements in two of my radios and will shortly get another set for my other radio. They are indeed nicely made. Very elegant indeed...

Until a few nights ago I had one of his 3TF7 replacements which was working well...until I made the mistake of switching back to the original glass 3TF7 with the receiver powered on. You all are probably wondering why I even thought of it...I was trying to track down a noise issue so I did a quick A/B test. Now the unit is non-functional so I'm back using the glass 3TF7. So please learn from my mistake! The replacement 3TF7 seems to be electrically fragile in that regard. BTW no...that is NOT a criticism, just an observation. I built a SS regulator for the 3TF7 some time ago using an LM-317 and that thing is very robust so I'm probably going to go back to using that.

Date: Sat, 21 Sep 2013 02:15:39 +0200
From: sigmapert <sigmapert@gmx.de>
Subject: Re: [R-390] Sigmapert 26Z5W's and otherness

When handled appropriate solid state devices are not fragile. But if you e.g. would remove or insert the CPU in a running computer you certainly wouldn't be surprised when the CPU thereafter is scrap.

Each of my 3TF7 replacements is accompanied by a brochure. Point 1 of the therein contained replacement procedure states: 'Switch the receiver OFF". Using a LM 317 in current mode or a 7812 voltage regulator produces considerable heat requiring a bulky heat-sink. No chance to construct a true plug-in device.

One remark regarding the use of modern components in vintage gear. IMOH acceptance depends on at least 3 criteria:

1) the technical data have to be BETTER than the original ones
2) the modification has to be fully reversible
3) the replacement should optically nicely fit into the vintage gear

Best Regards & vy 73   Kurt - DH3PJ
mailto:sigmapert@r-390a.eu

Date: Sat, 21 Sep 2013 10:37:57 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Sigmapert 26Z5W's and otherness

Yes agreed, I was very annoyed with myself when I realised what I had done but I can't turn back time. What I thought was a harmless experiment ended up being a valuable lesson...nothing worse than being hurt in the wallet!

I like your products and plan to purchase more, which brings me to a question. Are you planning on doing a SS module for the 0A2 regulator?

Date: Wed, 25 Sep 2013 15:38:55 -0400
From: "Ed Tanton" <n4xy@comcast.net>
Subject: Re: [R-390] Sigmapert 26Z5W's and otherness

The more I thought about it, the more of a good idea it seemed to me to go ahead and get BOTH the pair of 26Z5s and a 3TF7 from Kurt. The obvious quality, as well as the ever-increasing costs associated with the hollow-state versions, convinced me. Also, Kurt is great to deal with.

Date: Wed, 25 Sep 2013 13:25:47 -0700 (PDT)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] Sigmapert 26Z5W's and otherness

When I contacted Kurt directly via email to order his 3TF7 replacement and also the antenna balun, he offered a 5% discount for the direct order via Paypal. I agree, his products are top notch, his delivery is prompt and his service level is great. I haven't tried the 26Z5 replacements - I replaced the 26Z5's with ss rectifiers and no apparent ill effects.

Your R390A looks great. I have two that Chuck has gone through. He is meticulous as to detail and function and very particular about quality. I also highly recommend his work.

Date: Sun, 06 Oct 2013 21:29:09 -0400
From: "Robert N. Newberry" <N1XBM@amsat.org>
Subject: [R-390] CL-80

I have a R-390 (non A) and maybe my "seach fu" is not working. What is the best place to mount these. It appears the info I find is for the 390A and the 390 is a little different with that regard.

Date: Sun, 06 Oct 2013 22:43:59 -0400
From: "Robert N. Newberry" <N1XBM@amsat.org>
Subject: Re: [R-390] CL-80

Need more sleep, I put CL-80 in the title, but made no mention in the body of the message. I am wondering where people are finding the best

place to mount a CL-80. This is so I can soft start my R-390.

Date: Sun, 06 Oct 2013 20:03:05 -0700
From: Manfred Antar <mantar@pozo.comcastbiz.net>
Subject: Re: [R-390] CL-80

I put mine on the hot lead from the cord (black) to the line filter.
I think after the fuse on the hot lead ======> line filter.

Date: Sun, 6 Oct 2013 21:07:12 -0700 (PDT)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] CL-80

I soft start mine with a variac.? Advantages are:

1) It entails no modification to the receiver.
2) You have complete control over the AC voltage setting, (aim for 115 volts).

Date: Mon, 7 Oct 2013 09:51:11 -0400 (EDT)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: [R-390] CL-80

I put mine in an outboard box and plug the 390-A into it using its switch. That also protects the 390 power switch which has caused others grief in the past.

The box also houses the additional detectors running off the IF output. I added a dual product detector with the BFO in quadrature for 'SSB stereo', a precision rectifier AM detector and a PLL FM detector. Of all of these, the product detector is the most useful. In stereo' mode, there's little effect on the SSB signal but the noise is more like a waterfall and is a lot easier to listen through.

Date: Mon, 7 Oct 2013 13:55:46 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] CL-80 Status

I put mine in a drawer. Have always been uncomfortable with those as they run so very hot. Installing a pair of the the Sigmapert 26Z5W replacements are a much more elegant compromise w/out the heat.

Date: Fri, 20 Dec 2013 13:32:04 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] L601/L602

I replaced them in one of my AF/PS modules thinking they are bad. The PS circuit sure works good now, all the voltages are right on, where before the voltages were real high with lots of ripple, like 20VP-P ripple. They measure 65/82 ohms. L603 was definitely bad, it was swollen up and burned on the outside. But I'm wondering if L603 may have been the whole culprit? I really don't want to pull out the ones I put in, is there any easy way to test the chokes? I tried with my Heathkit LCR meter, but they measure in the mH range at 1000Hz. I understand they need to be measured at their rated current, but how does one really do that? I also understand the resistance as marked (137) is a max and may be lots lower than that.

Date: Fri, 20 Dec 2013 13:32:04 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] L601/L602

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Date: Sat, 21 Dec 2013 14:11:22 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] L601,602,603

OK, without benefit of a proper way to test the chokes, I swaped the 'bad' chokes into the module one at a time. When I put the swinging choke in, L601, the output voltage went right to 225. Removed that one and installed a good one and then put in my 'bad' 4 H L602, the voltage went to 218. So I'm thinking the swinging choke is definitely bad, the 4H one is marginal, but I'm going to keep the chokes in the module that give me 205V and the least ripple.

Date: Wed, 25 Dec 2013 17:59:24 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] B+ Ripple

I'm getting less than .01VP-P ripple in general on the 2 AF/PS modules I have. However, I seem to be getting some jumps, but they are still less than

0.1VP-P. I'm wondering if this is a typical thing, or maybe it's something on down the line? Both AF/PS modules act the same in the same radio. I can see the jumps on the DVM as spikes on the 'analog' display part, but on the scope, there doesn't seem to be any relation to timing, it just randomly happens to jump, maybe once a second or so. I'm measuring at C606 pin 5, the DC volts is around 200-205 and I'm using the rectifier tubes in the PS with thermistors in the AC line. New caps mounted under the chassis. Comments welcome.

Actually I've got 3 of those thermisors left, I ordered too many. If anyone wants them, let me know, just mouser price plus postage, I could probably send them in an envelope but I might have to add $.20 for un-machineable mail. CL-90's.

Merry Christmas everyone.

Date: Sat, 4 Jan 2014 20:31:11 -0800 (PST)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] Saturday's Line & Local Report

A quick (and cheap) way to build plug-in caps is to get hold of a pair of metal-skirted octal bases such as those from worn out 6082 or 6080 tubes and fit new electrolytics to them.

Modern caps should fit inside the skirt, permitting the positive leads go straight to the correct pins thereby eliminating any shock hazard.? The exposed negative side wiring, of course, is neutral to ground and safe to touch.

The octal bases are a snug fit that involves removal of the clamp assembly, IIRC.? Keep them handy should you decide to replace the caps with authentic versions such as those from Hayseedhamfest.

Date: Thu, 16 Jan 2014 14:25:37 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: [R-390] Electrolytic capacitors - current best BA choices

When rebuilding boatanchor electrolytics, it makes sense to use the most reliable, high-temperature capacitors available.

At this point (2014), the best commonly available (in the US) high-voltage aluminum electrolytic caps in these respects seem to be the United Chemi-Con "KJX" series.

For low-voltage applications (<= 50v), it's the United Chemi-Con "EKZM" series.

Mouser has both, as most of the major parts distributors probably also do.

Other manufacturers have similar lines, and there is always some back-and-forth as they improve their products, but UCC seems to have the lead right now.

Date: Thu, 16 Jan 2014 19:15:36 -0500 (EST)
From: lasavidge@aol.com
Subject: Re: [R-390] Electrolytic capacitors - current best BA choices

Try the con brothers as they have been referred to for years-----United Chemi Con, Nichicon and Rubycon. Tnx Lee W3EFE

Date: Sun, 19 Jan 2014 12:15:13 -0600
From: "Thomas Frobase" <tfrobase@gmail.com>
Subject: [R-390] Regulated B+ supply R-390A

If one were to build a regulator for an A model what do you all feel the optimum B+ should be

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Date: Sun, 19 Jan 2014 14:18:21 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Regulated B+ supply R-390A

From one of my previous posts (not a recommendation, but some information):

>I once built a 390A for a friend with regulated B+. The test mule
>had a pot that could dial the B+ from 180v to 300v. I could not
>measure any difference in receiver performance regardless of where
>the B+ was set. So, I concluded that the actual value of B+ in a
>390a is monumentally non-critical.

This does suggest that there is precious little, if anything, to be gained by regulating the B+ in a 390A. What would you be trying to accomplish?

Date: Tue, 21 Jan 2014 09:35:57 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Regulated B+ supply R-390A

According to the Cost Reduction Report, they chose operating points and circuit constants that would minimize the amount of regulation necessary. They winnowed it down to some screen grids, which they put on the OA2. The rest, as demonstrated, is not sensitive.

Date: Wed, 22 Jan 2014 20:54:36 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Regulated PS for R390A B+ and Filament

I have soft-start regulated circuits for both the B+ and filaments. Reply off line if you'd like a copy.

Date: Thu, 23 Jan 2014 12:35:09 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: Re: [R-390] Schematics

Yahoo mail in its insolent wisdom made one message out of 11 requests for the schematics I offered the group.

In figuring out how to reply and attach the schematics, I may have double replied or missed a reply.

If you asked for them and didn?t get copies please contact me again off list but please use your individual e-mail address instead to the reflector header.? This will better insure that I succeed in a reply.

Date: Thu, 23 Jan 2014 12:36:28 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] R-390A power switch

There have been many postings about avoiding the micro-switch from welding the points together over the years. While a snubber network may prevent arcing I think it may allow some voltage leakage to the transformer while in the off position.

My vote goes for using CL 90 or CL 80 input surge suppressor that has been discussed before. That's what I'm using now.

Date: Thu, 23 Jan 2014 13:29:41 -0800 (PST)
From: Chris Farley <kc9ieq@yahoo.com>
Subject: Re: [R-390] R-390A power switch

I have been following this with great interest. I like the snubber idea, but agree there is chance over time for the series capacitor to develop some leakage. Perhaps using a Y safety capacitor instead of a normal disc ceramic would be beneficial? Inrush MOV's are good devices too, but don't have the best reliability long-term. Most if not all suppliers for this switch have dried up. Using a Triac to power the rig might also be a worthwile consideration, but as another list member pointed out online, it may be an unwanted source of RF noise as well. Ho hum, what is a boy to do re: saving that daggum power switch.?

Several years ago I purchased one from Fair Radio for $18.27. Upon checking back, they are long gone.? I was however, able to recently secure the remaining stock from a surplus dealer. I do not mean to make this a commercial posting, but if anyone needs one (or a few) of these switches I have a reasonable quantity available. $20 shipped for 1, $15/ea for 2 or more for list members.

Date: Thu, 23 Jan 2014 15:56:35 -0600 (CST)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] R-390A power switch

Unless my calculations are wrong, the impedance of 0.1uF at 60 Hz is about 26K ohms, so the current leakage is less than 5ma.

Date: Thu, 23 Jan 2014 18:12:47 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R-390A power switch

Good idea. I will after a while make another order to justradios.com who sell these caps. If that cap failed with the switch open, it would mean an amp of current through the 100 ohm resistor - smoke would come out for sure.

> Inrush MOV's are good devices too,

I wonder if they make too much heat in the place they are often installed: near the fuse holder.

> but don't have the best reliability long-term.

Do they short or open up?

> Using a Triac to power the rig might also be a worthwile consideration,

Or even a relay. There has been published a modification to the Collins S-Line 516F-2 Power supply to install a relay for the job. The power switch is at the back of a volume control in the transmitter itself, and is both failing due to the inrush overload and very hard to find.

Date: Fri, 24 Jan 2014 08:39:17 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] MOV's and snubbers

One of the ways to overcome the long term reliability of an MOV is to use one that is substantially higher in current handling capacity than the aspirin sized MOV's that are available. You need the larger quarter sized or bigger MOV's as they are capable of tolerating much more.

I gave Perry a few V150PA10A MOV's that you could install by screwing them onto the chassis. This helps in heat dissipation. Still, you want to protect the circuit with a fuse so install the MOV after the line fuse.

The switch contacts weld due to high inrush current when the power is applied when the current is at peak levels on the AC sine wave. In industrial applications this was remedied by "zero crossing" switching where current is at an absolute minimum on the sine wave.

How we can address it is with either a device lilke a PTC (positive temperature coefficient) resistor like the CL-80 or CL-90, or with a soft-start setup with a relay, series load resistor and a small RC timing circuit on the coil side of the relay.

A soft-start can add tens of milliseconds or up to more than a second of current limited startup to the power supply so capacitors can start to charge up and the inductive slap of the transformer is minimized. It all depends on how you size the RC time delay and the series load resistor.

An MOV is just providing protection from incoming voltage transients above the triggering voltage. MOV's are not exceedingly fast devices. They occupy the middle ground between avalanche diodes and gas tubes. A more appropriate transient protection system would be a hybrid with a fuse in series, gas tube in parallel, inductors in series, MOV in parallel, PTC in series, avalanche diode in parallel and Y safety capacitors in parallel.

