

## HEAT BUILD UP IN THE R390A

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<http://www.qsl.net/kh6grt/page4/shields/shields.htm>

More than you ever wanted to know about heat-dissipating tube shield mil specs...but just the item for those \*HOT\* 6BF5s in Collins equipment.

### MIL SPEC HEAT-DISSIPATING TUBE SHIELDS

by Pete Wokoun Sr., KH6GRT (6/2004)

We all have heard the benefits of using International Electronic Research Corp (IERC) type heat-dissipating shields in the R390A and other equipments to reduce tube operating temperatures. However, I haven't seen any information on just how much they actually reduce the temperatures.

Collins did some temperature studies but I haven't been able to find a copy of their study, possibly called service bulletin 303. I don't know if that study included heat dissipating shields. Searching thru the mil specs that these shields were made to I finally found some definitive temperature reduction figures.

The specs are all in degrees C; they have been converted to degrees F in this presentation. The mil spec heat-dissipating shields designated for retrofitting to existing equipment come from three mil specs: MIL-S-9372(USAF), MIL-S-19786(NAVY), and MIL-S-24251.

These shields are designed to replace the shiny, nickel plated JAN types. Mil-S-9372 was an Air Force spec and MS24233, its mil standard for retrofit shields, was implemented January, 1958. MIL-S-19786 was a Navy spec and its amendment for retrofit shields was implemented May, 1964. Both these specs were cancelled in 1968 and replaced by mil spec MIL-S-24251 which covered all branches of the service and was implemented March, 1967.

Shields made to any of these specs will have the mil spec part number on them. Here are those mil spec part numbers cross referenced to the well-known IERC numbers:

SIZE	IERC #	MIL-S-9372	MIL-S-19786	MIL-S-24251
Short 7 pin	5015B	MS24233-1	S0761*V00	M24251/6-1
Med 7 pin	5020B	MS24233-2	S0762*V00	M24251/6-2
Tall 7 pin	5025B	MS24233-3	S0765*V00	M24251/6-3
Short 9 pin	6015B	MS24233-4	S0966*V00	M24251/6-4
Med 9 pin	6020B	MS24233-5	S0967*V00	M24251/6-5
Tall 9 pin	6025B	MS24233-6	S0968*V00	M24251/6-6
Ex-Tall 9 pin	6027B	MS24233-7	---	M24251/6-7

\*(X or

C)

All the above sizes except the short and ex-tall 9 pin ones are used in the R390A. You can get information on how many of which ones on many web sites. The IERC numbers are normally used when searching for these shields. If someone other than IERC made them, they may only have the mil spec number and some other model number. I have some made by Waterbury Pressed Metal Company (WPM in the table below) that are this way. One I have made by Cinch Connector Company does carry the IERC number. I found documentation that the Atlee Corp also may have produced some of these shields. Their different model numbers are noted in the table below and cross referenced to the IERC numbers:

SIZE	IERC #	WPM #	ATLEE #
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Short 7 pin	5015B	RS-215-1	A10041-1
Med 7 pin	5020B	RS-215-2	A10041-2
Tall 7 pin	5025B	RS-215-3	A10041-3
Short 9 pin	6015B	RS-216-1	A10042-1
Med 9 pin	6020B	RS-216-2	A10042-2
Tall 9 pin	6025B	RS-216-3	A10042-3
Ex-Tall 9 pin	6027B	-- ---	

BTW, I noticed the last two digits in the IERC number correspond to their height in decimal inches. For example, the 5015 is 1.5 inches high, 5025 is 2.5 inches high, etc. Anyone know if the 50 and 60 designate anything?

Physically, from ones I have seen, the shield inserts (the part that contacts the tube) are of two types: a multi-sided cylinder (5-sided for 7 pin tubes and 6-sided for 9 pin tubes) or a round insert with a multitude of 1/16 inch fingers. I found both types on shields from both the -9372 and -24251 mil specs. The multi-sided inserts have an open top between the insert and outer shell whereas the mini-fingered insert has a top closed. I personally have not seen or heard about any shields that have the MIL-S-19786 markings.

Shields made to MIL-S-9372(USAF) (MS24233) were qualified to reduce the surface temperature of a test 'slug' by 36 degrees F, minimum (a 10-11% reduction). The test 'slug' was an aluminum piece shaped like a tube with an internal heater and 3 imbedded thermocouples. This 'slug' was heated up to 338 to 356 degrees F when the shield was applied. The average reading for all thermocouples had to be at least 36 degrees F less than the starting temperature. How well this test 'slug' with its greater thermal mass related to actual tubes I don't know.

Shields made to MIL-S-19786(NAVY) were qualified using an instrumented glass tube called a Thermion. Apparently these were tube-sized things containing a heater and thermocouples. It was heated to its test temperature when the shield was applied. The shields designated for retrofit service were only required to reduce the temperature of the thermion between 10 and 25%

(symbol 'X' in the tables). However, the shields worked so well they were qualified to the next higher reduction of 25-38% (symbol 'C' in the tables). Specific temperatures for this spec are as follows:

MIL-S-19786 #	Bare Bulb Test Temp	Shield Temp (X) 10-25%	Reduction (Minimum) (C) 25-38%
S0761 (short 7)	293°F	27- 65°F	65-99°F
S0762 (med 7)	437°F	41-101°F	101-154°F
S0765 (tall 7)	455°F	43-106°F	106-161°F
S0966 (short 9)	266°F	23- 59°F	59- 89°F
S0967 (med 9)	446°F	41-104°F	104-157°F
S0968 (tall 9)	347°F	32- 79°F	79-120°F

Note: The V00 in the -19786 mil part number refers to a vertically mounted shield with no separate base provided.

Shields made to Mil-S-24251 were qualified using actual electron tubes. The temperatures were measured from a thermocouple imbedded into the test tube's glass at its hottest spot. The hot spot location was determined by temperature sensitive paints. Like in the previous specs, the test tube was heated to its test temperature when the shield was applied. The shield had to reduce the bulb temperature by at least the amount indicated in the following table:

MIL-S-24251 #	Bare Tube Test Temperature	Shield Temperature Reduction (minimum)
M24251/6-1 (short 7)	239°F	45°F (19%)
M24251/6-2 (med 7)	419°F	72°F (17%)
M24251/6-3 (tall 7)	464°F	81°F (17%)
M24251/6-4 (short 9)	266°F	45°F (17%)
M24251/6-5 (med 9)	437°F	99°F (23%)
M24251/6-6 (tall 9)	446°F	81°F (18%)
M24251/6-7 (ex-tall 9)	455°F	81°F (18%)

Typical tube operating temperatures I expect are somewhat less than these test temperatures which maximized tube dissipation. This would lead to somewhat less than the above temperature reductions in actual situations. However, I think these tests were closer to actual conditions than the 'slugs' and Thermions used in previous testing.

The mil spec Mil-S-24251 remains in effect today. However, there are no products on its qualified products list. What that means is no one currently makes any of these shields because the military doesn't have a need for any. Personally, I think shields made to any of these mil spec are going to perform similiarly because they're not all that different from each other. There are other types of mil spec heat-dissipating shields even of improved design but they are

not designated for general backfitting into existing equipments. These shields and their sockets were designed from the start as an integral part of their equipment. As such, significant quantities to use in other equipments are probably not available. So, what does all this mean? Here are my thoughts: These temperature reductions listed that the shields had to meet are all minimums so actual reductions cannot be determined. Physically these shields seem to remain pretty much unchanged throughout the years; it was the mil specs that were changing. And mil specs are sometimes written just to document what is normally used and available! From the mil spec 19786 qualified products list the manufacturers had test data that supported their products qualification of 25-38% reductions in bulb temperatures. This range also allowed them to meet the newer mil spec 24251 minimum reductions. So I would venture to say a typical bulb temperature reduction of 20-25% is realizable with the heat-dissipating shields. Having a temperature reduction figure only leads to a further question: By decreasing the operating temperature of a tube by some amount, how much improvement in tube life does this lead to? This becomes harder to answer than determining how much cooler the tube operates. But one can generalize by saying any increase in tube life by lowering bulb temperature is beneficial. The most informative article I was able to find on-line which related tube bulb temperatures to tube life was [pearl\\_tube\\_coolers.pdf](#) on the [www.pearl-hifi.com](#) website. Although much of the website borders on the more esoteric nuances of high-end audio, this paper presents some of the earlier works done by GE and IERC on tube temperatures and life spans that are difficult to find these days. An example from an IERC study in that article: a 6AQ5(6005) tube operating near maximum plate dissipation has a bare bulb temperature almost 460 degrees F. Enclosed in a bright JAN shield its bulb temperature rises to 600 degrees F. With an IERC type B cooler installed the bulb temperature drops to 365 degrees F. This is a 20% drop from its bare bulb temperature and an 39% drop from its JAN shield temperature. This related to a tube survival rate after 500 operating hours of 35% using no shield, to less than 5% using the JAN shield, to over 95% still working using the IERC type B cooler. In another example from a GE study: From a batch of 200 6AQ5(6005) tubes running at 502 degrees F, 15% were still operational after 2500 hours. A second batch running at 428 degrees F, 74 degrees cooler or about a 15% reduction in bulb temperature, still had 90% operational after 5000 hours. It seems "small decreases in bulb temperatures often result in seemingly disproportionately large increases in tube life". The article is also interesting in that it touches on other factors like filament voltage, forced air cooling, and temperature gradients that also have an influence on tube life.

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### **IERC Heat Dissipating Tube shields**

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About IERC Tube Shields -  
by Chuck Rippel

The R390A uses 5 different sizes of heat dissipating, black, IERC or WPM labeled tube shields. Installing the correct type and part number shield can dramatically decrease the operating temperature of the vacuum tubes and in turn, increase their service life. Collins addressed this back in the early 50's in service bulletin

#303 which graphically compares the performance of various types of tube shields and not using shields at all.

The proper tube shields can easily be identified. They are anodized black (or deep purple), have an open top with a series of tabs folded over a thin, octagonal metal tube inserted longways inside the shield. They are also plainly labeled **IERC**. There is a unique model number stamped on the outside of the shield denoting which size it is designed to fit. Refer to this number when obtaining the shields.

Below is an inventory with individual quantities of the 5 different part number IERC tube shields used in the R390A:

- (1) 6025-B Tall 9 Pin, used for the ballast tube
- (9) 6020-B Medium 9 pin, used on 5814A's and 26Z5W's
- (2) 5015-B Short 7 pin, used on the 5654's
- (13) 5020-B Medium 7 pin, used on 6BA6's, 6C4, 6AK5 etc.....
- (1) 5025-B Tall 7 pin, used on the OA2

Black tube shields labeled "WPM" may also be found. While I personally don't feel these are quite as effective as the IERC design, they are far and away better than the shiny types described below.

Radios which still have shiny, nickel-plated tube shields should have them replaced with the above IERC shields as soon as possible. Even if they have been painted black on the outside, these shields have no provision to grip the tube bottle and sink the heat away from it. Also, the bright internal surfaces of the shield actually reflect the heat back into the tube and on to its dark internal plate structure which could then cause the tube to over-dissipate and shorten its service life.

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Date: Sun, 12 Oct 1997 10:03:40 +0500  
From: "Chuck Rippel" <crippel@...>  
Subject: [R-390] IERC Tube Shield Resource

I recently made an addition to the "Care & Feeding" document which I return with each completed R390A I restore. This additional information addresses beneficial IERC tube shields which, according to Collins' study, increase vacuum tube life by as much as 55%. While the list quantities is specific to the R390A, the types are collateral with the tubes commonly found in Collins and other vintage vacuum tube equipment.

Also, save for the hot running audio tubes, don't wholesale add a shield to every tube in your radios. Tubes which require shields will have a collar attached to the tube socket which extends about 1/2" up the side of the tube. If there is no collar, think twice about adding a shield as the circuit involved may not have been designed to employ a shielded tube. At the very least, adding a shield could introduce additional capacitance into a circuit which may cause improper

operation.

I have added additional commonly used tubes in parentheses as an additional cross reference.

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From: Doug <doug@alpinet.net>  
Subject: Re: [R-390] Heat build up in the R-390A

After reading about the enclosures available, then not available. I thought it might be nice to have one. Lather on, common sense said to me: The R-390A was designed >for rack mount. Racks generally have some type of forced ventilation. Why do we >want to put the radio in a hot box? Heat and electronics don't mix. It would be interesting to know what a "mil spec" rack for a R-390A consisted of. Did it have a ventilation system? Could it have directed air into the side pannel openings and out >the top and bottom louvers? Maybe picking up a surplus rack, or building one >could be one of the nicest things we could do for this well respected piece of gear. Along with using the IERC tube shields, and running with the covers off. Also running a variac in line will reduce heat and increase tube life. Some of our line voltages are up to 123vac, the set was designed for 115vac. I run mine at 110vac, it doesn't seem to care about the lower voltage.. I hope this is some food for thought, and it wasn't intended to offend anyone.

Will and the crew.....I can say from experience installing a couple hundred 390A's in rack cabinets that they were hot and hard on tubes and gear. It seemed the top receiver had the highest failure rate...and of course was the hottest. Each rcvr had the covers removed and IERC shields installed, which helped a bunch, but never did extend tube life to the point equal to the same tube run in the open air.

We put dual blowers and filter downs in the first 4 rack units of each cabinet, and continued to replace them monthly as they filled up quickly. Each bay had 4 rcvrs and tty converters mounted. The converters put out more heat than it's companion rcvr, and one field change that was sent out to us was to rewire each converter power supply with teflon insulated conductors to reduce insulation failure due to heat.

Cabinet mounting the R390A is a nice, clean way to have one on the operating bench. But, take into account the heat buildup and construct your enclosure accordingly, perhaps incorporating a couple muffin fans on the top or back to aid in air movement, along with removing both covers. In addition, dont hesitate to blow it out occasionally with a bit of canned air or a small compressor.

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 dissipation in all of the tubes, causing more heat

related failures!

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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

I detect different users have different concerns, and it might not always be based on absolute longevity of the radio and its parts. It may be based on military usage where there were both a superb supply of spare parts, but a shop with NOTHING else to do but maintain radios, along with enough spare radios installed that if one failed, there was no loss of communications. Today there's not that supply of parts and for any individual user besides Chuck Rippel, there's not a back up radio on hand.

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.

I suspect that the ballast tube does more for the longevity of those tubes by softening power up transients on those two tubes and it accomplishes by roughly regulating their heater power. I'm beginning to doubt that the ballast does anything detectable for long term stability, except that by softening the power up transient and keeping the heaters closer to their rated power that those two tubes last significantly longer and so replacing them leads less often to a need for recalibrating those two oscillators.

I used the resistor scheme when replacing seleniums with silicones in my old Tek 541 scope back about 1970. With the right resistors, I didn't raise the voltage on any electrolytics, and so didn't blow any which were already old then. I sold that scope at least 22 years ago, and doubt it still is in use. The 475 that I bought to replace it is working fine yet, though I've had to fix it a few times.

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To: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Heat build up in the R-390A

This is to give some insight about how temperature is done during the engineering evaluation of a product. At least, this is how it was done at the Dallas Rockwell Collins facility. The product was put in a temp chamber with forced air circulation.

This made sure that all points were at the same temperature. The temp of the chamber was slowly cycled up and down within the limits (Max +20C & min -20C) while measurements were made. Statistical analysis of the measured data provide insight on the behavior. The product was left soaking at each discrete temperature for long time to make sure that performed properly. The reason for such abuse was to find weak points. I am pretty sure that 390s have no problem performing in our home controlled enviroment (21C).

Regards,Francesco

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From: Bill Riches <richesb@algorithms.com>  
Subject: Re: [R-390] Heat build up in the R-390A

In 1961 when I was in the Air Force in Athens Greece and Tripoli Libya we had racks of R390's. 6 foot racks with 1 rack spacing between receivers. The racks had doors on the back with perforations and the top of the rack had perforations. The equipment rooms in tripoli were not airconditioned > - room temperature would hit 90 - 100 degrees - Racks would get warm but > radios would work ok.

Most of my maintenance on the radios was preventative - as far as radios blowing up - I felt like the Maytag Man!! Just for my own benefit I will put a 390 in several cases - solid & holes with a thermocouple temp probe inside and see what kind of heat build up is there. I go along with Tom that the heat buildup wont be that extreme - but Will brings up a good point. It would be nice to know what is happening in the box.

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Date: Fri, 13 Feb 98 09:00:22 EST  
From: w2ec@vnet.ibm.com  
Subject: Re: [R-390] Premier DCR cabinets

Just out of curiosity, what is the purpose or fascination with putting the R-390's in cabinets? When in the service I never saw an R-390x in a cabinet, they were mostly rack mounted. The few we had that were set up on a makeshift bench had top and bottom covers, but no case. Heat was a real problem (real or perceived) and we wanted these things where air could circulate, not cooped up in a case that would turn into an oven. Was there actually a military issue cabinet for the R-390x series?

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Date: Fri, 13 Feb 98 09:13:49 EST  
From: w2ec@vnet.ibm.com  
Subject: [R-390] 390A in Cabinet/Temperature

Has anyone ever witnessed a 390A burn up? Of course not.

Actually, yes. Not in the sense that it caught fire, but in the sense that heat stresses the electrical components to the point where they go far enough out of tolerance, therefore requiring re-alignment at minimum, or potentially major parts replacement. If parts need to be replaced, does it matter if they were charred from a fire or not? The damage was a result of too much heat over a long period of time, ie "burning up". Specification MIL-R-13947 requires a radio that will operate and meet performance specs within an ambient range of -40F to 149F. Keep in mind that the rig would need to be yet hotter than 149F to reject 220W.

I think the operative word is ambient, where the surrounding air is 149F. The



temperature of the operating components is another variable. What causes our beloved BA's, whether R-390's or something else, to go out of alignment? I can't think of anything more destructive to our radios, in normal operation, than heat. Age alone doesn't do it. What causes caps to break down? Either poor construction originally or heat breaking down the seals and drying them up. What causes resistors to go out of tolerance? Prolonged heat. Yes, age can take it's toll on old resistors, but adding heat can speed it up. What causes adjustable coils to go out of alignment? Possibly constant expansion and contraction, mechanical movement, due to heat. What other variables are there that would have as great an affect on the components lifespan in our radios, than heat? I'm not saying heat is the only thing that causes this, but in my opinion it is one of the major factors. In order to prolong the life of your radio do you really want to seal it up and risk accelerating the "heat aging" process?

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Date: Fri, 13 Feb 1998 09:30:01 -0600  
From: Terry Muncey <Terry@electrosys.com>  
Subject: [R-390] R390A MilSpec Cabinet

I have an Army milspec cabinet for my Collins R-390A/URR receiver. It has ventilation slots on the top, both sides and holes in the bottom of the cabinet. All holes and slots use RFI screening for radiation reduction. It is brand new, obviously made of heavy guage aluminum and has a beautiful grey paint job that matches most front panels of the R-390A receivers. It has matching grey shockmounted feet as well. If the Government did not think that good ventilation was a good thing to have, they would not have gone to the trouble to put all the holes in their "official" cabinets.

These cabinets are not cheap, but are the real McCoy, not wanna be's. I am sure that the government paid one heck of a lot for these cabinets to get a sturdy cabinet that was light weight with welded machines aluminum.

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Date: Fri, 13 Feb 1998 08:28:17 -0800 (PST)  
From: "Walter R. Quitt" <wa6fec@znet.com>  
Subject: Re: [R-390] Premier DCR cabinets

I'll be asking about those issues today when the rep comes by. I am sure there is information about air flow considerations. In the unit we build there is a fan in the back. Might be an option. Everybody loves fans, NOT...:-)

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Date: Fri, 13 Feb 1998 11:39:26 -0500  
From: "Will Schendel" <n8azw@concentric.net>  
Subject: [R-390] Heat build up in the R-390A

Hi All, My main concern was for the electrolytics. Age and heat are their greatest enemy. At 46 bucks a pair from Surplus Sales of Nebraska, cooler is better. Long life... isn't that what we are after? Anyone know of another source for these

octal caps? Keep up the good work Bill, would like to hear the results of your temperature investigation. Wonder what the mil spec is for a 30+ year old radio?

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Date: Fri, 13 Feb 1998 10:54:21 -0800  
From: Travis Martin <travism@door.net>  
Subject: Re: [R-390] Heat build up in the R-390A

The R-390A is one more rugged piece of gear. I worked on them all day every day for a couple of years while in the service, and operated them for about a year and a half. We musta had a couple of hundred of them at each of the sites; each operator position had two, plus we had a bunch of spares on the shelves. They were used in equipment racks but there wasn't much else in these racks...I don't recall there being any fans. 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.

I never saw it first hand since the ones I used and worked on were rack mounted, but I believe that there was a genuine military table cabinet made for the 390... perhaps someone else is familiar with it and could give details on ventilation or fans. My guess is that unless you leave it on 24 hours a day 7 days a week in a hot room you'd have trouble hurting it, even in an enclosure. But I certainly understand the desire to be safe before sorry, as it is a marvelous receiver and deserves a very long and comfortable life.

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From: Doug <doug@alpinet.net>  
Subject: Re: [R-390] Heat build up in the R-390A

Will and the crew.....I can say from experience installing a couple hundred 390A's in rack cabinets that they were hot and hard on tubes and gear. It seemed the top receiver had the highest failure rate...and of course was the hottest. Each rcvr had the covers removed and IERC shields installed, which helped a bunch, but never did extend tube life to the point equal to the same tube run in the open air.

We put dual blowers and filter downs in the first 4 rack units of each cabinet, and continued to replace them monthly as they filled up quickly. Each bay had 4 rcvrs and RTTY converters mounted. The converters put out more heat than it's companion rcvr, and one field change that was sent out to us was to rewire each converter power supply with teflon insulated conductors to reduce insulation failure due to heat. Cabinet mounting the R390A is a nice, clean way to have one on the operating bench. But, take into account the heat buildup and construct your enclosure accordingly, perhaps incorporating a couple muffin fans on the top or back to aid in air movement, along with removing both covers. In addition, don't hesitate to blow it out occasionally with a bit of canned air or a small compressor. 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 receiver about 20 volts (the drop across each rectifier tube no longer in the circuit), increasing heat dissipation in all of the tubes, causing more heat related failures!

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Date: Fri, 13 Feb 1998 09:09:40 -0800  
From: John R Bookout K7JB <k7jb@ptld.uswest.net>  
Subject: Re: [R-390] Heat build up in the R-390A

Wonderful idea. I for one would appreciate the effort you are going thru in order to further understand how the temperatures vary. I used another interesting idea many years ago (1960) to see where the hot spots were in my 545A vertical amplifier.

I used infrared photographic film. After being developed, I could immediately see the hot spots then concentrate my efforts in those particular areas for trouble shooting.

John

I go along with Tom that the heat buildup wont be\* that extreme - but Will brings up a good point. It would be nice to know what is happening in the box

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Date: Fri, 13 Feb 1998 10:24:02 -0700 (MST)  
From: Richard Loken <richardlo@devax.admin.athabasca.ca>  
Subject: Re: [R-390] hot Premier DCR cabinets

I wouldn't know a DCR cabinet if it bit me on the ass but Colin is right on the money here. The Army R390 manual says to make darn sure the cabinet is adequately ventilated and I reckon the A manuals do too.

Hammond makes a couple nice 10-1/2" table top cabinets for less than the DCR but none of them are adequately ventilated. A DX100 cabinet would work nice but you have to rework the opening a bit. With the demise of tubes there is less demand for very ventilated cabinets to our woe.

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Date: Fri, 13 Feb 1998 14:28:50 -0800  
From: "clarence thompson" <clarence@kilgore.net>  
Subject: [R-390] Heat and plenty of it.

Hi everyone, i might as well jump in there with my two cents worth, here goes when i was in the SUN we had a r-390 one deck above the engine room and one compartment away from the laundry room, mind you it was plenty hot every day, there were no fans the r390 was in the compartment by its self locked up, with a lot of spare radio parts it was a backup or emergency receiver but it was operating most of the time at sea. FWIW

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Date: Fri, 13 Feb 1998 15:55:00 -0500 (EST)  
From: Steve Stutman <sstut@world.std.com>  
Subject: Re: [R-390] R-392 Cooling?

Probably with lots of therapy and a group of techs who "really care". hihi. At the beginning of the thread, I simply commented that Premier said DCR cabinets were discontinued, jeppers. My five cents is that thermal variations, cycling, are probably more deleterious than light elevations from room temp.

To biomass 40 F degrees is quite significant. To electronics, especially BAs, probably not such a big deal. That's one of the charms of BAs. I do however agree that long term high temperatures, the definition of which varies with gear, do not help longevity. Hence we are told to turn "OVENS" to "OFF". First guy to say Peltier is in trouble.

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Date: Fri, 13 Feb 1998 16:17:55 -0500  
From: Bill Riches <richesb@algorithms.com>  
Subject: Re: [R-390] Heat build up in the R-390A

Today I ran the ""heat build up test"". R390 EAC in a 12 1/2 high, by 23 1/4 wide by 15 inch deep cabinet - louvers on the side and back - solid top. Results - room temp 75 degrees - after 3 hours of use the inside temp between the bfo and bandwidth shafts (inside the case measured with a thermocouple temp gage) was 105 degrees. After 3 more hours the temp was up to 106. My navships manual says operation is ok up to 75 deg c which would be 167 degrees F. Ouch. IMHO I don't think much damage would be done with radio in the box under normal 3 - 5 hours a day operation. If the radio is on 24 hours a day more than heat is going to stress its intestines. I have never seen a 390 or an sp600 for that matter in a case. My reasoning for the case is if the radio looks pretty in a case perhaps it may be allowed into the living room!!!.

More info on these DCR-100 cases. Talked with Tony Bozza today at Premier. The DCR-100 box is grey hammertone, non-perforated lid, louvers on the sides and back with a cable cutout on the back.

NOTE THE DIMENSIONS::: HEIGHT 12 1/2 WIDTH 23 1/4 DEPTH 15 3/4

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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.

<snip>....Regards heating, the shipboard radio rooms were all forced air cooled with some areas getting quite chilled. Most racks had one or more pieces of equipment with fans, so without covers and just doing their thing, the R390s enjoyed a good environment. As Ray points out, and I suspect John Kolb would too, the 390 was a rack mounted application and covers were never used unless an air conditioning duct nearby threatened with condensation ;>).

Once outside of Hong-Kong we stood what was called Station Ship, moored in the harbor and assumed radio guard for all ships under R&R. In this one case

we used Red-Devil blowers to keep air moving and temperatures reached perhaps 100+ at times in and around the equipment. Of all the equipment about, the R390's and teletypes seems least affected.

The ET's who never operated the radios unfortunately were tasked with maintaining and aligning them and perhaps that was good. If we complained that a set just was not performing, they worked very hard to bring the set into the "numbers" range. I do remember that alignment was the only time the covers were used and I, for a long time, wondered whether the top and bottom covers were not just part of a maintenance kit as opposed to being a part of the radio. They would set the repaired 390 up on their bench, block any A/C vent, and with covers running, let the set warm up overnight. Then the next day when their test room was warm enough, they would pull the covers and run through the alignment. After they had finished, they would check the radio and reinstall where needed but without covers. The moral was, as an ET friend once told me, use mild heat to stabilize the radio for alignment but keep the radio breathing while in service. In short, there were radios which we worried about during A/C failures, etc. but the 390 was not one of them.

For my part, I think the desk cabinet idea is a good one if the cabinet could be fitted with a large lift top and as well as the ventilation holes on the side and bottom. Lift the lid during extended operation but close when the radio is off to keep dust, pigeon poop, and paper airplanes out of the inside. Whatever the design, good luck to all with your cabinet adventure! 73, Doug W5JV

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Date: Fri, 13 Feb 1998 19:51:29 -0600  
From: "Scott Meador" <esm@gte.net>  
Subject: Re: [R-390] Heat build up in the R-390A

Degradation of any electrical components (transformers, capacitors, resistors, etc.) is a function of materials used in construction of that component. Insulation classes are as follows:

Class A	105 Deg. C	221 F	Class B	130 Deg. C	266 F
Class F	155 Deg. C	311 F	Class H	180 Deg. C	356 F

In the electric motor rewind business, the rule is for every 10 Deg. C you exceed the insulation value of the insulating material, the insulating life of that material is decreased by half, thus decreasing life. I suspect the same rule applies to electronic components. Most insulating components (especially those in our R-390A's) breakdown with age and heat. Cracked material and degraded insulation decreases dielectric, thus promoting heat/failure. IMHO, various branches of the gov't were not concerned with heat because these machines were new, could be replaced very easily, serviced at the depot, serviced on site, replace bad parts from the spare part box, etc. To us collectors, we should be concerned with heat due to the age of = insulated components in our 30-40 year old relics. I am new to the group and don't have a 390 yet..it's on the way. However, when I get mine, I am going to perform an infrared test on all

connections and components to identify abnormally hot components. The test will be performed with an Ambertherm camera. I will post the results on my web site if anyone is interested. Some ideas..IMHO..If the radio is in a cabinet, it should have forced ventilation. Pancake fans are cheap. Some protection (Computer UPS / Variac) should be afforded to the radio due to fluctuating house currents, surges, and sags. I may run the radio on a regulated inverter limited to 110 Volt output.

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Date: Fri, 13 Feb 1998 19:14:46 -0800 (PST)  
From: John Kolb <jlkolb@cts.com>  
Subject: Re: [R-390] Premier DCR cabinets

Aboard ships in the Navy, only saw R-390A's in cabinets, not racks :) These contained a single R-390, and two CV-591's above it. The cabinet had a completely open back - don't remember if it had holes in bottom or louvers on sides or not. Then there was the 6' tall cabinet that held two R-390A's and two CV-157's.

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Date: Sat, 14 Feb 1998 13:30:58 -0700  
From: Doug <doug@alpinet.net>  
Subject: Re: [R-390] Heat build up in the R-390A

Will and the crew.....I can say from experience installing a couple hundred 390A's in rack cabinets that they were hot and hard on tubes and gear. It seemed the top receiver had the highest failure rate...and of course was the hottest. Each rcvr had the covers removed and IERC shields installed, which helped a bunch, but never did extend tube life to the point equal to the same tube run in the open air. We put dual blowers and filter downs in the first 4 rack units of each cabinet, and continued to replace them monthly as they filled up quickly. Each bay had 4 rcvrs and tty converters mounted. The converters put out more heat than it's companion rcvr, and one field change that was sent out to us was to rewire each converter power supply with teflon insulated conductors to reduce insulation failure due to heat. Cabinet mounting the R390A is a nice, clean way to have one on the operating bench. But, take into account the heat buildup and construct your enclosure accordingly, perhaps incorporating a couple muffin fans on the top or back to aid in air movement, along with removing both covers. In addition, don't hesitate to blow it out occasionally with a bit of canned air or a small compressor. 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 receiver about 20 volts (the drop across each rectifier tube no longer in the circuit), increasing heat dissipation in all of the tubes, causing more heat related failures!

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Date: Sun, 15 Feb 1998 10:22:48 -0600  
From: Francesco Ledda <fledda@airmail.net>  
Subject: Re: [R-390] Heat build up in the R-390A

This is to give some insight about how temperature is done during the

engineering evaluation of a product. At least, this is how it was done at the Dallas Rockwell Collins facility.

The product was put in a temp chamber with forced air circulation. This made sure that all points were at the same temperature. The temp of the chamber was slowly cycled up and down within the limits (Max +20C & min - -20C) while measurements were made. Statistical analysis of the measured data provide insight on the behavior.

The product was left soaking at each discrete temperature for long time to make sure that performed properly. The reason for such abuse was to find weak points. I am pretty sure that 390s have no problem performing in our home controlled environment (21 C).

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Date: Sun, 15 Feb 1998 09:44:10 -0700  
From: Doug <doug@alpinet.net>  
Subject: Re: [R-390] Heat build up in the R-390A

Hi Jerry....no doubt a good plan. It was kind of a "catch 22" modification, with one problem solved and two more created. But, remember also that the decks also have a bit of filtering on them...the 390A never has been a hummer. I think the choke idea is a dandy....just to find a place to mount it without making too much of a mess.

Series resistance would help, and would save the tube complement from too much dissipated heat. Another way to cool things down would be to come up with a nifty little solid state (blasphemy!!!) constant current reg to replace the ballast tube, mounting it on the main frame to allow for heat sinking and dissipation. That ballast really warms things up on the IF deck.