The idea behind a hybrid protector is to put the more robust protective devices in line to first catch the transient. They are not very fast devices, fuses and gas tubes are millisecond-acting types of devices. The MOV and inductors are middle-ground and delay and stretch out the time of the transient to the ~1 millisecond response time. Next is the silicon avalanche diode (SAD) that has a response time that is really limited by the speed of light through wire (lead length) but can respond in micro and nanoseconds. SAD's are very fast but fragile devices so you want the gas tubes, inductors and MOV's to eat up the device-killing part of the transient.

You may see hybrid protectors designed into high end electronic devices or some of the more sophisticated transient protection systems.

Date: Fri, 24 Jan 2014 12:56:47 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] MOV's and snubbers

The fact remains that the vast majority of switch arcing occurs on the "break" operation, when the switch is turned OFF. It is the damage to the contacts from this switch-off arcing that sets up the conditions for the switch to weld on a "make" cycle. A PTC does not protect the switch contacts from arcing on the break cycle, so the contacts continue to be chewed away every time you switch the radio off. Snubbers help mitigate this.

I'm not saying don't install a PTC. Just that installing a PTC will not protect the microswitch contacts from erosion due to arcing on the break cycle and, consequently, will do little or nothing to prevent switches from welding themselves "ON."

Date: Fri, 24 Jan 2014 10:00:28 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] MOV's and snubbers

What do you recommend for snubber R and C?

Date: Fri, 24 Jan 2014 13:24:17 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] MOV's and snubbers

>What do you recommend for snubber R and C?

The values Jim used (0.1uF and 100 ohms) are nearly universal for transformer-operated equipment that draws 0-5 amps. Sometimes you see 0.15 or 0.05 uF instead of 0.1. Use a safety capacitor and a 1/2 watt carbon composition resistor.

Date: Fri, 24 Jan 2014 13:32:38 -0600 (CST)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] MOV's and snubbers

There is an application note at
www.illinoiscapacitor.com/pdf/Papers/spark_suppression.pdf
I used 0.1 uF and 100 ohms

Date: Fri, 24 Jan 2014 11:44:49 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] MOV's and snubbers

Thanks, Jim. Please describe construction details, like where you put it, along with any extra terminals necessary. If you managed a "neat and workmanlike" installation, I'd like to do it the same way.

Date: Fri, 24 Jan 2014 13:50:47 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Correction NTC resistor

Roy, K1LKY caught an error I made. The CL-90 is a NTC (negative temperature coefficient) device. Here is an excerpt from a CL-90 datasheet;

"Energy Surge at Turn-On
At the moment the circuit is energized, the filter caps in a switcher

appear like a short circuit which, in a relatively short period of time, will store an amount of energy equal to 1/2CV2. All of the charge that the filter capacitors store must flow through the thermistor. The net effect of this large current surge is to increase the temperature of the thermistor very rapidly during the period the capacitors are charging. The amount of energy generated in the thermistor during this capacitor-charging period is dependent on the voltage waveform of the source charging the capacitors. However, a good approximation for the energy generated by the thermistor during thisperiod is 1/2CV2 (energy stored in the filter capacitor). The ability of the NTC thermistor to handle this energy surge is largely a function of the mass of the device. This logic can be seen in the energy balaPositive

http://www.ge-mcs.com/download/temperature/920-325D-LR.pdf

And for PTC devices here is an excerpt from a Cooper Industries datasheet on the "Polyfuse";

A PTC device is a resettable fuse, where high curent causes the resistor to go open. This is a positive-temperature-coefficient device.

Positive Temperature Coefficient (PTC) devices are simple, inexpensive, but critical circuit components that protect against overload or short-circuit (fault) conditions. Although multiple differences exist between PTCs and traditional one-time fuses, probably the most notable is that PTCs can allow current to flow after the fault is cleared without replacing the fuse, often referred to as resettable.

PTC exhibit a positive temperature coefficient (resistance increases exponentially with increased temperature) allowing them to protect circuits exposed to increased currents or temperature. The Positive Temperature the circuit by increasing its internal resistance in the event of a short-circuit or overcurrent.

Date: Fri, 24 Jan 2014 12:34:07 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Correction NTC resistor

Thanks, Tisha, I read straight through your original post and I guess I substituted NTC without even thinking.

Is it just me, or do the last few sentences in the datasheet (the conclusions from the worked-out example) seem to go counter to the table?

Reproduced here for convenience:

"Criteria indicates that either the CL-150 or CL-160 would be suitable for the application. In the case of the CL-150 less heat is dissipated allowing the operating resistance to drop but at a higher temperature. This increases efficiency of the system but may lead to shorter component life."

Dave Wise

It seems to me that of the trio of {CL70,CL80,CL90}, the CL70 will have the lowest steady-state resistance... and therefore temperature. The tradeoff is increased surge current.

Date: Fri, 24 Jan 2014 14:36:13 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] MOV's and snubbers

Both sources indicate that proper values for the R-390A are more like 0.1uF and 10 ohms, not 100.

Date: Sun, 26 Jan 2014 00:06:23 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] MOV's and snubbers

Yes, that certainly is the case.

> Is that chart in the manual good for AC circuits?

Very good question, I suspect it was not meant for keying AC.

> Roy, thanks for pointing out that manual. I used
> an HA-1 for several years and never paid any attention
> to that table or the need for a snubber.

You probably did not need to. Most or all of the transmitters I've heard of being used with the HA-1 (HT-32, Ranger, Valiant,) have keying voltage and currents that figure out by the chart to need NO snubber for the mercury relay. So no worries.

Date: Mon, 27 Jan 2014 09:22:40 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] MOV's and snubbers

The formula in the Illinois Capacitor app note computes the same values as the HA-1 chart. For the 120V 1A-2A load of the R-390A, that's 0.1uF and 8 ohms to 0.4uF and 4 ohms. Next time I have mine apart I'll put one in. I'll use 0.1uF and 10 ohms, and add it to the Mod List.

Date: Wed, 29 Jan 2014 20:22:13 -0800 (PST)
From: "R. David Eagle" <kb8nnu@yahoo.com>
Subject: [R-390] AF Deck Caps

Hello all...I'm sure this has been mentioned quite a few times and for some reason I cannot not find a supplier that sells the plug in caps for the AF deck of a 390A.? Am I dreaming here or is there someone out there that actually supplies new replacements because I thought I saw a listing at one point somewhere....??? Any help would be appreciated.

Date: Wed, 29 Jan 2014 23:31:42 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] AF Deck Caps

No, you are not dreaming. The business is called Hayseedhamfest:
Contact Tom at Hayseed Hamfest www.hayseedhamfest.com

Date: Wed, 29 Jan 2014 23:33:59 -0600
From: Raymond Cote <bluegrassdakine@hotmail.com>
Subject: Re: [R-390] AF Deck Caps

What do the plug-in caps for in the 390 and what do they look like pls?

Date: Thu, 30 Jan 2014 05:06:19 -0500
From: "KK4XO - Bill" <kk4xo.bill@gmail.com>
Subject: Re: [R-390] AF Deck Caps

Dr. Kurt Schmid, DH3PJ also makes the plug-in cap replacements as well as solid-state replacement modules for the 3TF7 and 26Z5W tubes in the R-390A. They are occasionally available on Ebay by searching for "Sigmapert" or you can email him direct: sigmapert@gmx.de
Also see: http://www.schmid-mainz.de/elco.pdf
http://www.schmid-mainz.de/Flyer.pdf
http://www.schmid-mainz.de/26Z5W

Date: Thu, 30 Jan 2014 09:30:49 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] AF Deck Caps

Dreaming, you best bet is to re-stuff them, if you search the list I think others and myself have detailed the process in the past 73, tom, N3LLL

Date: Thu, 30 Jan 2014 10:43:25 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] AF Deck Caps

http://hayseedhamfest.com/cartview.html?id=12

Date: Thu, 30 Jan 2014 10:46:08 -0500
From: cnixon <cptcurt@flash.net>
Subject: Re: [R-390] AF Deck Caps

There is a guy in Europe that sells them. And, I thought I just saw some from the Heathkit shop.

Date: Thu, 30 Jan 2014 07:52:10 -0800 (PST)
From: "R. David Eagle" <kb8nnu@yahoo.com>
Subject: Re: [R-390] AF Deck Caps

Great!? Thanks to everyone for the info and the contacts.? I will contact the sellers and see what they have available.

Date: Thu, 30 Jan 2014 10:53:13 -0500
From: cnixon <cptcurt@flash.net>
Subject: Re: [R-390] AF Deck Caps

Ah..yes...Thot it was one of the two..hayseed or heath shop.
Also this refers to the Eu units: http://www.schmid-mainz.de/elco.pdf

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Date: Thu, 30 Jan 2014 09:51:17 -0800 (PST)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] AF Deck Caps

I'm using the Sigmapert replacements in two of my R390A's that Chuck Rippel worked on as well as the solid state 3TF7 replacements. Very nice looking and well made with quality components. The caps look factory and you can use the mounting hardware.

IF, and I stress IF, you want to go the least expensive route - or want a temporary solution until you can save up for more expensive replacements - I would suggest, at the risk of being heretical, picking up a couple of small octal base relays for cheap and stuffing them with small correct value and voltage electrolytics. I have that too in another R390A and it works fine. They fit very well in the space, look OK, and mount securely in the octal sockets so the clamps aren't needed, AND the electrolytics are a snap to solder into the base pins.

Date: Thu, 30 Jan 2014 14:23:37 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] AF Deck Caps

I think I still have a set of caps installed in octal bases that I no longer need. If anyone wants them, they're yours for the price of postage.

Note that I cannot guarantee the caps. I seem to recall accidentally connecting one (or more?) of them in reverse under a low voltage when attempting to use them for another purpose. I _think_ the caps are good but use at your own risk or replace them with new.

BTW, if the octal socket pins have through-holes (some do), it's simple to thread the caps down through the holes, solder them under the chassis, bring the ground leads together into a solder lug and screw that to the cap clamp support.

Date: Thu, 30 Jan 2014 16:53:24 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] AF Deck Caps

I just put mine under the chassis, there's room if you use some discretion and shrink tubing. I know it's heretical, but it was simple and the price was right.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/afbottom3267_zps32c593e6.jpg

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Date: Thu, 30 Jan 2014 20:46:31 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] AF Deck Caps

Stuff the caps in some 8 pin octal relay cases and plug them in.
Some day you may find some new plug in caps.
Or get around to re stuffing.
But today repurpose a couple relays and get back to listening to the radio.

Date: Fri, 31 Jan 2014 08:20:59 -0500
From: <Jbrannig@verizon.net>
Subject: Re: [R-390] AF Deck Caps

On a whim I went through the whole "re-stuffing" procedure:
Cut open the case   Clean out
Drill and tap the aluminum terminals for brass screws
Install the new capacitors   Re-seal the case with JB Weld...
It was fun and certainty NOT worth the effort.....
Install the capacitors under the chassis....

Date: Fri, 31 Jan 2014 09:22:31 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] AF Caps

I did take one of the cans apart, but it looked so horrible when I got done, I thought it looked better just covering the holes with blue tape and installing the caps underneath. I kept the hardware though. If the economy ever recovers enough and my 401K starts making a few bucks, I'll get those hayseed caps. $60 is not too outrageous for that, but it's like the Norton M/C, where do you stop? That one cost me $8K and I could spend another 4 or so easy.

Date: Sat, 1 Feb 2014 20:10:51 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] AF Deck Caps

If one is going to install new electrolytic caps in the underside of the AF deck. One should seriously consider also remounting R617, R618 and R619 power resistors on the top of the AF deck. Probably in the vicinity of the old removed caps. This will seriously aid in keeping the new caps from frying to an early demise.

Date: Tue, 25 Mar 2014 13:46:02 -0400 (EDT)
From: SHELLY199@aol.com
Subject: [R-390] R390 solid state supply

Hello all list members. Tks for the good reads about a subject that is dear to my heart. I have a lovely R389 which is truely in remarkable shape and has been restored to almost new condition. I have been considering solid stating the regulated power supply. I have a PDF file that shows instructions on how to install a solid state power supply mod that someone came up with and sells somewhere. Problem is I don't and can't find info on who makes the board. Seems like a great mod in that no holes need to be drilled and a lot of heat is removed from the circuitry. Does anyone know of the source for this mod?

Date: Tue, 25 Mar 2014 14:06:10 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R390 solid state supply

One such mod is found in Hollow State News issue 52 Spring, 2001, page 2: A Solid State Voltage Regulatorfor the R-390 (non-A) by Dr. Gerald N. Johnson, K0CQ

Date: Sat, 19 Jul 2014 12:18:12 -0400
From: Robert Newberry <N1XBM@amsat.org>
Subject: [R-390] In rush current

I picked up a few things for my r-390. One of them being a in rush current limiter. The instructions are for a r-390a. From reading the instructions it appears that I just need to put this on the AC hot lead for the fuse basically unsolder the wire at the holder and put this in between. Anyone have any other suggestions? I only ask because my instructions are for a 390a so the land marks are different than mine.

Date: Sat, 19 Jul 2014 14:02:10 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Inrush current

Basically, that's it. It runs hot, so keep it well away from anything that could be overheated. I'd put it affter the fuse, just in case it burns down, sags, and shorts to chassis. Top of chassis is better than underneath, so the heat has somewhere to go. Add a terminal strip if you need to.

Date: Sat, 19 Jul 2014 20:17:30 -0400
From: "Bill Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] Inrush current

What is the current carrying rating on the thermistor? If it was sold for an R390A and used in an R390 it may not like the extra current that the 390 pulls maybe.

Date: Sun, 20 Jul 2014 10:02:12 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Inrush current

Unlikely to be a factor. According to the specs, the 390 draws 270 watts with ovens on and 170 W with ovens off, while the 390A draws 225 watts with ovens on and 140 W with ovens off. Most folks run them with the ovens off these days, so the line currents in practice are ~1.2 A (390A) or ~1.4 A (390). Even the 390 with ovens on only draws ~2.25 A.

Date: Mon, 21 Jul 2014 01:02:05 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: [R-390] Cap Voltage

I forgot what I read. There was once thread on AC caps and how much DC voltage could be used on them in a power supply. If my cap is marked 400VCA 20UF how much DC can I apply to the cap if I use it as a filter cap in a DC power supply and want it to last?

Date: Mon, 21 Jul 2014 02:06:51 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Cap Voltage

Much, much less than 400V, but I'm not aware of any generalized conversion factor. It all depends on the particular cap design. I once put this question to a Sprague capacitor engineer, and he looked at me cockeyed and said, "Don't ever put DC on AC-rated caps. They're not designed for it. We make DC-rated caps for that."

Date: Mon, 21 Jul 2014 06:52:29 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Cap Voltage

AC caps are rated for RMS volts plus surge. DC caps are rated for DC volts plus surge. RMS to DC usually is a 1.414 sort of thing. The surge numbers - that depends, 20% is not uncommon. On some parts (rated by marketing) the number is 0%. (Long ago 450 was the max on electrolytic caps, one company sold 550 volt parts ? check the fine print ?).

Current is the bigger issue. AC caps likely are designed for a specific frequency (or range) and an anticipated continuous current. DC caps are rated for a peak discharge current (as in you short the cap).

Simple answer - they are different beasts.

Date: Mon, 21 Jul 2014 11:19:03 -0400
From: "KR4HV" <kr4hv@numail.org>
Subject: Re: [R-390] Cap Voltage

Morning: I have put two files containing information concerning an inquiry I made regarding using AC rated capacitors for DC voltages.

These files may be of interest to some. BTW, I didn't make them available to start a "I know more than you" confab, but only to provide the response that was sent to me by a manufacturer. You can see them on BOX.com in my "KR4HV" folder.

Sorry, I forgot the links!!!!!
Here they are: https://app.box.com/s/o88kje615srxb6m4la1m
https://app.box.com/s/5i4bthom2hr9loraxl99

Date: Wed, 17 Sep 2014 21:29:32 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Was - AGC voltage issue - Now - Original cap kit by Birmingham Dave.

If you want to step down to 110 V, something like a 12V filament transformer hooked up as an autotransformer is a much cheaper / smaller / (likely) more reliable solution. The first reliability gotcha with a Variac is bumping the setting. The second gotcha is having something strange come in contact with the exposed wiring. Yes with care and custom packaging you can avoid both for years and years. Why bother - just wire up a still cheap fixed transformer. $12 at Radio Shack. Slightly less at Mouser.

Date: Thu, 18 Sep 2014 08:57:23 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Was - AGC voltage issue - Now - Original cap kit by Birmingham Dave.

I have a little box from Senco, called the "Up-Down" that uses that idea. A three-position switch puts the 12V winding in phase, out of phase, or bypassed. It's very convenient. But I still expect to build a special-purpose box sometime, to combine ICL, bypass relay, and stepdown-auto.

Date: Wed, 1 Oct 2014 10:27:35 -0700
From: Larry H <dinlarh@att.net>
Subject: [R-390] R390-A Power On B+ Voltage and Choke Filter

.... it is possible for the B+ to be >400v for a short while..............

I certainly agree that the initial voltage will be higher with SS recs, however, the purpose of the 'swing choke' input power supply filter in the R390-A is to eliminate a high voltage surge at 'power on'. I have done indepth testing on my two R390-A's with 26Z5's in this area and have found that the B+ at C606A (1st filter cap) rises quickly to a maximum of 255V in Standby and slowly goes down to 242V, where it holds. The attached picture of my scope trace of this shows that is the case (the A trace is the C606A point and the B trace is the F102 point and trigger scope point). Turning a R390-A on by switching immediately to AGC yields a little lower initial maximum voltage (250V), as you would expect and is an identical scope trace.

Link to scope trace picture:
http://s29.postimg.org/a2yqc2tyv/IMG_6239s.jpg

Here's why:

The R390-A uses a 'swing choke' input power supply filter, the immediate load on the supply in standby is 6.7 ma and in AGC is 16.9 ma. This load is from: Standby: 4 ma - 150V reg, 2.7 ma - audio resistors to gnd; AGC: standby current + resistors to gnd: 2.2 ma - RFamp, 8 ma - IF amps 1, 2, and 3. I have verified that my 2 rx's do not have any undo load (ie: leaky caps, gassy tubes, or additional resistors from B+ to gnd or anything else). The AC input is 117 VAC at my home. The reason that the additional 10.2 ma load in AGC only reduces the initial maximum voltage by 5 volts is the way a 'swing choke' input power supply filter works.

The following is an excerpt from Norman H. Crowhurst's book, 'Basic Audio' from 1959. I like this explanation of a swing choke as it is short and clear:

> Another kind of filter circuit employs the so-called "swinging" choke. All smoothing chokes employ iron cores with air gaps that prevent saturation. By properly choosing the size of the air gap, a special action is produced. At low load currents, the core is not saturated, but for higher current it progressively approaches saturation, which makes the circuit act as a capacitor-input filter. Capacitor-input filters produce higher output voltages; hence, the output at the filter can be made to rise with increased load current.

> At small load currents, the inductance of the choke is sufficient to make the filter behave as a choke-input arrangement, and the output voltage is not more than 0.637 of the alternating peak voltage. As the current drain increases, the choke begins to saturate, and the rectifier starts pulse-feeding the capacitor at the output end of the choke. The circuit then begins to act as a capacitor-input filter and the output voltage rises.

> Because the current is increasing at the same time, the output cannot possibly reach the peak value of the applied a-c because the drain effect will cause dips between the peaks, but the average voltage can rise with a carefully designed filter of this kind. This is useful because it will serve to offset the voltage drop in the supply circuit that always tends to reduce the output voltage with increased load current. If the rise produced by the swinging choke just offsets the losses produced by increased current through the rectifier, the power transformer, and possibly a further smoothing choke, the output voltage of this kind of filter will be almost perfectly constant as the load current is changed.

Link to the picture of the associated graph from Norman's book:
http://s9.postimg.org/usu46ncgv/IMG_6241s.jpg

As you can see from the voltage versus current graph, it takes very little current to hold the output voltage down. That's the whole purpose of the large 12H swinging choke as input. As the current load increases, the inductance reduces to a low 2H. The way I verified I have no leaky caps is I removed all the tubes except the recs, plugged it into my variac, while measuring the voltage and current at F102, brought it up to 255V, in AGC I read 12.9 ma, as it should be (16.9 ma - 4 ma for the regulator).

I know that one book may not convince you that this is true, so you can google 'choke input filter' and find many articles written about them. I found the following:

1. Aiken Amplification - Randall Aiken, 1999
2. Wireless World - Cathode Ray, 1957
3. Power supply design - Henry A. Pasternack, 1995
4. Basic Electronics - Albert Malvino, David Bates, 2008
5. Analog Electronics - Ian Hickman, 1990, 1999

So, if your R390-A's are working correctly and using 26Z5 recs, it will never see more than 255V DC on any capacitor (even C551 because there is no agc voltage at initial power on). If you measure the voltage at F103, it will reflect the voltage at C606A -2 volts at initial power on if L601 is working correctly (it's probably ok if it measures 125 ohms (you could easily measure L601 and L602 in series for about 245 ohms)).

The way I scoped C606A was to unplug it, wrap a wire (bare on both ends) around pin 3 and hang it outside the rx after plugging it back in. Be careful not to short anything out with this risky connection.

This is why I believe the designers rated the 5 electrolytic filter caps C603 and C606 in the power supply mounted in the 2 cans on the audio deck at 300V and not higher. They knew what they were doing.

Now if your AC input is higher than 117VAC, it would adjust upwards by the percentage. 125 is about 9% higher, so your C606A would be about 9% higher, or 277V.

If you are using SS recs, your initial C606A voltage I would estimate could be up to 40V higher, but I don't have any way to test this. This will certainly add additional stress to your R390-A, but I don't know how much. I do know that you will need to watch C606 A & B and C603 A & B for excessive leakage if they are still 300V caps.

Date: Sat, 04 Oct 2014 03:00:48 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390-A Power On B+ Voltage and Choke Filter

>I certainly agree that the initial voltage will be higher with SS ....

A swinging choke is nothing magical -- it just acts like a larger choke at low current than at higher current (i.e., inductance decreases with increasing current). In the case of the 390A, L601 (the only choke that matters for the choke-input filter analysis, because it is the only choke before the first filter capacitor) is a 2-12H swinging choke (12H at very low current, decreasing to 2H at rated current). So, there still has to be enough load current from

the moment the rectifiers are conducting to bring the filter capacitor voltage down to the choke-regulated value for the choke's maximum inductance. And since the maximum inductance of L601 is 12H, 6 times the inductance at rated current, that minimum required current is about 1/6 of the rated current of the choke. That will NOT be just a few mA -- the rated current of L601 is at least 150mA, so the minimum load current for choke-input regulation to occur will
be at least 25mA. And, indeed, calculating the choke-regulation current for the 390A supply bears this out.

>I have done indepth testing on my 2 R390-A's with 26Z5's................

More or less exactly as I and others have said here many times, provided that the radio uses 26Z5s and that the 26Z5s warm up normally. Not the case, however, if the radio has SS rectifiers installed or if the 26Z5s warm up faster than normal (as some do). (But I think your measurement method missed a short excursion above 255v, for reasons explained below relating to the strike
current of the 0A2 regulator tube. If the voltage had only reached 255v, the 0A2 would not have started.)

>Here's why: The R390-A uses a 'swing choke' input power supply
>filter, the immediate load on the supply in standby is 6.7 ma and in
>AGC is 16.9 ma. This load is from: Standby: 4 ma - 150V reg, 2.7
>ma - audio resistors to gnd;

Neither 6.7mA nor 16.9mA is enough current to hold the C606A voltage below 300v, even assuming that L601 still exhibits the full 12H maximum inductance at those currents (which it wouldn't). However, the 150v regulator actually draws much more current than you have calculated (note that 5mA is the minimum operating current for a 26Z5 -- see datasheet -- and that a shunt regulator cannot supply more than about half of its no-load current to the regulated circuits).

The 0A2 strikes at ~75mA [see datasheet], then holds at about 25mA for a C606A voltage of 240v [R617 + R618 + R619 = 3.6k; current = 240-150v/3.6k = 90v/3.6k = 25mA]. The holding current will be higher if the C606A voltage is more than 240v (Ohm's Law).

To reach the 75mA strike current, there must be at least a short excursion of the C606A voltage to ~420v (75mA through 3.6k produces a drop of ~270v, plus the regulator voltage = 420). In practice, most 0A2s strike at less than 75mA, so the overhead is typically less than 270v -- but the total voltage required with 3.6k of dropping resistance is still well above 300v. Even a strike current of only
50mA requires a C606A voltage excursion to ~330v.

25mA *is* enough (just barely) to hold the C606A voltage below 300v, once the 0A2 is conducting.

Note: the above analysis is somewhat simplified. R619 is actually switched out of circuit (shorted) when the radio is in AGC mode, so the dropping resistor is R617 + R618 = 2.8k. If you switch from OFF straight to AGC, after the 0A2 strikes it will be drawing 32mA (for 240v on C606A; more if the C606A voltage is higher). This explains why the C606A voltage peak is lower in AGC mode, even before the signal tubes are fully warm.

>The reason that the additional 10.2 ma load in AGC only reduces the
>initial maximum voltage by 5 volts is the way a 'swing choke' input
>power supply filter works.

Not so. The reason is that the 25mA drawn by the 150v regulator, by itself, is enough to hold the C606A voltage down to its nominal choke-input value. The extra 5v is due simply to the resistive drop in the power transformer secondary, the 26Z5s, and L601, as well as the increased 150v current due to shorting out R619.

>The following is an excerpt from Norman H. Crowhurst's book, 'Basic
>Audio' from 1959. I like this explanation of a swing choke as it is
>short and clear:

It is a good explanation, but your interpretation makes it sound as if a swinging choke magically satisfies the current requirement to hold the voltage of a choke input filter down to its choke-regulated value with just a few mA of current. It doesn't. The best it can do is act like its maximum inductance -- in the case of L601, 12H. Note that the diagram in Crowhurst's book shows no scale, so there is no basis to conclude that "it takes very little current to hold the
output voltage down."

The amount of load current required to bring a choke-input filter down to its choke-regulated value can be calculated, which is what I have done wherever I have cited currents and C606A voltages.

>The way I verified I have no leaky caps is I removed all the tubes
>except the recs, plugged it into my variac, while measuring the
>voltage and current at F102, brought it up to 255V, in AGC I read
>12.9 ma, as it should be (16.9 ma - 4 ma for the regulator).

As I noted above, all of your current estimates and measurements appear to be wildly off the mark. Somewhere I have measurements of the B+

currents of quite a few 390As. I would need to look in my notes to be sure, but ISTR that the total B+ current of an operating radio in good repair is around 125mA, perhaps a bit more.

>So, if your R390-A's are working correctly and using 26Z5 recs, it
>will never see more than 255V DC on any capacitor

Except for the brief excursion to the high 300s or low 400s every time you turn it on, to fire the 0A2. And assuming that your 26Z5s warm up slowly.

>This is why I believe the designers rated the 5 electrolytic filter
>caps C603 and C606 in the power supply mounted in the 2 cans on the
>audio deck at 300V and not higher. They knew what they were doing.

As I and many others have pointed out many times on this list, the stock 300v electrolytics generally survive the even longer excursions to the low 400s at turn-on and to the low 300s (during operation on a 125v AC line), when the 26Z5s are replaced with SS rectifiers. That is true even after they have run for 60 years at the lower voltage developed by the 26Z5s. So, yes, the designers knew what they were doing. But what they were doing wasn't keeping the C606A voltage below 300v at every instant -- it was trusting the capacitor design
margin to tolerate the excursions above 300v that they knew occurred.

Interestingly, that has implications for choosing replacement electrolytics. Generally speaking, the technology of aluminum electrolytic capacitors has come a very long way since the 1950s/60s. However, note that today's electrolytics are MUCH smaller, value for value, than those of the '50s/'60s. One consequence is that the dielectric layers are thinner these days, which means that today's capacitors are not as robust when it comes to dielectric failures from voltage surges. So, I would NOT trust a 300v capacitor you buy today to replace an original 300v cap in a 390A. I use 450v caps of the highest temperature rating I can find (125 degrees).

Date: Mon, 01 Dec 2014 20:46:21 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Cap Confessions

>The risk you run is that it is a choke fed supply so on power-up those
>capacitors appear like a dead short on the B+.