One thing's for sure, heat kills these things. It was an ongoing expense for the Navy for sure to keep the rigs running, but I'd like to hope I can keep both mine a couple tens of degrees cooler and save the cost and hassle of constant maintenance. I don't run mine every day, but use it often and for a long time, so it gets the chance to heat up some, but is mounted in a 7 foot rack that's a framework (telephone style) only, so the air gets to move through easily. I monitor the high seas shipping freqs and 500kc at night when the noise doesn't irritate me too much. 'Used to leave one or the other running all night and could copy the CW when lightly asleep, but for some reason can't do that any more. My biggest headache is the wood stove that heats the house. It generates fine ash that settles into everything and therefore requires an annual "blow out" with compressed air. But, that gives me a chance to do a sense check and lightly lube the cams and gears with a toothpick of very fine machine oil. 'Seems to keep things running well and smoothly.

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Date: Sun, 15 Feb 1998 11:20:09 -0800  
From: Colin Thompson <burkec@goldstate.net>  
Subject: [R-390] Premier POR cabinets.

After all the hoopla over the heat issue and my experience with the DCR series cabinets, I have an alternative to offer. Premier also makes a POR series cabinet for about \$150. The back and top are removable panels of perforated steel. This cabinet seems to have acceptable cooling for the 390s. Dick Dillman has a R-390A in a POR series cabinet. I asked him to take some temperature measurements and he kindly responded with the following detailed report. Please note that the top and bottom covers were installed. Many thanks to Dick for his efforts.

report follows: Well, Colin, here are my results.

Test article: Motorola R-390A/URR with stock top and bottom covers, installed in a cabinet: Cabinet: Premier type POR. Solid sides and bottom, perforated removable top, completely open rear

Ambient temperature at start of test: 19C/66F Length of test: 3 hours

Test instruments - Two thermometers, calibrated fingertips

I placed the two thermometers - one an aircraft type for measuring outside air temperature (OAT) and a brass unit for measuring water temperature at depth - inside the POR cabinet on top of the top radio cover and replaced the top cabinet cover. With this placement I figure the thermometers were pretty much measuring the temperature of the air exiting the louvers of the radio's top cover. The OAT thermometer was placed right at a louver exit while the brass unit was placed between the two sets of louvers.

NOTE: the brass thermometer reads 3deg higher than the OAT thermometer. After three hours the measured temperatures rose to and remained steady at: Louver exit: 40C/104F (OAT)

Between louvers: 35.5C/96F (Brass) or 32.5C/93F corrected to correspond with OAT reading

These figures were higher than I expected but then I'd never measured these parameters before. I therefore called into play the calibrated fingertips which have a decades-long history of lovingly examining tube-type equipment. According to the fingertip (and palm) report the temperatures at the top of the R-390A radio cover were "quite pleasant to the touch" and "just about what you'd expect for a radio with this many tubes inside". The front panel of the radio was warmest around the BFO/Bandwidth control as you mentioned. But it was nowhere near the temperatures at the top of the radio. The fingertip report for this area was "slightly warm".

In summation it seems to me that the operating temperatures of my R-390A/URR in the POR cabinet are just about normal for a radio of this class.

However, now that I know what a radio panel at about 95F feel like, if the front



panel of your radio is actually at that temperature I too would be concerned about it. I hope you find this information useful.

Please let me know if the group decides to go for the DCR cabinet order. What's the price for these from Premier?

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Date: Sun, 15 Feb 1998 12:24:36 -0800  
From: John R Bookout K7JB <k7jb@ptld.uswest.net>  
Subject: Re: [R-390] Premier POR cabinets.

Thanks to you and Dick Dillman for your work on determining the heat from the R-390A housed in a Premier POR series cabinet. With the recent offerings of R-390A's from David Medley and George Rancourt. I would expect to see more interest in buying cabinets for these radios as they become available. I think David has about 100 to offer and George has 140. Perhaps it would be a good idea for those interested persons to speak up and possibly delay cabinet purchases. So here it is I have brought this out in the open. So what do you BA's think about the cabinet offer being delayed?

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Date: Sun, 15 Feb 1998 15:36:43 EST  
From: KB9VU@aol.com  
Subject: Re: [R-390] Premier POR cabinets.

As an alternative to the very fine Premier units, if you can find an old DX-100 case these work very well also for housing an R-390A. I have one of Chuck Ripple's units mounted in a newly painted DX-100 case and it has NO heat problems at all. BTW, pitch the top and bottom covers when you put it in a case as they are superfluous. Good listening.

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Date: Sun, 15 Feb 1998 15:55:14 -0800  
From: "clarence thompson" <clarence@kilgore.net>  
Subject: [R-390] One more time for heat.

Hello all, I know this is the BA listserver but a few months ago June 97 I ran a temp test on my Drake R8/R8a and the NRD535d they all ran 95F to 98F. So all this heat thread is good information, but the solid state rcvrs are not much cooler unless you turn off the back lighting on these rcvrs, if I remember correctly someone made the comment, that heat was a non issue with the R390a is that correct?? Please correct if I am wrong!! Seems like we were worrying about a non issue??

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Date: Sun, 15 Feb 1998 19:34:41 -0600  
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Heat build up in the R-390A

Francesco, I am fully aware of the military and Collins heat run procedures,

because I worked in Cedar Rapids and Dallas in 1963 to 1966 with some of the same people who had designed the S-line and broadcast transmitters. My title was Jr. Engineer in the high power transmitter department.

The discussions is not what the radios WILL STAND, given maintenance, but how to lengthen the periods for required maintenance by better environmental controls. In many or most military applications, there was a fully equipped and manned shop for doing all the maintenance AND a warehouse of spare parts. Since heat is a known cause of shortened lifetimes, it would seem beneficial to operate the subject radios in a manner that would lengthen the MTF rather than shorten it. Sure, the radio in the home environment, with cabinet or without cabinet, WILL OPERATE for quite a while. But heat causes resistors (even or maybe especially mil-spec carbon composition, film types were not in the Collins specs except in the 1 and 2% varieties) to drift unpredictably. Heat causes insulating materials to age more rapidly, especially such as the paper insulation of transformers and paper capacitors. Heat causes electrolytics to loose their electrolyte, though operating they last longer than if stored cold. Very few users on this list have a warehouse of NEW parts, or the inclination to dig deep into the broken radio to install them and so would prefer to get as long a life out of the radio as possible. I believe civilian fans of the R-390(a) and the military have different expectations, repair capabilities, and desires for these radios and so perhaps far more conservative operating environments for the non-military users may be worth trying to achieve.

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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. bridge + 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, K0CQ

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Date: Fri, 13 Feb 1998 19:14:46 -0800 (PST)  
From: John Kolb <jlkolb@cts.com>  
Subject: Re: [R-390] Premier DCR cabinets

Aboard ships in the Navy, only saw R-390A's in cabinets, not racks :)These contained a single R-390, and two CV-591's above it. The cabinet had a completely open back - don't remember if it had holes in bottom or louvers on sides or not. Then there was the 6' tall cabinet that held two R-390A's and two CV-157's.

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Date: Tue, 10 Feb 1998 14:51:24 -0500 (EST)  
From: Steve Stutman <sstut@world.std.com>  
Subject: [R-390] Premier DCR cabinets

Just talked to Premier Metal Products in Bronx, NY as listed in Mr.Rippel's Care and Feeding. They were selling "DCR" series cabinets in 10.5 inch rack height for \$104. Were, because they are now discontinued and out of stock on both coasts. A run would be 25 pieces. If people are interested, a letter or call to the factory, 718-993-9200 might induce them to make a few more. Believe same cabinet fits SP-600.73,

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Date: Sun, 14 Jun 1998 08:37:05 -0400  
From: "Chuck Rippel" <crippel@exis.net>  
Subject: Re: [R-390] bristol wrench

Actually, you are better off without the "covers" certainly the top one. There was a government directive to remove and discard them some years ago. I will have to search through my Navships manual and try and find it. Apparently, the covers (really RF shields) caused a higher than acceptable heat build up in the receiver. Their only function is to provide some RF shielding when the receivers were stacked one on top of another in 6' relay racks. If you were to get one of Macs CY-whatever real R390A cabinets, the radio will not fit in it with either cover on. Mine are in my attic being held down with old paint cans and dust.

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Date: Sun, 12 Jul 1998 13:35:02 PDT  
From: Gary Gitzen <garyg@cup.hp.com>  
Subject: [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.

My apologies. I was far from clear. My primary goal is minimizing heat generation inside the R-390A chasis. Electronic component failures roughly double every 10 degrees C, at least soiled state stuff does. Every time the Rx temperature cycles, cumulative stresses & strains occur in internal components. A while back someone (on the BA list???) described how repeated temperature cycles result in fractured solder joints. A combination of heat and temperature cycles significantly affects failure rate. I want the lowest reasonable heat generation in the box. I've already pulled the 6AK6 audio outputs and their 5814 driver (audio comes off the pot wiper to the stereo). That significantly cooled things down. I saved another 3.78W by removing the ballast and replacing two osc 6BA6's with 12BA6's. If I can further reduce internal heat buildup by moving more heat (10W???) outside the box, it's a price I'm willing to

pay to help my R-390A stay a lifetime friend. Outboard regulation of R-390A B+ appears frivolous, but it can move significant heat outside the box if done right.  
Gary

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Date: Fri, 15 Jan 1999 17:58:45 -0000  
From: s-biddle@ti.com  
Subject: [R-390] 3TF7 hype and tube life

One of the posting on Chuck Rippel's site is regarding tube shields. One of the first thing I did was dump all the shiny shields and replace with heat dissipating shields. I did a little research (actually sitting around and jawing) with someone who did military reliability studies in connection with MIL-HDBK-217. This guy is older than dirt and passed along some tidbits on tube life that sounded interesting. Chuck was right on the nose about getting the heat away from the tube. The IREC type tube shields allow improved thermal radiation into the ambient than a bare tube.

As far as mil-spec tubes go, the base failure rate for receiver triodes, tetrodes, and pentodes is 5 failures/10<sup>6</sup> total hours operation. Power rectifiers jump to 10 failures/10<sup>6</sup> hours of operation..... This would allow that you would see an average of a failure of a non-rectifier receiving tube once every 200,000 hours if operated within data sheet conditions. For the R-390A, this would translate to a tube MTBF of 7,692 hours of operation (not including rectifiers). This is in a fixed ground application where there is adequate cooling air and a controlled environment. If you look further, for Navy sheltered use the failure rate is increased by 8X, ground mobile by 14X, and airborne by 5X. This is the tube life only and doesn't count if something else lets go and pops the tube. The definition of "good" is 50% of the time zero tube specifications.

The full tube reliability model concerns itself with total power disipation and envelope temperature as factors to consider in calculating actual failure rate. Temperature related failure rates are on an exponential curve so anything to reduce power and the resulting heat goes a long way. The factors also assume normal levels of stress and vibration in the application so dropping the radio or shipping by UPS blows the prediction:)

Of course once you add in all the passive components and mechanical factors, the MTBF is not nearly as nice.

Sorry for being a little long winded, but to bring things back to the subject, I suppose the position (that a 3TF7 should last for quite a while) is officially supported by the DoD:)

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Date: Mon, 22 Feb 1999 20:30:49 -0500 (EST)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] IERC tube shields

> I have noticed in my investigation for the IERC tube shields that some are

> listed as, say 5020 or 5020B. What would the "B" indicate?

Probably some kind of design change. I have three IERC versions before me:

1. TR6-6020

Matte black shell with rounded over top. Finger style heat dissipator, semi shiny.

2. TR6-6020B MS24233-5

Matte black shell with rounded over top. Finger style heat dissipator, matte black.

3. M24251/6-5 TRN5-6020B

Matte black shell with six bent over tabs on top.  
Hexagonal style, heat dissipator, matte black.

Version one's semi shiny fingers probably reflect a tad more heat than version two. I prefer version three because it looks like the heat convects out of there faster and also because I think it looks "kewl." :-). Any one of these versions will work fine. They're hard to find and one is thankful to get them. The WPM's have a smaller diameter opening which I enlarged by forcing a slow graduated taper down there. Made it look like an IERC shield.

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Date: Fri, 2 Apr 1999 12:17:55 -0800  
From: "Phil Atchley" <ko6bb@elite.net>  
Subject: Re: [R-390] Solder joint failures.

This problem is usually due to heat. Thermistors, Power resistors, some transistors, flyback transformers in consumer products often have that problem due to excessive heat buildup around the connections.

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Date: Sun, 06 Jun 1999 13:43:00 -0500  
From: "Jerry G. Kincade" <w5kp@swbell.net>  
Subject: [R-390] Re: IERC Tube Shields on 75S3C

Mac, I have seen this statement made on several lists, and while I WANT to believe it, I'm having trouble swallowing the thermodynamics part of it. I've always wondered if boatanchors might not be better off with no tube shields (absent a requirement of rf radiation suppression) than ANY tube shields, heat wise. Deliberately capturing a wall of dead air around a heat-producing device like a vacuum tube always seemed like folly to my inner instincts. I seem to recall also an advisement to pull all the shields except for a selected few when rackmounting R-390's. The latest Jennings tool catalog has, in addition to my drool marks on it, a Tektronix laser thermometer that can take no-touch accurate readings on a teeeeeny-tiny pinpoint area. Sure wish someone would buy one of these, and take the temp of the glass surface of the top area of a tube without and with several types of common tube shields installed. Then maybe I could get rid of this nagging feeling we're all being had by an old piece of radio

mythology here. Maybe there's a thermo engineer out there who's tried this?  
Y'all fire away.. I have my helmet and Nomex on.

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Date: Sun, 06 Jun 1999 21:53:49 -0500  
From: "Jerry G. Kincade" <w5kp@swbell.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

I was hoping you would weigh in on this, Dr. J. The radar repeaters I worked on in my Navy days had about a bushel basket of the older shiny/springy versions in them. Always figured they were there for battle shock/damage more than anything. They got hot enough to leave flesh on them if you grabbed the wrong one, which is why the equipments all had noisy nine million CFM blowers, I guess. Also, per Chuck Rippel, there was a Collins report that said tubes benefitted to the tune of about a 50% longevity increase with shields, and I think that was done even before the IERC era.

So I guess I'm convinced, and thanks for the info. Now back to the hunt for all the right sizes of IERC's. I still wonder why the 390A manual says to remove most of the shields when rackmounting, though. Of course, at the time those shields were not IERC's - maybe again illustrating a drastic difference in efficiency between the old and newer types of shields.

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Date: Sun, 06 Jun 1999 21:24 -0600  
From: "Staupe, Paul T." <PTSTAUPE@comdisco.com>  
Subject: RE: [R-390] Re: IERC Tube Shields on 75S3C

We've been happily moving along with the wisdom of the ages telling us that our tube shields are protecting us... and now you rock the boat and throw fear uncertainty and doubt (FUD) in our faith in tube shields. Next thing, you'll be telling us that solid state devices may be superior (in certain applications of course) than tubes! Please resist the temptation to buy that Tek laser thermometer, 'cuz I've got a lot invested in IERC ..... and I want to sleep peacefully tonight while my EAC warms up my hotel room (through the tube shields!)

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From: Jerry G. Kincade  
Sent: Sunday, June 06, 1999 8:26 PM  
To: Mac McCullough  
Cc: COLLINS; r-390  
Subject: [R-390] Re: IERC Tube Shields on 75S3C

Deliberately capturing a wall of dead air around a heat-producing device like a vacuum tube always seemed like folly to my inner instincts. I seem to recall also an advisement to pull all the shields except for a selected few when rackmounting R-390's.

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Date: Sun, 06 Jun 1999 19:54:12 -0400  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

Speaking of tube shields. I have a new/old FSK converter that has a type of tube shield I've never seen before. It would seem to be the ideal. This is new old stock, still hermetically sealed in the foil packing, so the components are all original. They're black inside and out, but vented. There are vertical louvres running all around the shield. This would seem to provide a degree of shielding, but also heat-sinking and open cooling. I don't have them handy, or I would post a photo somewhere.

The design would seem ideal in dealing with all issues. Has anyone else seen these and/or know anything about them?

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Date: Sun, 06 Jun 1999 19:29:58 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: [R-390] IERC Tube Shield Effectivness

The better quality ones are supposed to act as a heat sink. I use them. It shouldn't be very hard or very expensive to run a few tests on the various styles of tube shields verses no tube shield at all on the envelope temperature of the tube. It shouldn't cost more than a couple of dollars.

Attach a small thermistor to the top of a 5814A next to the pip with some JB Weld epoxy. Use a small one that won't be contacted by the various tube shields. Run the 5814A in an area with good ventilation but no breeze or draft for an hour. Measure the resistance of the thermistor.

Next, install one of the old silver shields, run it an hour and measure the resistance. Next, the WPM, IERC, etc shields and plot the results. I suspect that we'd see that the heat conductive WPM and IERC shields do lower the envelope temperature. But, maybe not! <grin>

I don't have any of my tube data manuals handy, so I don't know the temp. range of the thermistor you'll need. The data isn't hard to come by. If I had the time and energy, I'd do it and post the results, but I don't. One of you guys give it a try. Just make sure that I get proper credit for the really brilliant method. :-)

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Date: Sun, 06 Jun 1999 20:00:39 -0500  
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

The passive thermometers (lasers are only there to show where they are looking) work most accurately on a surface that radiates heat very well. That's not the glass surface. You'd get a better measure by sticking a thermocouple to the glass with duxseal or some other adhesive that can take the temperature.

The finer the thermocouple the better. Tubes do need some shielding from each other, and the tube shields also help to hold them in the sockets when the big guns are fired. A tube rattling around on the deck isn't one to be trusted to continue to work... And the radio it has jumped from may not be working at that point either. Though there are NO tube shields in the 75S receivers. But the IF stages beyond 2 in a receiver give a lot of trouble because then a couple stages have the same phase and oscillation is more likely. Question is, what is the effect of temperature on the operation of the tube, or better what is the effect of envelope temperature on the longevity of the tube? For sure the cathode needs to be red hot. And equally sure the control grid needs to be cool so it doesn't emit electrons. The plate is cooled by radiation and has to dissipate more power than the heater in some tubes, less in RF tubes. Depending on the plate metal, some transmitting tubes run just fine at a dull red. Probably the most critical parts are the metal to glass seals. The metal coefficient of thermal expansion never perfectly matches the glass, to the greater the temperature of those seals, the more likely there will be damage. So, as I see it, cooling the base is most important.

I've tried to compute the effect of radiant energy hitting glass and to compute what the operating temperature of the glass surface would be (for a light bulb buried in shell corn) and gave up. It was far easier to bury a lamp in a bucket of corn and see if it ignited. It did. A non contacting thermometer might measure plate temperature reasonably, and detect if the shiny shields caused it to operate at a higher temperature for the same power dissipation. Since cooling is by radiation, I'd think that any tube shield that was black instead shiny inside would run the tube cooler than a shiny shield. There is some heat introduced into the glass because its not perfectly transparent at IR, so the fingers of the IERC tube shields undoubtedly cool the glass some. I believe that the IERC makers probably would have a lot of data on tube longevity using their shields, else they'd never have sold any.

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Date: Mon, 7 Jun 1999 08:39:10 -0500  
From: "Spencer Petri" <wa5jci@flash.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

If anyone does a temp test would you paint one of the silver shields flat black and see what difference, if any, it makes in the temp. As for heat, the old Motorola tube radios in car trunks here in Texas ran so hot during the summer that I couldn't unlock them without using gloves.

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Date: Mon, 07 Jun 1999 16:40:17 -0500  
From: "Jerry G. Kincade" <w5kp@swbell.net>  
Subject: [Fwd: Re: [R-390] Re: IERC Tube Shields on 75S3C]

Nolan, I totally agree this should be tried. Greg has the right idea here, I think. Hope he'll go ahead and do it. Results could be very interesting. Also hope he doesn't mind my forwarding his input to the list!



Greg, sounds like a great idea to me. Would be very interesting to see if they run cooler or hotter in each case. Measuring at three different points might also lend credibility to the theory that most of the heat is conducted to the chassis via the shield base when tube shields are used. I'm not an engineer by any means, so hardly qualified to comment on the test method - but it sounds reasonable to me. How about it, Dr. Jerry?

Greg W. Bailey wrote: > Hello Mac and Jerry:

> > I have always wondered about this tube shield thermal question. Having access to a lab full of equipment, I was thinking of putting this question to bed once and for all. Supposing, I took a 390A, operating at normal room temps (20 C), selected two 6BA6 bottles in the IF (I don't have my book open right now but there has to be two of them somewhere in the radio that have commonality in their location, filament voltage, plate current, and so on.

>

> Then attaching three #38 AWG J-type thermal couples to each tube in the exact same locations. The locations could be 15% up from the bottom of the tube, 50% up, and 85% ..... I really don't care, as long as we agree BEFORE the test and not play the "you should have tried this or that" after the test. One of the tubes to be covered by the shiny bayonet type and the other by the IERC black multi-internal fingered shields. Then measure the difference in temperature of the two bottles, recording it at say 15, 30, 45, and 60 minutes OR until thermal stabilization is achieved.

>

> ASSUMING this was done, do you think once and for all we would have the data to put this to bed.

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Date: Mon, 7 Jun 1999 16:35:28 -0700 (PDT)  
From: Joe Foley <redmenaced@yahoo.com>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

I've got some other questions before we start the test. If you test the effectiveness of the shields how do you know what type of heat sinking method you're testing? Is it conductive, convective, or radiation? Or some combination of those?

Did one manufacture have reasons to consider one more important than the other? Just which ones were addressed when considering how the heat is transferred to, or through, the glass envelope? How to measure each?

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Date: Mon, 7 Jun 1999 16:58:09 -0700 (PDT)  
From: Joe Foley <redmenaced@yahoo.com>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

Yes! I've seen them. Be careful with them, the louvres bend easily and they're SHARP!

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Date: Mon, 07 Jun 1999 18:35:35 -0700  
From: Dennis Sharp <kd7ena@uswest.net>  
Subject: [R-390] IERC Tube Shields

I was at Electronic Dimensions in Tacoma, WA Saturday and was talking to Glen who's the owner about tube shields and he mentioned that he had a good supply of the IERC tube shields. He stated he had both new and used ones. If you want to give him a call his number is (253) 272-1061 and e-mail address is: eldim@worldnet.att.net. He works from Wednesday to Saturday 10-?. I have bought quite a lot of things from him and he is a reputable dealer. He specializes in military surplus electronic equipment, i.e. test equipment, communication equipment, and hard to find parts. I've been doing business with him for 2 1/2 years and haven't ever had any complaints. Anyway give him a try.

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Date: Mon, 07 Jun 1999 21:13:09 -0500  
From: Richard Biddle <theprof@texoma.net>  
Subject: Re: [R-390] IERC Tube Shields

So all we have to find is the service bulletin:) I think the principle is pretty much the same for tube shields as any other - the IERC shield has the cute little corrugated fingers that hug the surface of the tube and so reduces envelope temperature by conduction.

The black color assists by absorbing heat by radiation and then rerediating it to the ambient. At least that is how it works when you do mil boxes. I figure that anything is a help so I use the shields. I also have a 4" fan in the rear of my cabinet with intakes at the top and bottom near the front of the radio. Runs reasonably cool.

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Date: Mon, 7 Jun 1999 20:24:04 -0700 (PDT)  
From: W Li <wli@u.washington.edu>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C]

This thread is very interesting and salient to our needs. Scientific documentation as Greg proposes is the way to go. IERC shields are made to fit very snugly to special thin aluminum tube bases that lock into the base of the shield for maximal thermal transfer to the chassis.

My suggestion is to sample two major sources of heat: one below the chassis (the 26Z5's) and the other above the chassis (the 3TF7). The heat generated by the 26Z5 goes up to the tube base, and the heat generated by the 3TF7 goes up away from the tube base. It would be of some interest to see how the IERC handles heat in these configurations.

The tubes in the signal path really run fairly cool, so that any differences seen between IERC and the shiny shields are likely to be less dramatic. Sequential measurements at three locations on each tube would clearly show all of us how well these shields "cool". Control measurements would be with NO shields

attached. My guess is that all three locations on any one tube are going to be pretty close... but that is only conjecture on my part....

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Date: Mon, 07 Jun 1999 21:28:11 -0500  
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

With the more open IERC shields we have all three. Conduction from the glass by the internal fingers, radiation to the black fingers and inside of the outer shield, and then convection through the open top.

The heat is transferred from the plate entirely by radiation. Some of the radiation is absorbed by the glass (more at the labels and when dirty), but some passes unchanged to be absorbed by the black metal of the shield for reradiation with a larger area.

Then that metal is cooled by convection too, a lot. There's no convection inside, that's for sure and the mica supports don't conduct much. The pins conduct some heat out of the tube.

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Date: Tue, 8 Jun 1999 03:33:54 -0000  
From: "Michael P. Olbrisch" <kd9kc@elp.rr.com>  
Subject: [R-390] IERC Tube shields - found em, thanks.

Well, I found the info. Thanks. For anyone else, the info is included below.

Thanks to Chuck, WA4HHG, for the info from his website.

- (1) 6025-B Tall 9 Pin, used for the ballast tube
- (9) 6020-B Medium 9 pin, used on 5814A's and 26Z5W's
- (2) 5015-B Short 7 pin, used on the 5654's
- (13) 5020-B Medium 7 pin, used on 6BA6's, 6C4, 6AK5, etc...
- (1) 5025-B Tall 7 pin, used on the OA2

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Date: Tue, 08 Jun 1999 20:50:12 -0700  
From: "Gene G. Beckwith" <jtone@sssnet.com>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

No answers, just thoughts and questions...I've noticed that during warm ups for alignment, I felt the black tube shield, real ones with the fingers touching the glass, and was surprised to find the actual "touch temp" seemed to be lower to the extent that I could touch the black shields and not the shiny ones (aprox one hour elapsed time)...this is subjective I know, and maybe if I'd waited longer, it would be different

Further, if the shield is open at the top, with or without fingers touching the glass, is this a sort of 'chimney' effect with a convection cooling draft induced by the hot

tube?

Also, wonder if the pins that support cathode/filaments are heat sinks themselves? I recall that EIMAC has written about the critical need to cool glass to metal seals in very large hot tubes, so perhaps the pins to socket combination is important and that maybe that assembly, whether in large tubes or in the little guys like our 390x stuff should be considered...I think Norm suggested mounting the audio chassis up on some washers to allow a bit of convection and cooling for under chassis stuff....

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Date: Tue, 08 Jun 1999 21:07:01 -0700  
From: "Gene G. Beckwith" <jtone@sssnet.com>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

Yep, I got two...they were in the beauty I picked up at Dayton (R390A), and ur description is accurate..one can see the tube through the open structure...I have them in hand as I type this and there are no markings as to mfg, or other info..totally plain jane. The two I have are meant for a 12AU7 dia and height tube...they were in the chassis and mixed with miscellaneous other shields, mostly non black and some missing. BTW, is there an source for the IERC's? Need the short ones for the xtal oscillator and the other (6C4) under the back var if rack...those seem esp difficult to find, but need others too..

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Date: Tue, 08 Jun 1999 20:14:15 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C]

IERC and possibly Cinch also made little flexible heat conductive strips that fit inside the raised collar that the tube shield attaches to on the tube socket. They were supposed to help dissipate heat at the bottom of the tube and decrease the heat soak to the tube socket terminals.

I use them in the R-390A's on the 26Z5W's, the 3TF7, and the 5749 on the PTO. I've never seen them for sale or even know the exact name of them. I ended up with a few from a bunch of T-195/R-392 stuff that I scrapped. I think that there were about a half a dozen used in each T-195 and anywhere from 1 to about 4 or so in each of the R-392. Usually, the tubes for the PTO's will have them even if nowhere else does.

>My suggestion is to sample two major sources of heat: one below the chassis (the 26Z5's) and the other above the chassis (the 3TF7). The heat generated by the 26Z5 goes up to the tube base, and the heat generated by the 3TF7 goes up away from the tube base. (W. Li)

I like to space the R-390A audio away from the chassis about "one washer thickness" to aid in air flow. I've never tried this with the power supply module. It might be worth looking at.

>It would be of some interest to see how the IERC handles heat in these configurations. The tubes in the signal path really run fairly cool, so that any differences seen between IERC and the shiny shields are likely to be less dramatic. Sequential measurements at three locations on each tube would clearly show all of us how well these shields "cool".

The "top" of the tube wouldn't be a problem, but it'd probably be rather difficult to do the side and the base of the tube.

>Control measurements would be with NO shields attached. My guess is that all three locations on any one tube are going to be pretty close... but that is only conjecture on my part....

There's a big difference over the surface of a light bulb. <grin>

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Date: Tue, 08 Jun 1999 21:24:50 -0700  
From: "Gene G. Beckwith" <jtone@sssnet.com>  
Subject: Re: [R-390] IERC Tube Shields

Seems I recall an article in ER that treated this subject in great detail.. maybe it was a reprint from Collins, but I thought it was some original work or a study of published data...would take a bit of looking at the ER index listings, but I don't have them... anyone have the time to do a bit of research?

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Date: Tue, 08 Jun 1999 21:29:33 -0700  
From: "Gene G. Beckwith" <jtone@sssnet.com>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C]

Interesting that the rectifiers are mounted up-side down and that they are mounted on the heavy aluminum flange that further heat sinks to the transformer...wonder if this is by intention or was it a fluke that heat transfer questions might have been considered in that configuration... Also wondering how Chuck mounted that fan, and in what cabinet, and how it might help, because the top and bottom decks are not really designed for convection of air through the main frame...?

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Date: Tue, 08 Jun 1999 22:49:51 -0500  
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

I'm sure the base pins act as some heat sink for the hot elements, (cathode, heater, and plate) but except for the plate that's undesired since it just adds to the heater power required to get adequate cathode emission. I'm equally sure that the socket does help cool the pins and base seals on the miniature tubes.

In the power tube, first the base is often ceramic and probably a poorer thermal expansion match to the metal, and not molded to the metal but soldered with some intermediate material that makes the joint a bit more fragile, and there's a lot more power involved.

In some Eimac tetrodes, I've found the screen dissipation necessary to meet their advertised output is essentially all that the screen is rated to dissipate. So any added cooling is a benefit.

Any time there's a nearly closed vertical space with allowance for air to enter at the bottom, be heated, and to leave the top, there will some air flow because hot air rises.

I think I come close to making blisters grabbing a shiny shield with power on. And I don't remember causing that sort of damage with the IERC type shields.

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Date: Tue, 8 Jun 1999 22:27:19 -0700 (PDT)  
From: W Li <wli@u.washington.edu>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

You are right about the upside down rectifiers. In fact, guess what is above the power module: the Xtals Y201 and Y203 in their own oven!  
W. Li

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Date: Wed, 9 Jun 1999 02:56:02 -0400 (EDT)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

> Any time there's a nearly closed vertical space with allowance for air to enter at the bottom, be heated, and to leave the top, .....

Yes, that's been my experience also. No way can you hold onto a shiny shield for long when the tube is up to temperature, but the IERC shield can be held in most cases. (Don't try it with a 26Z5W!) For those stuck with shiny shields, you can help them a bit with some Krylon ultra-flat black spray paint on the inside. Mask off with masking tape the bit that twists around the socket base and spray inside. This also helps the shiny shields that have heat dissipating inserts inside. Remove the insert before masking and spraying. By far the IERC shields are the ones to try and locate. The desired ones come in two styles-- with tabs on top and a five-sided insert -or- with rounded over top with finger style insert. Use these on the tubes under the set first. A runner-up is the WPM heat dissipating shield. The top is rounded over but to my mind the hole on top is too small. Venting can be improved by taking a tapered rod and carefully pushing it down the hole into the shield. This will further round over the top and enlarge the opening. This mod makes the WPM just about as good as an IERC. Atlee heat dissipating shields are on a par with the WPM. Looking forward to the results of the temperature measurement studies under way.

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Date: Wed, 09 Jun 1999 09:14:47 -0500  
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

Some years ago I was playing with active solar collectors. I found Krylon Ultra Flat black was a better absorber of solar energy than the \$15 a can special paints from Edmund Scientific.

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Date: Wed, 09 Jun 1999 10:46:25 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

I wonder if there'd be any benefit to using longer IERC shields on the 26Z5W's like the 3TF7 uses? I use an abnormally tall IERC shield on the 3TF's. I's guess offhand that it's 3/4" of an inch taller than the tube envelope. I ain't never had none of them thermodynamics classes but would guess that even mounted in the upside down position on the 26Z5W's that they'd still radiate more heat, because of the increased surface area, but I ain't no engineer and may be wrong. ;- When the R390A was first introduced, those shiny shields were pretty much state of the art. I can't help but remember the notice in the 1956 tech manual that recommended removing the shields on all but a handful of tubes for improved cooling. I don't remember seeing that recommendation in the later manuals after the heat dissipating shields were introduced. I'd sure like to read the study by Collins on the heat dissipating shields. surely, someone has a copy they can post. Chuck? Most of the shiny shields are plated brass. I've seen some that are copper and some that were aluminum with a silver anodized coating. I'd suspect the the ones with the hundreds of fingers would be more efficient. The pentagon shaped inserts will pull out of the shield on occasion a lot easier too. Cinch made some too. I've only seen a handful. I think that the major area of dissipation is the outside body of it.

Me too. If I had the extra time, I'd hack on my Radio Shack indoor/ outdoor electronic thermometer. Another thermistor and either a series or parallel pot should allow it to be "dialed in". The display wouldn't give an accurate reading as far as the actual temperature, but it'd give an indication of hotter or colder. I suppose that a base line could be calibrated using boiling water and the dial calibrated with a an accurate meat thermometer or something.

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Date: Wed, 09 Jun 1999 12:15:03 -0500  
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>  
Subject: Re: [R-390] Re: IERC Tube Shields on 75S3C

A longer shield made of aluminum or copper especially should run cooler just because it has more area to radiate heat and to be cooled by air convection. It may not radiate more heat, because it has only so much supplied by the tube, but should stay cooler.

Just use the outdoor thermistor on the indoor/outdoor thermometer and you are as close as you need to be. The sensor these days may not be a simple thermistor, it might be a transistor junction or a dedicated digital thermometer

chip.

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Date: Wed, 20 Oct 1999 19:12:54 -0400 (EDT)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] Progress Report from South of the Border (and some queries)

Sounds like you're making good progress on your restoration.

If C227 is OK, you sure don't want to mess with it. Do you know for sure if it is faulty, or are all the caps being replaced as a matter of course? If the latter, I'd skip C227 and hope for the best. The glass sealed caps found in the later EAC stuff tend to perform well anyway, unlike the black beauties and the brown caps of death (all plastic encased). Those are the real troublemakers.

The WPM and ELCO shields are OK if they have the little heatsink inserts in them. I take a taper reamer (smooth surfaced, not toothed) and press it into the WPM's from the top inward in order to widen the opening. I feel this helps heat to rise out of the shield more freely.

It's true the IERC's are most favored, but just about any make shield is good if it has the heatsink insert and is blackened inside. The shiny non-insert variety is worse than no shield at all as it reflects heat back into the tube.

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Date: Thu, 25 Nov 1999 18:38:02 -0700  
From: "Bill, KD0HG" <klerosb@frii.com>  
Subject: [R-390] Tube cooling, life and shields

I've received several inquiries regarding my post here concerning IERC tube shields and in response, here's a quick elaboration. In ER #66 for October, '94, I described the results of a 1954 ARINC [Aeronautical Radio, Inc] and GE tube life studies that were done using over 150,000 tubes of 20 different types. I provided summaries and graphs of tube life vs. envelope temperature for several representative tube types- here are a couple:

5654/6AK5W, 200 tube random lots

The 80% survival of this type was

750 hours @ 192 C  
1500 hours @ 125 C  
2000 hours @ 100 6005/6AQ5W

Over 95% of the 6AQ5 survived 5000 hours of operation at an envelope temperature of 220 C, but at only 17 degrees hotter fewer than 70% survived even 2500 hours.



Another chart in the article shows the measured envelope temperature of a 12BY7A dissipating 10 watts [including heater]. Under still air conditions, at room temperature, worst to best,

- >220 C inside a shiny JAN tube shield
- 190 C inside a black anodized JAN tube shield
- 165 C inside a black JAN shield with ventilation slots
- 150 C bare bulb, no shield
- 82 C inside an IERC T6-1025H shield/cooler

The results of these life tests indicate a bare bulb is the way to go for reliability's sake, unless one uses the IERC coolers. Of course, electrical considerations often mandate the electrical isolation of a shield.

I once read a reference that around 1960, the shiny tube shields were removed from the military's QPL listings as a consequence of these earlier studies. This does not agree with my observation that many pieces of military gear from around that time are full of the shiny type of shields, so I don't know if this is really true. As of the article's press date in '94, IERC was still in business and making tube shields and coolers. I don't know about today.

IERC  
135 W. Magnolia Blvd.  
Burbank, CA 91507

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Date: Thu, 25 Nov 1999 16:14:37 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Tube cooling, life and shields

I'd always heard that a bare tube was better off than one within a shiny tube shield, but WOW! Now I know why I see so much gear with the shields missing! Interesting to see that IERC was still making shields in '94, I wonder if they're still in business today and if so, perhaps we could put together a bulk-buy for shields like others have for things like cabinets or filters? I started making a list a hile back of what I needed and found the number to be quite high. Yes indeed, verry interesting... Thank you for posting this information, Bill.

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Date: Thu, 25 Nov 1999 23:31:48 -0500  
From: Mike Dinolfo <mdinolfo@erols.com>  
Subject: Re: [R-390] Tube cooling, life and shields

For information: IERC is, apparently, still in business. I remembered that IERC is a listed supplier of (semiconductor) heat sinks in the Digi-key catalog; a quick search of the Digi-key website indicated a link to IERC's website:

<http://www.ctscorp.com/ierc>

I did a brief check of the IERC website but did not find any references to tube shields. I might have missed it, however. Incidentally, both Mouser's website

(<http://www.mouser.com>) and Digi-key's website (<http://www.digikey.com>) offer extensive links to the websites of individual manufacturers; these are great starting points for locating technical info for many of the components that we may need from time to time.

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Date: Fri, 26 Nov 1999 12:12:47 EST  
From: DJED1@aol.com  
Subject: Re: [R-390] Tube cooling, life and shields

I'd certainly be interested, both for my R-390A which has the shiny shields removed, and my SP0-600, which has the shiny shields in place. Now I know why the R-390 tubes have lasted so long.

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Date: Mon, 01 Nov 1999 11:04:14 -0500  
From: Roy Morgan <[roy.morgan@nist.gov](mailto:roy.morgan@nist.gov)>  
Subject: [R-390] Cooling the R-390

First, there are four things which in my opinion should be done for ALL models of these radios (the R-390 non-A and R-390A, the R-391 and the R-389):

1) Operate the whole radio on 115 volts supply. They were designed for 115 volt operation. Modern house current is 120 volts and is often found to be more than that. It is normally 122 to 123 at my house and sometimes gets to 125. Use a filament transformer to buck the line voltage. See the following URL for the Boatanchor FAQ page for details. At my place, I run the normally-operated radio on an isolation transformer that reduces the line voltage, but I plan to install line bucking transformers permanently inside my radios. The URL is: <http://www.mindspring.com/~tirevold/faq-index.htm> and the direct link to the particular item is: <http://www.mindspring.com/~tirevold/faq-HiVolt.htm>

Note that the SP-600 has a 120 or 125 volt tap on the power transformer primary which can be used to easily solve this whole problem.

2) Do not operate the VFO oven. Place the rear "OVEN" switch in the "OFF" position and leave it there. This reduces overall heat dissipation significantly and avoids running the PTO at an unnecessary elevated temperature.

3) Use heat dissipating tube shields, the most well known of which are made by the IERC company. A description and list are on Chuck Rippels page but I don't have that URL handy. It is widely believed that normal shiny tube shields are worse than none at all, and that only one or two tubes in the radio need shields for proper shielding of signals and circuit capacitance. (The 6CL6 driver tubes in Collins 32S-3 and KWM-2 transmitters need the shield for the circuit to operate correctly.)

4) Do not use chassis covers, unless you have mounted fans to ensure good air

flow.

In the R-390 non-A, the big heat problem is in the audio chassis, which contains the two 8082 series B+ regulator tubes and associated cathode equalizing resistors. That module is located under the main chassis deck upside down at the left edge of the radio (viewed from the front). The power supply with two rectifier tubes and four cathode equalizing resistors also makes some heat.

In the R-390A, the power supply makes a lot of heat, and many other tubes in the set contribute to the overall heat production. The -A does not have the series regulator tubes. To cool the -A version, it seems to me that a moderate amount of air circulation both below the chassis and above the chassis will be a good thing. I have not used fans on my -A radios yet, but I plan to do so in the future. I think that a no-holes add-on plate or bracket that holds two fans could be made to bolt to existing frame hardware

One approach for rack mounted radios is to find a rack panel fan unit and install that in your rack. Normally they are quite noisy, but if you get one that has an even number of fans in it, you can re-wire them in series. Or you can add dropping resistors to reduce the speed.

Another approach for just one radio is to build a fan mounting plate as I describe below. One plate could be built that holds two fans, one blowing on the upper part of the radio and one blowing on the underside. If two fans are used, running them in series on normal house voltage may provide enough air to cool the radio just fine.

For my R-390-non-A, I built a plate of aluminum with big holes for the air to go through, and small holes to attach the fan and to mount the whole thing to the side of the radio. I used countersunk flat head screws to mount the fan so that plate would rest flush against the radio side panel without marring the finish. The plate is about a half inch larger than the 4-inch computer fan I used. I attached it to the side of the radio with existing frame screws. One or two 10-32 screws at the level of the horizontal frame deck and two of the screws normally used for the bottom cover are used. I made slots for each mounting hole at 45 degree angles to allow mounting of the fan after the radio is installed in a rack panel or cabinet. You can't get the radio with fan mounted into a rack panel or cabinet. The existing screws are loosened enough to slip the plate behind them, the radio is mounted in the cabinet, then the plate with the fan is slid into place and the screws are snugged up by feel with offset screwdrivers or short handled drivers as needed. This fan running at normal speed keeps the two 6082 tubes cool enough to touch with the fingers whereas without the fan, the tubes run hot enough to cause a permanent and painful burn to the fingers and melt normal wire insulation.

One problem is how to power the fan. I have a main station cut-off switch which shuts off power to all radios and test gear so plugging a fan cord into the normal power is ok. For an improved installation, I would install a small ac outlet inside the radio operated by the power switch. For greatly improved installation, I'd find

a place inside the radio itself and mount and wire the fan permanently. This is a development project there has not been time and priority for yet.

Mounting an R-390 or 390A in a military desk top cabinet is a special problem. There likely is room inside the cabinet for one or more fans, but I don't know if there is enough room for normal sized 4 inch square fans. Some folks who are lucky enough to own the new old stock original military cabinets sold by Mac McCoulough may be reluctant to drill holes in it, but clever use of existing holes should work fine.. There are holes for air flow in the bottom and top of the cabinet as I remember, so it might be possible to build an air-guide system of wood or metal that would bring air from a fan at the rear of the cabinet under the thing and force it up into the set from below. The bottom edges of the radio contact guides or rails in the cabinet and form an air seal. Ensuring air flow across the tubes in the top of the radio could be harder.

Finally, a word about the cathode dropping resistors in the R-390 and R-390A. In the non-A radio each cathode of the two 8082 series regulator tubes and each cathode of the two rectifier tubes has a 47-ohm two-watt balancing resistor. (The R-391 and R-389 use the same power supply and audio/regulator modules as the R-390 non-A.) The original resistors were carbon composition units. These will very likely be found to have drifted in value, most likely upward. Values measured in my radios varied from the correct 47 ohms to over 90 ohms. In the earlier radios, UNEQUAL drifting will cause unequal currents in the triode sections of the 8082 regulator tubes, which would likely lead to premature degradation of that section. Similar things would happen in the rectifier section in all radios. In my opinion, the eight resistors in the non-A radio and the four units in the -A version should be at the very least tested for drift and replaced if found much different in value. Modern rectangular ceramic cased "sand" power resistors rated for 5-watt dissipation will fit into the existing spaces. I recommend that all four units be replaced if any of them need it, that only teflon sleeving be used to insulate the leads, and that careful lead dress be observed to prevent any short circuits in the future. Careful study of the schematic and cabling diagrams will reveal ways to measure all eight of these resistors without dismounting any modules from the radio.

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Date: Mon, 15 May 2000 11:19:18 -0500  
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>  
Subject: [R-390] Nice find

Recently, a neighbor of mine gave me some older Collins aircraft comm equipment (tube-type, of course). While I don't care to restore these, there are some nice finds in them, particularly, some black tube shields. I know we've discussed tube shields to death, but I did find these somewhat interesting: there are Collins shields (Collins is stamped on the top edge). I didn't know Collins made any of these. Anyone seen any of them before?

These shields are the "good" kind that have the ribbed "fingers" that contact the glass and transfer the heat to the shield. Another thing I found is the tube sockets themselves have fins that contact the tube as well, transferring the heat

from the bottom of the tube to the shield. I have one on the PTO where I figure it's needed the most, but haven't installed any of the rest of them yet.

Are these shields "@@@RARE@@@"? Can I start making retirement plans?? ;)

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Date: Mon, 15 May 2000 13:02:33 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Nice find

Collins had developed these shields back in the late 50's, I think. One of their product catalogs I have from back then explains the construction and materials used. I guess the biggest discussion over shields has been whether they were actually meant to shield at all, or just meant more as a device to hold the tubes in place in a hostile environment. IERC came out with what are probably the best shields available later on.

I did notice one shield in my R-388 has the sides cut away, apparently to let the heat escape? I've seen this in other similar receivers, too.

Whether these shields could be considered 'rare' or not is open for debate. Collins used them in a lot of their military and avionics gear after developing them. There must be millions of them out there, it's just a matter of locating them. And yes - you need those little fingers in the bottom of the socket because a lot of heat builds up there which can cause failure through loss of vacuum if the tube exceeds its limit around those pins.

While I'm sure some tubes do need shielding, I doubt the majority do, and perhaps leaving the shields off is the best choice. Someone mentioned seeing some test results comparing different shields as well as the bare, unshielded envelope. This would make for interesting reading. We do need to consider how best to preserve and extend tube life, afterall.

I'm still trying to locate more IERC shields myself, occasionally I find the black Collins type as well. I'd say hang onto them, you never know when they'll come in handy - but I wouldn't plan a trip to the Bahamas based on selling them.

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Date: Mon, 15 May 2000 12:21:42 -0500  
From: "Jon & Valerie Oldenburg" <jonandvalerieoldenburg@worldnet.att.net>  
Subject: Re: [R-390] Nice find

A list member posted a report on this late last year which found tube life improved with the black IREC shields. Don't have it handy but it could be found in the list archives. Jon KB9VFD

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Date: Mon, 15 May 2000 17:36:05 EDT  
From: Llgpt@aol.com  
Subject: Re: [R-390] Nice find

<<Someone mentioned seeing some test results comparing different shields as well as the bare, unshielded envelope. This would make for interesting reading. We do need to consider how best to preserve and extend tube life, afterall.>>

Bill Kleronomos wrote an excellent article in ER several years ago, I'll look it up and let you know which issue it was in.

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Date: Mon, 15 May 2000 18:00:13 EDT  
From: Llgpt@aol.com  
Subject: Re: [R-390] Nice find

An article written by Bill Kleronomos KD0HG appeared in Electric Radio Magazine, Number 66 October 1994. It is titled Electron Tube Survival Primer. Bill covered everything from tube life vs envelope temperature, using shiny tube shields, ierc shields, no shields, black JAN shields and black JAN shields with windows. Also covered tube life vs heater voltage. A very extensive well written article. And well worth reading.

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Date: Mon, 15 May 2000 19:08:06 EDT  
From: DCrespy@aol.com  
Subject: re: [R-390] Nice find

Collins (and others) used them. They are used in the KWM-2 transceivers and others. I find them as often at the swaps as the IERC shields. My last 3 or 4 came from another brand (non-Collins) tube type aircraft radio. Obviously, when you find the shield alone, the corrugated insert is normally inside the shield but the corrugated socket insert is long gone. So I'd hold on to those!

Harry KG5LO Saline MI

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Date: Mon, 15 May 2000 19:11:13 +0000  
From: "B.L.Williams" <B.L.WILLIAMS@prodigy.net>  
Subject: Re: [R-390] Nice find

This was a long discussion a while back. There are three types of black shields that I know of:

- The plain black ones that slip over the tubes
- The ones with 4 or 5 fingers only
- The IERC ones with many, many little fingers

The IERC ones are best for dissipating heat. The other types make the tubes run hotter than without shields. Chuck Rippel has a list of tubes that should be shielded. I don't think he has all the reasons posted on the site, but he wrote a pretty good list of reasons for each tube selected. He may have used just the manuals, but I'm not sure anymore. It was several years ago when he wrote about it. I think AES has IERC shields for around 1 or 1.5 bucks. If not them, then it was Fair who listed them in a flyer.

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Date: Mon, 15 May 2000 20:37:49 EDT  
From: Llgpt@aol.com  
Subject: Re: [R-390] Nice find

ER No. 66 October, 1994 Electron Tube Survival Primer written by Bill Kleronomos KD0HG. This is the best article written on the subject of tube shields. Covers test of shiny shields, black JAN shields, black JAN shields with windows, bare tubes and IERC T6-1025H cooler tube shields. Also covered, tube life vs heater voltage..tube life vs envelope temperature. As usual, Bill has written an extensive article covering this subject.

Les Locklear

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Date: Mon, 15 May 2000 21:24:02 -0500  
From: "Jon & Valerie Oldenburg" <jonandvalerieoldenburg@worldnet.att.net>  
Subject: Re: [R-390] Nice find

Heres the Info from Nolan last fall;

Date: Sat, 27 Nov 1999  
Subject: Re: [R-390] Tube cooling, life and shields

>5654/6AK5W, 200 tube random lots  
>The 80% survival of this type was  
>750 hours @ 192 C  
>1500 hours @ 125 C  
>2000 hours @ 100 C

Interesting. Now I know why the 5654's in the R390A's go flat as fast as they do. It appears that they aren't a "longlife" tube. Fortunately they'll still work well even when they get weak.

>6005/6AQ5W  
>Over 95% of the 6AQ5 survived 5000 hours of operation  
>at an envelope temperature of 220 C, but at only 17 degrees  
>hotter fewer than 70% survived even 2500 hours.

That's pretty interesting. I'd have never thought that that particular number would have lasted that long in the tests. Thjey run very hot. Come to think of it, the 6AQ5 is basically a 6V6 in a smaller package if I remember right.

>>220 C inside a shiny JAN tube shield  
>190 C inside a black anodized JAN tube shield  
>165 C inside a black JAN shield with ventilation slots  
>150 C bare bulb, no shield  
> 82 C inside an IERC T6-1025H shield/cooler

Wow! I'd have never believed that there would have been that much of a

difference in the temperature. There might be a five or six or more times difference in tube life between the old shiny shields and the IERC's.

- >The results of these life tests indicate a bare bulb is the way
- >to go for reliability's sake, unless one uses the IERC coolers.
- >Of course, electrical considerations often mandate
- >the electrical isolation of a shield.

Agreed. It appears that this information must have been pretty well circulated at the time and it's results considered in a favorable way. Just two years after it was originally published, in the 1956 manual for the R390A, they recommended removing the shields in the R390A on a number of the tubes to improve cooling of the tubes.

- >I once read a reference that around 1960, the shiny tube
- >shields were removed from the military's QPL listings as a
- >consequence of these earlier studies. This does not agree
- >with my observation that many pieces of military gear from
- >around that time are full of the shiny type of shields, so I don't
- >know if this is really true.

I've also seen lots of gear that was built well into the mid 1960's that still had the shiny shields. Plus a bunch of depot refurb'd gear that still used them. I have seen a number of the shiny shields that had the black heat conductive inserts in them, too. Well, after all, it was the Govt. <grin> I guess that the right hand and the left hand weren't always in sync. ;-) I appreciate you posting the information Bill. Was there any information on voltage regulator tubes and/or rectifiers in the original article?

thanks,  
nolan

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Date: Sun, 23 Jul 2000 23:00:17 -0700  
From: Raymond Cote <rjcote@hawaii.rr.com>  
Subject: [R-390] FS: cool off that BA heat furnace??

My last posting was for coiled mic cords that I found at a going-out-of-business-sale. I also found some fans to cool off that BA. I tried one on my R-390a power supply tubes and also on the top of the audio/RF section. It did not make the radio work better, but coupled with the correct tube shields and a good air flow, my tubes should last longer than I do. With that in mind your BA gear should get added air flow with these small fans made by POMOTOR. They are 115VAC, 50/60hz. 4 inches square and will work anywhere. I have 10 and will sell them for \$6 each plus \$3.20 S & H each as they weigh about 1 pound apiece.

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Date: Wed, 18 Oct 2000 18:17:18 -0400  
From: Rod Murray <dw130@mediaone.net>  
Subject: [R-390] Tube Shields



I have a Collins R-390A and was looking for some insight on tube shields. In my surfings I have read recommendations for IERC black tube shields but these seem to be a little hard to find. Are they really that much better than the chrome shields? I have also seen IERC tube shields that are not actually black but rather a purpleish color. Are these any good? I would imagine that certain tubes such as the 26Z5's get hotter than others. Would it be more important to have the black shields on tubes such as this? Any thoughts would be appreciated.

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Date: Wed, 18 Oct 2000 18:49:36 -0400  
From: "Ed Tanton" <n4xy@att.net>  
Subject: RE: [R-390] Tube Shields

Yes Rod. IERC shields are THE ones... with any black shield next.

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Date: Thu, 19 Oct 2000 18:10:20 -0500  
From: "Spencer Petri" <wa5jci@flash.net>  
Subject: Re: [R-390] Tube Shields

I spray paint my plated tube shields with high temp flat black paint. Works pretty good.

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Date: Wed, 18 Oct 2000 20:27:19 -0400  
From: "Phil (VA3UX)" <phil@vaxxine.com>  
Subject: [R-390] Tube Shields ??

Alright. I've had enough. I figured if I read enough of these posts about different tube shields that I'd figure out what's going on with them. But, I haven't figured out anything. To me a tube shield is a tube shield. SO, what's the big deal with these IERC shields ? What does IERC stand for ? What distinguishes them from any of the other tube shields ? What tubes in the R390A should have IERC shields and which ones shouldn't and why ? I've only had a 390A for 16 years. You expect me to know everything.

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Date: Wed, 18 Oct 2000 20:50:16 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Tube Shields

Yes, the IERC shields are the way to go, without a doubt. The shiny ones are more like tube 'holders', and actually reflect heat back into the tube and cause temps to rise higher than with no 'shield' at all.

This is an issue we've been through many, many times on here, so you might find a lot of info in the archives. Personally, I like it each time this and other 'familiar' threads resurface, seems I learn something new each time.

There are a couple of other sources for info: once is Chuck Ripple's R-390 page (sorry, I don't have the address handy) in which he gives the different sizes of

the IERC shields and which tubes they fit, as well as explaining which tubes actually require a shield.

There is also a test report of sorts done by Bill Klernomos(sp?) if I remember correctly, which compares the different temps measured on the tube envelopes and which shields worked best at dissipating it.

I know the IERC's are best, followed by either the Collins black shields or the WPM's, can't recall which. The main thing to make sure of is that the inner 'fingers' are present in these shields, as without it they are basically useless. These fingers are a wrap around device which contacts both the tube itself and the inside of the shield, allowing heat to transfer between the two and air to circulate within as well.

If you're in a pinch and \*must\* use a shiny shield, at least spray the inside with flat black paint - this will prevent some of the heat from being reflected back into the tube.

Oh, the purplish IERCs are fine, probably just a difference in the manufacturing process later on.

Hope this is of some help - I'm sure others can(and will) add a whole lot more detail for you. I just know some of the basics. ;)

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Date: Wed, 18 Oct 2000 18:52:11 -0600  
From: Jordan Arndt <jordana@nucleus.com>  
Subject: Re: [R-390] Tube Shields ??

Here is a Re-post on the IERC tube shields.... I hope the list management doesn't mind.... 73 de Jordan....

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Date: Thu, 25 Nov 1999 18:38:02 -0700  
From: "Bill, KD0HG" <klerosb@frii.com>  
Subject: [R-390] Tube cooling, life and shields

I've received several inquiries regarding my post here concerning IERC tube shields and in response, here's a quick elaboration. In ER #66 for October, '94, I described the results of a 1954 ARINC [Aeronautical Radio, Inc] and GE tube life studies that were done using over 150,000 tubes of 20 different types. I provided summaries and graphs of tube life vs. envelope temperature for several representative tube types- here are a couple:

5654/6AK5W, 200 tube random lots

The 80% survival of this type was  
750 hours @ 192 C  
1500 hours @ 125 C

2000 hours @ 100 C

6005/6AQ5W

Over 95% of the 6AQ5 survived 5000 hours of operation at an envelope temperature of 220 C, but at only 17 degrees hotter fewer than 70% survived even 2500 hours.

Another chart in the article shows the measured envelope temperature of a 12BY7A dissipating 10 watts [including heater]. Under still air conditions, at room temperature, worst to best,

>220 C inside a shiny JAN tube shield  
190 C inside a black anodized JAN tube shield  
165 C inside a black JAN shield with ventilation slots  
150 C bare bulb, no shield  
82 C inside an IERC T6-1025H shield/cooler  
+++++

The results of these life tests indicate a bare bulb is the way to go for reliability's sake, unless one uses the IERC coolers. Of course, electrical considerations often mandate the electrical isolation of a shield. I once read a reference that around 1960, the shiny tube shields were removed from the military's QPL listings as a consequence of these earlier studies. This does not agree with my observation that many pieces of military gear from around that time are full of the shiny type of shields, so I don't know if this is really true. As of the article's press date in '94, IERC was still in business and making tube shields and coolers. I don't know about today.

IERC  
135 W. Magnolia Blvd.  
Burbank, CA 91507

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Date: Wed, 18 Oct 2000 21:31:31 -0400 (EDT)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] Tube Shields

Any hue of IERC tube shield is fine as long as the heat dissipating insert isn't missing. What's so good about IERC's is that they carry heat off the tube better than any other make. There are other makes that come close, but IERC made more of them.

WPM is another make with the heat dissipating insert, not as sturdy, but they're OK. I take a taper reamer to them to curl the top down into the shell so as to enlarge the opening. Idea is to increase heat convection out of the tube.

The shiny variety sometimes come with heat dissipating inserts but they are not as efficient. To improve them, take out the insert, use masking tape, and spray

flat black paint inside the shield. If the insert also is shiny, paint it separately. Any good quality spray paint is OK --Krylon, Rustoleum-- just make sure it's flat black and not glossy or even matte.

Avoid shiny tube shields that come without inserts. They make tubes run hotter which defeats heat dissipation. I'm not sure the R-390\* tubes (with the exception of the oscillator tubes including PTO) need electromagnetic shielding as such. I use IERC tube shields primarily for extending tube life. Yes, if you have limited numbers of shields, use them on the hottest running tubes first such as the 26Z5W's and the other tubes under the receiver.

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Date: Wed, 18 Oct 2000 21:37:42 -0400 (EDT)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] Tube Shields ??

IERC are still in business, but I believe our beloved tube shields are out of production. Nowadays they make mostly heat sinks for things like CPU chips. :-  
( Someone on the list wrote IERC and, I think, got a reply to the effect that a huge order would have to be placed.

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Date: Wed, 18 Oct 2000 20:19:02 -0700  
From: Ed Zeranski <ezeran@concentric.net>  
Subject: Re: [R-390] Tube Shields ??

Ok, the IERC shields were designed as heat radiators while the regular JAN units shielded the tube but were a close at hand heat sink rather than a radiator. I'll have to dig through older, '60s, advertising and product data to get a bibliography of the data. It does exist. From what I read there was a lot of study at the time on extending tube life. Can't remember what IERC stood for but am damn sure I can dig it out of old QST, IRE Proceedings, etc. If you have access to old QSTs from the '60s check out the ads...IERC 'be' there.

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Date: Thu, 19 Oct 2000 00:38:30 -0400  
From: twleiper@juno.com  
Subject: Re: [R-390] Tube Shields... Who needs them??

You want to talk about a unit you can broil a steak on, try either my CV-116 or CV-157 converters. The CV-116 has about fifty tubes in less than two square feet of area. Even a CV-591 will get hotter than one would think is possible, or even logical. Like all the stuff in the racks, I pop off all covers and shields. An old 8K BTU air conditioner has been modified (front panel discarded and replaced with "improved" version that interfaces to 10" flexible duct for inlet and outlet. These ducts go to the top of the two rack cabinets, which are bolted together but communicate freely between them in the bottom three feet.

So the cold air comes in the top of the left cabinet goes down, over and up out the right cabinet and back to the AC. A few other well placed muffin fans within the cabinets assure good cooling of hot spots, such as the converters. In the

winter when the RH is low, I open the "vent" on the AC and that is enough to keep things cool but still retain enough heat to keep the shack warm. If I need to warm up quickly, I fire up the T-3 and pound it into a 1KW Bird dummy load for ten minutes. It's so much fun doing things the hard way.

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Date: Wed, 18 Oct 2000 22:04:13 -0700  
From: "Wayne Rothermich" <rother@impulse.net>  
Subject: Re: [R-390] Tube Shields ??

IERC stands for International Electronic Research Corporation. They're still around, are now a division of CTS Corporation, and are located in Burbank, California. [www.ctscorp.com/ierc/](http://www.ctscorp.com/ierc/)

I wonder if they still make vacuum tube shields (and what they cost if they do).

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Date: Thu, 19 Oct 2000 08:16:05 -0400  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Tube Shields ??

One of these days, we ought to pull together all of the tube shield intelligence into one FAQ -- maybe put it in the Y2K manual, among other places.

Aside from electrical shielding, the main purpose of the original bayonet mount, shiney shields with the spring on top was to keep the tubes in their sockets, both during shipment and when the 16 inch guns were firing. If you're not in the habit of running off a few salvos, then ...

There are several different styles of the IERC's. Probably the nicest looking are the ones made of seamless aluminum tubing with a narrow formed edge at the top and the "fingerstock" type insert. The inside bottom surfaces are usually machined and shiny to make good thermal contact with the socket base. But, I've seen some that are formed of rolled and staked aluminum sheet. Usually these don't have a formed or rolled top edge, but just a few tabs to hold the insert in place. Quite a few IERC's have the flat hex or five sided insert in common with the WPM's.

There are also a few open style IERC shields that favor ventilation over electrical shielding. I believe most, if not all, have a different style mount.

Jordan just reposted something from Bill K. about life expectancies of tubes at different temperatures. There was another post in the archives about the temperatures of some tubes with the various types of shields as well as no shields.

More recently there was a thread about the composition of the inserts - a beryllium alloy. Upshot of that was difficult to find and bad to eat.

But let me ask y'all this (just back from N'Orlins): If water cooled is better for 30

cal machine guns (as clearly demonstrated on the History Channel), then ....?

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Date: Thu, 19 Oct 2000 09:06:28 -0400  
From: rbussier@lexmark.com  
Subject: Re: [R-390] Tube Shields

Same here, but don't forget to paint the inside too!!.

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Date: Thu, 19 Oct 2000 09:25:50 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] Tube Shields ??

THANKS for reposting real numers. IERC was still in business ..... They are in business. I can't tell if they still make tube shields: <http://www.ctscorp.com/ierc/index.html>

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Date: Thu, 19 Oct 2000 10:17:38 -0400  
From: "AI2Q Alex" <ai2q@ispchannel.com>  
Subject: RE: [R-390] Tube Shields ??

With the ongoing discussion of IERC shields, I thought I'd drop my two-cents worth in. I have a few of these black shields on an old homebrew W2JAV/ W0HZR RTTY TU I built many years ago. The ones I used back then (1960) were part of a mating tube socket. The shield is held down by a number of keys or tabs at the base.

These twist-lock into the mating socket assembly. So, if you place IERC shields on R-390A tubes, how are they retained (or are they designed as a retrofit that doesn't need socket retention)? It seems to me that using shields that simply sit on the tubes will help dissipate heat, but may not provide any electrical shielding. Also, for the purists among you, won't they look kinda weird in your R-390A?

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Date: Thu, 19 Oct 2000 09:56:47 -0500  
From: "David Wendt" <dwendt@electrocam.com>  
Subject: [R-390] tube shield treatment

I would be very very careful about doing the treatment mentioned below to tube shields. The plating is either zinc or cadmium. I am not sure which (both may have been used actually) and both are very unhealthy when vaporized. The zinc fumes will cause what was sometimes called "welders chills". It poisons the nervous system and was first noticed in people welding galvanized steel. I don't know the problems that the vaporized cadmium will cause, but it is not good. There are real public health reasons why cadmium is now only used on military stuff and even banned in Europe. Cadmium plating on steel is great stuff. It is 10

to 20 times more effective than zinc against rust and used to be used a lot. It is the health and environment hazards that keep it from being used now.