The reason the SP-600 draws high(er) current at turn-on is because it is NOT a choke-input supply. It is a capacitor-input filter (C161A is attached directly to the rectifiers).

Power supply filter capacitors always appear as a low impedance until they are charged, typically within a few cycles of the AC mains supply after it is applied -- it doesn't matter whether the filter is capacitor input or choke input. In a choke-input supply, the choke limits the inrush current somewhat, both because of its inductance and also because of its resistance -- 170 ohms, in the case of L51 in the SP-600 (note that if the SP-600 had been designed with a choke-input filter, L51 would almost certainly have been larger than 8.5H, as well).

Sometimes a choke-input supply SOUNDS like it is drawing a greater surge current, because there are two magnetic things to go "thunk" instead of just one (the power transformer and the choke). But the actual surge current is less than it would have been if the first capacitor was moved upstream of the first choke.

Date: Mon, 01 Dec 2014 21:09:22 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Choke input vs Capacitor input power supply filters

A 1957 Wireless World article that does a pretty good job of discussing the differences between choke input and capacitor input filters is posted here:
http://www.r-type.org/articles/art-144.htm

Date: Wed, 3 Dec 2014 07:22:21 +0000 (UTC)
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] SP 600 fixes

>The risk you run is that it is a choke fed ....

There are two easy ways to prevent “thunky” with SSrectifiers. The simpler way: add 10 Ohm 0.5W resistors to each SS diode input from the transformer. A better way: Use a CL-90 thermistor in rush current limiter. This is better as it gives a slow warm-up tothe tubes as well as the B+.

>.....except for the transformer and the chokes............

I don’t know about power transformer replacement. For the chokes, Triode Electronics sells a Dynaco replacement choke rated 1.5Hy and 200mA for

$17. A whole lot smaller. You make up the for the lower inductance by far larger and less expensive electrolytic caps. For example a Nichicon 220uF/450Volts 105C rated for 10K hours for $6.50. An unintended side benefit is you take a fair amount of weight out of the set. I was able to get some higher rated new Nichicons at a hamfestfor $2.50

There is a sneaky workaround for the turret clips. Although the ceramic base is completely filled with clips, careful examination of the schematic shows that some are not used. They can be relocated although it is a PITA.

Date: Mon, 8 Dec 2014 17:19:09 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] Audio HUM WAS: B+ short in RF deck

First I want to be sure and thank everyone who contributed to the previous thread regarding the shorted B+ line in my RF deck. The shorted cap was located and replaced, as well as the resistor nearby that was taken out when the cap shorted.

Reassembled the radio and powered on. Loud 120 cycle hum with some
signals audible underneath. The local gain control varies the hum volume, and its present in both line and local channels.

In looking through the Pearls, I see a couple of references to the 120 cycle feature being a sure sign of filter cap degradation, but the writer said the hum wouldn't vary with the gain setting. 60 cycle hum was felt to be associated with bad grounds, bypassing, etc. The filter caps were replaced above chassis about 10-12 yrs ago.

I need a few of pieces of advice..(at least :)) First, how can I systematically isolate the offending stage? Being that the hum is controled by the local gain suggests a stage before the 1st audio stage, but the 120 cycle part confuses me.

Second, I'd like to measure the ripple on the B+ line. Is there a location of choice to make that measurement, and what kind of values should I be looking for?

Third, could there have been other collateral damage from the shorted RF deck cap that might have triggered this him problem?

Roger's plan to take readings from each of the RF deck plates to ground was the "magic bullet" that led me to the offending cap (Thanks Roger!). I'm hoping for a similar gem here. Well I can be optimistic, can't I? :)

Date: Mon, 8 Dec 2014 18:26:44 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

I'd start with the power supply. First the 26Z5W's or their diode replacements, check them. Then move on to L601 &L602, next stop would be the filter caps C606A&B. You stated the receiver was in daily use till the cap failure, so this could be collateral damage. The filter caps should be tested for value and leakage at rated voltage. Question: Which fuse blew with the cap failure?

Date: Mon, 8 Dec 2014 22:09:09 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

To answer your question...I'm not completely sure because it was several years ago that the problem surfaced. At the time I couldn't trouble-shoot it and the radio went into storage for several years. As best as I recall, it was the 1/8th amp fuse that blew. At that time I was running the tube rectifiers. and that's what I kept in there till I found the short. At that time, I swapped in some solid state replacements from Sigmatec that had no impact on the hum. I will work on checking the power supply. Thanks

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Date: Sat, 13 Dec 2014 14:57:47 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

Did more troubleshooting last night and this morning. To briefly review, unit was blowing fuses caused by shorted C248 which caused R205 to roast. Both replaced. Unit now has strong 120 cycle hum. Hum is controlled by local AF gain. Present in both audio channels. Can see with the scope very large 120 cycle ripple on RF/IF B+ line at the B+ fuse and plate of V201 as well as the plate of the 1st audio amp. Didn't check other plates. V601 and 602 were both swapped out for new tubes with no change. Checked L601, 602 and 603 for DC resistance with a VTVM, they are within spec. Can't check the inductance.

Caps C603 and 606 were previously replaced by axial caps installed on octal
headers and plugged into the original sockets. 33uf/350 and 45uf/350 caps
were used. They were checked with the VTVM and do not appear shorted or
open. Can't test for leakage at rated voltage. I'm at a bit of a loss now as to what to do next. I have a feeling its something obvious that I'm missing....

Date: Sat, 13 Dec 2014 19:29:58 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

>Can see with the scope very large 120 cycle ....

So, there's your problem. (But, what is "very large"?? How many volts peak to peak?)

>V601 and 602 were both swapped out for new tubes with no change.

Do you really mean the audio tubes, V601 and 602, or the rectifiers, V801 and 802?? (The accumulated observations do not implicate V601/602, so there would be no reason to pull them.)

>Checked L601, 602 and 603.................

If there is large ripple at the B+ fuse, it means either (1) something is wrong with V801, V802, L601, L602, C606A, or C606B, OR (2) something is drawing massively too much RF/IF B+ current, OR (3) something is drawing massively too much AF B+ current. Any RF/IF B+ current drain sufficiently large to cause excessive ripple should blow the 1/8A RF/IF B+ fuse, and would also drag the B+ voltage down. So, (2) seems unlikely. Similarly, any sufficiently large AF B+ current drain would also drag the B+ voltage down. Does your AF B+ still measure about right? If excessive current were being drawn by V601A or B, it would fry R606, so V601 is not the problem. Excessive current could conceivably be going through V603 or V604, or there could be leakage from the primary of T601 or T602 to ground. So, if the AF B+ voltage is low (or just to be sure), pull the AF B+ feed from Terminal 2 of L603 and see where you stand.
If L601 and 602 are within spec for resistance, they are almost certainly not the problem. L603 is not implicated by the symptoms. SO: By elimination, you most likely have a problem with excessive current drain on the AF B+ supply, OR a problem with V801, V802, C606A, or C606B. Just in case there is excessive current being drawn somewhere, I'd limit how long you leave it on to 2 or 3 minutes at a time until you know there isn't.

Date: Sat, 13 Dec 2014 20:09:51 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

Charles, I'll answer your questions inline.

>How many volts peak to peak?)
Measured 70 V p to p at the 1/8 A B+ fuse

> Do you really mean the audio tubes, V601 and 602...........
No, I really meant V601 and 602. I have a stock handy and just swapped them out for giggles, and to conclusively eliminate any odd failures.

> If there is large ripple at the B+ fuse, ...
When I started having the fuse blowing problem it was running the tube rectifiers. I kept the tubes in until I cleared the short, then installed solid state replacements (the SigmaTech product). No change. Just for giggles I put the tubes back...still no change. It's not the rectifiers.

> Any RF/IF B+ current drain sufficiently........
Plate voltages that I've checked in the RF deck and AF deck are normal. I'm pretty certain there is no excessive current drain going on for that reason. And no fuses being blown in case you were wondering.

> SO: By elimination, your most likely have a ....
So I'm back to C606 (or possibly 603). Someone suggested that I bridge (carefully of course) a 45 uf cap across the B+ line and see what the hum does. I remember now I used to do that as a kid, thanks for the reminder. Now to look and see if I have a suitable cap to bridge.... Thanks for the analysis Charles.

Date: Sat, 13 Dec 2014 20:45:38 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

I found a 10 uf cap at an appropriate voltage and hung it across the B+ line. Dramatic reduction in hum. So I'll be ordering some caps. Hopefully that will let me get on with an alignment. The thing is, these aren't the original caps! I replaced those a while ago, and really didn't expect to have to do it again. That's what was confusing me (in part). C606 and 603 were down on the suspect list since the original parts were replaced before. Lesson learned I suppose.
For those who might be curious, the caps I used previously (and apparently failed) are "Xicon" 33 uf (or 45 uf) at 350 V axials mounted on octal headers.
Thank you all for your learned advice. :)

Date: Fri, 2 Jan 2015 13:13:05 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

An update to the audio him issue. Received replacement caps for C603 and 606 and replaced the 20 year old caps on the headers I made back when I got the receiver. Audio hum remains at previous levels. Placing a 47 mf cap across the B+ reduces the hum drastically, as before, and another 47 mf cap in parallel drops the him down to about 160 mv on a 195 volt B+ line.

Obviously, something isn't working right. I did check the DC resistance of the inductors which is within spec. Nothing obviously over-heating. I am very tempted to wire in the additional C. Short of swapping in another inductor(s), anything else I can check? The rectifiers are good.

Date: Fri, 2 Jan 2015 13:14:18 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

That should be drops the ripple on the B+ down to 160 mv.

Date: Fri, 2 Jan 2015 16:25:41 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

Does this receiver have the fuse in the B+ line? If not, can you measure the load on the B+ supply to ensure it's not more than the rated load?

Date: Fri, 2 Jan 2015 13:58:07 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

Barry, yes...it has both fuses on the B+ line..

Date: Fri, 02 Jan 2015 17:59:10 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Audio HUM WAS: B+ short in RF deck

>An update to the audio him issue................

When you eliminate the impossible, whatever remains, however improbable....
It sounds like C606A/B are not actually in circuit due to a bad ground, broken wires, bad socket connections, bad solder joints, or whatever. If C606A/B are each ~45uF (per the schematic), then adding another 47uF should only drop the AC hum voltage 50%. Since it drops the hum drastically, one must conclude that C606A/B are not really connected. Are you sure you didn't get the header pins mixed up when you built your plug-in caps (sometimes people get confused with pin assignments as viewed from above vs. below)?

Here's a test -- pull C606 out. Does the hum get worse, or stay the same (as measured w/ an oscilloscope at the nodes where C606A and C606B should connect)? From what you said above, I'm guessing it stays the same. If all else fails, pull C606, throw it away, and replace it with two 47uF capacitors soldered in under the chassis. (I didn't mention C603, because it isn't contributing to THIS problem. But it may have the same problem as C606.)

Date: Sun, 4 Jan 2015 21:51:05 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] SOLVED - Audio Hum

Well, its fixed..at least the hum problem anyway. And Charles gets the prize. His advice was to check the improbable. And sure enough, the header was miswired. The caps were never in the circuit. Am I embarrassed? That's an understatement. It is amazing what filtering can do to a power supply. :)
Thank you all for the kind advice. I learned/am learning a lot.

On to the alignment. See my next note.

Date: Fri, 15 Jan 2016 05:35:00 +0000 (UTC)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] another C603/C606 replacement

Rather than restuffing an old can or using an octal relay case, one can use a common pill container. In this version, the base is a dead octal metal tube. Just cut off the upper metal, and gut the interior, preserving the base and interior pins. The I.D. of a pill container is 2.11 inches, and the O.D. of an octal metal tube base is 2.11 inches. The fit is exact. The container may be secured using small screws. The caps will fit in, but just barely. I got three 22μF in one and two 47μF in the other.

Date: Tue, 9 Feb 2016 21:23:34 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: [R-390] R-390A line filter change - was: Hi there

Welcome to the mailing list - we are glad to have you. I would like to ask what reasoning you went through to determine that the line filter needed to be replaced. It's well recognized that:

- the line filter can trip ground fault interruptor outlets and electrical panel GFI
    circuit breakers even it there is no fault
- the capacitors in there will act as voltage dividers and put half the line voltage
    on an UNGROUNDED chassis
- The bypass caps in there are quite old now, and MAY be leaky or shorted, but
    it may happen less than is suspected.
- replacing the caps IN the line filter is a messy job

- replacing the line filter with a modern IEC line filter makes sense to many folks.

Maybe your country operates on 220 or 240 volt “mains supply” - this would lead to leaky or shorted caps more often than stateside 120 volt supply.

Date: Wed, 10 Feb 2016 08:28:48 +0100
From: gs@oaft.com
Subject: [R-390] GFI

Hello Roy - concerning line filters:

Yes we use 230V AC but most of the time its close to upper tolerance of 239V ! (guess they want to sell more energy - hi).

Had the issue with the filter also on my EK07 . The R390A did the same - the GCI tripped. As its a big job to open the filters and replace faulty Cs I did change to new filters found in PC powersupplies. When one runs more oldies the failure currents are summing up and trip the GCI. We have to use 0.03A types. In the R390A did set the filter inside mounted on a small aluminum-board fixed on the bolts of the old filter. The existing hole is just wide enough to clear the new plug (standard 3-pole PC cable). Works fine in all my boatanchors. (51S1, 51J4, KWM2 etc.)

Date: Sun, 18 Sep 2016 04:28:43 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: [R-390] R-390A blows F103 occasionally, current distribution

For the last couple of years, F103 has blown twice. I use the recommended 125 ma fuse, and that has been good for many years. I thought for sure it was some cap going bad, but first, I'm going to check the current usage on it. I pulled F103 out and hooked up my amp meter across its socket. So, here's what I get with RF max, no antenna, and below 8mc (includes 1st osc & mixer):

Standby: 12 ma, AGC; 100 ma, BFO on: 110 ma, Cal: 130 ma.

Oh, I forgot, this 390A has the BFO converted to a product detector, but this does not explain the 100 ma in AGC (it should be around 95 ma). The conversion added about 5 ma to the load with BFO on. Here's the readings I took a couple years ago:

Standby: 12 ma, AGC; 95 ma, BFO on: 104 ma, Cal: 124 ma.

Well, it just dawned on me that the AC input is probably higher. I measured it when we moved in 4 years ago and it was 117 VAC. Bumber, I just measured it and it's now 121 VAC. No wonder the current went up. Come to think about it, the transformer that provides our house power blew 2 years ago and when they replaced it, they must have raised the voltage.

Just to make sure my RX is ok, I hooked it up to my Variac and set the AC voltage for exactly 115 VAC. I have 2 recently calibrated AC meters and they both agree. Here's the readings I got:
Standby: 12 ma, AGC; 93 ma, BFO on: 102 ma, Cal: 122 ma.

This is much better. Now I just need to decide how I'm going to reduce the voltage. While I'm here I think I'll check the current through F102. Here's what I get at 121 VAC in:
Standby: 88 ma, AGC; 175 ma, BFO on: 183 ma, Cal: 203 ma.

Running it in Cal with BFO on for a long time won't be good for L601, which is rated at 200 ma.
Here's what I get at 115 VAC in:
Standby: 77 ma, AGC; 151 ma, BFO on: 160 ma, Cal: 178 ma.

As long as I've gone this far, I'm going to check the high voltage caps in the VFO, 2nd osc, IF and RF decks for leakage. Since F103 only feeds the oscillators, IF and RF deck, I'll test those at one time. I do not need to disconnect the VFO power or remove its tube (removing BFO removes VFO filament), so pull all the tubes in those 2 decks and the 2nd xctal osc. You might want to keep track of which tube went where. Pull F103 out and hook up my amp meter across its socket. I turn it on for a few seconds and turn it to AGC. I register 10.2 ma, 8.2 in the IF deck and 2.0 in the RF deck. This is due to resistors from B+ to gnd. The VFO and 2nd osc should have 0 current. I usually disconnect the IF deck power in order to check the rest. This is exactly what I expected at 115 VAC. This does not check all caps for leakage nor will it show up low leakage caps in the IF deck, but it will show any leakage in the VFO, 2nd osc, and some in the RF deck. The best check for the VFO and 2nd osc, is to also disconnect the RF deck power. However, if you do have more current than this, you might have a problem.

To make it easier to measure the current through F102 and F103, I made up an adapter. I made it to plug into the fuse socket (instead of the fuse) and I can measure the current this way. Another reason I made this adapter for the fuse socket is that I like to measure the current periodically as a health check. The adapter is very easy to make. Drill a hole in both ends of a blown (or good) fuse. Get some very small diameter wire that will carry .5A and insulated to 300V and insert one wire through the center of the fuse end so it is sticking out the other end and solder it there. Solder another wire (preferably a different color) on the other end of the fuse, so it looks like the two wires are connected to one end of the fuse. Of course, the two wires are connected to opposite ends of the fuse. Then, take the fuse cap off of the R-390A and drill about a 1/16" hole in the end and insert the two wires through it, so it can be inserted with the adapter into the fuse holder with the two wires sticking out. You can then hook up your amp meter to the two wires (watch the polarity).

https://s22.postimg.org/se1xj5we9/IMG_7296vs.jpg

CAUTION: remember, with this installed and power on, it's hot so be very careful to NOT short it to ground.

Date: Sun, 18 Sep 2016 00:55:44 -0400
From: Guido Santacana <gsantacanav@gmail.com>
Subject: Re: [R-390] R-390A blows F103 occasionally, current distribution

Keep it going at 115VAC. My line voltage is 123VAC so I run all my old gear on Variacs or bucking transformers. Just by lowering the voltage you may have resolved the problem.

Date: Tue, 4 Oct 2016 08:27:52 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: [R-390] Reduce high line voltage - bucking or auto transformer

As I said in my previous post of about 2 weeks ago, my occasional F103 blowing was due to high line voltage. I've been using my variac to reduce the line voltage from 121 to 115 vac. This has been working great, so I decided the solution I would use is a bucking transformer. The reason is, I have other equipment that will benefit from using 115, also. And, I need to use my variac quite often on other projects.

I know how to hook it up, but I thought I'd look around to make sure I was right about the proper xformer I should use. On my way, I found an article by Mr. Rod Elliott from 2010 about bucking transformers and autotransformers. You can see it here:
http://sound.whsites.net/articles/buck-xfmr.htm

Section 3 is the relevant information. He discusses using a bucking transformer as we think about them, but also discusses how to use the same transformer as an autotransformer. The latter being more efficient (uses less current), but the resultant output voltage is a little different. Using a 6.3 vac filament xformer in bucking connection, my 121 went down to 114, but using the same xformer in autotransformer mode, it went down to 115. I'm going to opt for the autotransformer mode. I'll let you know how it works out in the near future.

Date: Sat, 15 Oct 2016 17:28:20 -0400

From: Blair Batty <blairbatty@gmail.com>
Subject: [R-390] Electrolytic Caps

We are all familiar with the capacitor plague that hit electrolytics, a decade ago, caused by a faulty dielectric recipe. Is that behind us now

I'd like to buy an inventory of Electrolytic Caps, and kits can be quite inexpensive from China via eBay. Are all brands dependable Surely the problems are sorted out by now. Or should I stick to name brands from, say Digikey, etc. But for the price of a couple of caps & shipping from Digikey, I can get a complete collection from eBay/china. But not if it's crap. I'd appreciate any advice or suggestions.

Date: Sat, 15 Oct 2016 17:54:40 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Electrolytic Caps

If these are for the R390[A], Hayseed makes replacements.
https://hayseedhamfest.com/collections/collins-plug-in/products/r-390-r-390a

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Date: Sat, 15 Oct 2016 18:35:21 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Electrolytic Caps

> I'd like to buy an inventory of Electrolytic Caps, and kits can be quite
> inexpensive from China via eBay. Are all brands dependable

No, not at all. And it's not just brands, it's also individual product lines within each brand. China, Inc. makes a huge variety of electrolytic capacitors, from unmitigated junk to space-qualified parts. You, or someone acting on your behalf, has to navigate this swamp and figure out which are which, and how to get what you need. The ones that sell in small quantities for next to nothing on ebay or from far east exporters are the unmitigated junk.

Above, I'm talking about capacitors that are marketed honestly by the manufacturers (but NOT NECESSARILY by the middlemen between you and the manufacturers) as exactly what they are. In addition to those, there are the outright counterfeits -- capacitors, invariably from the unmitigated junk catagory, packaged as products from reputable product lines, but that in fact have nothing to do with the brands and lines they appear to be from.

Sadly, counterfeiting of electrolytic capacitors is so rampant that even major distributors are victimized by the practice. But at least if you buy from a major distributor, you can expect to get a recall notice when the distributor finds out it has 20 million bogus capacitors in stock (this happens reasonably quickly because the caps get sold to hundreds of companies, many of which qualify incoming parts and will discover the problem sooner than later).

We have gotten such notices from most of the major distributors, and it seems to affect about 2-5% of the (combined) major distributors' inventory (that's a WAG based on our own recalled orders and conversations with other users and distributors' sales engineers). It is enough of a problem that savvy manufacturers have learned to buy 'lytics well in advance, so they are still sitting on the shelf when they get the recall notice -- not installed in products that would then need to be recalled.

Date: Sat, 15 Oct 2016 19:57:29 -0300
From: Norm n3ykf <normanlizeth@gmail.com>
Subject: Re: [R-390] Electrolytic Caps

General purpouse cap assortments can be bought from this dude. (or mouser or digikey). vakits.com VA is the owner, new ham after 30 years in the electronics buisiness. He's got a bunch of kits that work for general building. SMT or discrete. Reasonable prices. Oddball stuff of course from the big vendors.

Date: Sat, 15 Oct 2016 20:13:34 -0400
From: jbrannig <jbrannig@verizon.net>
Subject: Re: [R-390] Electrolytic Caps

Allow me to add: with the amount of work necessay to replace a component, it is a false economy to to save pennies on sub par parts.

Date: Fri, 23 Jun 2017 15:24:51 -0500
From: "Thomas Weigel" <tomweigel1@comcast.net>
Subject: [R-390] R-390A

Having recently come into possession of a very clean EAC 1967 build R-390A, I brought it up with variac and dim bulb tester. While bringing the set up to 115 volts, I notice the dim bulb lights up very well. My question: Does the R-390A normally draw heavy current? So far, I do not have any audio. Also, have replaced the 3TF7 with a solid state unit, along with several of the tubes.

Date: Fri, 23 Jun 2017 19:32:50 -0400
From: "Bill Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] R-390A

Average draw is 90- 110 watts at 120 volts. I have a refurbished one on my bench now and it pulls 95 watts at 120 volts. If I can be of help I repair and restore R-390a and SP600 receivers.

Date: Sat, 24 Jun 2017 00:05:31 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A

Hi Thomas, The label on mine says 220 W, but that's with the heaters on. At 115 vac that's about 1.95 amps, but they usually draw a little less than that. With the vfo ovens off, about 140 watts. You should not need them on unless your operating temp is very cold. The switch is on the back. The thermostat has a habit of sticking on and ruining the vfo. For the audio, check the links on the back. Did you replace the killer cap, c553? If not, do so asap.

Date: Fri, 23 Jun 2017 20:43:59 -0400
From: Guido Santacana <gsantacanav@gmail.com>
Subject: Re: [R-390] R-390A

Replace C553 and all of the brown paper caps in the IF, RF sections. That is good insurance. Also check that the plug-in electrolytics in the AF section are not getting too hot and not leaking. Sometimes they can be reformed. Clean all the contacts and tube sockets too. A few months ago I got an EAC R390A that had not seen use for many years. I did all of the above before even testing it. It has been working fine since then.

Date: Fri, 23 Jun 2017 22:49:41 -0400
From: "Bill Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] R-390A

My measured average power drain taken with over 75 R-390a receivers of 100 watts is measured with an accurate wattmeter. It is actual drain within 5 percent with ovens off.

Date: Sat, 24 Jun 2017 03:24:53 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A watts power consumption

Bill, That is good to know. The 140 Watts I quoted was taken from the R-390A FAQ at http://www.r-390a.net/faq-overview.htm. It looks like we need to correct it. Does your 100 W measurement include the bfo and calibrator being on? From what I knew, I felt the actual was less than the stated 140 W. Also, is that with tube rectifiers?

Date: Mon, 26 Jun 2017 01:06:55 +0000 (UTC)

From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A watts power consumption
Message-ID: <1214384528.2066668.1498439215121@mail.yahoo.com>

Bill got back to me and he said that his measurement of 100 W was in a common mode of operation: BFO off and Cal off. The rx's had tube recs, power in was 120 vac, and it was set above 8 mh. I did some quick rough calculations and with those and the 1st xtal osc on (below 8 mh), I estimate the additional draw would be about 9 Watts. About half of that was the calibrator.

Date: Fri, 14 Sep 2018 21:42:53 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] B/A receiver voltage management

ER magazine published my article on Voltage Management for Large Boat Anchor Receivers in the July 2018 issue. For anyone wanting a copy please send me AN ORIGINAL email using my header address. This way I'll make sure I don't miss anyone who wishes a copy.

Date: Wed, 1 Aug 2018 09:16:38 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

So I'm about to sell this guy this 390A and I turn it on and notice that after 5 minutes or so the noise level of the RX goes way up. Figuring it's a tube problem, I start swapping tubes out. I get to the RF section and turn the radio on and all of a sudden I see a wire in the harness to P108 melting in real time and smoke starts coming out of the RF section over by the crystal osc. Turn off the power and unplug it. Well, it appears as if the wire to P108-B has burned up. That's the 6.3V for the filaments in the RF, Crystal osc, the break in relay, and the filaments in the audio section. So it looks like I've got my work cut out for me. Better it happens now than right after the guy gets it home after a 4 hour trip. I'll dig into it today, it's going to be a challenge to replace the burned wire/wires in the harness. Think I've got some Teflon wire I can use to replace it. Wonder if it's one of the tubes that's shorted

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Date: Wed, 1 Aug 2018 10:02:20 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] Smoke got out

I would not expect a shorted tube, but rather a shorted filament bypass cap. I have not seen the R-390A schematics for quite some time now, but I do seem to remember (vaguely) that there are some filament bypass caps. This would seem more likely in the RF section than in other places.

Locating a short may be a challenge because cold resistance to ground of the filament line to a module may be very low, UNTIL you remove all the tubes.

Seems like the crystal oscillator is a target to investigate. Not all that complicated compared to other modules. I'd expect other folks could comment based on more concrete information/schematics. You may decided to *replace* the burned wire(s), or you might only run a new wire on the outside of the harnesses involved. Note that teflon insulation is possibly not as physically strong as other types, so overly vigorous re-lacing of harnesses may not be in order. We have heard that the EAC-made radios have teflon wire in the harnesses. I have one EAC here at hand and the wire does not seem to be teflon insulated. Maybe I'm wrong on that. When I get it out for overhaul I'll look carefully. Roy

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Date: Wed, 1 Aug 2018 11:01:18 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Smoke got out

I've got the RF section out and it sure smells burned around V205, 206 and 207 and that appeared where the smoke was coming from besides the wire. I measured each tube in it's socket to pin B J208 and all the filaments appear normal. No tubes, no resistance, no measurable shorts. Trouble is I've got those huge orange drop caps in that osc section and they cover everything in that osc section. I'll have to pull them out to measure/see things in there. This is an EAC and it doesn't have Teflon wires. Opps, I see a burned wire over going to V204.

Date: Wed, 1 Aug 2018 08:44:24 -0700
From: Renee K6FSB <k6fsb.1@gmail.com>
Subject: Re: [R-390] Smoke got out

I have an EAC, with all modules save the PTO, definitely not Teflon insulation. There is a cap on the Fil to gnd. on a first contract Collins in the RF deck it was split and ugly but not shorted....resistive yes like 1k.

Date: Wed, 1 Aug 2018 12:16:12 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

All the filament wires (white/black stripe) that go to V203, 204, 205, 206, 207, the tubes in the rear of the RF section, show evidence of over heating. V202 and 201 do not show that. But I cannot find any shorts, anywhere. I haven't measured the bypass caps yet but they would show up right on the filament line if they were shorted. Looks like I need to replace all that filament wiring from the jack to the tubes, some are burned enough to show bare wire. I'll have to look at that harness with P108 and see what it looks like going back. That wire is showing bare wire too. Something happened.