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Date: Thu, 19 Oct 2000 10:03:55 -0700  
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>  
Subject: RE: [R-390] Tube Shields N+1

The IERC shields used on the R390's have a bottom end that mates with the existing socket mount on the R390's. Some look like the bayonet twist lock of the stock shield. Some have a short split and a hole that slips over the lock dimples on the socket shield skirt. The slip on ones are best. The fingers inside make twisting to lock almost impossible. It seems to me that using shields that simply sit on the tubes will help dissipate heat, but may not provide any electrical shielding. This could be true. Also, for the purists among you, won't they look kinda weird in your R-390A? Yea and so does no ballast tube. and so does solid state 26Z5's. And so does micro dials. And so does black front panels. And so does blah blah blah. In our application tube shields should do two things for us. First and for most is move the heat away from the tubes. Cooler tubes are less noisy and longer lived. Second is provide isolation. If your receiver is enclosed in a cabinet or into a shielded operating room then the tube shield only serves to limit RF from other Radio circuits in the receiver or other circuits within the cabinet or room. Yes shields do help. The 6DC6, PTO, BFO, 6C4 mixers and 5654 (6AK5) crystal oscillators tubes should be covered in this order. In a small operation no cover is better than a bad cover. If you have good covers use them for longer tube life and less tube noise. Cover from the antenna to the audio as you can collect the shields.

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Date: Thu, 19 Oct 2000 12:23:43 -0600 (MDT)  
From: Richard Loken <richardlo@devax.admin.athabasca.ca>  
Subject: [R-390] heat conducting tube shields: a modest proposal

Regarding heat conducting tube shields. Some McIntosh tuners and receivers used black heat conducting tube shields. Picture this: we start buying Mac tuners and stripping out the 12AX7 Bugleboys and the tube shields and landfilling the carcasses. But yet: start a thread on wreck.audio.high-end.tube that the ham radio community is buying and stripping Mac tuners just so we can all watch the fireworks. Now don't get me wrong, I love McIntosh audio gear and would never do such a thing but it would be oh so poetic!

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Date: Thu, 19 Oct 2000 14:48:51 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Tube Shields ??

First, thanks for mentioning the tube 'holder' function, that was one of the points I thought of after posting last night. I'm not saying that this was the explicit decision behind making the shiny holders to start with, but it makes a lot more sense than any heat-dissipating function. As well, I'm sure they do shield out(or keep in) stray RF. As far as water-cooled, this has been around for many years in the broadcast industry for the 'big boys'. Not sure how practical or cost-

effective it would be on the scale we require, but it might be fun to try. ;) I do also recall seeing a posting where someone had actual temperatures of tube envelopes in all types of shields as well as naked. Maybe I'm wrong and it was just the data that Bill had forwarded previously. BTW, I went through my ER library last night and found volume #66 - it definitely makes for interesting reading. For those who do not subscribe to Electric Radio, I cannot stress enough what a fabulous magazine this is. The information is priceless, far more than you'll ever find in a library (probably due to the fact that most of this knowledge is still carried around in the minds of the contributors, not in print except in ER). I was a late-comer and ended up subscribing in the mid-90's, but I bought the 'box set' of back issues. I had a great time for months reading through them. As I said, a lot of useful information not just about specific radios/transmitters, but in general. And talk about R-39\*\* info.....! Other than being a VERY happy subscriber, I have no connection with ER - but I wish I did. ;)

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Date: Thu, 19 Oct 2000 15:00:30 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Tube Shields ??

They not only should have a base, but the correct bases had these little strips of finger-like material in them as well, to conduct heat away from the tube bases and pins. Try finding those if you really want to have fun. ;) The IERCs just clip down over the bases of the old twist-lock types. I have no doubt the IERC shields will have some heat-sinking effect even on tubes without a base socket - however, I'm not sure just how well or how much. The article that Bill sent to ER in '94 makes mention of this as well. As far as how they look inside of an R-390? Well, the one's I've seen look pretty nice. With those gray transformers, aluminum covers, alodined (anodized?) parts and such, the IERCs look very....industrial and tuff. ;) Even my SX-115, which had all of the gold-colored shields to match the chassis (that 'a' word again) looks great with 'em. I feel a lot better having them in there, too.

The best part is, this is one 'mod' that not only works, but is VERY easily reversed, should you ever wish to display your rig as 'authentic' with the shiny shields (holders). No soldering required.

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Date: Thu, 19 Oct 2000 14:24:03 -0500  
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>  
Subject: RE: [R-390] Tube Shields ??

I found some of those little strips of finger-like material in some old Collins aircraft radios someone gave me. Those things do a terrific job of wicking the heat to the chassis. On the tubes I have those installed in (I didn't have enough for all the tubes), I can grab the tubes with my bare fingers after they've sufficiently warmed up. If I try that on the same tubes without the fingers, they're almost too hot to handle, scientific proof positive that they work. ;) The combination of IERC or WPM shields with fingers and these little strips are very effective.



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Date: Thu, 19 Oct 2000 14:44:04 -0500  
From: "Terry O'Laughlin" <terryo@wort-fm.terracom.net>  
Subject: [R-390] heat conducting tube shields

I have seen several varieties of heat conducting tube shields in addition to the IERC. On Fender guitar amps, I have seen heat sink tube shields that were a coreless toroid of brass spring wire. Difficult to describe, but a simple concept.

The tube went in the open center and the loops of wire carried the heat out. On some military gear I have seen round finned aluminum extrusions that were slotted down one side and slipped down over the tubes. I saw a few on 9 pin tubes and I have many from nuvitors. I would not have imagine you could do this to a glass tube without cracking it, but they apparently worked.

I have also seen (once) a copper sleeve with fins sweated around the outside that was held over the tube with springs.

They were sprayed matte black and were ugly as homemade sin but they worked well on the 6CA7/EL-34 with their tubular shape.

I also purchased 7 military pressurized 225-400 MHz AM transmitters that had a modulator with P-P 2E26s in a nifty cast aluminum heat sink that also bolted down to the chassis as a retainer and transmitted the heat to a heat exchanger in the base of the radio. (to get heat out of a completely air tight box).

Lurking, out there, are other unknown designs...

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Date: Sat, 21 Oct 2000 10:56:32 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Tube Shields... Who needs them??

>You want to talk about a unit you can broil a steak on, try either  
>my CV-116 or CV-157 converters. The CV-116 has about fifty  
>tubes in less than two square feet of area.

Been there and done that. Even with its cooling fan the CV-116 ran very very hot. I guess the fact that it needed five rectifier tubes should have clued me in. <grin> They were cramped and tedious to work on, too. I retired and scrapped the last one a year or two ago. All of the ones I've had all had blacked tube shields. I don't think that they were the type with inserts, just black paint.

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Date: Sat, 21 Oct 2000 11:39:13 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: [R-390] water cooled tubes/tube shields

Realistically, water cooling something like a single straight walled 5749/6BA6W wouldn't be that much of a problem. You could build the fitting easy enough. A

piece of copper or brass thin wall rigid tubing that fit loosely around the tube would be the basis. Cap one end and add a 1/16" nipple made out of brass tubing to the center. Add another one maybe a third of the way up from the large opening. Slip it over the tube and add a bead of silicon. If the wall thickness of the tubing was sufficient you could machine a groove and use an o ring instead along with a stop. Don't forget that the inlet and outlet of each of these would be opposite for the tubes located on the underside of the R-390A.

I'd use distilled water to kill the chance of shorts in the event of a leak. It'd be an evil sombitch to do the plumbing in something like an R-390A though.

In addition to the cramped area to work in, you'd probably want to plumb them in series/parallel to keep the last tube in line from running hotter than the others. With the small diameter of the cooling coils and the length of the interconnecting tubing, I don't think that I'd rely on a thermosyphon system. You'd have to use a pump.

An easier solution might be to use the IERC fingered shields as the basis. Simply tightly wrap the outside of each shield with however many turns of thin walled copper or brass tubing. Then secure the tubing to the shield with one of the heat conductive epoxies that's loaded with metal particles and then interconnect all of the shields with clear plastic tubing.

If you could manage bending aluminum tubing to such a small radius, it could be tig welded to the shield about every eighth turn and then you could skip the epoxy. Come to think of it, you could probably acetylene weld the copper tubing to the aluminum tube shield using a zinc filler rod. They work pretty well for aluminum and should adhere to copper well too.

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Date: Sat, 21 Oct 2000 11:52:16 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Tube Shields ??

They were used on some tubes in the T-195's. I have them installed in a few of the tube sockets in my EAC. Namely, the PTO tube, the 3TF7, and the 26Z5W's and a few others that I don't remember. I wish I had more of them.

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Date: Sat, 21 Oct 2000 11:56:06 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: RE: [R-390] Tube Shields ??

>I found some of those little strips of finger-like material .....

Yep, they do. They came in two lengths. One for the 7 pin tubes and one for the 9 pin tubes. I'd love to find a roll of the stuff some- where. Come to think of it, have you seen any rf shielding type finger stock where the finders run long ways like the inserts?     nolan

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Date: Sat, 21 Oct 2000 12:00:28 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] heat conducting tube shields

At 02:44 PM 10/19/00 -0500, you wrote:

>.....round finned aluminum extrusions that were slotted down one side and slipped down over the tubes. I saw a few on 9 pin tubes and I have many from nuvitors.

Some of the slip on transistor heat sinks will fit the nuvitors. I like the extruded ones made like a closed "C". One of the fellas here in the list turned me onto that a couple of years ago.

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Date: Sat, 21 Oct 2000 12:55:57 -0400  
From: Rod Murray <dw130@mediaone.net>  
Subject: Re: [R-390] Tube Shields ??

\$urplus \$ales of Nebraska has them for about \$5 each!

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Date: Sat, 21 Oct 2000 12:05:56 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] heat conducting tube shields: a modest proposal

A while back over the period of a few weeks I watched several old 5xx series Tek scopes auctioned off on Ebay that were ALL missing ALL of the tubes except the CRT's. I never thought to check the other auctions the guy was doing to see if he was listing the tubes. ;-( About the only thing the Tek's would be good for it parts with all of the tubes missing. Having to re calibrate the beast wouldn't be that much of a problem. Digging up 50 to 100 low noise tubes would be. Not to mention the matched pairs. ;-( Bummer, huh?

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Date: Sat, 21 Oct 2000 12:10:47 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Tube Shields ??

This is something we could all benefit from, and by the looks of the ones I have here, they should be easy to make, provided you could find the proper material. All mine are is a strip of springy aluminum or other light metal, perhaps alodined (maybe not necessary?), with little blocks stamped out on 3 of 4 sides, the last acting as a hinge of sorts to hold it onto the strip, while also pushing it out to contact the base. There must be a way to get ahold of this stuff...stamp out a 100' reel and then just shear it length. We must have some machinist-types with access to the materials. I'll by a chunk, I promise...

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Date: Sat, 21 Oct 2000 13:46:04 -0400

From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Tube Shields ??

If what you're referring to is the insert in the IERC shields or bases, I believe someone on the list determined that the metal is some kind of beryllium alloy. Another list member mentioned that IERC would have to have a pretty big order to do a production run of shields, but maybe they can crank out some inserts. The ones it sounds like your describing are basically a perforated piece of thin flexible metal just rolled up and stuffed into the shields -- as distinct from the five sided ones without stamped "fingers". Thread left off that, along with meter needles and scales, tranformer bug juice and cadmium oxide corrosion, you shouldn't eat your tube shields due to the highly poisonous nature of the beryllium. Also not a good idea to sand or grind the things.

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Date: Sat, 21 Oct 2000 14:19:48 -0400  
From: "Mike Feher" <n4fs@monmouth.com>  
Subject: Re: [R-390] heat conducting tube shields: a modest proposal

I have several of the large variety Tek (5XX) scopes in my 2000 sq. feet basement. I am able barely move around in the basement now as it is a true obstacle course made up of radios and test gear. I just got rid of about 40 pieces of Hallicrafters stuff including about 12 SX-28 types and you cannot even tell the difference. What do you recommend I do with the scopes? No way am I putting them on ebay or taking them to a hamfest, too big and heavy and relatively worthless except as for heaters in the winter. I am sentimental as well as I used these types exclusively in the 60's. I would give them away if some one came to get them. Barring that, I am going to wind up stripping them and trashing the carcass. I have about 150,000 tubes but I guess I could pull those if they have value. That is, unless you have something better to suggest. I hate to do it but I am hurting for space. And, of course, I cannot store them in my 2 car garage either as we have not had any cars in there in about 8 years. 73

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Date: Sat, 21 Oct 2000 14:32:21 EDT  
From: Llgpt@aol.com  
Subject: [R-390] IERC Tube Shields, prices and availability

A few years ago, Rick Mish of Miltronix contacted IERC in Burbank, California regarding a large purchase of the IERC tube shields. He was given an exorbitant price for start up costs etc. In the end, the price for each tube shield would have been \$ 8.50 ea. !!!!!!!! Rick had estimated that he would have to order somewhere in the neighborhood of 500,000 tube shields to get the price right.

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Date: Sat, 21 Oct 2000 13:47:46 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Tube Shields ??

I think that the ones I have are beryllium copper. Regular copper might work OK. It isn't nearly as springy though. ;-(

>There must be a way to get ahold of this stuff...stamp out a 100' reel.....

It could be sold in three foot lengths with just the cuts for the fingers. The end user could "cut it to fit" as far as the length is concerned and bend each of the fingers out. Ideas?

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Date: Sat, 21 Oct 2000 15:50:24 -0400  
From: "Wm. L. Townsend" <wlt@tesnet.com>  
Subject: Re: [R-390] Tube Shields ??

How about brass shim stock? It's fairly springy if it's thick enough and I think you can get it in rolls - at least, you can get it in fairly large sheets and it's cheap and not too hard to cut. If brass won't work you could use stainless.

Its heat properties aren't as good as brass, but it probably would still work pretty well. Cutting it would be a little more difficult, but it's pretty springy in thin pieces. What's needed here is for somebody with a machine shop to make up a set of dies to punch out the little finger things.

Once that's done, you could crank the stuff out by the pound. Probably some money to be made there...

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Date: Sat, 21 Oct 2000 20:41:50 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Tube Shields ??

Actually, I recall the issue of IERC cranking up to produce shields again - such a shame, too. The pieces I was referring to are the small strips used in the actual base the holds the shield in place, these are small pieces just over 1/8 inch wide or so, with small, square, 'kick outs' stamped along them to contact the tube base and sink the heat away, as well as probably contributing to convection cooling. I would think these would be a whiz to make for someone familiar with the process and materials. These strips didn't look like the beryllium oxide sleeves used in the shields, more like an anodized strip of aluminum or such.

I just discovered them in the last year or so, make me wonder now how much junk I never checked before tossing, to see if these guys were hiding in the bases....ugh.

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Date: Thu, 26 Oct 2000 19:00:03 -0600  
From: Jordan Arndt <jordana@nucleus.com>  
Subject: Re: [R-390] yellow caps?

<snip> The IERC type finger tube base insert box reads:

10EP 48986  
Insert,Shield,Electron Tube  
U/W JAN Type TS-102U01 electron tube shield ( no Collins Pt# )  
Patent 568170  
Qty. 10  
Method III  
Packed /19xx  
CD. 775338/0869/600-75-73-661DDP Serial 2-PE-8-869  
these measure 13/16" h x 2 7/16" l

The large shield for the removable shield reads:

10EP 48990 5960 00 519 6885 ( Collins Pt# ? )  
Insert,Shield,Electron Tube  
U/W JAN Type TS-103U02 electron tube shield  
Patent 568170  
Qty. 10  
Method III  
Packed /19xx  
CD. 775338/0869/600-75-73-661  
DDP Serial 2-PE-8-869 these measure 1 1/2" h x 2  
7/8" l

There is probably other sizes, but these are the type that I use when I don't use IERC or WPM type shields ( in other words almost never !!! ) If you find them grab them, cuz they ain't gonna get any easier to find...!!!

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Date: Wed, 17 Jan 2001 18:28:50 -0500  
From: Al Solway <beral@videotron.ca>  
Subject: [R-390] R-390A Is Fan Requir'd with Covers or Case

I would like to know if it is advisable to use a fan if the top and covers are installed or if the radio is installed in a case. If yes, would air have to be moved in the bottom area also. What type of fan.

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Date: Wed, 17 Jan 2001 19:10:14 EST  
From: Llgpt@aol.com  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

Having had R-390's and A's in various cabinets over the years, this is what I have found..... YMMV The CY-979 series cabinets seem to have the best convection capabilities...ie: the heat is drawn up through the bottom which has ventilation holes that are similar to the holes in the bottom dust covers. That coupled along with the top louvers the R-390's seem to be quite a bit cooler. I now have my current R-390A mounted in a Bud cabinet, with 10 louvers per side, non on top. But, i modified the bottom plate on the cabinet and used a Greenlee punch to knock out holes like the bottom dust covers. It now runs alot

cooler. I also have my R-390A and SP-600 mounted on ventilated shelving, so air can freely pass up through and around the chassis. These plastic shelves are available at Lowe's and Home Depot. I paid \$38.00 for mine, 6 ft. tall 18" deep shelves, 36" wide. Each shelf is rated at 250 lbs.

Les Locklear

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Date: Thu, 18 Jan 2001 08:39:18 -0500  
From: rbussier@lexmark.com  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

Al, I consider myself the 'fan man', as I make fan kits for Drakes, lcoms, etc. I even have one on my 75A-4. The purpose is to move the air around to minimize local hot spots. All my fans are mounted so no modifications are needed. Currently, I have 2 in my R-390A. They are just small, DC muffin fans that are run at a lower voltage. This way, they just draw 10 ma or so and although inaudable, move a lot of air.

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Date: Thu, 18 Jan 2001 10:09:34 -0500 (EST)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

A four inch muffin fan rated at 220 VAC run on 120 VAC should work fine. It still provides enough air movement with virtually no whoosh. Hamfests are a good source of fans. Before buying, test to see that 120 VAC will turn the fan. Some 220 VAC fans won't work that low. Remove the covers if you place the receiver in a case.

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Date: Thu, 18 Jan 2001 11:11:17 -0500  
From: "Ed Tanton" <n4xy@att.net>  
Subject: RE: [R-390] R-390A Is Fan Requir'd with Covers or Case

Having performed EXTENSIVE testing of air movement in a large closed cabinet; I can tell you that an internal fan, simply circulating the internal air of a cabinet, can be worth up to 10 Centigrade degrees lowering of all involved surfaces. My parameters included a metal (probably steel) cabinet the size of- perhaps-12 or 14 R-390s, with something on the order of several kW (measured very carefully) being inserted into the sealed cabinet in an insulated, sealed-off (no-air-movement) room. The results were very impressive as far as I was concerned. Simply moving the internal air around uses the cabinet/etc. (all the external and internal surfaces) as a heat sink; as the circulating internal air-effectively-attempts to equalize those temperatures. Anywhere, anytime, I'd advise adding an internal fan when you have concerns about any temperature concentrations.

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Date: Thu, 18 Jan 2001 10:22:29 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

>The CY-979 series cabinets seem to have the best convection  
>capabilities...ie: the heat is drawn up through the bottom which has  
>ventilation holes that are similar to the holes in the bottom dust covers.  
>That coupled along with the top louvers the R-390's seem to be quite a bit  
>cooler.

I never did like that model cabinet but have to agree that the CY-979 was probably the best as far as cooling. It'd be an evil SOB in a dusty environment though. I'm mainly into rack mounting with covers, but for an R-390A cabinet, I like the older desktop design one with the rounded side panels. It's got the door and latch in the top panel, but other than that, the top panel is unvented. I think it's the CY-917. The back is open and there are a good number of side louvers. About the only thing it's lacking is chrome. <grin>

Les, I can't help but wonder if the general concept that the R-390A is in need of extra cooling is really valid. Don't get me wrong, I realize that as the temperature goes down, component life goes up, but we're talking about a 75 pound object that only sucks up about 100 watts and has a pretty good bit of surface area. I doubt that the side panels on mine ever got more than 10 degrees or so above ambient.

Personally, I wouldn't put a fan in one on account of the dust that it puts all over everything. I'd guess that after short while, the dust would counteract any benefit of the extra air flow.

I think that there is a valid reason to add a small cooling fan in the R-390 non A for the two 6082's but really don't see the need in the R-390A. About the only "cooling" addition that I'd add to one would be IERC tube shields if it didn't already have them.

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Date: Thu, 18 Jan 2001 19:04:00 EST  
From: Llgpt@aol.com  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

You got that right....the screens would only keep the big critters out. My Bud cabinet is just like that, and allows easy access. ( to the top anyways) I totally agree, it is probably a subject of much less importance than we place on it, but it gives us a forum to show our knowledge or lack of it at times when the list is slow..<grin>.

I tried it once upon a time long ago, but gave it up because of the dust. Man, I used one on my Old R-390 when I had that. Once a year, the local Kiwanis Club would borrow it to cook pancakes on....<grin> Those old 6082's run hotter than a firecracker. All of you R-390A owners pay attention..it is a VERY GOOD idea to replace, or at least inspect very closely the caps and resistors in the Power Supply area/audio deck of the R-390 ( non A ) You will almost always find they have been cooked to death.



>About the only "cooling" addition that I'd add to one would  
>be IERC tube shields if it didn't already have them.

Quite true, and if you don't own IERC shields, remove them (the shiny ones that is ).

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Date: Thu, 18 Jan 2001 20:44:59 -0500  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

True -- the downside of a fan is the dust it can pull or push in. But what can help that is some AC filter foam -- the gray stuff that sells for about a buck apiece for a big sheet. It keeps out most of the dust without impeding airflow significantly. You can put it up with some double stick tape or velcro either on the muffin fan if it's set up to blow in or on the vent if it's drawing air out. Just vacuum or pull it off and run the tap through it, squeez like a sponge to dry. I suppose if you're really fussy, you could use a HEPA filter -- with a much more powerful and noisy blower. Then the radio would be microbe and pollen-free. More practical, though, is one of those Honeywell or similar air filters in the room. They do cut down dust quite a bit, but don't use the ionizer if it has one. Not really as healthy as they make out, for you or your equipment. It tends to cause airborne stuff to settle and cling to surfaces. With a fair amount aof electronic equipment in a room -- laser printers, HV supplies, copiers, monitors, etc. there's usually plenty of ozone to begin with. Raise the level enough and you might get a nosebleed, or maybe a chronic sore throat.

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Date: Thu, 18 Jan 2001 22:32:14 -0800  
From: Robert Tetrault <tetrault@teleport.com>  
Subject: Re: [R-390] R-390A Is Fan Requir'd with Covers or Case

Dust is bad, I agree. Let the little 'muff' suck through an electrostatic filter...or forget it. I cleaned that gear train so you could do surgery on it... They don't get THAT warm. The A's, mind you...

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Date: Fri, 19 Jan 2001 19:14:12 +0100  
From: Kurt Brandstetter <kurt.brandstetter@teleweb.at>  
Subject: [R-390] IERC tube shields - Additional question

I use IERC tube shields for all tubes in my R-390A, but not for the 3TF7. This tube I use without a tube shield. Is this ok or should I also use an IERC tube shield for the 3TF7 ? I have one in my box. Please give me a short info !

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Date: Fri, 19 Jan 2001 13:23:59 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

The 3TF7 only needs a tube shield in battleship service. Then only to hold the tubes in the socket when the big guns are fired. Perhaps in mobile van service,

but rarely in domestic residential service unless directly over an active earthquake fault, and then tube shields may not prevent the falling structure from crushing tube and tube shield.

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Date: Fri, 19 Jan 2001 13:51:10 -0800  
From: jan@skirrow.org  
Subject: Re: [R-390] IERC tube shields - Additional question

Perhaps. But this is the one tube in the R-390A that I'd be inclined to put a decent shield on. Reason? It sticks up a long way, is fragile and made of pure unobtainium, and it attracts stray screwdrivers, pliers and the techies hands. You can always take the shield off when you're finished working on the radio - and then drop a screwdriver down inside, smashing your 3TF7 (last one of course) as you juggle the R-390A with one hand and a knee - trying to get it back into the rack. If it's not in a rack, and has no covers - leave the shield in place. Of course - in an earthquake the 3TF7 will be the last thing you'll be worried about ;:>)

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Date: Fri, 19 Jan 2001 21:48:42 -0000  
From: "Fraser Bonnett" <fraserb5@home.com>  
Subject: [R-390] Tube Shields?

With all this talk about IERC tube shields ... just what is the purpose of a tube shield?

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Date: Fri, 19 Jan 2001 16:52:11 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] IERC tube shields - Additional question

I'm not so sure the IERC shields were even meant to hold the tubes in, they have split sides which open to a small hole where the dimples are located on the side of the tube shield base. A shock strong enough to dislodge a tube would most likely remove the IERC shield as well. The older 'shiny' shields had a bayonet mount which would be much more secure. My guess is that the IERC types were more intended for heat dissipation, perhaps RF shielding as well. My approach is more one of using a shield if there was a shield, but only to aid in removing heat from the envelope. Of course, some tubes also require RF shielding, a side benefit of the IERC shields. I'm still trying to find the taller IERC 5025 and 6025 sizes, is there a source for these out there?

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Date: Fri, 19 Jan 2001 16:45:47 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

Good point. I was thinking only of the need for electrical shielding. I find racking heavy gear is far easier when there's support rails for the chassis, or when I insert the bottom two panel screws from the back and put flat washers and nuts

on the front. Chrome plated acorn nuts look nice. There's been discussion here about how hanging a 390(a) by the panel alone upsets shaft alignments also, that because of that it should be supported by rails or a shelf (though the shelf impedes cooling).

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Date: Fri, 19 Jan 2001 16:45:50 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

There is some latching to the slotted IERC tube shields. Though they might not hold as snugly as the bayonet ovens. I recall the IERC a pain to remove so they can hold fairly well.

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Date: Fri, 19 Jan 2001 17:00:11 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] Tube Shields?

Two major functions. Help hold the tube in the socket, and then to provide a barrier to unwanted electrostatic field coupling in and out of the tubes. Some small RF tubes (like the 6BA6) have internal shielding around the works, but still the ends of the tube elements are exposed above and below the shield along with the leads to the base. Shielded tube sockets hide those exposed base leads from their neighbors. When you have gain stages, the phase is inverted in each stage, so the output of the second stage is IN PHASE with the input to the first stage and stray coupling from poor layout or inadequately shielded tubes is ripe for oscillation. In phase is crucial. The IERC tube shields also help cool the tube by contacting the glass with black phosphor bronze fingers that cool the glass by contact and since they are black by accepting heat radiated from the tubes. Shiny tube shields with a bayonet lock do hold the tubes in, and do the electrostatic shielding, but tend to reflect radiated heat back to the tubes, causing shortened tube lifetimes. Secondly the tube shields can protect the tubes from falling tools, heavy handed technicians, and flying debris as Jan pointed out.

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Date: Fri, 19 Jan 2001 19:00:25 -0500  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] IERC tube shields - Additional question

There are good heat dissipating non-IERC shields -- black bayonet types with the magic corrugated heat sinks in them. Some are shiny, but the heat sinks are flat black. So, if you're concerned about earthquakes, there ya' go. Actually, to protect against earthquake damage and injury, what you need is about 120 running feet of sturdy rack cabinets filled to the brim with R-390x's and SSB converters, etc. with extra bracing at the backs. Arrange in a rectangle with about 8 foot square space in the middle and a small opening to walk in. Run a dozen and a half two by sixes over the top and secure. In the event of an earthquake, dive into shack and hold onto the rack handles really tight. Tornado

protection would require a welded I-beam and football uniform upgrade, available at additional cost.

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Date: Fri, 19 Jan 2001 21:55:38 -0500  
From: Al Solway <beral@videotron.ca>  
Subject: Re: [R-390] IERC tube shields - Additional question

Back in the early 60s I was a Canadian Airfare Radar Tech working on long range search radar. Tube shields especially those black little @\$%& were a pain in the butt. Imagine an equipment rack with say one of the 30Mhz IF strips giving poor MDS. The usual fix was to start replacing tubes. Each of those tubes had one of those little black tube shields that were just about impossible to get off. Now each rack was on drawer slides that only allowed the rack to come 2/3s of the way out. Reaching in to get that last tube in the strip was a real B. Usually resulting in burnt fingers and skinned knuckles as the tube let loose and your hand banged up against the cabinet top. A lot of those tubes went back in less the shield. What I wouldn't give today for a couple dozen of those little black @\$%& that were thrown over the cliff in back of the radar tower.

Question: Which tubes is it necessary to put the shiny tube shields on.  
Is there a source for the IERC shields.

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Date: Fri, 19 Jan 2001 21:16:28 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

Ideally no tubes should be abused by the shiny tube shields. They lead to shortened tube life because they tend to make the tubes operate at a higher temperature that leads to more rapid seal deterioration. I'd think that the most important tubes needing shielding, for RF shielding sake, would be the RF and IF tubes, especially the later IF stages. It might be debated whether the external shields helped the 6AK5 sized tubes significantly.

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Date: Fri, 19 Jan 2001 06:46:53 EST  
From: G4GJL@aol.com  
Subject: [R-390] Heat Reduction Checklist

The effect of Heat reduction modifications are cumulative in nature. No single modification apart from the inclusion of fans, is likely to result in an appreciable change to the mean time to failure of components in the sets. However the other modifications which can be made elegantly, I believe, should be. This especially applies to users in the UK and such like countries, where the nominal mains voltage exceeds either the 110 or 220 volt rating of the power transformer primaries. These modifications are NOT attributable to me, but to the many contributors which form this list.

The archive would be the place to find more details, however I will attempt to list the modifications I am aware of, here, as a checklist for those wishing to buy

some cheap insurance. viz:

- 1) Use bucking transformer or variac to feed the rated voltage to the primary of the power transformer, if line voltage exceeds rated value.
- 2) Use Keystone thermistors (or equivalents) to limit inrush current. Place these in open space inside the set to avoid heat damage to adjacent wiring etc. I place mine on the rear terminal of the primary power fuse holder, and use PTFE sleeving to shield the connections.
- 3) I remove (and carefully store separately) both top and bottom covers for the R390-As, when the receivers are in racks in my shack.
- 4) I do not place hot running equipment beneath R390s whilst racked.
- 5) Use 1U Fan trays in the rack or cabinet, and power these from a rack-side breaker, on a separate circuit to the radio equipment in the rack. Each fan tray is 1U high and contains 6 (or sometimes 4) 4-inch muffin fans...these are obtainable from hamfests and computer companies.....often in scrapped computer equipment racks. Use of fan trays avoids the need to internally modify the receivers by placing fans INSIDE the receivers.
- 6) Use heatsink compound on the mating surfaces of the power transformer and the RX mainframe.
- 7) In receivers having silicon rectifiers, use heatsink compound on the mating surfaces of the 200 ohm HT dropper and the PSU / RX mainframe. There is a recommendation to add a 200 ohm resistor in series with the main HT current path. This modification was not done in every receiver, by the services, so anyone with a silicon replacement rectifier should fit this resistor if it has not been done. Often the location of the series resistor was chosen to be in the audio deck, which I believe is a bad location, because the heat cannot escape readily. A better location would be on the power module.... either bolted to it in order to maximise conduction or bolted to the adjacent side cheek, with trailing wires (less aesthetic), for the same reason.
- 8) Use IERC or similar tube shields. These are finished matt black, both internally and externally, and have a rather larger hole in the top end than the normal commercial tube shields. They have a flimsy springy insert, which contacts the sides of the tube, thus providing a heat conduction path to the outer surface of the shield.
- 9) Use heat conducting tube socket inserts, which are formed from a strip of beryllium copper placed inside the tube holder. These form a conductive path from the very base of the tube, near the pins, to the chassis.
- 10) Shotgun all paper coupling and decoupling capacitors to minimise leakage currents everywhere in the set. This includes electrolytics. (Refer to Nolans Capacitor list, on his web page, for types, locations etc of these caps. Obviously,

while you are in there, test all resistors for nominal value +/- 10% or +/- 20% which ever you can afford. Pay attention to the audio stages(As, G2s and Ks) where there is more power in the resistors. Invariably they go high there.

11) Run an 'excessive heat test' using what ever means you have available to detect elevated temperature within the set, after it has been left on for an hour or two, in its normal operating location. This will help you to determine the cause of the temperature rise, and determine if it is legitimate. Test equipment for this ranges from finger tip (be careful!) to adhesive removable LCD thermometers, to infra-red thermal imaging cameras (if you are lucky!!!). I use the finger!. I actually never found a leaky audio coupling cap in an R390, but one in my AR88-D was putting about +220 volts on Grid 1 of the audio output tube last week! (RIP for the o/p tube due to  $I_g^2R$ )

I may have missed items from this check-list, so please paste them in and re-publish to the world!