Date: Wed, 1 Aug 2018 15:13:27 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

The wire to P108-B comes from P112-20, the connector to the IF strip. That pin also has several other B/W wires on it including a heavy gauge B/W wire that comes right from the PS 6.3V. Only the wire to P108-B is burned, so it will be easy to replace right in the harness.

Actually that 6.3V on those RF tubes is all connected one after the other in series from P108B and the last tube on the burned string is V205. It must be there somewhere and it's really tight in there. There's still no sign of a short though, that tube measures 3.3 cold. The 5814 for the calib osc buffer.

I didn't have any #20 stranded wire so I ordered some mil spec Teflon wire for a few bucks.

I'll measure that tube alone in the other RF module I have.

Date: Wed, 1 Aug 2018 15:22:58 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Smoke got out

Do you have a way to connect just the filament supply through an ammeter (e.g. pull the plug and connect just the filament pin)   You could pull all (or, at least, the pertinent) tubes and see if anything's drawing current without them. If so, then go from there; else, plug the tubes back in, one-by-one, watching the ammeter. That might help isolate the problem.

Date: Wed, 1 Aug 2018 16:36:14 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

Thanks Barry, well, I'll have to re-wire it first and that will involve pulling some parts off in the osc section. What I can do is isolate that filament wire temporarily in the plug and put an ammeter on it while I plug in the tubes, one by one. Maybe even fuse it while I'm there so I don't burn it up again. I'm just not seeing what went wrong though, I really can't find anything strange. The wires got hot enough to melt onto others and it happened in about 3-4 seconds after I turned it from off to agc right after I was messing with the RF section tubes. I didn't put one in wrong, I checked that.

Like I said it was acting strange to start with. After I changed some tubes and I would switch on the BFO, it would take a few seconds for the BFO to come on and go off too. Like the AGC went off. And then there's the noise level that would change after warming up a few minutes. It was working fine the other day.

I hate switching RF sections between radios and am going to try to avoid that.

Date: Wed, 1 Aug 2018 16:51:05 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Smoke got out

Hi Dave, Don't forget the octal plug in oven. It operates on 6.3 and can stick on or perhaps draw too much current when on. Sometimes you can look at the oven and tell if it's over-heated.

Date: Thu, 2 Aug 2018 12:41:27 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

I found what smoked, it was the 10uH choke on V205 pin 9. That explains all the burned wires to that point. I had to remove a whole bunch of stuff around that tube to find it, burned to a crisp. It's buried under everything. But still doesn't explain why it burned up, I must have a tube with a shorted filament, or I got it in wrong somehow. The 5000pf bypass cap measures fine. Even the capacitance measures good. I have some replacements, I'll change it anyhow. Now where to get a 10uH choke, what's the current rating on it

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Date: Thu, 2 Aug 2018 13:49:04 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Smoke got out

Apparently not very high... ;)   Once you find the spec, I presume the usual places (Mouser, eBay, etc.) would have them. Still curious that it burned up that way.

Date: Thu, 2 Aug 2018 16:52:20 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] 10uH filament chokes

I've found a bunch of 10uH chokes at Mouser. Wondering what the current rating is on the OEM filament chokes These look decent

https://www.mouser.com/ProductDetail/JW-Miller/8250-100K-RC
qs=sGAEpiMZZMv126LJFLh8y59d8wtqlhUH%252byGGKPbwLGE%3d

https://www.mouser.com/ProductDetail/Fastron/SMCC-N-100J-01
qs=sGAEpiMZZMv126LJFLh8yxvhUgVKZ8iMEWCYJPaa0ww%3d

The Fastron is 680ma where the Miller is only 532, but the Miller has a higher self resonance and higher resistance. The originals seem to measure about 0.5 which is more like the Fastron. Fastron is a lot cheaper too. The highest filament current tube that I can see is the 5814 at .35A so I would think 500ma rating for the 10uH choke would be sufficient. 680ma would be almost double rating.

Date: Thu, 2 Aug 2018 17:26:53 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] 10uH filament chokes

Oh, wait, the choke that burned up is actually feeding both V205 and V206, both 5814A's. and the current rating at 6.3 on those tubes is 0.35 each, which makes 0.7A. I better start looking again.

Date: Thu, 2 Aug 2018 17:10:19 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] 10uH filament chokes

Hi Dave, According to the parts list, L202 through L207 are the same, so I have one I'll send you for postage. Let me know.

Date: Fri, 3 Aug 2018 17:28:51 +0000 (UTC)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] Smoke got out

I had a look under a spare R-390A RF deck to see what might have caused L206 to fail and noticed that my choke was touching the chassis side. Seeing that, I bent the wires away from the chassis slightly to keep the choke from shorting. Perhaps a similar condition in your case caused the choke to short to ground.

Date: Fri, 3 Aug 2018 14:58:16 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

I noticed that choke is right down on the chassis, underneath everything. So far I've gotten the wiring replaced, but I'm waiting on a new choke. Still not sure what happened. I haven't really looked at the tubes yet either. My choke was a black mess, so something must have shorted right to ground from that 6.3V line, as well as burning all the wires back to the plug into the IF. Luckily they're not too hard to get to. Not as bad as taking the mechanical filters out. I did have to pull out the var cap for the calib osc, as well as a bunch of parts around that tube. Hope I get it all back together right. Dave N3DT

Date: Sun, 19 Aug 2018 17:33:40 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

I've replaced the RF section 6.3VAC wiring, including the 10uH choke on V205. I never did figure out what happened. I used an old transformer's 6.3 winding to feed the Fluke AC Amp meter, to a 3A fuse and plugged it onto the J208-B and tested all the tubes I have individually in their respective sockets. Nothing strange found. Amps on the Fluke correspond to the correct draw for each tube with a short warm up. Both sets of tubes.

Also replaced the 6.3V harness wire from the IF connector to the RF section connector and re-tied the lacing which was burned. At this point I'm wondering since I pulled a lot of components off around V205 what I should check for before I sock the thing with HV and all. I'm sure it's all wired correctly, everything fit back like I can't remember as usual. I hate to pull the other one out just to compare. I used the schematic to find where each component went, I only pulled off one end of each component. I just want to be careful not to burn up something else. Any easy resistance checks I can make I'm ready to put the RF section back in mechanically.

Date: Sun, 19 Aug 2018 17:01:46 -0500
From: Stan Gammons <s_gammons@charter.net>
Subject: Re: [R-390] Smoke got out

Do you have the Y2K manual http://www.r-390a.net/faq-refs.htm#Y2K
Chapter 5 is the chapter on troubleshooting and it has voltage and resistance diagrams.

Date: Sun, 19 Aug 2018 19:05:58 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

Thanks for the reminder. I've got a real Nav manual and also the Y2K on computer. Page 5-15 gives all the voltage and resistance measurements. That would be a good place to start before I put it back together just to see there's no big problemo's.

Date: Sun, 19 Aug 2018 21:09:18 -0400

From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Smoke got out

> I've replaced the RF section 6.3VAC wiring, including the 10uH choke on
> V205. I never did figure out what happened.

Norman Ryan previously suggested that the original choke shorted to ground (chassis), due either to vibration or the insulation on the winding wearing off (or both). Leaving aside purely fantastical and magical explanations, that is the only way I can see that the damage you observed can be caused to a working radio. Accordingly, I concur with Norman's diagnosis.

Date: Sun, 19 Aug 2018 22:35:34 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Smoke got out

I'll have to agree with you. I really can't see any other reason. But where was the vibration, etc, after 51 years, maybe it was just the 51 years and time It was interesting watching the insulation melting off the wire in real time and the lacing melting off. And then the smoke. I've never seen that before with such immediacy, I just happened to be looking at the harness when it happened. The new choke is a bit smaller and isn't right on the chassis. I'm just glad I didn't get it sold and the guy took it home and it happened. At any rate he's still interested.

The burned wires and choke certainly point right to that choke on V205 and not past it.

Date: Mon, 20 Aug 2018 01:46:54 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Smoke got out

> ..where was the vibration, etc, after 51 years, maybe it was just the 51
> years and time

Mechanical engineers' Rule 11: "There Is Always Vibration." There is also always thermal cycling, which rubs surfaces that are in contact against each other. And also, shifting when the radio is moved, lifted, flexed, etc. I expect that, like Norman's radio, yours had the (insulated) choke windings touching the chassis right from the factory. [NB: this is, and always has been, an absolute no-no in military electronics construction standards. Collins actually wrote and published the standards back then. Rest assured, the ghost of Art Collins is even today haunting the assembler and the inspectors who let that slip by in the next world. It takes very little vibration to wear through a thin enamel layer

and allow direct metal-to-metal (wire-to-chassis) contact.

Date: Fri, 31 Aug 2018 19:59:38 +0000 (UTC)
From: Robin Filby <robin.filby@yahoo.co.uk>
Subject: [R-390] 3 fuse modification sheet for R-390a.

I have a couple of single fuse R-390a receivers and wish to convert them to the 3 fuse variant. Was there ever an official modification document issued detailing the modification details from single fuse variant to a 3 fuse variant If so, does anybody have a copy and could they share it with me please. Thanks in advance.

Date: Sat, 1 Sep 2018 03:02:33 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] 3 fuse modification sheet for R-390a.

I searched my saved files for this topic but did not discover any official change order or MWO. Likely there is one however. The Y2K manual likely has a list of changes.

In the Pearls of Wisdom files,
http://www.r-390a.net/Pearls/ <http://www.r-390a.net/Pearls/>
the one called “PowerSupply.pdf"
http://www.r-390a.net/Pearls/PwrSupply.pdf
has discussions of the fuse holder situation, but no official document is mentioned that I can see.

I look forward to any that list folks find.

Date: Sat, 1 Sep 2018 10:30:07 +0000 (UTC)
From: Robin Filby <robin.filby@yahoo.co.uk>
Subject: Re: [R-390] 3 fuse modification sheet for R-390a.

Thanks for all the information. I will print of the modification document and study it over the weekend. Once again thanks for your help.

Date: Sat, 1 Sep 2018 23:54:53 -0600
From: "Gary I. Biasini" <gary.biasini@shaw.ca>
Subject: Re: [R-390] 3 fuse modification sheet for R-390a.

While not an official document, check out:
http://www.r-390a.net/Adding-Fuse-F102-and-F103-to-the-R390A_2.pdf
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Date: Sun, 2 Sep 2018 10:16:57 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] 3 fuse modification

Notice that the AC input is fused and B+ is fused twice. The 8A 6.3V line to the filaments is *_not_ *fused at all, except by the AC input. It sure would have saved me a lot of grief. That may not be a bad mod. That 6.3V is a healthy current. It could easily be done inboard somewhere on the PS module perhaps.

Date: Mon, 3 Sep 2018 10:42:24 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] 3 fuse modification

Or better yet in the chassis so if you change power supply modules, the protection does not go away with the changed out module.

Date: Mon, 3 Sep 2018 22:21:30 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] R390A 3 fuse conversion article

I have copies of a R390A 3 fuse conversion article that was published in ER magazine a while back. Please send me an email and I'll email a copy to those interested.

Date: Thu, 28 Feb 2019 20:28:24 -0800
From: Larry H <larry41gm@gmail.com>
Subject: [R-390] R-390A Power On Voltages, 0A2 Operation Document

I wrote a couple of posts on the R-390 reflector a few years ago that had links to pictures on the web. Well, that didn't last very long, so I rewrote them and embedded the pictures within a .pdf file. This document covers 2 related subjects: (1) the operation of the 0A2 in the R-390A during power on and (2) voltages encountered in the R-390A during power on. It includes information about Solid State rectifier usage.
It's out on the R-390A disk in the 'tutorials' section. Here's the link:
http://www.r-390a.net/faq-refs.htm#Tutorials

Date: Thu, 28 Feb 2019 21:25:09 -0800
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390A Power On Voltages, 0A2 Operation Document

Thanks Roy. Yes, that is the one. I'll ask Al to look into it.

Date: Fri, 1 Mar 2019 13:27:33 -0800
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390A Power On Voltages, 0A2 Operation Document

Or you can use the link to the 'tutorials' here:

http://www.r-390a.net/faq-refs.htm#Tutorials

Date: Thu, 7 Mar 2019 09:23:36 -0800
From: Manfred Antar <manfredantar@gmail.com>
Subject: [R-390] 3TF7 Tube

I just bought a R-390.
Opened it up and this was in the 3TF7 tube socket:
Not sure what the tubes are.
Replaced it with solid state module.

Date: Thu, 7 Mar 2019 12:28:16 -0500
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] 3TF7 Tube

Manfred, the pictures did not pass to the distribution.
Was it a 2HTF11B ??

Date: Thu, 30 May 2019 00:08:56 +0200
From: atfu <atfu@gmx.de>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Recently an exceptionally good looking R-390A came my way. It even performed reasonably well on all bands but I knew, before I bought it, that the radio would require a little overhauling and care. So I cleaned contacts and recapped the AF and IF decks. Then, within a few days, I had this problem: nil < 8 =< fb

In words: The radio wouldn't even play the calibration signal below 8MHz, but from 8 upwards, all was alright. Browsing the net, I found that this is a not so uncommon problem.

I first suspected some mishap during recapping but couldn't find any fault. At this point I needed help. Larry, well-known list contributor, was very kind in steering me through the rest of the trouble-shooting.

Obvious suspects were the bandswitch S208, the 1st mixer, the crystal Y201, the connection P221/J221. All turned out to be OK. Ground checks showed no shorts in B+. But values at F102 and F103, and at E601 were so much down that the mixer tube couldn't possibly do its job.

Checking the pwr supply quickly uncovered the fault: one of the rectifier tubes had a bad filament (didn't heat up, no glow). A very simple solution to the problem; perhaps never mentioned in the net because it is so unspectacular or because there are so few rectifier tubes left (see below).

Rest of the story: 26Z5 are virtually unobtainable in Europe, expensive in the US and the shipping costs prohibitive. So Field Change 6 (diode rectifiers) and a resistor (220R/11W was at hand) to drop the voltage were in order. As I was at it, I also inserted an NTC-thermistor for soft-starting. After a re-alignment I am the happy owner of a beautiful radio that I now understand a little better. I almost look fwd to the next problem ;-) Many thanks agn, Larry!   Regards, Andre

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Date: Wed, 29 May 2019 23:42:22 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Thank you for the report, Andre. It's very helpful to hear how a problem was solved.