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Date: Fri, 19 Jan 2001 10:59:36 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: [R-390] Heat Reduction Checklist addition

Looks like we have an addition to the "knowledge of the ancients" project for the R-390A. "Pete's R-390A Heat Reduction FAQ". :-)

I like the idea of the heatsink compound between the power transformer and the mainframe. Very clever. I'll do that the next time I pull the EAC.

One that you might want to add to your list is one that I came up with a while back to help lower the temperature of the under chassis components in the AF deck. I never was impressed with the under chassis layout of the power resistors.

Before installing the AF deck, place a washer over each of the holes for the four mounting screws.

Place the deck over the screws and make sure that the green headed screws each pass thru the washers.

This will space the audio deck up and away from the main chassis by the thickness of the washer selected. Since the normal position of the AF deck is "upside down" this will allow an easy escape for heat from under the AF chassis.

I've been using the IERC heat conductive tube base strips for a while. They're rather hard to come by and I only have a few. As a result, I used them on what I consider "critical" tubes. like the 26Z5W's, 3TF7, PTO osc. tube, etc.

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Date: Fri, 19 Jan 2001 19:14:12 +0100

From: Kurt Brandstetter <kurt.brandstetter@teleweb.at>  
Subject: [R-390] IERC tube shields - Additional question

I use IERC tube shields for all tubes in my R-390A, but not for the 3TF7. This tube I use without a tube shield. Is this ok or should I also use an IERC tube shield for the 3TF7 ? I have one in my box. Please give me a short info !

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Date: Fri, 19 Jan 2001 13:23:59 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

The 3TF7 only needs a tube shield in battleship service. Then only to hold the tubes in the socket when the big guns are fired.

Perhaps in mobile van service, but rarely in domestic residential service unless directly over an active earthquake fault, and then tube shields may not prevent the falling structure from crushing tube and tube shield.

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Date: Sat, 20 Jan 2001 07:55:30 -0500  
From: "Walter Wilson" <wewilson@knology.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

> I'd think that the most important tubes needing shielding for RF.....

An article in Hollow State News (issue 5 page 3, or HSN reprints page 3) says that tube shields are needed only on V201, V206, V505, and V701.

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Date: Sat, 20 Jan 2001 09:55:17 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

I believe that not shielding the mixers and IF tubes as well as the AGC and regular detectors might lead to more spurious receiver signals from signals getting to tube grids without seeing all the tuned circuit's selectivity, and from IF harmonics being radiated by the power IF stages and the nonlinearities of the detectors.

Some of these spurious signals may only be detected when the antenna wire is connected direct to the receiver (instead of the remote coax or balanced line fed dipole) or when there are strong locals unwanted sources (which might well be VHF leaking to the mixer tube grids). Try listening on 910 KHz and see if shielding the IFs and detectors doesn't clean up a birdie there.

If there's a TV or FM transmitter in the neighborhood, try an HF frequency where the first crystal is first IF range away from that TV or FM transmitter (or a crystal harmonic) and see if the noise level in the receiver drops when the first mixer is shielded.

The oscillator tubes can also be detectors and mixers because their grids have rather distorted wave forms and can act as mixers, so shielding them is of benefit (besides cutting down on RF radiated from the mixers to bother other receivers or to be a harmonic birdie in the subject receiver).

I have an old Hallicrafters VHF radio that is perfectly useless without the front end shielding because of hearing all that TV and FM broadcast stuff getting to the mixers.

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Date: Sat, 20 Jan 2001 15:31:53 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

Doc, I suspect that using the IERC type tube shield on the 3TF7 will extend its life. I'm running one of the extra tall ones on mine. It extends about 3/4 of an inch or so above the pip on the envelope.

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Date: Sat, 20 Jan 2001 15:26:55 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

>I use IERC tube shields for all tubes in my R-390A, but not for the  
>3TF7. This tube I use without a tube shield. Is this ok or should I also  
>use an IERC tube shield for the 3TF7 ? I have one in my box.

Use it. The cooler it runs, the longer the thing lasts.

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Date: Sat, 20 Jan 2001 15:34:05 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Tube Shields?

The primary purpose of the IERC type is to lower the envelope temperature and increase the life of the tube. It's been well documented and it works.

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Date: Sat, 20 Jan 2001 15:37:02 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

Damn good point, Jan. In the unlikely event that cooling the tube didn't improve life, projecting it from accidental mechanical damage alone makes the use of the tube shield a good idea.

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Date: Sat, 20 Jan 2001 15:57:09 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] Tube Shields?



I had thought that they were phosphor bronze myself for years. I scored copies on the patents on them a couple of weeks ago along with a sales sheet from about 1966 and as it turns out, the finger material is made of beryllium copper that's coated black cadmium. It'd probably be a good idea to wash your hands after handling them before eating. ;-(

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Date: Sat, 20 Jan 2001 16:10:16 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

>Why, you ask? The tube shield will cause the 3TF7 to run cooler, thus the  
>resistance will drop slightly and the voltage out to the filaments will be  
>higher. The tubes connected to the ballast will last longer if their  
>filaments do not operate at voltage higher than normal.

I doubt that the amount would be noticeable. According to a chart done by Amperite, their ballast tubes will hold within approximately 2% over the temperature range of -50 to +85 degrees centigrade. That would mean that the change of 300 ma would be in the range of 297 ma to 303 ma. If anyone cares to do the math, I'd be curious as the swing in the tube filament voltage this would translate into. I suspect that it isn't much.

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Date: Sat, 20 Jan 2001 17:52:07 -0500  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Tube Shields?

There are at least three types of heat sink liners I've seen, and probably you too -- The "finger" ones as you mention, but also the five flat-sided ones (not as good I think) and the corrugated ones that look a bit like this: *Z/Z/Z/Z/Z/Z/Z* (from the edge -- oh, well, not exactly.) Are all made of beryllium copper? I'd guess the last type might provide the most efficient heat sinking. I've found some bayonet types with that the corrugated inserts.

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Date: Sat, 20 Jan 2001 21:14:07 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] Tube Shields?

I don't know that any beryllium copper chunks are normally going to come off, but you sure don't want to make any inhalable sized chunks and inhale them.

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Date: Sat, 20 Jan 2001 21:14:14 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

The IERC tube shields may let the 3TF7 envelope run cooler, hence the seals run cooler so there less likelihood of a gas leak. Should oxygen get in, the iron filament probably wouldn't last long. Should the normal gas leak out to a lower pressure probably the time constant would change. I think the filament has to

pretty much operate at whatever temperature the circuit demands to achieve the resistance needed for that applied voltage and the thermal environment around the ballast has only a secondary effect because the -50 to +85°C environmental range is a small fraction of its normal operating temperature. The wire would probably work for a while in air, but as it rusted would change its resistance.

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Date: Sat, 20 Jan 2001 21:18:26 -0600

From: Nolan Lee <nlee@gs.verio.net>

Subject: Re: [R-390] Tube Shields?

>There are at least three types of heat sink liners I've seen, and probably  
>you too -- The "finger" ones as you mention, but also the five flat-sided  
>ones (not as good I think) and the corrugated ones that look a bit like  
>this: Z/Z/Z/Z/Z/Z/Z/ (from the edge -- oh, well, not exactly.)

Some if the five sided ones are six sided too if I remember right. :-)

>Are all made of beryllium copper? I'd guess the last type might provide the  
>most efficient heat sinking. I've found some bayonet types with that the  
>corrugated inserts.

Barry, I'd guess that they probably are if they were made by IERC. On a side note, I was junking out a piece of gear last year and ended up with some Cinch made ones that are exact clones of the IERC types down to the patent numbers stamped in the upper rolled edge. The Cinch part number is MS-24233-5. These are the type with the finger type inserts. I've got several other variations scattered around here. The IERC type shields were made by IERC, Cinch, Cool-Fin, and another company who's name escapes me right now.

The Cool-Fin uses a spring at the top in addition to the fingered insert. It also uses the dimples on the tube socket base like the old original shiny military tube shields. Instead of the raised bulges, it has cutouts. All in all, I must have close to two dozen different styles of the head conductive tube shields. It's amazing just how many variations there are.

Oh, here's a tidbit for you that will make you cry. The average "retail" price, in quantities of one, for the IERC finger type 7 and 9 pin shields was 45 cents in the mid 1960's. Pretty damn cheap for such a neat piece of hardware. But, a lot more expensive than the 6 to 15 cents for the standard military type shields.

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Date: Sat, 20 Jan 2001 21:49:42 -0600

From: Nolan Lee <nlee@gs.verio.net>

Subject: Re: [R-390] Tube Shields?

>I don't know that any beryllium copper chunks are normally going to come  
>off, but you sure don't want to make any inhalable sized chunks and  
>inhale them.

Agreed. I'm wondering about the white "dust" that forms on the inserts sometimes. Hell, even if it isn't an oxide of the beryllium, it could be some type of cadmium oxide. Either way, you loose. ;-( I wish that they HAD used phosphor bronze. ;-( I had some power transistors some years back that came out of NASA. They had either had a beryllium alloy case or were plated with the stuff. At any rate, there were warnings galore on a little sheet packaged with them. Lots of stuff about not handling them if you had open cuts, washing hands before eating or smoking, etc. This was long before MSD sheets were even a dream. I don't know what beryllium tastes like but I can remember the very distinct metallic taste of cadmium after welding stuff plated with it back in the 1970's. Yellow dust/smoke when it gets hot. Ditto for the taste after cutting gear out of scrapped Navy ships with lead paint a quarter inch thick. About the only smokes you could taste at the end of the day were Picayunes, Pall Malls, or Lucky's.

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Date: Sat, 20 Jan 2001 21:59:01 -0600  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] IERC tube shields - Additional question

>The IERC tube shields may let the 3TF7 envelope run cooler, hence the  
>seals run cooler so there less likelihood of a gas leak.

This by itself is a good enough reason for me to use them I like the idea that Jan had about physical protection too.

>Should oxygen get in, the iron filament probably wouldn't last long. Should the  
>normal gas leak out to a lower pressure probably the time constant would change.

I don't have the Amperite stuff in from of me but I think that it was hydrogen that they used as the filler gas. I wondered about this since hydrogen is not only volatile but very "light". I'd have figured that they would have used a denser inert gas to help transfer heat. I don't remember if it's hydrogen or helium, but one is famous for escaping from containment. You can take a sealed steel cylinder along the lines of any oxygen cylinder and the stuff will migrate thru the walls of the cylinder. ;-(

>I think the filament has to pretty much operate at whatever  
>temperature the circuit demands to achieve the resistance needed for  
>that applied voltage and the thermal environment around the ballast has  
>only a secondary effect because the -50 to +85°C environmental range is  
>a small fraction of its normal operating temperature. The wire would  
>probably work for a while in air, but as it rusted would change its resistance.

Yep. ;-( nolan

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Date: Sun, 21 Jan 2001 11:16:25 -0800 (PST)  
From: W Li <wli@u.washington.edu>  
Subject: [R-390] Re: IERC shields (more)

If you look closely, there are actually two varieties of IERC tube shields: those with thin linear slots and holes to slip over and secure to the "normal" shiny tube base, and those (less common) ones with a unique twist-lock to fit a custom IERC tube shield base. The latter has a thermal advantage of being made out of the same black/violet metal as the shield... resulting in improved heat transfer to the chassis (which is the heat sink). Clearly this is most important in those tubes that are up-side-down on the AF and Pwr Supply chassis.

Clearly, either one will work in reducing bulb temperature, but I reckon that the twist lock variety is a tad more efficient. Unfortunately, one can not easily retrofit the IERC tube shield bases without major effort.

As to sources of IERC shields, do not give up. They can be found in unusual places. Recently, I stumbled upon an out of the way "used technology" store selling older tape decks etc.. and came upon a box on the floor full of shields forgotten by the owner... Among them was a surprising bunch of genuine IERC shields! Needless to say, I cleaned them out giving me just enough to install on both of my R390A's. The tragedy is that in the 50's and 60's most were just dumped into land-fills. So keep looking.. they are still around

For those inclined, the publication showing tube-life/temperature and type of tube shield is somewhere in the shack, and I'll post it as soon as I find it.....

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Date: Mon, 22 Jan 2001 09:52:16 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] IERC tube shields - Additional question

Those would be the WPM types, if I recall correctly. Collins also made some, or at least had their name stamped on 'em(I think the company who actually produced them was ELCO). I find that the Collins sheilds often include the little insert for the tube base, as well. I really should scan that page from my late 50's Collins product catalog and post it to the archives, it explains how it all works as well as the details like how hot the bottom of the tube can get around the pins, to the point of losing its vacuum at times. But then, scanning it in would require a scanner, and my pc system seems to be lacking due to my CORI (Compulsive Old Radio Illness) which seems to take any spare money I have.

I've got my R-390A, CU-286, R-390, and SP-600 all in one of those nice looking rack cabinets with the rounded corners. It's about 5+ feet high. In my carriage house (that's the civilized title for where I pile excess stuff),

I have one of those HUGE honkin' surplus Air Force cabinets that stands about 7 feet high, has a squirrel-cage blower in the bottom, exhaust fan in the top, outlet strip inside, and is made of thick, not thin steel. Eventually I'll have the time to restore it, then I can populate it with heavy items. I think I figured my radiator room to be somewhere in the vicinity of 2500+ lbs already, and it hasn't moved anywhere yet(except perhaps downward a bit). Adding this mother-of-all-racks

would persuade it to stay put. ;) We don't have many earthquakes here (maybe one every ten years), but I'm all for using any excuse...reason I can find for obtaining more radios and associated gear.

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Date: Mon, 22 Jan 2001 10:08:51 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] IERC tube shields - Additional question

Yep, I've had this happen to me. Haven't broken any tubes(yet), but I have had a few of them hang up. Most of them seem to pop off if you apply much pressure to the sides, even bumping them. Perhaps these are the more 'worn' versions?

If that's the same guy who auctions stuff on ebay, I don't think he sells privately anymore. I asked him for some prices last year and he said to 'see his auctions'. He was auctioning the IERC shield in packs of 2 or 3 for \$20, as I recall. Seemed rather high, Fair was selling them for \$1 each as I recall.

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Date: Mon, 22 Jan 2001 10:39:29 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] IERC tube shields - Additional question

Okay - I think we need to set up a support group, or some kind of 'early warning' alert for these things. That way, when someone discovers a stash, we can spread them around, all the while protecting them from getting tossed down that mine you mentioned. ;)

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Date: Mon, 29 Jan 2001 10:05:58 -0500  
From: rbussier@lexmark.com  
Subject: RE: [R-390] tube temperatures

I have enjoyed the banter back and forth concerning tubes and the effects on the tubes with use of various shields and colors. This is a very rough first pass on some experiments I conducted Saturday. All temperatures that follow are in degrees F. Equipment: a restored CV-591A that was being burned in on the bench (no covers), a high end Omega IR temperature sensor with laser sighting, various tube shields. The Omega was locked into a vise mounted to the bench and sighted on one of the 12AU7s on the rear of the '591..... The temperature of the glass envelope stabilized to 187 deg. An IERC (insert type) shield with twist lock base was installed and let stabilize for 1 hour, The outside was measured then the glass envelope was measured. This shield was freshly painted with a THIN coat of ultra flat black paint, inside and out. The outside measured an average of 175 deg. The glass dropped to 143 deg. This was repeated 3 times with long stabilization times in between. Next, I installed a polished inside and out 'plain jane' shield from another radio. The outside of the shield averaged 160 deg. where the glass envelope measured 205 degrees. I experiment a LOT with small muffin fans on every radio I own. I placed a small one inside the 591, about 6 inches from the 12AU7, running at 1/2 speed. Measuring the IERC equipped tube one last time, the results were: shield 138 and the glass 150 degrees.

Conclusions: A lot more work needs to be done here.....but off the cuff, I can state:

1. the insert type tube shields work well
2. no shield, is better than one silver on the inside
3. the use of any fan to stir the air will help

So far, known, simple results. Surprises? The Omega has a very small target . However, at close range, one must be careful to correctly position the actual target in relation to the laser, since they do not originate at the same source. For those shooters out there, it is the same as having very high scope rings on your rifle. The temperature delta at various places on the tube and/or shield was tremendous. I would never have believed that there were such hot spots. Next time I will examine a different tube. The 12AU7 runs much cooler than I expected. Perhaps a shield on an 0A2 might be a good candidate.

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Date: Mon, 29 Jan 2001 09:20:01 -0600  
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>  
Subject: RE: [R-390] tube temperatures

You say the glass is at 143 deg without the fan and 150 deg. with the fan. Is this a typo? It appears the fan makes the tube run hotter.

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Date: Mon, 29 Jan 2001 11:01:56 -0500  
From: rbussier@lexmark.com  
Subject: RE: [R-390] tube temperatures

The glass envelope with an IERC shield (quickly removed for measurement), dropped to 143. The 150 degrees mentioned WAS the temperature the glass envelope reached, with the same conditions but adding the fan. It can be seen that the o/s of the shield dropped dramatically. I cannot account for the 7 deg rise of the tube itself. Yes, the fan dropped the shield temperature (which is intuitive), but I am a loss to explain the temperature rise of the glass.

As I said this bears more experimentation (and dedication to one project at a time!), However, (in my own defense) I will state that scanning just the length of the tube shows temperature deltas of greater than 50 degrees.

Although the Omega was locked in a vice, I would say an excursion of 1/16" at a distance of 2 feet could easily explain the delta. Also, this tube runs too cool. I want to find a candidate, like the rectifiers in a 390a that really cook.

One thing that surprised me was the temperature differences on the surface of the tube/shields. It would be easy to lose sight of this with regular thermocouples, on such a relatively large surface.

BTW, the major (!) heat contribution in the 591A is the power supply. The 5Y3 and 0A2 run very hot. The finished 591A will have a tube in this area. This was the first tube I ss in my 75A-4..... In the A-4, it really cooks the transformer next to

it. I would appreciate your input on specific tests you would like done.

I wanted to do the following combinations of tubes and shields:

bare tube  
silver / silver shield  
silver / black shield  
black / black shield  
IERC

+ all of the above with and without air movement (fan)

This grows large quickly. I will develop a test 'plan' based upon Taguchi's Design of Experiments.... naw, just SWAG it....

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Date: Fri, 2 Feb 2001 14:22:14 -0500 (EST)  
From: Norman Ryan <nryan@duke.edu>  
Subject: [R-390] Overly Snug IERC's

I don't know of a puller, but when I run into a stuck shield, I try to lever it out with whatever works and then adjust the spread at the bottom to make it less snug. It's a pest to get them right, I know, but I still like what they do to help extend tube life.

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Date: Fri, 2 Feb 2001 13:30:11 -0600  
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>  
Subject: [R-390] RE: Overly Snug IERC's

Perhaps I should design and build a puller and market it to the BA crowd. It wouldn't be too difficult provided the shields in question had the "lip" at the top.

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Date: Fri, 2 Feb 2001 15:12:29 -0500  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Overly Snug IERC's

Not sure if they still make them, but GC had scissors style pullers which look a little like those tongs that were used in sterilizing baby bottles to take them out of the boiling water. Except the jaws are curved and rubber coated, like tool handles.

When tubes "went out of style" these were re-carded as PC board tongs -- for handling the boards when etching. I've used these to pull stubborn and hard to reach shields, as well as tubes. They help to get a grab on the things and put enough force straight up, or to push down and twist for the bayonet type.

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Date: Fri, 02 Feb 2001 15:29:37 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] RE: Overly Snug IERC's

The newer IERC types only have small clips around the top to retain their octagonal (okay, I'm not sure if it has 8 sides) heatsinking insert. I'd sooner think you could make something that would slip under the bottom edge and allow you to pop it loose from the nipple on the base. This would save all the rockin' and rollin' sometimes required to get these things loose. Even after the base is loose, though, more often than not, the tube comes with the shield. Hey, it almost saves a step...

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Date: Fri, 2 Feb 2001 17:17:09 -0800 (PST)  
From: Joe Foley <redmenaced@yahoo.com>  
Subject: Re: [R-390] Overly Snug IERC's

Ok, Here's what you do. You take some electrical tape, 'bout 4 inches. You fold it in two with one end running down each side of the tube or shield. Smooth it down with a dental pick or plastic screwdriver, leaving a tab over the top of the item to be pulled out. Grab the tab with hemos, needle nose pliers, or your fingers. And PULL!! It may take a few tries but it works!!

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Date: Sat, 03 Feb 2001 16:28:01 -0500  
From: Gene Beckwith <jtone@sssnet.com>  
Subject: Re: [R-390] Variacs vs bucking xfmr

In the realm of Variacs and such...one more question...Have a need to quiet a "muffin fan" that's installed on the rear of a small transmitter here at W8KXR.

What's the best way to slow it down a bit to reduce noise level? I don't want to completely kill it, but would be nice to get some of the high speed whine out of it...?

Experience and thoughts? I don't have a mini variac to contribute to this need, so looking for alternatives...

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Date: Sat, 3 Feb 2001 18:50:18 -0500  
From: "John F. Bunting" <w4net@carneconn.com>  
Subject: Re: [R-390] Variacs vs bucking xfmr

I always use a series cap (usually an oil filled paper 1 to 2 Mfd @ 3 to 400v) to slow down and reduce the noise. In power supplies, sometimes I put a small toggle switch across the cap. If I want it to run at it's original speed with it's normal noise I just turn it on to short the cap. I suppose you could put a temp sensor in and use a relay to short out the cap if the power supply heat sink gets over a specified temperature. I usually don't have much of a load on them, so the quieted fan moves enough air quietly to keep things under control.

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Date: Sat, 03 Feb 2001 18:55:03 -0600  
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>



Subject: Re: [R-390] Variacs vs bucking xfmr

There's not a lot of power involved. A series resistor or capacitor can slow the fan. I did that for the first computer I built about 1976 (and it still works). I don't remember the value of the capacitor. Probably between 0.5 and 2 mf. Paper or orange drop, not electrolytic.

I have also used a series capacitor to begin to resonate at 240 volt fan motor so I had 240 volts on the winding will connected to 120 volts. That is a concern when testing the series capacitor for slowing, except that the AC fan winding for 120 volts will have 1/4 the inductance of the same fan wound for 240 so the capacitor would have to be 4 times larger than that one I used for resonating eons ago.

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Date: Thu, 08 Feb 2001 20:56:06 -0800  
From: Ed Zeranski <ezeran@concentric.net>  
Subject: Re: [R-390] Overly Snug IERC's

>Not sure if they still make them, but GC had scissors style pullers which  
>look a little like those tongs that were used in sterilizing baby bottles to  
>take them out of the boiling water.

Got a set! They still work OK even with the dirty red rubber coating on the grabby end. GC used to have pullers that looked like a piece of aluminum tubing with slots on two sides, kinda like ice tongs, with rubber tips too. Then there were the Chinese hand cuff jobs like with the GRC-109s and the tapered rubber cones. Darn.. there could be a thread or research project on tube pullers. If someone wants .jps of the raskals I can send 'em .

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Date: Wed, 07 Feb 2001 20:59:53 -0800  
From: "Walter (Volodya) Salmaniw, MD" <salmaniw@home.com>  
Subject: [R-390] Air conditioned tube shield

Inspecting my newly acquired S-W ex USCG R-390A, I noticed an interesting tube shield... one that's "air conditioned". Wonder how this one stack's up with the IERC shields? At least it provides physical protection, without the worry of excessive heat build-up:

<http://skirrow.org/walt/tubeshield.jpg>

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Date: Thu, 8 Feb 2001 01:47:34 -0500  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Air conditioned tube shield

I've seen a lot of these in a variety of equipment -- most often a tall one for the ballast tube and a shorter one for the regulator. We had a thread on shield types some time ago (no not that last one) where it was pointed out (me) that one of the functions of the bayonet/spring shields was to keep the tubes from

popping out of their sockets -- in transit or when firing broadsides with the 16 inch guns. So, that "air conditioned" shield is really more of a retainer for a tube that doesn't require shielding.

There are also IERC vented shields -- black with inserts. The inserts are different than the usual five or six-sided or fingerstock types. They also require a different chassis mount. I found these supplied as original equipment in some FSK converters.

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Date: Thu, 08 Feb 2001 12:50:18 -0500  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Air conditioned tube shield

I have one of these in the R-388, perhaps this was an early attempt at removing excess heat from the tube, while still using the bayonet mount to retain the tube in its socket?

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Date: Thu, 8 Feb 2001 13:55:09 -0500  
From: rbussier@lexmark.com  
Subject: Re: [R-390] Air conditioned tube shield

I have seen these as well. Without further tromping on this thread, I was quite surprised at how hot an 0A2 was, in my 591A. Anybody have any comments? Since its dropping 300V to 150V, I guess the dropped voltage is dissipated as heat? Even with no load on the B+?

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Date: Mon, 19 Feb 2001 13:06:53 -0500 (EST)  
From: Norman Ryan <nryan@duke.edu>  
Subject: Re: [R-390] Air conditioned tube shield

Have also found that same shield on VR tubes in R-390A's. I'm so sold on the IERC shields that I'm inclined to replace the "air conditioned" shield with an IERC. Finding that size is a bit difficult, though. I much prefer the cut out type to a plain shiny shield without heat dissipating insert.

On Wed, 7 Feb 2001, Walter (Volodya) Salmaniw, MD wrote:  
> Inspecting my newly acquired S-W ex USCG R-390A, I noticed an interesting tube >shield...one that's "air conditioned". Wonder how this one stack's up with the IERC >shields? At least it provides physical protection, without the worry of excessive >heat build-up:

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Date: Mon, 19 Feb 2001 11:16:49 -0800  
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>  
Subject: Re: [R-390] Air conditioned tube shield

If you are going to use your 390's in the shack with out regular motion. I would pull those air conditioned tube shields off and run the ballast tube bare until you get an IERC shield for it. If you are in motion then you may need some retainers

(things that look like tube shields). Even the vented shields run hotter than bare glass. If you are only running one receiver in the shack or rack then off with all the non-IERC shields. If you have a couple radios in the shack then you have to decide if its hot tubes shielded from other radiation or run bare and susceptible to RF noise from other sources. The ballast tube is susceptible to nothing but heat and glass breaking. I would just run it bare. Roger.

P.S. Then again you can change the whole problem and use no ballast tube and two 12BA6's. You to can help prevent global warming.

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Date: Fri, 9 Mar 2001 09:22:26 EST  
From: Llgpt@aol.com  
Subject: Re: [R-390] R-390A IERC Tube shields

QTY.	IERC No.	Used
1	6025-B	3TF7 Ballast Tube
9	6020-B	5814's & 26Z5W's
2	5015-B	5654's
13	5020-B	5749's, 6AK6 & 6C4's
1	5025-B	OA2

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Date: Mon, 04 Jun 2001 16:18:26 -0400  
From: Joe Falcone <joefalcone@chartermi.net>  
Subject: [R-390] Stacking equipment vs. too much heat.

I am putting together my ham shack and I am having to stack up my hollow state radios. I only use them for an hour or two at a time so it is not like I am going to leave them on 24/7. What I have in mind would be like putting another receiver on top of my R-390A or other receivers on top of a Hallicrafters SX-101 or HT-32. We have seen racks of R-390A's going 24/7, so do you think that it is OK to stack radios?

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Date: Mon, 4 Jun 2001 16:43:53 EDT  
From: Llgpt@aol.com  
Subject: [R-390] Re: [BoatAnchors] Stacking equipment vs. too much heat.

Sure Joe, as long as there is a space between them. The military had them stacked in racks, but had fans on 'em.

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Date: Mon, 04 Jun 2001 17:26:52 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: [R-390] Re: [BoatAnchors] Stacking equipment vs. too much heat.

Racks have a lot of open air space inside, so airflow tends to be more generous. Stacking units in cabinets one on top of another is a lot different because the

cabinets inhibit the airflow. Placing another unit on top just aggravates the situation. If you really feel this is the route you'll follow, I'd suggest using some 2x2's or similar to increase the gap between. Don't rely on simply the feet for enough clearance. Adding some muffin fans behind the equipment to help aid in air circulation wouldn't hurt, either. I've stacked equipment before when I had no choice. It works, but there's a reason the manuals suggest a certain amount of space between the back, sides, and advise you not to place anything on the top.

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Date: Fri, 06 Apr 2001 12:31:24 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: [R-390] 6080/6082 cooling and tube life

> > Interesting; I find the 6082 have a short life with over  
> > disappation, then going gassy, turning in a loss of regulation.

That better than the 16 8068 tubes that a couple of my Kepco HV supplies use. Hell, they go gassy in storage. ;-( Anyone got any cheap spares?

> Haven't the foggiest, but doubtless the answer will p----- maybe you've got a  
> bad cap somewhere. I've never replaced a 6082, but I have lots of  
> spares that were bought in anticipation years ago.

I don't have the specs handy on the 6082 and the only ones at my fingertips right now for the 6080 are from the 1968 Phillips manual. According to it, the life test for the 6080 is 500 hours. I don't know about the 6082 but there were several versions of the heavy duty 6080's. The 6080WC was the latest and greatest. It might be worth investigating if any HD versions of the 6082 were produced. anyone have the specs on the 6080WA and 6080WC? Other than the filament voltage requirements, the 6080 and 6082 should be the same. Both are current hogs at almost 16 watts a piece for just the heater. I can see where two of them crammed in close proximity could generate a lot of heat. It might be worth trying to track down a pair of IERC type tube shields for the 6080/6082 tubes. I know that they made them, I've seen them in a power supply that used to have that used a pair of 6080's. I didn't really pay them much attention since this was long before I had a clue on just exactly what an IERC tube shield really did. Failing that it should be easy enough to fabricate your own IERC type tube shields for them using copper or aluminum flashing soldered or riveted into a cylinder with two or three of the beryllium copper "finger" inserts from some scrapped long 9 pin shields inserted inside. Make sure that you chemically darken the copper or aluminum cylinder AFTER you solder it together. If any of you guys want an interesting project to test an idea that I've had for a while: My idea was to take a 5U4 (cheap, common, and a current hog too) and mount a sensor on it. Then run it in a draft free environment and get an envelope temperature. Next, paint all of the exposed glass of the envelope (but not the sensor) with a thin coat of flat black paint. Run it again and compare the envelope temperatures. I'm curious if the paint will help or hurt the heat dissipation. If it works, you're looking at a cheap method to lower the envelope temperature and increasing tube life. Ideas?

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Date: Fri, 06 Apr 2001 14:29:07 -0500  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] 6080/6082 cooling and tube life

Forget it. Use a fan.

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Date: Fri, 6 Apr 2001 14:29:17 EDT  
From: Llgpt@aol.com  
Subject: Re: [R-390] 6080/6082 cooling and tube life

Very true, if there is any drawback to a R-390, it's the heat generated by these tubes. Other than that, they are a better receiver than the A.

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Date: Fri, 06 Apr 2001 16:11:51 -0500  
From: Nolan Lee <nlee@gs.verio.net>  
Subject: Re: [R-390] 6080/6082 cooling and tube life

>Amazingly, it had two IERC labeled tube shields for the 6082s. They're >half height, and probably about 1/8" thick.

Sounds like them. I remember them being a little taller though like maybe 2/3 or a bit more and closer to 1/4 inch thick. It's possible that there were several models. I suspect that the extra clearance at the top was for tubes that used a plate or grid cap.

>I agree with Nolan that they add value to the heat loss equation,

I'm sold on the IERC shields. The two year endurance run of my EAC was more than enough evidence to me to become a total and very firm believer in them.

> and would be easy to make. These in combination with a small low speed > fan (I haven't figured out where to put it) would solve the heat problem.

Each would require the sacrifice of two or three of the miniature tube shields. Considering how expensive and hard to find that the 6082's have become, who cars? :-) Come to think of it, the heat inserts in the shiny nicked shields that have them would make good sacrificial candidates for parts. The corrugated style ones would be nice in that they can be overlapped easily. Yes, it would be easy as hell to make one using those. Those shields are next to useless anyway.

>Has anybody compiled a tube list for the non-A????

That's discriminatory against A model owners and other example of the bias and intolerance that non-A people show toward A people... Bummer, I couldn't even hold a straight face typing it. It'd never fly for a face to face confrontation. <grin>

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Date: Mon, 04 Jun 2001 14:55:20 -0700  
From: Leo Jormanainen <lexa@mail.island.net>

Subject: Re: [R-390] Stacking equipment vs. too much heat.

I've got my R-390A installed in a cabinet with louvered back panel. At first I used a single 220VAC muffin fan at 110VAC attached to the back panel. The temperature was 103 degrees F inside the cabinet. Now I'm using two 220 VAC muffin fans at 110VAC. The temperature dropped to 71F, I can live with that.