Date: Mon, 16 Mar 2020 09:26:23 -0400
From: Jim Bishop <jim.bishop@gmail.com>
Subject: [R-390] Silent R390A won't turn off

After working fine last night, my R390A was turned off. It was turned to standby this morning long enough to fix coffee. It was silent when switched out of standby and now will not turn off. Ideas?

Date: Mon, 16 Mar 2020 10:48:54 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Silent R390A won't turn off

Sounds like the power switch, a small micro switch, has welded its contacts closed. This is not uncommon. Best to run the R-390A from a buck transformer to reduce the line voltage. The R-390A was designed in an era where line voltage was less than today. Have a suitable on/off switch on the buck transformer and use it to power the R-390A on and off.

Date: Mon, 16 Mar 2020 11:11:06 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Silent R390A won't turn off

Good idea. I fixed a similar problem in an R390A I owned by simply dismantling the microswitch, putting a drop or two of contact cleaner on the plunger and "flicking" it a few times. I think welded contacts might be an issue but just a plain old gunked up plunger will also cause that.

Date: Mon, 16 Mar 2020 14:23:55 -0400
From: Jim Bishop <jim.bishop@gmail.com>
Subject: [R-390] No audio

Advice here fixed the standby switch on my R290A. I still detect zero audio on the earphone jack, outlets 10/13, or 15/16. None.
Thanks for the help so far. This is a great group.

Date: Sun, 29 Mar 2020 20:08:51 +0000 (UTC)
From: "R. David Eagle" <kb8nnu@yahoo.com>
Subject: [R-390] R390A Blowing fuses...newby question

I have been working through the alignment procedures outlined in my manual and am now on day 3 of it. Everything was going great with the alignment yesterday and receiver was on WWV and sounded great. I came in this morning and flipped the switch on to warm it up, and poof the fuse blew. I was extremely blown away because it was working fine when I shut it down for the evening. So I went through and pulled all of the plugs off the modules except main power supply plug. I put a new fuse in and poof...it blew again. I pulled the rectifiers which are actually the soft start upgrades from Sigmapert, put a new fuse in and everything seemed ok as the transformer powered. I then became suspicious that that the soft starts went bad and I plugged one of them in, and it powers up fine with it in either socket. Here is the weird part - I did the same to the other one and it works fine as well, BUT if I have both plugged in it blows the fuse.
So I then pulled out the original 26Z5W's and plugged them in and all is good until one of them warms up and the fuse blows. I then verified the wiring on the drawing and traced one wire that comes from the rectifiers to CR102 and unsoldered that and still get the same results.

Another odd thing that has transpired is that when the radio is switched to the off position, the frequency lights are on.... Has murphy decided to come play for the weekend or has my radio been plagued by the Corona?
Thanks again, Dave

Date: Sun, 29 Mar 2020 17:02:41 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] R390A Blowing fuses...newby question

The lights being on may be welded contacts on the microswitch.
There have been many posts about this.
Search the archives.

Date: Sun, 29 Mar 2020 18:08:47 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R390A Blowing fuses...newby question

Hi Dave, This doesn't sound good. I assume that when you said you unplugged all the connectors except the power supply, you did unplug both of the connectors on the audio module. Just to verify, is this a 390A unit? If so, it sounds like there is a wiring problem with the B+ line. With power off, you could measure it from the plug you disconnected from the audio module. Also, is this a single fuse unit?

Date: Tue, 31 Mar 2020 00:56:33 +0000 (UTC)
From: "R. David Eagle" <kb8nnu@yahoo.com>
Subject: Re: [R-390] R: R390A Blowing fuses...newby question

Hi Francesco, I have located the problem and it looks like the sigmapert 26z5w soft starts died on me. I found the original tubes and put them back in and it works fine now except the power switch issue. I suspect the contacts got welded...seems to be a common problem. I have never taken the front off so that will be another challenge! Can you send me the info on the filter and cl you put in yours?

Date: Mon, 30 Mar 2020 20:25:38 -0500
From: Don Cunningham <donc@martineer.net>
Subject: Re: [R-390] R: R390A Blowing fuses...newby question

Makes one wonder if the switch contacts caused the 26Z5 subs to go bad, or if they just went? I have a set of those I was going to try, but am curious what you find now first. I would hope the builder of those subs would give some guidance.

Date: Wed, 24 Jun 2020 16:04:23 -0500
From: Don Cunningham <donc@martineer.net>
Subject: Re: [R-390] PING!

I am here as well, other projects have taken over the R-390A work, but will get back to my pair in the winter. Adding a tower and monoband antennas for the ham station right now!! Getting WAY to hot here in Oklahoma, so I may well be back to the R-390A's sooner than I think! Do have an audio problem in my homebrew AM transmitter (2x813's modulated by 2x810's) that one R-390A will be paired with and the other will accompany a Viking II on AM. I'll need some help likely in the winter.

Has anyone investigated the "solid state" 26Z5 replacements made by SigmaPert since one of you had problems using them?? A pair of those came in the deal with one of my R-390A's and I have tentatively installed them and won't use if they cause the problem described.? I still have the good ones that came with that rig and a spare or two of the tubes.? I know about the resistor mod too.

Date: Wed, 24 Jun 2020 14:27:09 -0700
From: Renee K6FSB <k6fsb.1@gmail.com>
Subject: Re: [R-390] PING!

I have a pair of the "solid state" 26Z5 replacements made by SigmaPert and so far have been fine for the past year......then again I have not been running the radio as much as I had been.

Date: Wed, 24 Jun 2020 14:35:14 -0700
From: Manfred Antar <manfredantar@gmail.com>
Subject: Re: [R-390] PING!

I've got 2 - R390's with Sigmapert 26Z5's and Sigmapert 3TF7 solid state replacements, Work fine been using for 4 years now.

Date: Fri, 26 Jun 2020 08:26:02 -0500
From: Richard Anderson <n0abt1976@gmail.com>
Subject: [R-390] Power plug bent ground pin

Greeting all the power plug that is on the Follower is not bent. It's a military plug with a folding ground pin. You can fold it out of the way so you can plug it into and outlet that only has 2 connections. I am looking for one of these to put on my rig.

Respectfully
Richard Anderson
(816) 896-5232 cell

Date: Fri, 26 Jun 2020 10:49:51 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Power plug bent ground pin

I think I have a few of those "military-style" plugs. I'll check and see and if I do, I'll be willing to sell one or two of them.

Correction to Hi Volts entrly
Roy Morgan <k1lky68@gmail.com>
Sun, Jun 28 2020

Hello I have been discussing voltage bucking on another list and have found a couple of errors in the entry at:
http://www.r-390a.net/faq-HiVolt.htm

Here is what I found and a correction. I think this is now correct but may need some word-smithing to be more clear.

NOTE THERE IS AN ERROR IN THE EXPLANATION:

It says: " Check the voltage from the open end of the secondary to the low side of the transformer primary (that is the neutral input connection). If it is less than the applied voltage, disconnect the power and swap the secondary leads. If is is greater, then the wiring is correct. Then, for use, apply the high line voltage (127 or so) to the series connection of the two windings and connect the receiver load across the original primary alone.

It SHOULD say: " Check the voltage from the open end of the secondary to the low side of the transformer primary. If it is MORE than the applied voltage, disconnect the power and swap the secondary leads. If is is LESS, then the wiring is correct. (Swapping the bucking transformer primary wires will do the same thing.) Then, for use, apply the input line voltage (122 or so) to the series connection of the two windings and connect the receiver load FROM THE TRANSFORMER SECONDARY AND PRIMARY JOINT TO NEUTRAL.

Roy Morgan
K1LKY since 1958
k1lky68@gmail.com

Date: Wed, 15 Jul 2020 15:02:25 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: [R-390] Bucking Transformer / Autotransformer Question

I'd like to employ a bucking transformer for some of my equipment - particularly a Fluke 760A calibrator. I have a pretty hefty old transformer with two, separate 10V secondaries that can deliver 1.0A and 10.0A. It also has a tapped primary with taps at 115V, 120V, 126V, and 132V (I think I'm remembering all those correctly).

I was thinking that since my mains voltage is right around 126V, then I could connect that to the mains and use the 115V tap in an autotransformer configuration. I'm unsure, though, whether that is the best way to do this and whether the primary windings will have to carry more current than it's capable of supplying.

While I could connect one of the secondaries as a standard bucking configuration, I was thinking the autotransformer configuration might be better/simpler.

Any thoughts on this approach? I'm just unsure of how much current that small section of primary would need to supply. I think it would be the total current drawn by the load but I might be thinking of that incorrectly so thought I'd ask.

Date: Wed, 15 Jul 2020 16:18:05 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

The load current goes through the secondary. If you have a randomly chosen 12V filament transformer, it likely will do a fine job.

The math:

10A load current
10A secondary current (in the 12V winding)
1A primary current (to feed 10A at a 10:1 ratio into the 12V winding)

Obviously, 10A is a pretty big load.

Date: Wed, 15 Jul 2020 18:45:10 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

Find the r-390 website and look for the "Hivolts" article. Briefly you have all that's needed and are worrying about something that's not a problem.

Date: Wed, 15 Jul 2020 22:48:59 -0400 (EDT)
From: Barry <n4buq@knology.net>
Cc: r-390 <r-390@mailman.qth.net>

Yes, that's the traditional method. From what I've read, an autotransformer configuration is supposed to be slightly more effecient so am looking at trying that.

Date: Wed, 15 Jul 2020 22:50:53 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

As I replied to Roy just now, I'm thinking the autotransformer configuration may be the better way to go. I could get fancy and set it up with switches to that all of the tap combinations could be used for inputs and outputs to do both bucking and boosting with a few different values. Might be a fun project.

Date: Wed, 15 Jul 2020 22:57:00 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

There is *no* difference between a filament transformer wired this way or that and an autotransformer. None. In both cases, if you are “dropping” voltage, the primary current back feeds the line.

Date: Wed, 15 Jul 2020 21:02:24 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

Barry, I posted an article on this subject on 10/4/2016 and here is the link: http://mailman.qth.net/pipermail/r-390/2016-October/056213.html .

You will find it helpful. Unfortunately, the link in it to the article by Mr. Elliot is nolonger valid, but here is a valid link to it: https://sound-au.com/articles/buck-xfmr.htm . He claims that the autotransformer configuration is more efficient, and I agree with him.

Date: Thu, 16 Jul 2020 19:55:22 +1200
From: Ken <kenharpur@startmail.com>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

Hi Barry and list,   I have a transformer with a 12.6v winding from an old domestic tube receiver. It's wired up as an auto-transformer and works beautifully. I use it to feed an R-390 and it runs completely cold so I do believe it is very efficient.

Date: Thu, 16 Jul 2020 10:01:55 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

I tend to disagree with that. There are two basic ways to wire a bucking transformer.

One way is to wire the secondary in series and out of phase with the primary to then feed the load through the secondary.

The other way is to wire it as an autotransformer (wiring the primary and secondary in series and feed the load at the tapped point).

If you have a 125V primary and a 12V secondary and configure them as an autotransformer, then the primary is essentially wired as 137V but being fed with 125V. Of course, if the primary is 115V and the secondary is 10V, then that would be closer to correct but the secondary may not be exactly suitable for primary usage. All that may not really matter that much in practice but it is worth mentioning.

In my case, with mains voltages running around 125V, then using the 125V tap on the primary and feeding the load from the 115V tap may very well be the better method.

All that said, I'm not a EE and don't I don't pretend to be an expert on transformer construction/theory but knowing that a true autotransformer is designed to do exactly what I'm wanting to do, then I think it may be the better overall choice.

Date: Thu, 16 Jul 2020 11:06:57 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

Well, back a long time ago in EE class we went over all this stuff . If the secondary is “in phase” then the voltages add. You get 120V + 12V out. If the secondary is “out of phase” then the voltages subtract and you get 120V - 12V out. If the secondary is rated for the current you are putting through it, all is fine. Yes, voltage rating also matters, but filament transformers have pretty good voltage isolation numbers. Is there a 0.1% impact in there somewhere? Maybe there is. The gotcha there is that your typical autotransformer may or may not be as conservatively designed as a filament transformer. This or that example of either one might be 2 or 5% less efficient, simply to reduce cost.

Date: Thu, 16 Jul 2020 11:06:57 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

Well, back a long time ago in EE class we went over all this stuff . If the secondary is “in phase” then the voltages add. You get 120V + 12V out. If the secondary is “out of phase” then the voltages subtract and you get 120V - 12V out. If the secondary is rated for the current you are putting through it, all is fine. Yes, voltage rating also matters, but filament transformers have pretty good voltage isolation numbers. Is there a 0.1% impact in there somewhere? Maybe there is. The gotcha there is that your typical autotransformer may or may not be as conservatively designed as a filament transformer. This or that example of either one might be 2 or 5% less efficient, simply to reduce cost.

Date: Thu, 16 Jul 2020 20:02:36 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Bucking Transformer / Autotransformer Question

Actually, it is DC (output of the bridge rectifier but before the regulator). Hmmm, that zener idea looks like a good one. The other, similar, front panel lamp is fed from the regulated side so that one is okay. I think it was inconvenient to power them both from the regulated side (and would add another 40ma to regulate as well).

Date: Wed, 17 Mar 2021 19:37:41 -0700
From: "Manfred Antar (KN6KBS)" <manfredantar@gmail.com>
Subject: Re: FL-101

My FL-101’s in two R390’s were leaky, showing fault on ISOBAR Ultra Surge Protector. Although the radio worked fine. I removed the FL-101 and replaced with a Corcom 3EF1 Power Line EMI Filter 250V 3A 50-60Hz I think I drilled a couple of small holes to mount the Corcom.
It fits right in the hole where the FL-101 was. Uses a regular computer

type AC cord. I know it's not stock, but it is safer and the original filter can be put back in place.   Works great !!!

Date: Wed, 17 Mar 2021 22:51:05 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] FL-101 for R390/URR

I replaced mine with a IEC 320 socket with integral filter.
The IEC 320 just fit the hole in the rear panel.
I still have the original filter module.
E-mail me privately if interested.