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Date: Mon, 4 Jun 2001 18:31:59 -0700 (PDT)  
From: Bruce - KB6LWN <kb6lwn@qsl.net>  
Subject: [R-390] Re: Stacking equipment vs. too much heat.

I did some trading (computer labor for goods) a while back and got myself a 7 ft doored rack cabinet with filtered forced air ducting system installed (commercial grade) and could no doubt run several R-390/URR's, SSB conv's, and some TMC gear 24/7 with no problem (except for the drain it would make on the line (and hence the pocketbook)), so if you or anyone else has some excess R-390/URR's, etc that they would like to place to a good home ? I have one available ;) Sorry guys, but NO WAY am I going to be able to afford 1.2 or 2K for an R-390A/URR anytime in the foreseeable future. I'd be fortunate to afford payments of \$100/mo for 3-4 mos. (which I AM willing to do for a servicable R-390/URR) (seller to retain possession, until balance=0 of course)

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Date: Sat, 14 Jul 2001 09:43:10 -0700 (PDT)  
From: <jlap1939@yahoo.com>  
Subject: [R-390] Tube Shields

Am going to go w/Joe (Foley) and put out a dead horse to be beaten.. (his statement was appreciated)..... Can anyone revisit the problem of tube shields in these colors::: Out silver,in silver...Out blk, in silver...out silver in blk...out, and in black... You may recall I had a question relating to high school physics, and when I asked several very "learnedd" persons (here), I could not get an answer. I included a PhD in my seeking here locally. It was mentioned by several persons that silver exterior was a superior configuration..(bl ins)(NOTE!) Then I brought it to the list, and Dr. Jerry was one of the only ones willing to put forth any science.. He never completed his comments, if I recall correctly. Who can explain what happens in the material itself that may affect what level of energy is radiated... YOU KNOW, I done ran radios all my life, and even w/hugh rects, never saw proof that it really makes much diff....Saw many in Mil. that had every shield thrown away and never osc. or failed...Who really "nose" what they are talking about here...It is obv. I DON'T... You may recall I never got an answer before....

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Date: Sat, 14 Jul 2001 15:20:50 -0400  
From: Bob Camp <bob@cq.nu>  
Subject: Re: [R-390] Tube Shields

More or less there are three ways to get rid of heat convection, conduction and radiation. An R-390 receiving tube with it's guts sitting in a vacuum pretty much

gets rid of the heat on the guts by radiation and conduction through the leads going to the glass header. Tube shields don't have much affect on the conduction through the leads so that leaves you with radiation effects.

If you wanted to cool down something in a hurry conduction would be your first choice. Throw a bucket of water on it ....

If you want to cool it down more slowly, use convection. Blow on it and it will cool down ...

If you don't much care how fast it cools off then use radiation. Put it in a vacuum and come back in a few days, maybe it's a bit cooler ...

Radiation is kinda weird. You have things like glass that let it through more or less unchanged. You have stuff like a lump of charcoal that absorbs radiant energy well. You have stuff like a sheet of gold foil that reflects radiant energy well. So far so good (I hope). Now for the weird part. The lump of charcoal also radiates energy well and the gold foil radiates energy poorly. Strange but true. If they didn't do this then they would heat up just sitting there on the table.

None of this is perfect. Glass is never totally clear. Mirrors never reflect everything that comes in. Black paint is never totally black.

What you want to do in a tube shield is to cool the tube down as well as shield it electrically. They do two things to make the tube cool. The first is to put something directly in contact with the glass of the tube. This uses conduction to get the heat from the glass out to the tube shield. Color does not matter for conduction, contact does. The second thing they do is to put black stuff on the inside of the shields to make them absorb radiation from the tube's guts. Since most of the radiation is IR the color you want may or may not be black in visible light. They coat the outside of the tube shield black to make it radiate well.

The simple answer is that the black inside and outside shields with fingers are the best bet. You want the ones that have the dull black coating on them and not the ones that have been painted. Generally the paint is not going to be "black enough" down at IR.

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Date: Sat, 14 Jul 2001 15:36:09 -0700 (PDT)  
From: Joe Foley <redmenaced@yahoo.com>  
Subject: Re: [R-390] Tube Shields

The available research done and reported in the archives suggests that the IERC shields are the best, with convection and conduction being considered in the design.

The WPM's are second, conduction not as well considered.

Any others were considered strictly ceremonial not having much effect on the situation. BUT, the manuals state that ANY shield should be removed before using the radio in a table-top type case. We don't totally agree with that.

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Date: Sat, 14 Jul 2001 22:16:16 -0700  
From: "Bob Tetrault" <rstetrault@home.com>  
Subject: Re: [R-390] Tube Shields

And then there is the convective currents inside the contact finger spacings and between the contact fingers and the "shield" with an opening at the top and bottom. Also, the convective currents under such conditions are much more active than a tube in the open. So it is literally true and even inevitable that a tube with the IERC shields are even cooler than an unshielded tube. And the generic shields have no opening at the bottom, so they can't even convect...

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Date: Sun, 15 Jul 2001 09:04:58 -0400  
From: Bob Camp <bob@cq.nu>  
Subject: Re: [R-390] Tube Shields

There is a lot of data on tubes that shows exactly what you describe. Tubes with the "good" (IERC) tube shields are cooler than tubes without shields.

It doesn't matter whether you are talking about bulb temperature or anode temperature they are cooler. Cooler tubes last longer provided you keep the filament at the right temperature and keep the getter activated. Liquid nitrogen cooling may not be a good idea long term :) The outside of the shield definitely cools by convection,

I'm not so sure about convection inside the IERC's that I have. The spacing between fingers is pretty tight. The holes in the bottom of the shield get covered up when I put them on the tube. Two of the holes go over the bumps on the tube socket to hold the shield on. Maybe I've got the wrong kind of IERC's .... I have seen pictures of others that have the whole side of the shield cut out to allow more air to get at the fingers but have never used them. Now, should the fan blow the air in to the radio or out of the radio :) (Time to run for the hills ..)

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Date: Sun, 15 Jul 2001 09:23:57 -0700  
From: Dan Merz <djmerz@3-cities.com>  
Subject: Re: [R-390] Tube Shields

Hi, I'm one of these skeptical guys that only believes if some numbers are given when you start talking about heat transfer - and I like those nice black tube shields with the fancy pressure leaves inside and all that black body radiation stuff sounds right - plus since I understand it was tested at one time and showed 50% increase in tube life, who can really argue with it. But I wondered how much heat could really be radiated from a tube shield if it still remained more or less touchable though somewhat uncomfortable - around 60 degrees C I



figured, 140 F or so.

A thumbnail calculation indicated about a watt or two could be radiated so that seemed reasonable since the tube filaments are around 2 watts for each tube. To me this meant a lot of the tube heat went out the sides rather than down the pins, or to the metal shroud at the base. At least this indicated that it was reasonable to expect the shield to have an effect (why else would they be there?) I dug out my small wire thermcouple and measured some temperatures in my 390a which mostly has the "approved" good black shields but one bad silver shield on the 6DC6 tube, one of those silver ones with the spring and bottom bayonet.

I can't remember whether it was there when I got the set or I stuck it on because it was all I had. I know the black shields were all there. Part of me still wants to think that a tube running hot has more umph - remember that Millen got the National SW-3 to perform better than competitors' sets back in the early 30's by boosting the filament voltage a bit - but that's digressing ! Sometimes it's hard to kill an idea whose time has passed.

The temperatures on some of my 390a tubes were:

510 tube	55/67	outside/inside the shield
5814	54/64	ditto positions ( and 60 with no shield ?? but hard to measure)
6BA6	/69	inside black shield /81 inside silver shield
6DC6	/53	inside black shield / 58 inside silver shield

My room temp was around 24 C and the air temp inside the covered R390a was around 35 C and the set had been running for an hour or so.

As you see when I exchanged the black shield on the 6BA6 and the silver shield on the 6DC6, the temperature was always lower when the black shield was used, which is as it should be according to the black vs silver emissivity argument and perhaps the better conduction contact of the black type shield with the inner leaves. These were quick and crude measurements but satisfied my need to see some numbers. I think my real reason for examining this was not fully answered, namely what is the degradation process. I can see that whatever it is, higher temperature should cause shorter tube life, particularly when we're talking about the order of 10 degrees C difference and rate processes that are likely affected by temperature. And of course my numbers don't say anything about temp inside the tube itself. I wonder if the metal glass seals are the determining factor.

The only large number of tubes that I have observed with high percentage of failed tubes were several boxes of 1940 era military 1T4 tubes that appeared to have leaked in a high number of cases, maybe 10 to 20%, even though they were in unopened boxes in seemingly good shape Whatever process that is causing degradation during service, other than filament "fatigue" of some kind, may involve the glass/metal seals and ingress of gases. I throw this idea in the pot to provoke a more informed response. If tube production is like most

manufacturing processes, failures due to one or another type of component failure was probably improved for each until no single type of failure accounted for the eventual demise of the tube.

Or perhaps there was one particular failure mode that could be improved only so much and the other parts of the tube had only to last that long. I yet wonder if the improvement of tube life with shields was dependent on some test cycling that involved turning the radio off and on or whether these tests were done with the tubes running continuously?, hope this doesn't confuse and clutter the ether and provokes some more informed soul to offer his (or her?) recollection of life in the fast lane of tube development, Dan

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Date: Sun, 15 Jul 2001 10:31:53 -0700  
From: "Bob Tetrault" <rstetrault@home.com>  
Subject: Re: [R-390] Tube Shields

I would submit that it is the thermal cycling from some elevated temperature that "gets" them, in that they get leaky (gassy) from the metal seals literally losing it. Someone a year or so ago, maybe Nolan, one of the Barry's, had some reprint of the actual numbers and lifetimes.

The old MIL HDBK 217, based on the Arrhenius equations would jump with joy with this phenomenon with tubes. They probably used some basic data from tube life research to come up with their temperature versus lifetime predictions.

BTW, I have none of the IERC shields. But a fair amount of interesting test equipment that may be "surplus to my needs." Anyone want to discuss a trade of some kind?

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Date: Sun, 15 Jul 2001 13:48:47 -0400  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Tube Shields

There are tube shields and there are tube shields. I suppose we regard the black IERC's with the fingerstock style insert as the best. However, there are also those which are nearly identical but have the pleated insert. I've also seen a number of shiny shields (not IERC) with the pleated insert.

One of those two styles of insert are probably the most effective. I'd think there's a tradeoff between ventilation/convection and surface contact.

The pleated type would seem have better surface contact with the tube envelope. I just worked on an R-392 where all of its shields were shiny bayonet types, but with the black, pleated (probably beryllium-coper) inserts.

There are other variations among the IERC's -- some are cut from tubular stock, others from flat stock and welded into a cylinder. The regular ones have a small flange at the top, the welded ones are open with four tabs to retain the insert. I

don't know if there's any difference in performance between the two.

The shiny shields with the black pleated inserts should perform nearly as well as the IERC's. I've also have some open frame IERC's that have an insert with horizontal "grids" which show through. These require special bases -- not compatible with the common bayonet type.

In reading Dan's post here, another thing occurred to me. I'd guess that most of us like to preserve the painted labeling -- mfr. name/logo -- on the tubes. However, the paint could interfere with the thermal bond between the envelope and the insert. Less likely with the fingerstock type which tend to cut through the paint when you install or remove them.

From time to time, I've noticed a slight trace of a white residue when removing some tube shields. Ordinarily I'd think it might be corrosion -- but could it be some heat sink compound?

Would it make sense to use heat sink grease between the tube and shield and where the shield mates with the mount? Anybody ever try that?

Dan -- did you notice if all of the IERC's in that radio were exactly the same? Were they all fingerstock type or do you have some pleated.

I've also seen IERC's and others with five-sided flat inserts. While these are black, it would seem they'd make the least contact in terms of surface area with the tube envelope.

Finally -- Dan raises some questions about tube life factors. Of course, many become weak before the filament burns out. Someone explained here once that the coating gradually boils off the elements (plate?) reducing the gain of the tube. Some tubes can be rejuvenated, but I think those were mostly the ancient ones. Can somebody (re)educate us on this?

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Date: Sun, 15 Jul 2001 22:16:51 -0400  
From: Bob Camp <bob@cq.nu>  
Subject: Re: [R-390] Tube Shields

Boy we're really getting in to it aren't we .... wow!

Glass to metal seals definitely have an effect on tube life. High temperature and temperature change are not good for seals. The expansion coefficient of the glass and the metal in the pins are never quite the same. The more you change temperature the more you stress the seal. If you take a look at the data sheets for glass transmitting tubes like the 4-1000 they have specific requirements for cooling the pins and the plate cap. You have to keep them cooler than the rest of the tube or you get in trouble. That said I doubt that it's a big deal in receiving tubes. The pins are pretty well heatsunk to the tube socket. A typical tube has a lot of lead length inside the tube and it's small diameter stuff. Not to good for

moving heat around. Thermal conductivity is just like electrical resistance in this case. You make something large diameter and short if you want low resistance. You make it long and thin for high resistance.

The magic number you really need to know is the temperature of the plate of the tube and the rest of the guts. The temperature of the glass it's self isn't much of an indicator unless you believe that the glass is going to degrade. Other than tubes I've dropped on the concrete floor envelope degradation has not been the top ten reasons why tubes seem to go bad around here.

To get the temperature of the guts you need some fairly neat gear and you need some basic data on what the guts are made of as well as data on the glass in between you and the guts. Assuming you have all the data and the gear you can measure the radiation off of the plate and figure out what temperature it's at. That's a bit tough for a poor old basement fiddler like me.

Not to throw water on the whole idea, but there are other things that worry me a lot more when it comes to keeping a 390 going than the life of the tubes. Regardless of how we get the heat off the tubes it still winds up in the radio and the radio gets just as hot either way. The hotter the radio the more the rest of the parts are stressed. Some of those other parts are going to be tough to replace. If I was going to spend cash to improve the life of the radio I'd spend it on a fan or something else that cools the entire radio rather than just the tubes. I would also think long and hard about stacking six of them one on top of each other in an un-ventilated rack cabinet.

The data on tube life versus the type of tube shield has been around at least since the mid 50's and was very well known in regard to the R-390. Your government and mine never saw fit to fill all the 390's with black shields. They have never been bashful about spending money so saving cash probably wasn't their motivation. I suspect that the effort involved in the relatively simple task of swapping all the shields is what kept them from doing it. It's the same labor and supply chain they used to change out bad tubes so you could probably figure out what the trade off would have been. All this is not to say that I'd throw away any IERC's any time soon. If you have them, use them. If you come across any that you don't need, send them to me - I'll gladly use them :) I simply would not spend major amounts of money going out to get lots and lots of them. If a tube costs 1/3 of the price of an IERC shield then the shield probably isn't going to do me enough good to be worth it. If the shield is 1/2 the price of the tube then it's probably a good deal. The published data on the IERC's would indicate a 40% increase in tube life as compared to a silver shield. Something less than that seems to be the case in comparison to a tube without a shield. Pretty neat stuff. Certainly got the reflector going again.

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Date: Sun, 15 Jul 2001 21:46:12 -0700  
From: Dan Merz <djmerz@3-cities.com>  
Subject: Re: [R-390] Tube Shields

Barry, as usual closer exam reveals more on the tube shields. The ones I have

are the type with 5-sided metal sheet inserts typically marked something like "WPM RS-215/2 MS 2433-2" on the one I checked closely. I dug through my outside parts drawer and found one of the IERC type marked as such and a number of others more or less the same design marked "Cinch TR5 1015B" with the finger-like metal contacts so my 390a didn't come with the IERC shields marked as such. All the tubes in my EAC 390a above and below except the 6DC6 have the "WPM" type shield with five sided insert. My first impression is that there is more contact area with the finger type but after I pulled one of the fingered inserts out and looked at it, I'm not sure. Each tine or finger may only contact on the very leading tip so the contact area may not be as large as it first appears, relative to the five-sided insert. The five-sided type gets compressed over some width along the five lines of contact. The fingered type sure evoke admiration for design. On tube rejuvenation: I don't know any way to rejuvenate coated filament or coated cathode tubes, though it seems I have read something along that line somewhere. But thoriated tungsten filament tubes, the 2nd generation of tube filament following early tungsten filaments, can sometimes be rejuvenated by holding the filament at high filament voltage to promote migration of thoria from within the filament to the surface of the filament. Thoriated tungsten tubes have enhanced emission due to lowering of the electron work function by thoria at the surface. The thoria there becomes depleted, probably by evaporation and sputtering over time, and filament emission falls off. I have done this once or twice on tubes like 201a's with success, but it is a procedure that can only be repeated a limited number of times. This procedure is documented in several books and magazines that I have come across, usually involving about twice the filament voltage for a few minutes followed by a slightly elevated voltage after that before the tube is put back into service. In my career in sputtering technology we used a different method to keep the tungsten filament enriched with either depleted uranium or rare earth oxides, which works even better than thoria, by constantly depositing the uranium or oxide on the filament surface via a nearby sputtering target. Of course, these gadgets were much bigger than ordinary vacuum tubes and a typical filament lasted only about 72 hours before evaporation of tungsten caused failure. Dan.

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Date: Mon, 16 Jul 2001 01:27:12 -0400  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Tube Shields

My feeling is that the finger type is probably better, than the five-sided type, but the pleated/accordion fold type of insert may be best -- at least in terms of percentage of contact with the tube envelope. Sounds like you don't have a sample of those. You might find a shiny shield that has one. These may have been a "retrofit" as there seems to be nothing special about the shiny shields I've found them in. Most often, I find them in black shields of various manufacturers, including IERC. I've found all three types -- finger, five-sided and pleated -- in IERC's. Another design variation that may have influence on convection is the size of the flange at the top and the space between the top of the tube and the top of the shield. And then, there's the specifics of the bayonet mount --whether any significant amount of air can enter through the base. Twist 'n lock bayonet

shields would block most of this, but the IERC's snap on type would seem to cover most of it also. All that's left is the punchouts from where the mounting ears are formed for the bayonet bases. One of these days I'll have to take some photo's of the different variants and put them up on a web site -- unless someone has done it already. <snip>

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Date: Mon, 16 Jul 2001 02:38:43 -0400  
From: Norman Ryan <nryan@intrex.net>  
Subject: Re: [R-390] Tube Shields

Don't despair if your gear comes with heat sink tube shields similar to the IERC type, such as the Cinch, WPM, or other makes. They work basically similarly, be they finger type or pentagonal, etc.

The shiny ones with shiny interiors and shiny heat dissipator inserts are suspect, IMO, and are little better than leaving the tube unshielded as far as heat dissipation goes. Shiny shields with no inserts at all definitely are to be avoided.

Shiny shields with inserts can be helped to dissipate heat better by spray painting their interiors with flat black paint. Take out the insert and give it a thin coat of flat black if it is shiny. Use masking tape to block the inside of the shield where it contacts the tube socket flange, then spray paint its interior also. When dry, remove masking tape and install insert. Replace these shields with IERC (or clones) whenever you find them.

WPM shields can be improved by pushing a tapered rod into the top of the shield to curl the top's rim inward. This will make the WPM fully as effective as an IERC-- it even resembles an IERC if you ignore the WPM logo.

Fair Radio still has IERC's from 85 cents upward.

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Date: Mon, 16 Jul 2001 03:57:24 -0400  
From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] Tube Shields

I dunno if I agree with painting the insides of shiny (or other) shields where you have inserts. If the inserts are black that's what counts in terms of reducing heat reflection back into the tube. Also, the black finish on tube shields and inserts is not paint -- it's black oxide or black anodized -- very thin and probably doesn't impede heat transfer much. However, paints that are typically available -- particularly flat paints -- will tend to insulate the insert from the shield body which is not a good

idea. Part of the heat is convected out in the space between the shield and the tube, part is conducted out via thermal transfer from the tube glass to the insert to the shield body and to the surrounding air, and part is conducted out through the chassis. Painting the inside of the shield may reduce 2 of the 3 routes out.

True, when you re-install the five sided flat type, the high spots (corners) may

well scratch through the paint, but I still don't see the advantage. The tube is "seeing" the inside of the insert, not the inside of the shield. If the inserts are shiny, then you'd best replace them or the shields. (If the contact surfaces have worn off, a few coats of magic marker or "Sharpie" marker might help, though not all that flat on metal.)

Painting would be an improvement for the standard shiny shields with no inserts. That would reduce heat reflection, but do nothing for conduction. True - the fingerstock type inserts are perforated, but I don't think the tube "sees" much of the shield with those, either. My 2 cents anywho. Am I wrong on this? Opening up the flanges sounds like a good idea, though.

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Date: Mon, 16 Jul 2001 10:23:19 -0700  
From: "Roger L Ruskowski" <rlruszkowski@west.raytheon.com>  
Subject: [R-390] Tube Shields black stuff

The black stuff is to reduce the impedance between the metal and the air. If the black stuff scrapes off at a point of contact between two metals or between metal and glass. "GOOD" Those two surfaces are now closer to one with each other and have less of a heat transfer interrupt. The black stuff is to get a better match between air and metal. How do you get more radiated heat out of the air and into the metal inside the shield. On the outside of the shield, how do you get the heat radiated from the metal back out to the air. Fingers in the shield help. Glass to metal transfer is better than a glass, air, metal transfer.

You can not get 100% coverage inside the shield. So there is some room for glass, air, metal transfer. The black stuff inside the shield makes this transfer more efficient. So it gets built in. Out side the tube shield there is only one mechanism at work. Metal to air heat transfer. More black stuff area, then more heat transfer. Touching up scratches is a waste. Better you go for clean finger oil free black stuff than any ting else you can do on the bench at home.

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Date: Mon, 16 Jul 2001 19:13:09 -0700  
From: Dan Merz <djmerz@3-cities.com>  
Subject: Re: [R-390] Tube Shields/mil spec

Jon, thanks for leading me to the milspec info. I had a look after downloading an unzip program that got lost on a disk crash. Most of the spec was essential to anyone wanting to sell the government a tube shield - not too revealing about what is really good about these things except I'd guess two or three suppliers got together on a committee with somebody on the military side and hashed this all out. When I look at the required temperature drop from a bare tube ( 25 to 55 C degrees decrease with shield in place) I'm tempted to think this was driven by some measurements on a tube shield of a particular type that was thought to be about as good as you could do, or was at least good enough, and then the spec held anyone else to that. But I don't know much about what was driving all the items in this milspec. So does anyone have a lead on where to find the Collins study that supports the idea that tube shields increase tube life, or any other reference for that matter that gives the details on tube life/shields or

temperature of the glass envelope/life for receiving tubes ? I haven't had much luck looking so far. Sorry to beat a dead, and now buried, horse, but gee why get on a reflector in the first place if not to rehash old knowledge, or at least become familiar with it, thanks guys, Dan

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From: "Bill Hawkins" <bill@iaxs.net>  
Subject: RE: [R-390] How to clean up tube shields?  
Date: Sun, 17 Feb 2002 23:12:12 -0600

Um, cadmium plated steel? Nothing that a good cad plating bath can't fix. If you can find one ..

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From: "Bill Smith" <billsmith@ispwest.com>  
Subject: Re: [R-390] How to clean up tube shields?  
Date: Sun, 17 Feb 2002 21:23:56 -0800

I've used Brasso to clean up shields to a mirror polish. But wear gloves!

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Date: Mon, 18 Feb 2002 09:36:09 -0600  
Subject: Re: [R-390] How to clean up tube shields?  
From: blw <ba.williams@charter.net>

I don't know if a few of these tube shields are aluminum or not. They probably are. They came with the receiver. I was trying a few things to see how well they work and Twinkle for brass and copper got the shields very shiny. I think I have some extra IERC shields to fit over those tubes when all is finished.

By the way, I think I may have mentioned a friend who had a McIntosh amp and tuner sitting in his shed. I called him last night and asked about it. I haven't heard from him in a few years. His brother gave it to him and he is calling this week to ask if he can give it all to me. I don't know model numbers, but I know he has spare tubes and all manuals and brochures with it. I'm hoping to have both units on the bench before the weekend. This is getting crazy around here. First, a Fisher 800b was given to me and now I may be getting a McIntosh amp and tuner.

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Date: Wed, 01 May 2002 22:45:30 -0500  
From: Ron Evans <cosmos41@ix.netcom.com>  
Subject: [R-390] CY-979A/URR Problem -- Can't Install Receiver

R-390 Guys, Some of you have probably endured my whining on the Collins list already. I *should* have asked my question here first. I recently bought one of the CY-979A/URR cabinets and finally got to ATTEMPTING to install my R-390A/URR today. The problem is that the rcvr will not go all the way into the cabinet. It stops about a half inch short, apparently when the bottom rear edge of the receiver contacts the folded over structural member of the cabinet. I believe that the lip of the receiver is supposed to go between the bottom of the cabinet and this folded over piece (the bottom of the cabinet opening at the rear). Am I supposed to take the bottom cover off the receiver before trying to



install it into the cabinet? Help! I've tried like crazy to force the bottom lip of the receiver into this "space," but it just won't go. All input appreciated. Very much!

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Date: Wed, 01 May 2002 23:29:01 -0500  
From: Don Reaves W5OR <w5or@comcast.net>  
Subject: RE: [R-390] CY-979A/URR Problem -- Can't Install Receiver

Take the bottom and top covers off before installing in the CY-979. The receiver won't fit with the bottom cover on, and it will get too hot with the top cover on.

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Date: Wed, 01 May 2002 23:38:16 -0500  
From: Ron Evans <cosmos41@ix.netcom.com>  
Subject: [R-390] Never Mind! (CY-979A Woes Banished)

Forget I asked about taking the bottom cover off my R-390A/URR before trying to get it to fit into the CY-979A/URR cabinet. I took it off and the rcvr slides in smooooooooooooooooooh! Finally! No more from me for awhile! Is that a deep sigh of relief I hear?! My gratitude to you all.

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Date: Wed, 01 May 2002 23:50:51 -0500  
From: Ron Evans <cosmos41@ix.netcom.com>  
Subject: [R-390] Success! Receiver Installed

Thanks to all who gently took me by the hand and guided me into the R-390 Promised Land. I took the bottom cover off, but I guess my R-390A doesn't have the top cover. It has some smaller covers over certain assemblies but no overall sheet metal cover like the bottom one. Am I correct in assuming that the top cover would be similar to the bottom one? If so, my rcvr lost its top cover somewhere or other in some distant past. Wow...I may get to sleep tonight after all. Grateful to all, Ron, KD5S

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From: "Greg Werstiuk" <greg\_werstiuk@msn.com>  
Subject: RE: [R-390] Success! Receiver Installed  
Date: Thu, 2 May 2002 01:00:55 -0700

Missing top and/or bottom covers are common. These were often removed to improve ventilation thereby reducing internal heat build-up.

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From: "Damon Raphael" <w7md@gci-net.com>  
Date: Thu, 28 Nov 2002 14:10:29 -0700  
Subject: [R-390] Help On Installing R-390 in CY-979A

Should I remove the top cover only, bottom cover only or both covers??

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Date: Thu, 28 Nov 2002 21:35:59 -0600  
From: Don Reaves W5OR <w5or@comcast.net>

Subject: RE: [R-390] Help On Installing R-390 in CY-979A

Remove both top and bottom covers.

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From: "Damon Raphael" <w7md@gci-net.com>  
Date: Fri, 29 Nov 2002 15:00:02 -0700  
Subject: [R-390] Re: Help On Installing R-390 in CY-979A

Thanx to the multitude who sent me emails on howto do it. I removed both covers. The R-390 looks and sounds great in its new suit. I couldn't figure out what to do with the "rails" Looks like they were drilled for a different set of shock mounts.

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Date: Fri, 29 Nov 2002 17:35:08 -0500  
From: "Jim M." <jamesmiller20@worldnet.att.net>  
Subject: Re: [R-390] Re: Help On Installing R-390 in CY-979A

I too would like to know what to do about the rails. I can't figure out where they go. I have the shock mounts installed on the bottom of the cabinet, and the unit is just sitting on the flat sides of the 4 shocks now. On the mounting rail that came with the cabinet, the holes don't line up with anything I can see.

Also, the front panel holes don't center with the holes on the radio front panel on the left side, they seemed to be about 1/32 inch too low on the left side (either that or the radio is warped). I had to pound on the inside rail and do some sanding/filing to bring it down. Any ideas?

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Date: Fri, 29 Nov 2002 16:14:36 -0800 (PST)  
From: "Tom M." <courir26@yahoo.com>  
To: Damon Raphael <w7md@arrl.net>, r-390@mailman.qth.net

I had the same impression on the rails. The shock mounts need to be cocked over 45 deg to fit I believe.

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From: "Ronnie Davis" <rdavis24@carolina.rr.com>  
Date: Tue, 8 Apr 2003 20:00:51 -0400  
Subject: [R-390] Rack question?

Hello to all I have a nice condition 5' Motorola rack cabinet that I plan on using to store 3 R-390A's. How close can I mount them and not have to worry about heat problems if all three are running? Should I just mount two in there and leave extra space for air? It has two fans on it and im going to leave off both doors, so only the sides will be covered. Any help will be greatly appreciated.

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From: "Bob Tetrault" <r.tetrault@attbi.com>  
Subject: RE: [R-390] Rack question?

Date: Tue, 8 Apr 2003 18:34:31 -0700

I'd try to ensure that the fans can push or pull the air past the radios, which pretty much means sealing it all around except for where the fans can have an intake and an exhaust. Usually the fans are exhaust fans at the top with the intake at the bottom, though some high heat racks were designed with the fans at the bottom pushing intake air through dust filters to exhaust at the top.

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Date: Tue, 08 Apr 2003 18:58:38 -0700  
From: Dan Arney <hankarn@pacbell.net>  
Subject: Re: [R-390] Rack question?

They were designed to be mounted in racks one on top of the other and were lined up in some rack after rack. They ran for years like that until all of the worry wart hams got to the point of re-engineering them. Just remove the top and bottom covers and put the sides on and if you have one put in a muffin fan at the top to pull some air through them. Oh yeah the redesign engineers are going to tell you to control the voltage. plug them and let them go. One guy that used to be here had one in a rack of equipment with unregulated power that had been running 24/7 for over 5 years with out a failure. Look at the specs for voltage, very wide SAFE field of operation. Let all of the re-design guys cause you to get an ugly "ULCER because you put 119.965 volts into the radio. Fill up the rack and go for it.

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From: "G4GJL" <G4GJL@btopenworld.com>  
Subject: Re: [R-390] New owner with (probably dumb) questions  
Date: Mon, 21 Apr 2003 10:33:38 +0100

I agree about the ridiculous priced IERC tube shields are going for these days. Witness Ebay from time to time as a (high end) price guide. I have two remedies for this situation which may arouse some thought amongst the group:

#### Thought 1

There are many items of none-radio-interest electronic equipment which turn up from time to time at boot sales, industry sales, rallies (hamfests west of here) and other suchlike sources. I have found that whilst this sort of kit is of no use to us in a pure radio sense, it will often yield high quality components such as transformers, chokes, switches, fuse holders, knobs, tubes and, yes tube screening cans. Better quality equipment will often have black high performance tube shields which can be put to good use in our, shall I say, more desirable equipment. Personally I build a lot of my own gear any way, so the source of components I mentioned is a very valuable one to me. I appreciate this is not everyones cup of tea, though.

#### Thought 2

Higher performance in tube shields is gained mainly by virtue of them being black. So many plain metal shields have the close fitting spring inserts to conduct heat away from the tube and will benefit from the following. These

shields can be enhanced simply by painting or spraying them black. Personally I use a USA product for this, which is a high temperature flat black spray aerosol paint, intended for renovation of barbecue equipment. It will easily withstand the tube heat. I dismantle the shields and spray all surfaces, inside and out. bulk spraying will improve your yield per can. Let them dry well, or oven them if the domestic situation permits, before they are put into use.. 73 and peace to you all this Easter

From: "blw" <ba.williams@charter.net>  
Sent: Monday, April 21, 2003 3:27 AM  
Subject: Re: [R-390] New owner with (probably dumb) questions

>  
> > Almost all of the R-390's had silver tube shields on them. The IERC's are a  
> > rare item. You can get a set of them but it will significantly increase your  
> > investment in the radio. I am not convinced that they are worth the money  
> > they are selling for these days. Tubes are still pretty cheap ...  
>  
> I think that if you are going to spend the money on the black IERC shields,  
> then get the best shields. I used to have a detailed report of lab tests  
> that somebody sent the list a few years ago, probably Dr. Jerry. Anyway,  
> without finding the specs of the tests, the shiny shields do damage to tube  
> life by reflecting heat back to the tubes. There are 2 types of IERC tube  
> shields. The type that doesn't do the job as well are the type with only 3  
> or 4 large finger tabs on the inside to contact the tube glass. The good  
> shields are the ones with a lot of small, mini fingers to grab the glass.  
> Those dissipate the heat more efficiently. That report had temps from the  
> different combinations, etc.  
> There are only a few tubes that should be shielded. Chuck has those listed  
> on his website, or he used to have it up there the last time I looked.  
> <http://www.R390A.com/>. I only shield those that he suggests.

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Date: Mon, 21 Apr 2003 10:32:21 -0500  
Subject: Re: [R-390] New owner with (probably dumb) questions  
From: blw <ba.williams@charter.net>

Found that older reference to tube shields. This was a long thread in 1999 and 2000. Maybe someone has the info on the pros/cons of cutting on the tube shields??? Wasn't that about beryllium, or some other nasty metal? I need more coffee before I finish beating horses. Barry

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Date: Mon, 21 Apr 2003 13:06:06 -0400  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: [R-390] New owner with (probably dumb) questions

The nasty metal is beryllium copper. Like the meters, it's OK to handle, but not to eat. Seriously though, don't grind/sand it or cause to become airborne dust. There are two main aspects of the IERC shields -- black surfaces to reduce reflection and heat sinking. The shields themselves are coated with something

special or black anodized. Even so, you'll notice that the lower 1/2 inch is shiny/uncoated on the inside, so as to make a good thermal connection to the socket mount. The tube mostly "sees" the heat sink insert which is blackened. It's actually better if the inside of the shield itself is bare to maintain good thermal coupling to the insert. It should not be heavily coated. I've seen 3 major styles of heat sink inserts -- simple 5-or 6-sided cylinders, the "finger stock" style with lots of springy contacts stamped into the insert, and the pleated type, which is a kind of accordion fold. I'd imagine these vary in terms of effectiveness of heat-sinking vs. ventilation, with a trade-off. The simplest 5-sided ones allow maximum direct cooling -- vertical airflow, but minimize the area contact between the glass and the heat sink. The finger-type improve on the thermal coupling and still allow for a lot of convection. The accordion pleated type maximizes the glass to heatsink area, but might limit direct convection cooling from the glass. However, the pleats run vertically and there's probably a good deal of convection through the insert as well as heat conducted away through the metal to the shield. There's another variation on the design of the shields themselves. Most shiny shields have a substantial flange which retains the spring at the top. This reduces the top opening and probably affecting convection cooling somewhat. The IERC's usually don't have springs and there is typically a minimum kerf on the top so it maintains its shape and the insert has something to back up against. I've seen some without the kerf, with small stampings to retain the insert. Lately, I've come across quite a few shiny shields with the pleated type of insert. I would imagine that performance is nearly the same as an IERC type. So, look inside before you cast them aside. I don't know if they were originally equipped that way or upgraded after the fact. As for painting -- particularly with barbecue or engine paint -- I don't think that's a good idea. Regular coatings serve as a thermal insulator, so the whole shield would tend to retain more heat inside. At minimum, mask off the bottom inside surface. Best to use some other blackening method, like gun bluing. Anyone ever try that?

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From: "Kenneth G. Gordon" <keng@moscow.com>  
Date: Mon, 21 Apr 2003 10:28:52 -0700  
Subject: [R-390] Re: IERC tube shields and tube temps...a field expedient...

I have had pretty good luck with simply spray painting the inside and outside of a shiny tube shield with flat black paint after masking off the lower part which would make electrical contact with the grounding ring on the socket. My idea was that the shiny interior of the tube shield was reflecting some of the heat back into the tube, and by painting it black, some of that reflected heat was absorbed instead by the shield and transferred to the outside. Temperatures were noticeably lower for tubes with which I tried this, although I didn't actually measure them. I have not yet tried to cut ventilation slots in them. I suppose I should try some sort of heatsink material around the outside where it might fit.

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From: "Darryl Jones" <sherri-darryl@erols.com>  
Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...  
Date: Mon, 21 Apr 2003 19:18:58 -0400

Well, I'm gonna give it a try and find out. Whats the worst that can happen? I lose a couple of tubes, of which with one or two exceptions, I have bucketloads :) Does anyone have a suggestion of how I can measure tube temps accurately?

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From: R274C@aol.com  
Date: Mon, 21 Apr 2003 19:40:10 EDT  
Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...

Get a laser thermometer. Used by most commercial hvac technicians. Very accurate. If you don't have IERC shields, remove the tube shields, they will live longer than with shiny or painted shields. And, contrary to popular belief, your radio will continue to work properly. Les

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Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...  
Date: Mon, 21 Apr 2003 18:45:16 -0500

I've been using regular tube shields painted flat black since the 60s, works great.

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Date: Mon, 21 Apr 2003 19:17:55 -0500  
Subject: Re: IERC tube shields and tube temps...a field expedient...  
From: blw <ba.williams@charter.net>

I was thinking you would prefer the other type of thermometer, but now you come up with a laser one instead. Go figure. (g) I went a long time without any shields, so I agree. I only put those that Chuck recommends because I had them sitting around. The only shields that I leave on the SP-600 are the ones that attach to the chassis for support. <snip>

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From: R274C@aol.com  
Date: Mon, 21 Apr 2003 20:38:43 EDT  
Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...

I agree Barry, the only reason I have a full set of shields on the R-274C is because they are all IERC with the "fingers." Many auctioneers are getting like most of America,.....GREEDY. Les

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Date: Mon, 21 Apr 2003 20:58:42 -0400  
From: Gene Beckwith <jtone@sssnet.com>  
Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...

Re fingers..and black shields and such...have been slowly but steadily collecting the little guys for a couple of years..and have been able to shield up a couple of my pet ST. Juliens Blue Stripers.... Am finding them in ones and two and such in the boxes under the tables at the fests...most don't know or care what they are and have had some given to me....also had to buy a bag of tube shields of

various types at local Ham auction...(local club) to get a few out of the sack...cost ... 2 bucks...threw the rest in the dumpster... So, gotta get on your hands and knees guys ... down where the spiders and and old tv rabbit ears reside under the tables...lot's of gold, errr. . . "black gold" down there, even if u have to buy the whole box; and then let the vendor keep the junk minus those little shields... btw... also a good way to find those little meters we lust after too... Good hunting...!! Gene W8KXR

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From: "Jim Shorney" <jshorney@inebraska.com>  
Date: Mon, 21 Apr 2003 21:15:47 -0500 (CDT)  
Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...

>Does anyone have a suggestion of how I can measure tube temps accurately?

Brew up a wheatstone bridge circuit with a forward-biased silicon diode in one leg as the sensing element. Connect it to your DVM and feed it a regulated DC supply voltage, calibrate it to 100C in a pan of boiling water and 0C in a cup of ice water. Quick, dirty, cheap, and surprisingly accurate.

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Date: Mon, 21 Apr 2003 22:16:08 -0400  
From: Mark Masin <mmasin@atc-us.com>  
Subject: Re: [R-390] Re: IERC tube shields and tube temps...a field expedient...

If anyone is interested we still have the tube shield inserts, (BeO2), accordian type on our website. There are 2 different sizes offered. Just for your info.

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Date: Tue, 22 Apr 2003 13:39:29 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: [R-390] Re: [R-390]IERC shields (was New owner with...)

To the best of my knowledge, the nasty part is the insert itself, not the shield. Don't hold me to that though, because I didn't build 'em! The thinking on shiney shields is that they weren't really intended as shields so much as holders to keep the tube in place for gear used in harsh environments (like on a battleship with 16 in guns firing). Makes sense when you look at the bayonet base and spring in the top to keep downward pressure on the tube. Whatever the case, it sure doesn't look like removing heat was a consideration. Here's my view of cutting them (IERC): Don't. They are designed a certain way to perform a certain way. Altering the shape could potentially mess this mechanism up and defeat the purpose. Now, having said that, here are some other thoughts:

-Use the correct size shield for the correct tube size. Or, don't use a shield designed for a short 9-pin on a 6U8A (slightly taller, medium-height 9-pin). I've seen this recently on an SP-600 listed via ePay. If you look at the tubes, you'll see that the shorter shield is snug to the top of the tube. This defeats the chimney or convection of heat being sinked away from the tube and passing up and out of the shield. You get the false security of having an IERC shield

'protecting' your tube, yet in reality it's just keeping heat in. Looks fancy, but doesn't work. One exception would be the later IERC types with the open sides. I've never seen these in the shorter 9-pin configuration, though. Still, the inner fingers have to align properly with the tube. If you tried using a tall 7-pin on a stubby 6AL5 for example, it wouldn't work worth a damn. Best thing to do is to take the different sizes and inspect them side-by-side. You'll quickly see the difference.

-WPM sockets work well also, just not as well as the IERC types. WPM are more along the lines of the ELCO/EBY/CINCH bayonet-base shiny shield, except they are black with inserts. I have a bunch of these in older equipment, I'm thinking of enlarging the top opening just a bit with a reamer to allow better airflow up through the inserts. There's a reason the IERCs have a wider mouth at the top.

-Some of the shiny shields actually have great inserts in them. I've always wondered how a shield with a shiny exterior and black interior with an insert would fair. Shiny exterior = reflects external heat floating around inside the radio instead of absorbing it. I have to guess that the engineers who came up with the IERC designs knew what they were doing, so I've never pursued it.

- Heatsinks/inserts for bases are important also. Somewhere between the shiny shields and the IERC types, these were used to pull heat away from the pin bases where too much heat can cause the seals to fail accompanied by loss of vacuum and the associated darkness within the tube. I've seen only a few IERC bases made to work with the IERC shields, and therefore conclude that the more standard IERCs were perhaps made to replace older types (or work with existing designs) and offer an improvement in cooling.

- Prices are only as bad as you're willing to pay. Sure, they appear on ePay for big \$\$ and if you want the convenience of not having to look around and can afford the price, it's a deal made for you. If your budget won't permit or you're a packrat at heart though, there are always the usual sources: old avionics, defunct test equipment, etc often yield these nice, black tube shields. It involves being patient as well as looking around at surplus outlets, under tables at hamfests, or even dumpster diving. Where do you think the dealers who sell them online are getting them? Just remember when cannabilizing an old piece of gear to also retrieve the little 'band of fingers' from the tube socket bases, if they're in the unit. Always check! Now, a couple years back a few of us put together a deal on here which yielded a lot of these shields. I'm fairly well set myself for now, although I could use a few of the taller 9-pin types. IIRC, there were 3 of us - Bill Cotter, myself, and one other person whose identity escapes me. We mainly traded with other list members, with trading being the preferred method, selling being the second choice (Bill sold a bunch, though). If there's enough interest and enough people have at least some amount of surplus they'd like to trade for sizes they need, we could try it again. Sizes are (from memory, don't yell if I'm wrong):

5015 - short 7-pin (6AL5/5654 etc)



5020 - medium 7-pin (6BA6)  
5025 - tall 7-pin (6AQ5 etc)

6015 - short 9-pin (6AK6?)  
6020 - medium 9-pin (6U8A, 12AX7 etc)  
6025 - tall 9-pin (12BA7, 3TF7, etc)

So....any interest? de Todd/'Boomer' KA1KAQ

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Date: Thu, 24 Apr 2003 08:54:35 -0500  
Subject: Re: [R-390] New owner with (probably dumb) questions  
From: blw <ba.williams@charter.net>

Yup, that's the nasty stuff. I use the accodian/pleated ones. More surface contact vs cooling spaces. I just happened to have enough of those types. I also have a few cardboard tube shields with aluminum foil that I've taken out of cheap plastic radios.

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Date: Thu, 24 Apr 2003 08:56:44 -0500  
Subject: Re: [R-390] New owner with (probably dumb) questions  
From: blw <ba.williams@charter.net>

Somewhere along the line I wrote down that it was suggested that V-204 be shielded too.

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From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>  
Subject: RE: [R-390] New owner with (probably dumb) questions  
Date: Mon, 21 Apr 2003 13:27:55 -0500

Aside from the shield itself, I've found the little strips of finger-like stock that are wrapped inside the tube socket is beneficial in conducting the heat from the tube base to the tube shield base and then to the chassis. I think they're made of beryllium copper as well.

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Date: Sat, 31 Jan 2004 19:25:08 -0600  
From: bw <ba.williams@charter.net>  
Subject: Re: [R-390] ReCapping R-390A

Somebody posted a report by somebody a while back. I have it on another computer at the moment. The IERC shields with 'fingers' lining the inside of the shield transfer more heat from the tube than any other type of shield. The shiny ones seem to reflect heat back to the tube and actually raise tube temperatures. Chuck used to have a short list of tubes suggested for having shields. Most are best used unshielded.

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From: "Phil Atchley" <k06bb@elite.net>  
Date: Sat, 28 Jun 2003 17:59:20 -0000  
Subject: [R-390] A question of covers.

Hi. I have just one quick question here. When I get the overhaul of this R-390A finished, probably in a couple weeks when the PTO and parts for re-cap have arrived and are installed, I plan on putting this unit back in it's CV-979 cabinet. Yes, I know that you remove the covers prior to installation and store them safely away (as I have already done). What about the Utah plate? On this unit the plate was removed (yes I did get it). It 'seems' to me that leaving the plate on would prevent dust and dirt that filters down through the top vents from settling in the coils and that part of the mechanism while I wouldn't think it would allow much if any heat buildup since there are only a few tubes in that area of the receiver. Are there any thoughts on the subject?

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Date: Sat, 28 Jun 2003 12:06:01 -0700  
From: hankkarn <hankkarn@pacbell.net>  
Subject: Re: [R-390] A question of covers.

Phil, I would install the Utah plate as it "MAY" cut down on stray RF from running around.

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From: "Barry Hauser" <barry@hausernet.com>  
Subject: Re: [R-390] A question of covers.  
Date: Sat, 28 Jun 2003 17:16:07 -0400

I agree -- install the Utah cover, but I have additional reasons as I've put a lot of thought into this issue:

1. Keeps not only dust out of the coils, but also potential spillage or squirtage.
2. Avoids loss of cover which is small and flat and could hide somewhere in a safe place -- forever.
3. Keeps essential information, silk-screened on top and bottom, close at hand. The rx needs that info to keep track of which coil is which, otherwise it may get confused and go out of mechanical synch spontaneously.
4. Pays respect & gives due recognition to the great state of Utah.
5. Further ensures that R-390A owners will know the outline of at least one state out of 50 at all times, which could come in handy in case of a pop quiz.

There ya' go -- from the sublime to the ridiculous in only five easy steps.

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Date: Sat, 28 Jun 2003 20:06:20 -0500  
Subject: Re: [R-390] A question of covers.  
From: blw <ba.williams@charter.net>

I think shielding is a good reason. That chassis is on the order of rolling stock for a reason. It isn't for structure, like the bottom plate of a SP-600. It also isn't for being used as a convenient place for beverages or ashtrays or tools or hamburgers/potato chips

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Date: Tue, 01 Jul 2003 16:39:31 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] A question of covers.

My thought is that you could install the Utah plate and figure out a way to also include in the case a small muffin fan or two. Just a small amount of moving air can keep a radio much cooler than without any fan(s). The R-390 non-A REALLY needs a fan at the voltage regulator tubes. Really. Roy

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From: "K3PID" <K3PID@comcast.net>  
Date: Fri, 26 Sep 2003 16:08:50 -0500  
Subject: [R-390] Covers & Cabinet

When the R-390/URR is installed in the cabinet does it normally have the top and bottom covers attached? Is there a cooling issue with both?

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Date: Fri, 26 Sep 2003 17:34:01 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] Covers & Cabinet

>When the R-390/URR is installed in the cabinet does it normally have the top and bottom covers attached?

NO

Is there a cooling issue with both

YES.

Many cabinets will not accept the radio with the bottom cover attached. Leave them off.

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Date: Fri, 26 Sep 2003 17:34:09 -0400  
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)  
Subject: Re: [R-390] Covers & Cabinet

Covers are meant only for rack use, Ron - to keep out dust, crud, and potential interference from unshielded areas within the rack. Put 'em in the closet.

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Date: Fri, 26 Sep 2003 17:53:21 -0400  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: [R-390] Covers & Cabinet

Conventional wisdom is to remove both top and bottom covers when installing in a cabinet. Also in the "official" instructions. Probably better to leave the RF deck cover (AKA "Utah cover") in place if you have it. Helps to keep dust out of the coils and mechanism. If this is an R-390/URR exactly -- meaning a "non-A", there are additional heat issues, particularly the 6082's which are upside down on the audio chassis. The heat rises and cooks the works. It's a good idea to position a muffin fan opposite the holes in the side panel to draw the heat out. Hopefully your cabinet has louvres on the left side that more or less line up on the 6082's. At least don't position the cabinet such that the left side is blocked. You might want to see if any of the components in the audio chassis have been "pre-cooked". Dave Medley advises replacing the (2-watt, I think) 47 ohm resistors with 5-watt.

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Date: Fri, 26 Sep 2003 20:13:57 -0400  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: [R-390] Covers & Cabinet

Correction -- if it's a non-A, it doesn't have a "Utah cover" -- more like a "Colorado" cover (rectangular) Or, I suppose, it may have an invisible, zero mass cover.

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From: Benzon Robert <BENZONR@ntsb.gov>  
Date: Sat, 27 Sep 2003 15:54:27 -0400  
Subject: [R-390] (no subject)

Gents: I am a new proud owner of a decent Motorola R-390A without covers of any kind except the sheet aluminum closest to the electronics, and would like to construct a wood cabinet for it. Has anyone out there done this? How much space around the aluminum do you folks recommend? And, what kind of forced-air cooling system would be involved? I am a user of this radio and not a technician, but could wire up external biscuit fans, I believe. This wood cabinet would be a tabletop type, to sit on the specially reinforced table I had to build for the thing when I got it. Boy, is it heavy. Thanks, in advance, for the advice.

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Date: Sat, 27 Sep 2003 19:46:30 -0500  
From: b w <ba.williams@charter.net>  
Subject: Re: [R-390] (no subject)

Welcome to the list. My first one was a long haired blonde, who had... wait a minute....okay- first time with R-390As. Got you. I lugged my first one, a Motorola too, into the bedroom and set it up on a somewhat sturdy night table.

It was in a SP-600 Bud cabinet too, so the weight was quite a lot more. Fans certainly don't hurt things, but they aren't absolutely necessary unless you are

going to have the top of the cabinet right down on the chassis. Maybe some kind of fan setup would be desirable then.

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Date: Sun, 28 Sep 2003 14:51:37 -0400  
From: Jim Brannigan <jbrannig@optonline.net>  
Subject: Re: [R-390] (no subject)

My station shelves are 3/4 inch birch veneer plywood, 12 inches deep . The entire assembly is a large box that sits on top of a 7 foot operating table.

All the joints are rabbitted, screwed and glued. 1X2's, on edge are used to support the long edge of the shelves. Molding was applied to all ends and it is finished with stain and polyurethane. At one end I built a rack "box" for the R-390A, CV-591 and a few small pieces. 3/4 inch angle iron is recessed in the vertical sides of the rack box.

The angle iron is drilled and tapped for standard rack screws. The R-390A sits on the bottom and it is "shimmed" level with wood spacers covered with flat aluminum stock.

The back is open. The shack is air conditioned during the summer and I never saw the need to install fans. The rest of the shelves are used for HF and VHF equipment.

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Date: Mon, 26 Jan 2004 16:09:21 -0500  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] Covers & Cabinet

>When the R-390/URR is installed in the cabinet does it normally have the  
>top and bottom covers attached?

I read your post that you get no/few replies..here is one:

The covers should be removed when installing the receiver in a cabinet, especially in the military desktop cabinet.

> Is there a cooling issue with both?

Yes. AND. the radio will not fit into the military cabinet with the covers in place.<snip>

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Date: Tue, 17 Feb 2004 20:49:30 -0600  
From: b w <ba.williams@charter.net>  
Subject: Re: [R-390] EAC R-390A parts needed

I think that I have a complete set of the real IERC tube shields between my 2 radios. I have one Utah cover plate and one set of top and bottom covers. All

came pretty much free with the radios. I only use a couple of the tube shields for the one working R-390A, and those are only the suggested shields listed by Chuck Rippel.

I keep one top cover loose on top of the radio in the rack for dust protection. I take it off most of the time when the radio is on to prevent heat buildup. I keep the Utah plate stored away. All of this is nice to look at from time to time, but most of it could allow too much heat.

Just keep your eye open for reasonably priced IERC shields. Sometimes, you find them for a buck or two. A whole lot of old timers have them rolling around in junk boxes or stuffed in plastic AM/FM radios. You only need something like 5 or 6 for shielding in a working radio....if you decide you need them.

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From: "Gene Dathe" <dathegene@hotmail.com>  
Date: Wed, 18 Feb 2004 14:17:34 +0000  
Subject: [R-390] IERC shields

Looking to buy some IERC shields; I need 1 of the 6025-B's and 7 of the 5020-B's. I want only the "finger" style, not the 3 piece... Thanks in advance!

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Date: Wed, 18 Feb 2004 11:48:14 -0600  
From: Dave Merrill <r390a@rcn.com>  
Subject: Re: [R-390] EAC R-390A parts needed

I think the evidence is pretty good that IERC tube shields reduce internal tube temperatures and prolong tube life. Collins did employ them on later tube gear. Can't fault earlier engineers for using components that were accepted practice, but when something clearly better appears, why not use it? BTW, was Nolan's radio from an early Collins contract? IIRC, it was a '67 EAC with IERC shields.

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Date: Thu, 19 Feb 2004 20:22:29 -0600  
From: b w <ba.williams@charter.net>  
Subject: Re: [R-390] EAC R-390A parts needed

Good to hear from you again. It isn't a big thing on the tube shields and dust covers, but the -20 manual does state that the dust covers should be removed if not used in extremely dusty conditions. I think the same paragraph in chapter 2 is where Chuck got his suggested group of tubes to be shielded.

These are: V201-V206, V505, and V701 if used in a fixed installation. The only point that I would quibble on is the type of shields. I posted a resend of the study of no shields, shiny, black, and IERC shields last year.

The measured temps was convincing data for tested tube life. I'll dig around and see if I can find it again. The shiny shields were the worst of the lot, and worse

than tubes with no shields at all. They always increased tube temps.

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Date: Sun, 14 Mar 2004 18:37:35 -0800  
From: David Ross <ross@hypertools.com>  
Subject: [R-390] none genuine without these numbers...

This reflector has been entirely too quiet lately. Against Hank's advice, I will now try to separate the fly's??t from the pepper.

The 1960 Collins General Catalog states, on page 82, under the category "TUBE SHIELDS", "Collins 66J Heat Reducing Tube Shields can lower bulb hot spot temperature rise above ambient to as low as 55% of former values".

The catalog further lists:

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Collins Shield Type Number (includes shield, corru- gated liner & base liner)	Equivalent JAN Shield No.	Height of Size Shield	Tube
66J-1	TS-102U01	1 3/8	7 pin short
66J-2	TS-102U02	1 3/4	7 pin medium
66J-3	TS-102U03	2 1/4	7 pin large
66J-4	TS-103U01	1 1/2	9 pin short
66J-5	TS-103U02	1 15/16	9 pin medium
66J-6	TS-103U03	2 3/8	9 pin large

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Anyone seen any tubeshields with this "66J-?" designation? No doubt now worth millions on egad...

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From: ToddRoberts2001@aol.com  
Date: Sun, 14 Mar 2004 22:28:44 EST  
Subject: [R-390] PEARL Tube Coolers

Hi All, Dave Ross's recent question reminded me that I wanted to ask the group if anyone has had any experience with the PEARL tube coolers? I see they are popular with some of the Hi-Fi crowd. Supposed to be even better than the IERC type shields at dissipating heat. They look kind of like a flexible accordion tube that slips over the glass envelope and snaps tight with rubber O-rings. The black accordion-like ribs act like small fins to dissipate heat away from the glass envelope. They are not designed to electrically shield the tubes but I have read that most tubes in the R-390A do not require electrical shielding or grounding of the shield. Thanks for any comments! 73 Todd Roberts WD4NGG.

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Date: Mon, 15 Mar 2004 09:37:19 -0600  
From: Harry Joel <hcjoel@direcpc.com>  
Subject: [R-390] Tube Heat Shields

Having followed the ongoing discussion re: heat shields, may I offer this: For the first three years as electrical engineer I worked for GE (AEG Germany) appliance division. There is had to perform heat related measurements on many of their products. Thermocouples were used almost exclusively to take readings. The small size of a thermocouple junction was an advantage. Drawback was the need to keep the reference for the thermocouple wires in an ice-water jar. A millivolt meter and the calibration chart was all to take very accurate temperature measurements. Now Thermistors could be used for the same purpose. Comparing the efficiency of the various tube heat shield designs could be done using a bead thermistor attached to a heatshield.

The effect of contact area (with the tube envelope), black or shiny shield color and other mechanical choices could be compared. It seems that with the preponderance of solid state devices, the development of better heat shields for vacuum tubes has not been on the front burner in the industry. The demand does not justify the cost of research in this area.

(with a 392 sitting on my work bench waiting for some TLC) I am encouraged by the ongoing discussions in this forum)

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Date: Tue, 16 Mar 2004 15:26:23 -0500  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] PEARL Tube Coolers

Todd, <Spoo mode ON> Yes, get them for all your tubes. They increase the sound stage image immeasurably and add a definite sense of presence and airy ness to the sound while removing a sort of graininess found in lower quality equipment. While you are at it, get some Cocobolo wood pyramids to mount your equipment on.. it reduces interference from the dreaded intergalactic noise field and cannot be done without. Only six hundred dollars a set of four. And have you heard of the cryogenically treated hospital grade 20 amp outlet sockets? None better. You have to try them to understand the improvement.. Only \$40 each. The accompanying cryogenically treated power cord is a mere \$150. ...<Spoo mode OFF> in my opinion:

Those tube coolers might work a bit better than IERC or similar tube shields in cooling the tubes\*, but if I were you I'd spend my money\*\* on spare tubes and normal heat dissipating tube shields, and a FAN! \*For a dissertation on their performance, including a very interesting bibliography on the topic, see: <[http://www.pearl-hifi.com/06\\_Lit\\_Archive/01\\_Audio\\_Notes/PEARL\\_Tube\\_Coolers.pdfv](http://www.pearl-hifi.com/06_Lit_Archive/01_Audio_Notes/PEARL_Tube_Coolers.pdfv)>

By the way, this reference shows a chart of tube temperature vs. cooling air velocity for a number of tube shields, including the shiny chrome ones and the black IERC ones. \*\*It appears that you can get Pearl tube coolers for small tubes



at about \$6 each. See:

<[http://sphl.audiogon.com/cgi-bin/buy\\_cl.pl?accstube&1083100833](http://sphl.audiogon.com/cgi-bin/buy_cl.pl?accstube&1083100833)>

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Date: Wed, 17 Mar 2004 07:11:07 -0800 (GMT-08:00)

From: "W. Li" <[wli98040@earthlink.net](mailto:wli98040@earthlink.net)>

Subject: [R-390] Re: Pearl tube shields

Interesting thread: reducing operating tube temperatures is one maneuver that will definitely prolong their life. Note that there are TWO types of IERC shields, one that merely slips over the the JAN socket, and one that actually mates mechanically to a special add-on sleeve bolted to the socket. The latter has an advantage in that a large area thermal connection is made to the chassis for conduction of heat away from the tube. This arrangement makes the most sense for those tubes below the chassis in the R-390 series, and not all that advantageous for those above the chassis. As Roy correctly points out, a fan is far more important to dissipate heat away from the tubes. On the market today are 80cm ball-bearing fans that are incredibly quiet that can be mounted strategically to dissipate heat... most useful for those of us that have the unit housed in a cabinet. My preference would be to mount the receiver in a ventilated rack with both top and bottom covers OFF.

Stictly speaking, this group (of all groups) ought to take the trouble to actually document operating temperatures of our units in a scientific way. After all, we are compulsive types, and prefer to pay attention to detail. Inexpensive battery operated LCD temperature monitors can be acquired from shops that sell customized computer case accessories for around \$16-\$22. These come with small temperature sensors that can be mounted anywhere on (or inside) a shield. Such results would be an interesting post for the ambitious members in this group....

Another point that has been brought up earlier, is to leave the unit on all the time, not only for temperature stability, but to avoid power surges through thermally vulnerable portions of our tubes. My own practice is to use a Variac to power up, with a thermal delay for B+, as described by another list member.

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From: "Bob Tetrault" <[r.tetrault@comcast.net](mailto:r.tetrault@comcast.net)>

Subject: RE: [R-390] Re: Pearl tube shields

Date: Thu, 18 Mar 2004 08:39:41 -0800

A final note for those interested in fans: Those ball bearing jobs are also available in 220V versions, and when run on 110 are **absolutely** silent. Sure they move much less air but still plenty.

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Subject: RE: [R-390] Re: Pearl tube shields

From: [murillo@furnas.com.br](mailto:murillo@furnas.com.br)

Date: Thu, 18 Mar 2004 14:45:38 -0300

Mine uses a 12 VDC PC cooler conected to the inners of a plug ( P- something ) , which feeds antenna relay. Micro rectifier-bridge and a electrolytic

capacitor rectifies everything. Absolutelly no wisper heard from propeller.

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From: "John KA1XC" <tetrode@comcast.net>  
Subject: Re: [R-390] Re: Pearl tube shields  
Date: Thu, 18 Mar 2004 15:20:28 -0500

Bob, do you have a specific vendor in mind or a URL handy for these?

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Date: Fri, 19 Mar 2004 19:45:27 -0600  
From: b w <ba.williams@charter.net>  
Subject: Re: [R-390] Re: Pearl tube shields

You may find it easier to buy one of the hand held RC plane temperature sensors. They run about \$25 and are used to get the temps of running engine parts. It should be fairly accurate if held around the tubes at various spots.

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From: "Drew Papanek" <drewmaster813@hotmail.com>  
Date: Sat, 20 Mar 2004 19:54:48 -0500  
Subject: [R-390] Tube Shields/Temperature Instrumentation

>Strictly speaking, this group (of all groups) ought to take the trouble to  
>actually document operating temperatures of our units in a scientific  
>way. After all, we are compulsive types, and prefer to pay attention to detail.

We also tend to be compulsively, shall we euphemistically say, frugal; which leads to....

>Inexpensive battery operated LCD temperature monitors can be  
>acquired from shops that sell customized computer case accessories for  
around 16-\$22.

Mal-Wart sells an indoor/outdoor digital thermometer for less than \$10.

>These come with small temperature sensors that can be mounted anywhere on  
(or inside) a shield.

The somewhat bulbous plastic encapsulated remote sensor of the unit I mentioned has some usefulness as is. For compactness, the plastic could be whittled down some.

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Date: Sun, 21 Mar 2004 07:38:53 -0500  
From: Bob Camp <ham@cq.nu>  
Subject: Re: [R-390] Tube Shields/Temperature Instrumentation

A few observations: Thanks to a twenty year old decision to stock up on tubes by our favorite pack rat government agency the world is awash in tubes for the R-390, R390A and a bunch of other stuff. Most of us have enough tubes to re-tube each of our radios a couple of dozen times. Tubes are easy to replace. I

have actually done it my self under a variety of less than optimum conditions \*and\* without any test gear at all. Tube swapping is a \*lot\* easier than any of the other maintenance procedures on one of these radios.

There are a couple basic parts of a tube as far as heat is concerned. You have the glass bulb, the seal between the glass bulb and the pins, and all the stuff inside. Each of these parts is affected by heat in a different way. They are also affected by a tube shield in a different way. The glass bulb will melt if it gets to hot. I have seen a lot of weird things happen, but melting glass on receiving tubes is not one of them. The amount of power required to get the glass that hot simply isn't available. The glass does not seem to be terribly forgiving when exposed to a drop onto a concrete floor ... The glass to metal seals on the tubes at the tube pins are an issue in terms of tube life. The glass and the metal have different thermal expansion coefficients. As temperature changes the seal is stressed. If the seal cracks even just a little you get a leak. Air inside a vacuum tube is not a good idea. I have seen tubes fail due to gas inside the tube. I'm not sure that the gas came from a seal leak though. The tube pins are heat sunk by the tube socket. They do not seem to be affected by the tube shield at all.

The guts of the tube do all the work and they are what usually fail due to heat. The filament obviously gets nice and warm in order to make the tube work. Hopefully nothing we do cools off the filament to much ... The rest of the parts get nice and hot and then cool down. Eventually the heat cycles make some of the grids sag or wires break. When they do the tube doesn't work as well as it might.