Date: Sat, 3 Jul 2021 22:59:51 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Need Dial Lock mechanism & knob

Sorry, but I do not have any dial lock mechanism left. For your question 2, the 3TF7 (2HTF11B) ballast tubes are becoming quite rare these days... What I use as a trick is to jump pin 2 to pin 4 and pin 7 to pin 5 of the RT510 socket. Then you can plug in either a 12BY7 or a 12BH7 tube to replace the 3TF7. The tube does not need to test good, as far as the filament still have continuity. Works fine in two of my R-390As.
Cannot see a difference with the third one that still uses a real 3TF7.
For the question 3, as far as the plug holds OK, you don't need it.
I also hope that your Hickock 600A still works correctly !

Date: Sat, 9 Oct 2021 22:45:53 -0300
From: "Studiumtelecom S.Rocha" <battcharger@gmail.com>
Subject: [R-390] R-390A measurement before switch on

Some good News! Last Monday I had bought an Amelco R390-A for a very good price as it was not working, with many years stored. The Amelco R390 A was cleaned inside and seems complete, I had changed the old worn power cord. But the 2 wire of the mains supply are measuring only 4 ohms, and the transformer is connected to 127 vca mains supply, so I would like to know if is it correct before I connect it to mains 127vca: is that value correct or the power line filter is defective?
I am printing the TM 11-856A. Pdf manual, is that correct and best suited for the R-390A?

Date: Sat, 9 Oct 2021 22:39:29 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390A measurement before switch on

Mains supply measured resistance: Mine measures 4.7 ohms, so yours is in the same range. Manual: try to download The R390A-Y2K Manual at:

https://www.r-390a.net/Y2K-R3/index.htm
Good reading !!

Date: Wed, 12 Oct 2022 15:14:24 +0000 (UTC)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] Selenium rectifier

I agree with Barry re that OEM selenium rectifier. I replaced my expensive 26Z5's with 12BW4's, and replacing the old discolored tube sockets with new ceramic ones and some minor rewiring. Has worked out swell for over a decade now.

Our house power varies more than I like, so I have a home-brew AC volt-ammeter mated to a Variac for a monitored soft-start. At least I know what's happening when I power up.

Date: Mon, 17 Oct 2022 14:13:51 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: [R-390] Broken Line Input Wire in R390?

As I've mentioned, I was observing "chattering" of the antenna relay when in STANDBY mode and, thinking the problem was likely the selenium rectifier on it's way out, I replaced it with a silicon bridge. Something I hadn't mentioned, though, was when the relay was chattering, the dial lamps were flickering seeming in time to the chattering. I chalked that up to both possibly being the old rectifier but in retrospect, I'm wondering if the root of the problem was really something else.

When I started testing the new silicon bridge, I noticed the STANDBY lamp flickering was still present; however, it only lasted a very short time at which point I lost all power. I've traced what I think is a broken wire that runs from the internal connection on the "A" side of FL101 to P118-1 (no continuity between those two points). Furthermore, the A side of the line input filter is also showing a very high resistance from the A input to the A output and I'm thinking that the chattering/flickering was actually a rapidly intermittent short in the wire from FL101 to P119-1 which has now opened completely and, probably, took out the inductor of the A side of FL101 with it.

If this is the case, then I'm a bit surprised that a wire as large as that would have developed a fracture (stress or otherwise) or some other type of short and am wondering if I'm missing something. As far as I can tell, that wire goes directly from FL101 to P118 through a large cable but until I can pull FL101, the PTO, and the mounting bracket, I'm not sure I can get a clear picture of that cable.

Anyone have this sort of issue before and can elaborate on it? If it is a broken wire in that cable, that's going to be a "fun" job patching it (but only for very small values of "fun").

Date: Mon, 17 Oct 2022 15:44:47 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Broken Line Input Wire in R390?

You wrote: "the A side of the line input filter is also showing a very high resistance from the A input to the A output"

I believe that your problem is just there: the inductor in the A side of FL-101 opened, or the internal solder(s) failed, whatever... I replaced the whole input filter (FL-101) in my set long ago, because it was making a GFI tripping and the leakage to GND of internal caps failed all the tests. I fitted an IEC 320 male receptacle in it's place that include a line filter with modern components. I also done the same with my three R-390As, and for the same reason. I can send you pictures if you are interested.

The alternate way will be to open your FL-101 and repair it.... Just hope it is filled with wax, and not epoxy. Most probably, the internal inductor on the A side gave up because the output capacitor within the filter shorted. I also bet that the live side of the 120V line was connected to the A side...

Date: Mon, 17 Oct 2022 16:44:39 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Broken Line Input Wire in R390?

Actually, I think the A side of FL101 is almost fully open (reads in the M-ohms between Line In and Line Out - probably reading through wax or potting compound) but the wire that runs from output side of the A connection to P118-1 checks completely open (in other words, I'm checking past FL101 to P118-1 and still getting an open reading).

I've replaced the line input on some R390A's before with IEC receptacles for the same reason; however, for this R390, I'd like to see if I can open and replace the caps and coils. I've seen it done and it doesn't look to be too hard to do and it maintains the originality with the line cord, etc.

Date: Tue, 18 Oct 2022 00:59:35 +0000 (UTC)
From: Jim Whartenby <old_radio@aol.com>
Subject: Re: [R-390] Broken Line Input Wire in R390?

R-391 repair, https://www.youtube.com/watch?v=pr8pXFtA_IU? at about the 12 minute point. Perhaps an better method then using a torch to open FL101 is to use a hot plate to bring the soldered seam to the melting point

and then use a soldering iron to heat the joint above the reflow point and to help remove the cover. Hopefully, the paint will not blister or burn.

Date: Mon, 17 Oct 2022 22:20:27 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Broken Line Input Wire in R390?

Thank you so much for posting the link to that video! It made me realize that the A connection on the inside of FL101 wasn't where I thought it was. I had not noticed that the letters for the connections are stamped on the housing and the A terminal was almost out of sight from the vantage point of looking at it from the bottom side of the radio.

The good news is the wire from FL101-A to P118-1 is not broken after all and the only thing wrong is that FL101's connection from "A" on the socket to the "A" connection point inside the radio is open and that eliminates having to find/fix a broken wire inside a cable which I think would have been the messier task.

It's also interesting to me that it appears that "My Messy Lab" guy didn't need to remove the PTO and the bracket that it mounts on in order to completely remove FL101. I need to try that again and see if perhaps I can do the same as that would also make this job a bit easier.

Date: Fri, 21 Oct 2022 14:32:07 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390 Antenna Relay Chatter

After replacing the selenium rectifier with a full-wave silicon bridge, the antenna relay is no longer chattering. Truthfully, I'm not certain the chattering was the old rectifier and was, more likely, a failing FL101; however, now that I can power up around FL101, the antenna relay still gives off a distinct buzzing sound. Since it's being fed a rippled 120Hz DC, is that expected?

Date: Fri, 21 Oct 2022 19:18:23 +0000 (UTC)
From: Jim Whartenby <old_radio@aol.com>
Subject: Re: [R-390] R-390 Antenna Relay Chatter

BarryI would think so, the buzzing is most likely the antenna coil winding vibrating at 120 cycles.? You must have good hearing! Out of curiosity, what is the AC voltage into the bridge rectifier and the DC voltage output from the new rectifier? I am assuming that you are using a DVM. I wonder how your reading will compare with the meters listed in the preliminary manual. The TS-297 is a AC-DC voltmeter with 1k ohms / volt. The TS-352 a VOM is 1k ohms / volt AC and is either 1k ohms / volt or 20k ohms

/ volt DC, switch selectable. The TS-505 a VTVM is 20 megohms / volt on most of the DC voltage ranges. I'm sure that since the impedance of this power supply is pretty low the DVM and the three meters above should agree closely but higher impedance circuits should show vastly different readings due to circuit loading.

Date: Fri, 21 Oct 2022 15:24:41 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390 Antenna Relay Chatter

I had noted that the relay is specified at 6VDC which I found just a bit odd given the voltage it's being supplied; however, I also presumed that the coil might be satisfied with a full-wave rectified signal like it's getting even though P-P is much higher. I'll take a look at the voltage and see about adding a resistor.

Other folks referred to that rectifier as selenium but I had missed that designation in the manual. Thanks for that.

Date: Fri, 21 Oct 2022 15:27:55 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 Antenna Relay Chatter

The input voltage is 12.6V.
The original bridge rectifier output voltage spec. is 6.5V
The Break-In relay coil is spec at 6V.
Maybe the ~10.5Vdc mean (120Hz pulsed) the coil receive now is a little bit too much. I recommended to Barry to add a resistor in series with the coil to drop the DC mean to 6.5V.
Maybe it will be less noisy this way...

Date: Fri, 21 Oct 2022 15:27:52 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390 Antenna Relay Chatter

Actually the buzzing is not all that quiet. I have at least one 20k/V analog meter that I'd planned to use to check that and should be able to determine a suitable resistor from there.

Date: Fri, 21 Oct 2022 16:24:12 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 Antenna Relay Chatter

I'm sorry but.... the Antenna Relay and the Break-in relay are BOTH powered by the bridge connected to the 12.6V winding. The way it's done, both will require a series resistor to lower their coil voltage.

Date: Sat, 22 Oct 2022 12:38:32 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: [R-390] FL101 Rebuild (R390)

After finding the connection between the input and output for the "A" connection was open in FL101 of my R390, I removed the filter, opened the lid (lots of fun there...), and found the problem.

Along with the ubiquitous wooden blocks and wax, I found that the connections for virtually all the capacitors were bad or going bad. The caps in my filter have three connections where the end points are the through connection and there's a center connection that serves as the third connection allowing the capacitor's ground connection. Each capacitor was housed in its own cute little thick paper box - a rather unique configuration that I'd not seen anywhere else.

I'm not sure what caused it, but the endpoint connections were such that I could simply pull the wires away from the capacitor and the capacitor for the "A" connection was the worse of any of them. I don't know if those are electrolytic and the electrolyte leaked (doubtful as they aren't really sealed) but something caused quite a bit of dark corrosion which had virtually destroyed the solder connections.

In any case, the inductors are still in great shape and I can rebuild it so a relatively happy ending for this once I get the necessary parts. Anyone know the proper value to use for those caps? The filter is stamped with FILTER TYPE 97JX56 and I wonder if those numbers indicate the inductance and capacitance value (e.g. possibly 56pF but that's just a guess).

Date: Sat, 22 Oct 2022 13:21:46 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] FL101 Rebuild (R390)

It occurred to me to simply test them! They're running from about 70nF to 80nF and the inductors check between 1.0mH and 1.1mH

I suspect the capacitors may have been 0.1uF. Does that sound reasonable?

Date: Sat, 22 Oct 2022 13:44:05 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] FL101 Rebuild (R390)

0.1µF (100nF) makes sense.

Be sure to use X2 rated (at 275VAC or more) units for replacements.

Date: Sat, 22 Oct 2022 17:49:36 +0000 (UTC)
From: Jim Whartenby <old_radio@aol.com>
Subject: Re: [R-390] FL101 Rebuild (R390)

I looked on Mouser's site for AC Line filer, 125-250 VAC 10 amps. here is a link to the datasheet:
https://www.mouser.com/datasheet/2/358/typ_FMW_41-1275852.pdf
IIRC, there are four inductors in FL-101 so just duplicate the values given.

Date: Sat, 22 Oct 2022 13:51:53 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] FL101 Rebuild (R390)

Sorry, I meant Y2 capacitors (line to GND use, designed to fail open).
The X2s are designed to fail short....

Date: Sat, 22 Oct 2022 15:14:48 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] FL101 Rebuild (R390)

Apparently there some versions have four inductors and some have only two. I suppose it depended on for which radio they were specified.
Interesting that those Schurter filters use 2.2nF capacitors which are significantly smaller than what I'm measuring from the original filter.

Date: Sat, 22 Oct 2022 15:15:57 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] FL101 Rebuild (R390)

Thanks for the reminder that those should be safety caps!

Date: Sat, 22 Oct 2022 13:20:19 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] FL101 Rebuild (R390)

I seem to recall reading something that suggested the valueof those caps was .068µF or thereabouts, and yes, that "filler" gets acidic and corrosive and wreaks hell on exposed connections and increasingly leaks AC to ground...

Date: Sat, 22 Oct 2022 21:51:48 +0000 (UTC)
From: Jim Whartenby <old_radio@aol.com>
Subject: Re: [R-390] FL101 Rebuild (R390)

A lot has changed in the 70 years since the R-390 was released for production. I haven't found the transfer curves for the line filter in the R-390 but we do know what frequencies the Schurter filter will attenuate. Personally, I would mimic the 6 amp version which uses inductors close to what you report. As for the smaller caps, lower leakage current perhaps won't trip a GFCI. Check the attenuation curves for the 6 amp standard version, this is how the filter will attenuate line noise in the radio.

Date: Sat, 22 Oct 2022 19:02:07 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] FL101 Rebuild (R390)

That seems like a good plan to me as well. Thanks,

Date: Sun, 23 Oct 2022 17:49:31 +0000 (UTC)
From: B Riches <bill.riches@verizon.net>
Subject: Re: [R-390] FL101 Rebuild (R390)

Here is some info on a Corcom 3E01 line filter that I use in restoring R-390-A Receivers, loss measurements: 5 Khz 7db 10 Khz 13 db
Used HP aud gen - read loss with HP AC VTVM
Used Tek Tracking gen + Spec An for traces.
Way too much time on my hands!

Date: Mon, 25 Sep 2023 09:00:15 -0400
From: comcast <kg2bz@comcast.net>
Subject: [R-390] need R390a power switch

folks. my r390a power switch will not turn off the radio. it appears when I turn it off the radio is still in standby

anyone have a switch to sell. this is the multiposition switch off standby mgc agc cal
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Date: Mon, 25 Sep 2023 07:01:32 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] need R390a power switch

Hi Jeff, The power on switch is a simple microswitch mounted on the frame of the rotary function switch. There is an arm that presses on the microswitch button to turn it on. Sometimes the mechanism just needs adjustment, but the microswitches do get stuck in on. There's a picture of the back of the front panel in the TM-11-856A on page 114 and in TM-11-5820-358-35 on page 79 that shows it a little.