All of the magic tube shields cool the glass bulb. That's fine, but the bulb isn't the problem in the first place. The guts of the tube are the problem. The guts cool by radiation rather than by conduction or convection. It all gets down to a wonderful concept called emisitivity. Black tube shields are a good idea for radiant cooling. The only trick is they have to be black at infrared.

Simply cooling the guts of the tubes does not cool the radio at all. the heat is still inside the radio. You haven't even moved it around much. The rest of the parts in the radio are still nice and hot. They are what you need to worry about. They are what's going to fail. They are what will be a real pain to replace.

Back in the good old days tubes cost a lot and the rest of the stuff was cheap. That included the labor to find a dead resistor. Times change ... The cost of that carbon comp resistor is a bit high now that they are no longer manufactured.

Forget about the tube shields. Buy fans. Buy lots of fans. Un-stack the radios. Open up the back door on the rack cabinet. Heat kills the rest of the parts in the radios. A single fan will do far more for a lot less money than a couple of fancy tube shields ...

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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.

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From: "Bernie Nicholson" <vk2abn@batemansbay.com>  
To: <r-390@mailman.qth.net>  
Date: Mon, 22 Mar 2004 05:23:12 +1100  
Subject: [R-390] Tube bulb temperatures

The best and most convenient way to measure tube bulb temps is with a Infrared thermometer they are quite cheap and very accurate and you don't have to make contact with the glass I measured the temp of the radiator on my 4CX1000A which is 3000 volts above earth the other day, and heat sinks are also easy to measure, the unit contains a Laser pointer and electricians use them to measure the case temp of transformers on power poles without climbing the pole regards to everyone.

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From: "Kenneth G. Gordon" <kgordon@moscow.com>  
Date: Sun, 21 Mar 2004 11:00:24 -0800  
Subject: [R-390] Tube heat and glass to metal seals

I was under the (properly informed) impression that the metal used for tube glass to metal seals was specifically chosen because its coefficient of expansion was identical to that of glass, so that leakage from this source was essentially non-existent. I have forgotten the trade name of this metal. Comments from the peanut gallery?

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From: "Chuck Ochs" <jmerritt2@capecod.net>  
Subject: Re: [R-390] Tube heat and glass to metal seals  
Date: Sun, 21 Mar 2004 14:52:45 -0500

Yes, this is true. How else can one explain how vacuum tubes that were made 80 years ago still function perfectly. This is an obvious problem in the design of vacuum tubes, and was worked out a long time ago, most likely by the people at Western Electric, but maybe much earlier. After all, the mechanical characteristics of vacuum tubes are based on the design for the lightbulb. Suspects like Tom Edison come to mind.

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Date: Sun, 21 Mar 2004 15:12:42 -0500  
From: Bob Camp <ham@cq.nu>  
Subject: Re: [R-390] Tube bulb temperatures

The gotcha here is that glass is more or less transparent. A good infrared thermometer is calibrated for an emissivity of around 95%. That's a nice black surface, but not quite perfect. Depending on the characteristics of the glass at infrared you may or may not see it at all. If you do see it then you need to know what its emissivity (wish I knew how to spell that ...) is at the magic wavelength your thermometer is measuring. One way around the whole problem is to grab a "known good" can of flat black paint and spray everything in sight with a couple of coats of it. Then you can assume you are seeing the paint and your readings are uniform. How to make sure your paint is "known good" - carbon black is pretty much the standard of comparison. Spray a surface with your paint and then smoke a portion of the same painted surface. If you can see a temperature difference between the smoked area and the paint then try another brand of paint. The worst thing to go after is anything with gold plating on it. Gold is a crummy infrared emitter. If you really want to give your paint a work out spray it on any gold bars you might have lying around the house. You should get a nice contrast between the painted and unpainted areas. I would be happy to confirm your measurements if you send me the gold bars after you measure them ... The whole "black paint isn't black" thing is the basis for the "better" performance of the IERC heat dissipating tube shields. The black varnish on the competitors parts wasn't black enough at infrared to make them work as well

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From: "Bill Hawkins" <bill@iaxs.net>  
Subject: RE: [R-390] Tube heat and glass to metal seals  
Date: Sun, 21 Mar 2004 14:43:02 -0600

Yes, the metal and glass have the same coefficients of thermal expansion, but they don't have the same coefficients of thermal conduction. The metal is not necessarily at the same temperature as the glass. Consider the heatsinking property of the socket and its wires. The largest difference probably happens at startup. Steel chemical reactors are sometimes lined with glass to prevent rapid corrosion of the steel. The glass must not crack. Temperature control schemes for an external heat exchanger jacket must not allow the difference between the jacket and the contents to be more than about 30-50 degrees C.

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From: "Drew Papanek" <drewmaster813@hotmail.com>  
Date: Mon, 22 Mar 2004 18:20:58 -0500  
Subject: [R-390] Re: Tube Bulb Temperatures

On the subject of tube temperature vs failure: There is a temperature-dependent outgassing of the tube elements to consider. Tubes are baked before and during evacuation to drive out residual gases but that takes time and time is money. Manufacturers hence will tend to bake as little as possible. We as users then bake the tubes by simply using them. The hotter we run them the greater the outgassing and no vacuum pump for removal. Nolan's Zippo trick can revive some of these casualties by reactivation of the tube's getter. Water vapor is a particularly egregious offender, bombarding the cathode and causing

deterioration. The getter is not effective in trapping those trace amounts of water. On emissivity, that which emits also absorbs. Place a hot surface (the envelope) in proximity to another (the anode) and the latter will run at a higher temperature than it otherwise would. Count me in as a real "fan" of the idea of forced convection cooling! Yes, as Bob said, we are awash in tubes. With the severe paucity of younger membership in the boatanchor hobby the supply to demand ratio for tubes will only improve as we oldsters die out. New carbon composition resistors (Xicon) were still available from Mouser as of recent.

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Date: Sat, 24 Apr 2004 17:27:56 -0500  
From: Tom Norris <r390a@bellsouth.net>  
Subject: [R-390] Collins Tube Shield Data up

Well, almost up. Bellsouth's lines have been so noisy the past month my upload speed is around 300 bps. That's NOT 300Kbps, BTW.... grumble.... This is scanned from the 1962 Collins Industrial Products catalog. Compares Collins "66J" heat dissipating tube shields to the normal shiny variety or none at all. Impressive. If I could find info on IERC shields of the period, I'd scan that too. I would imagine the IERC data to show them a few degrees cooler than the Collins shields. The files "Collinsgraph" 1 and 2 are closeups of the graphs on page 2 of the shield listing. Trivia, this particular catalog originally belonged to the tech library at Dayton Engineering Association, Dayton OH. Thin book, besides tube shields, it has data on PTO's and auto-positioner assemblies sold by Collins at the time. If anyone wants larger scans of the graphs please let me know.

If the scans ever upload, they will be under -- <http://www.fernblatt.net/Collins/>

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Date: Sat, 24 Apr 2004 23:42:50 -0500  
From: Tom Norris <r390a@bellsouth.net>  
Subject: [R-390] Entire 1961 Collins Industrial Cat is up

Went ahead and scanned all 12 pages. Scanned as moderately sized jpg for size reasons. Anyone needs anything larger, higher res, or gif (it makes cleaner lines), let me know. As before, it is a [www.fernblatt.net/Collins/](http://www.fernblatt.net/Collins/)

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Date: Fri, 02 Jul 2004 21:35:24 -1000  
From: "pete wokoun, sr." <pwokoun@hotmail.com>  
Subject: [R-390] IERC type tube shields

I can provide this info in a .pdf file if anyone wants it that way. I'll soon stick it in my website for future reference: [www.qsl.net/kh6grt](http://www.qsl.net/kh6grt) More than you ever wanted to know about heat-dissipating tube shield mil specs...but just the item for those \*HOT\* 6BF5's in Collins equipment. (You may need to change your font type to a constant-spacing one like Courier for the tables to line up properly.)

MIL SPEC HEAT-DISSIPATING TUBE SHIELDS  
by Pete Wokoun Sr., KH6GRT (6/2004)

We all have heard the benefits of using International Electronic Research Corp (IERC) type heat-dissipating shields in the R390A and other equipments to reduce tube operating temperatures. However, I haven't seen any information on just how much they actually reduce the temperatures. Collins did some temperature studies but I haven't been able to find a copy of their study, possibly called service bulletin 303. I don't know if that study included heat dissipating shields. Searching thru the mil specs that these shields were made to I finally found some definitive temperature reduction figures. The specs are all in degrees C; they have been converted to degrees F in this presentation.

The mil spec heat-dissipating shields designated for retrofitting to existing equipment come from three mil specs: MIL-S-9372(USAF), MIL-S-19786(NAVY), and MIL-S-24251. These shields are designed to replace the shiny, nickel plated JAN types. Mil-S-9372 was an Air Force spec and MS24233, its mil standard for retrofit shields, was implemented January, 1958. MIL-S-19786 was a Navy spec and its amendment for retrofit shields was implemented May, 1964. Both these specs were cancelled in 1968 and replaced by mil spec MIL-S-24251 which covered all branches of the service and was implemented March, 1967. Shields made to any of these specs will have the mil spec part number on them. Here are those mil spec part numbers cross referenced to the well-known IERC numbers:

SIZE	IERC #	MIL-S-9372	MIL-S-19786	MIL-S-24251
-----	-----	-----	-----	-----
Short 7 pin	5015B	MS24233-1	S0761*V00	M24251/6-1
Med 7 pin	5020B	MS24233-2	S0762*V00	M24251/6-2
Tall 7 pin	5025B	MS24233-3	S0765*V00	M24251/6-3
Short 9 pin	6015B	MS24233-4	S0966*V00	M24251/6-4
Med 9 pin	6020B	MS24233-5	S0967*V00	M24251/6-5
Tall 9 pin	6025B	MS24233-6	S0968*V00	M24251/6-6
Ex-Tall 9 pin	6027B	MS24233-7	---	M24251/6-7
		*(X or C)		

All the above sizes except the short and ex-tall 9 pin ones are used in the R390A. You can get information on how many of which ones on many web sites. The IERC numbers are normally used when searching for these shields. If someone other than IERC made them, they may only have the mil spec number and some other model number. I have some made by Waterbury Pressed Metal Company (WPM in the table below) that are this way. One I have made by Cinch Connector Company does carry the IERC number. I found documentation that the Atlee Corp also may have produced some of these shields. Their different model numbers are noted in the table below and cross referenced to the IERC numbers:

SIZE	IERC #	WPM #	ATLEE #
-----	-----	-----	-----
Short 7 pin	5015B	RS-215-1	A10041-1
Med 7 pin	5020B	RS-215-2	A10041-2

Tall 7 pin	5025B	RS-215-3	A10041-3
Short 9 pin	6015B	RS-216-1	A10042-1
Med 9 pin	6020B	RS-216-2	A10042-2
Tall 9 pin	6025B	RS-216-3	A10042-3
Ex-Tall 9 pin	6027B	--	---

BTW, I noticed the last two digits in the IERC number correspond to their height in decimal inches. For example, the 5015 is 1.5 inches high, 5025 is 2.5 inches high, etc. Anyone know if the 50 and 60 designate anything?

Physically, from ones I have seen, the shield inserts (the part that contacts the tube) are of two types: a multi-sided cylinder (5-sided for 7 pin tubes and 6-sided for 9 pin tubes) or a round insert with a multitude of 1/16 inch fingers. I found both types on shields from both the -9372 and -24251 mil specs. The multi-sided inserts have an open top between the insert and outer shell whereas the mini-fingered insert has a top closed. I personally have not seen or heard about any shields that have the MIL-S-19786 markings.

Shields made to MIL-S-9372(USAF) (MS24233) were qualified to reduce the surface temperature of a test 'slug' by 36 degrees F, minimum (a 10-11% reduction). The test 'slug' was an aluminum piece shaped like a tube with an internal heater and 3 imbedded thermocouples. This 'slug' was heated up to 338 to 356 degrees F when the shield was applied. The average reading for all thermocouples had to be at least 36 degrees F less than the starting temperature. How well this test 'slug' with its greater thermal mass related to actual tubes I don't know.

Shields made to MIL-S-19786(NAVY) were qualified using an instrumented glass tube called a Thermion. Apparently these were tube-sized things containing a heater and thermocouples. It was heated to its test temperature when the shield was applied. The shields designated for retrofit service were only required to reduce the temperature of the thermion between 10 and 25% (symbol 'X' in the tables). However, the shields worked so well they were qualified to the next higher reduction of 25-38% (symbol 'C' in the tables). Specific temperatures for this spec are as follows:

MIL-S-19786 #	Bare Bulb Test Temp	Shield Temp Reduction (Minimum)	
		(X) 10-25%	(C) 25-38%
S0761 (short 7)	293 ° F	27- 65 ° F	65- 99 ° F
S0762 (med 7)	437 ° F	41-101 ° F	101-154 ° F
S0765 (tall 7)	455 ° F	43-106 ° F	106-161 ° F
S0966 (short 9)	266 ° F	23- 59 ° F	59- 89 ° F
S0967 (med 9)	446 ° F	41-104 ° F	104-157 ° F
S0968 (tall 9)	347 ° F	32- 79 ° F	79-120 ° F

Note: The V00 in the -19786 mil part number refers to a vertically mounted shield with no separate base provided.



Shields made to Mil-S-24251 were qualified using actual electron tubes. The temperatures were measured from a thermocouple imbedded into the test tube's glass at its hottest spot. The hot spot location was determined by temperature sensitive paints. Like in the previous specs, the test tube was heated to its test temperature when the shield was applied. The shield had to reduce the bulb temperature by at least the amount indicated in the following table:

MIL-S-24251 #	Bare Tube Test Temperature	Shield Temperature Reduction (minimum)
M24251/6-1 (short 7)	239 ° F	45 ° F (19%)
M24251/6-2 (med 7)	419 ° F	72 ° F (17%)
M24251/6-3 (tall 7)	464 ° F	81 ° F (17%)
M24251/6-4 (short 9)	266 ° F	45 ° F (17%)
M24251/6-5 (med 9)	437 ° F	99 ° F (23%)
M24251/6-6 (tall 9)	446 ° F	81 ° F (18%)
M24251/6-7 (ex-tall 9)	455 ° F	81 ° F (18%)

Typical tube operating temperatures I expect are somewhat less than these test temperatures which maximized tube dissipation. This would lead to somewhat less than the above temperature reductions in actual situations. However, I think these tests were closer to actual conditions than the 'slugs' and Thermions used in previous testing.

The mil spec Mil-S-24251 remains in effect today. However, there are no products on its qualified products list. What that means is no one currently makes any of these shields because the military doesn't have a need for any. Personally, I think shields made to any of these mil spec are going to perform similarly because they're not all that different from each other.

There are other types of mil spec heat-dissipating shields even of improved design but they are not designated for general backfitting into existing equipments. These shields and their sockets were designed from the start as an integral part of their equipment. As such, significant quantities to use in other equipments are probably not available.

So, what does all this mean? Here are my thoughts: These temperature reductions listed that the shields had to meet are all minimums so actual reductions cannot be determined. Physically these shields seem to remain pretty much unchanged throughout the years; it was the mil specs that were changing. And mil specs are sometimes written just to document what is normally used and available! From the mil spec 19786 qualified products list the manufacturers had test data that supported their products qualification of 25-38% reductions in bulb temperatures. This range also allowed them to meet the newer mil spec 24251 minimum reductions. So I would venture to say a typical bulb temperature reduction of 20-25% is realizable with the heat-dissipating shields. Having a temperature reduction figure only leads to a further question: By decreasing the operating temperature of a tube by some amount, how much improvement in tube life does this lead to? This becomes

harder to answer than determining how much cooler the tube operates. But one can generalize by saying any increase in tube life by lowering bulb temperature is beneficial.

The most informative article I was able to find on-line which related tube bulb temperatures to tube life was [pearl\\_tube\\_coolers.pdf](#) on the [www.pearl-hifi.com](#) website. Although much of the website borders on the more esoteric nuances of high-end audio, this paper presents some of the earlier works done by GE and IERC on tube temperatures and life spans that are difficult to find these days. An example from an IERC study in that article: a 6AQ5(6005) tube operating near maximum plate dissipation has a bare bulb temperature almost 460 ° F. Enclosed in a bright JAN shield its bulb temperature rises to 600 ° F. With an IERC type B cooler installed the bulb temperature drops to 365 ° F. This is a 20% drop from its bare bulb temperature and an 39% drop from its JAN shield temperature. This related to a tube survival rate after 500 operating hours of 35% using no shield, to less than 5% using the JAN shield, to over 95% still working using the IERC type B cooler. In another example from a GE study: From a batch of 200 6AQ5(6005) tubes running at 502 ° F, 15% were still operational after 2500 hours. A second batch running at 428 ° F, 74 ° cooler or about a 15% reduction in bulb temperature, still had 90% operational after 5000 hours. It seems "small decreases in bulb temperatures often result in seemingly disproportionately large increases in tube life". The article is also interesting in that it touches on other factors like filament voltage, forced air cooling, and temperature gradients that also have an influence on tube life.

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Date: Sat, 3 Jul 2004 00:56:46 -0700  
From: "Bob Tetrault" <r.tetrault@comcast.net>  
Subject: RE: [R-390] IERC type tube shields

Nolan would be proud...

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Date: Sat, 03 Jul 2004 07:23:44 -0400  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: [R-390] IERC type tube shields

While compiling this body of knowledge, you might want to add yet another type of insert -- the pleated type of beryllium copper ones. I've seen these in IERC shields and also in black or shiny conventional shields. Some might be retrofits - depot, manufacturer or hobbist.

There is some variation in the style of the shields themselves, even within IERC ones. Some have a substantial rim at the top, others much thinner and some have none at all -- made of a flat piece of metal rolled up and crimped -- maybe spot welded, rather than cut and formed from tubular stock.. They may have different model numbers, dunno. The wider the top rim, the more convection is impeded. I'd guess there are at least three main attributes that determine the heat reduction effectiveness of the various inserts themselves -- percent of surface contact area to the glass envelope and inner surface of the shield, composition and mass of the insert and vertical airflow. It would seem -- using

"eyeball geometry" -- that the five or six sided cylinder type would be the worst, and the many-fingered and pleated type the best. The latter makes for more contact area and mass, but the finger type may allow for better airflow.

Another factor is how well the shield is heat-sunk to the chassis. Some of the heat convects/rises up out of the tube shield, some gets conducted away through the shield to the mounting base into the chassis. The best of the IERC's are all black except for the inside bottom which is bare metal, apparently machined or wirebrushed. Some black shields have the coating in place where they mount up, so might reduce heat transfer. All this works "as advertised" on the top half of an R-390, but not exactly on the upside-down bottom half, I suppose.

One tip: If you have the conventional wide-rimmed shields with either the five/six-sided cylinder or pleated insert, (or you're rolling your own) make sure the insert is pushed a bit down from the top of the shield to let the heat escape. This type of shield is usually missing the crimps in the sides which keep the inserts in place vertically, so tend to ride up when the shield is installed -- and fall out when removed.

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Date: Sat, 03 Jul 2004 08:01:35 -0500  
From: Jerry Kincade <w5kp@direcway.com>  
Subject: Re: [R-390] IERC type tube shields

Excellent post, Pete. A copy will go into my special "390 good stuff " file. Mahalo and Geev 'um, Brah.

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Date: Sat, 3 Jul 2004 22:41:06 -0500  
From: Tom Norris <r390a@bellsouth.net>  
Subject: [R-390] Re: IERC type tube shields - Collins 66J's

I have a scan of the 66J tube shield data, unshined/shiny/dissipating shield. Sort of similar to the various IERC models

[http://www.fernblatt.net/Collins/Collins66Jgraph\\_1.gif](http://www.fernblatt.net/Collins/Collins66Jgraph_1.gif)

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Date: Sat, 15 Jan 2005 10:01:42 -0500  
From: "Michael Murphy" <mjmurphy45@comcast.net>  
Subject: Re: [R-390] 6082 Question

An efficient switcher running at a nice high frequency like say 455 kHz -could double as a BFO?.. hmm... How about a combined 100 kHz power supply marker generator? Speaking of heat, My ART-13 would melt if I did not do something to get the heat out. The design is just too darned tight and the 813, 811's and 1625's really heat up when the thing is in standby at the higher (450 VDC medium voltage and High V 1500V) that I run . If I was in a B-24 at 12000 feet I suspect all would be OK. I will admit it - I use a big-ol muffin fan with a sand resistor in series with it to slow it down a bit, blowing out. Keeps the radio

cool and helps to heat the radio shack and best of all the tubes have never had to be replaced. Why not apply this primitive approach to the R390 series?

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Date: Sun, 16 Jan 2005 10:58:22 -0500

From: Bob Camp <ham@cq.nu>

Subject: Re: [R-390] 6082 Question

A fan is not a bad idea at all. The main issues with one seem to be noise and how to mount it. Probably the only better idea is two fans (one above and one below the radio). These days you can get fans that are pretty quiet acoustically. One of the common things to do seems to be to run a DC fan at half it's rated voltage. The air flow goes down quite a bit at half voltage but you don't need a hurricane to cool off a R-390. About all that leaves is RF noise from the fan....

Coming up with a way to mount the fans without cutting up the radio is an important part of the process. I can see no reason to chop holes in the radio simply for cooling, though that has been suggested in the past. One way or another you would need to come up with an external mount for the fans. Simply setting them on the radio sounds like an accident in the making ....

Air flow at least takes the temperature of the top of the modules down. It indirectly impacts the temperature inside the module as well. That said there's still some heat inside the modules.

There are a couple of high power resistors in the cathode's of the 6082's that seem to run a bit hot. Often these are reported as being well out of tolerance (like say 2 or 3X the rated value). If you do replace them recommendations have been made in the past to bump up the dissipation rating of these parts. Obviously the resulting radio would not be "100% natural / organically grown".

A lot of this comes down to what your objective is. Everybody would love to have a 100% original radio and have it work perfectly in all respects 24/7. Those of us without access to 100's of radios may have to choose between one or the other.

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Date: Sun, 16 Jan 2005 14:23:30 -0500

From: Dave or Debbie Metz <dmetz@ntelos.net>

Subject: Re: [R-390] 6082 Question-- Fans

At the risk of the sharp tongues, here goes. I added a 220v muffin fan to blow on those hot devils and run it on 120v. Very quiet and solves a big problem. However, one needs to make room for it so my solution was to remove the big electrolytic and replace it with a new modern version that was much reduced size. It's been running that way for at least 5 years about 6 months at a time and no failures. The "replaced" cap is carefully stowed away for future generations but in the mean time, I want to use it without concerns as to heat which the signal corps knew was a problem from almost day one.

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Date: Sun, 16 Jan 2005 15:52:37 -0800

From: "Bruce Hagen" <bhagen@msn.com>  
Subject: Re: [R-390] 6082 Question-- Fans

If I may put my two cents worth in here - from what I've learned in the audio business it does not take a whale of a lot of air movement to go from fried to happy.

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Date: Sun, 16 Jan 2005 13:06:39 -0800  
From: Buzz <buzz@softcom.net>  
Subject: Re: [R-390] 6082 Question-- Fans

Bruce is 100% correct. Over the years I have cooled a lot of equipment using 220 VAC equipment fans, and they run quieter too.

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Date: Sun, 16 Jan 2005 16:15:53 -0500  
From: Bob Camp <ham@cq.nu>  
Subject: Re: [R-390] 6082 Question-- Fans

As long as the modification is no holes / reversible it sounds fine to me. I have heard stories that AC fans can have trouble (run hot) when run at half voltage. I have never seen a problem but you do see notes about it.

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Date: Sun, 27 Feb 2005 08:58:21 -0600  
From: mikea <mikea@mikea.ath.cx>  
Subject: Re: [R-390] Ventilation

> Is a fan necessary? Thanks

Necessary? No. A good idea? VERY much so. Putting a fan in to move air through the radio will do wonders for extending its MTBF. Hot components change value faster, and they die faster. How? I don't have a CY-979 to play with, and don't know where the cooling apertures -- if any -- are. But I'd give serious thought to putting a fan under the bottom, pushing air in, and one on the top, pulling air out, even if I had to make holes to do it.

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Subject: Re: [R-390] Ventilation  
To: mikea <mikea@mikea.ath.cx>

I have my R-390( 's and various other receivers mounted in five separate CY-1119/U racks, with two receivers per rack, along with auxiliary equipment such as CV-591A's and CV-116( 's. With just one rack operating (I run dual diversity: frequency or space), I can heat a goodly portion of my house in chilly weather and in cold weather, I can keep the house warm with two racks operating.

Having used lots of R-390( )'s during my military career, ventilation was not of concern because of at least a 1.5-inch separation between receivers and other equipment in the same rack, a practice I maintain today because of my military experiences.

Of course, the consumption of electricity brings an audible sound of 60Hz to the house wiring and the lights in the nearby houses periodically flicker but, hey, who cares? Besides, Texas Utilities has lotsa transformers.

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Date: Sun, 1 May 2005 21:56:27 -0500  
From: "Cecil Acuff" <chacuff@cableone.net>  
Subject: [R-390] Tube shields

Found something interesting this evening while working on an R-390 restoration. Found two ELCO tube shields...the silver twist lock kind with the IERC finger style contacts between the shell and the spring. I thought at first some wise guy had shoved it up in there to make a somewhat hybrid IERC tube shield. Upon closer investigation it appears to be factory. There are two folded indentations in the shell that catch the bottom of the finger contact piece to keep it from sliding out when the shield is pulled off the tube. Interesting....Is this a new find or are these shields pretty common? First I have seen! Not sure they are any better than the silver variety as far as dissipation.

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Date: Mon, 02 May 2005 08:22:08 -0400  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: [R-390] Tube shields

I've seen quite a few shiny shields with the accordion pleat type of beryllium copper insert in them. Not sure if they were retro-fit or not. Same for the flat, hex-type. I don't recall seeing any with the fingerstock style of insert. The retrofitted ones usually reveal themselves when you remove them and the insert stays on the tube. Of course, there could have been an arbor jig where they made those indentations after the fact. My take is that the "silver" shields with the inserts -- preferably finger or accordion - -should be fairly close to full IERC shields in dissipation. However, other factors -- the stock shields have a rather large flange which can block the air channels and generally impede airflow -- and the IERC shield are made of aluminum or some similar alloy which may have better heatsinking characteristics than plated steel. But, I think the insert is most of the benefit and they also provide the black/nonreflective surface, nearly the same as the inside of an IERC shield in that respect. BTW - even the IERC's vary in terms of inserts and flange size. Some have no lip on the top at all -- just a piece of rolled up aluminum. We may be overdue to dig up the ol' tube shield pony and start whippin' it again. Been a while. Keeps 'em from spoilin'.

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Date: Wed, 04 May 2005 12:48:32 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: [R-390] R-390/URR FanPlate

R-390/URR owners, I have posted a little web page showing the aluminum fan plate I use on my R-390/URR (the "non-A"). The link is: <<http://home.comcast.net/~roysmorgan/ba/FanPlate.html>>  
Cooler radios to you all!  
(from link... ed.)

#### R-390/URR FanPlate at K1LKY

This simple aluminum plate holds a common computer fan against the side of my R-390/URR where the heat-producing 8082 regulator tubes are. Some points:

- \* This is a no-holes modification. Five screws already on the radio are used to hold the plate in place: Three frame screws and two bottom cover screws.

- \* The three large holes for the air could as well be a series of small ones, or a ring of medium sized holes, depending on whether you have only a drill or some hole punches at hand.

- \* The line cord is shown loose for plugging into a "convenient outlet". A nicer way to handle this would be to mount a small outlet on the radio fed by the switched power so the fan could be run automatically with the radio and removed conveniently when needed.

- \* With the 4 inch square computer fan shown, you can't get the radio into a rack or cabinet with the fan mounted. Thus, the screw holes have been shaped to allow mounting of the fan when you can't see it. The L-shaped slots for the frame screws allow the plate to be slid into horizontal position, then lowered down onto the bottom plate screws. Having the screws loosened the right amount with no washers on them helps make it all come out right. Substitution of thumb screws instead of phillister head or round head screws would make it possible to tighten them by hand once the fan is in place. The frame screws are 10-32, I think, and the bottem cover ones are 6-32. The bottom cover screws are likely missing from your radio unless your cover is in place.

- \* Use of thinner fans may make it unnecessary for the L-shaped holes. Three little fans, one for each hole in the frame side, would make a nice installation.

- \* Use of a resistor, or a capacitor to reduce heat, in the fan lead would make the fan run slower and give less noise.

- \* Owners of pristine or treasured raiois may want to put a layer of felt or other material on the radio-side of the plate to avoid marring the paint.

- \* I made up this fan plate because of the heat I found during testing of the radio. I had been using an audio/regulator module with 6080 (6.3 volt filament tubes) fed by an external filament transformer while trobleshooting the regulator circuitry. The heavy speaker wire I'd used happened to contact the regulator tubes and that melted the plastic insulation on the wire. "TOO MUCH HEAT", I decided! Thus the fan. With the fan operating, I can touch the tubes and leave my fingers on them without injury or pain. "Nice and cool, now" I think.

\* These pictures were taken without my normal fussiness over photography, but will give you an idea of what the thing is like. The last picture can be saved and printed, then copied to scale to give you a cutting/drilling template. Eventually, I can figure out how to make the picture printable "at specified size" so you won't have to fuss with copying at various zoom values.

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Date: Wed, 04 May 2005 17:36:56 +0000  
From: rbethman@comcast.net  
Subject: Re: [R-390] R-390/URR FanPlate

I agree with putting a "sand" resistor in series with the power lead to the fan. I've done "similar" installations with other tube radios. The slower speed does not reduce the cooling effects. It DOES make things less noisy and reduces the vibration aspects. Good on ya Roy! A good suggestion for ANY old BA!

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Date: Wed, 04 May 2005 14:01:46 -0400  
From: Dave or Debbie Metz <dmetz@ntelos.net>  
Subject: Re: [R-390] R-390/URR FanPlate

Great idea, I used a 220v muffin fan and run it on 115v and you cannot hear it but it still keeps thing cool! No resistors or caps that way and it's been running for years with no problem. dave

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Date: Wed, 4 May 2005 12:39:22 -0700  
From: "Monte & Ardelle Mueller" <muelleram@harbornet.com>  
Subject: [R-390] R-390 cooling

With your fan for 6082's in 390 : do you blow cool air on tubes or extract hot air from them?

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Date: Wed, 04 May 2005 17:41:12 -0400  
From: Gord Hayward <ghayward@uoguelph.ca>  
Subject: Re: [R-390] R-390/URR FanPlate

I used a capacitor (a few uF at lots of volts) in place of the resistor. Worked well and didn't get hot (imaginary "Wattless" power and all that stuff). Now I just use 240 volt fans and get the same result.

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Date: Thu, 05 May 2005 07:31:51 -0400  
From: Bob Camp <ham@cq.nu>  
Subject: Re: [R-390] cooling

You could always liquid cool the tubes. That would keep the glass and seals at a nice constant temperature.

There is reason to believe that reducing the temperature of the glass to metal



seals at the base of the tube has an affect on the long term performance of the seals. If you have tubes mainly failing due to gas then this is something to be concerned about. The tube socket probably heat sinks this end of the tube pretty well.

At the temperatures you find in a receiving tube the temperature of the glass envelope by it's self doesn't have much of an affect. If you get the temperature up a lot higher the envelope will have some problems. If we start to see tubes collapsing in use then this is one to worry about. I have seen pictures of transmitting tubes that have failed this way.

The real question is what makes receiving tubes fail. Transmitting tubes have been studied quite a bit. Audio power tubes and rectifiers have been studied to a lesser extent. Low power / small signal tubes have only been studied in a fairly cursory way. You can look at it as tubes are tubes, but we don't stress them all the same way. Plates and grids in receiving tubes simply do not heat up the same way they do in power tubes. Filament power is the main source of heat in a normal receiving tube.

Cooling tubes down helps reduce the temperature of things like plates and grids. Cooling also helps seals. I doubt that external cooling has any big effect on the filament. Most receiving tubes I have seen go bad die from filament related issues. Some simply do the light bulb thing and stop glowing. Others get to the point that cathode emission drops below the level needed to keep working. Certainly things like shorted grids do occur, but they are not very common.

If what I swap out here is any indication emission is the main (> 80%) issue for dead receiving tubes. Open filaments make up almost all of the rest. I can probably count the number of receiving tubes I have seen fail for other issues without taking off my shoes.

Black tube shields look cool. That alone is a good reason to use them. They definitely cool down the tube (though the radio is just as hot). Cooler is always better. They sometimes are easier to get on and off - never a bad thing. Given the way we use the radios these days I would not put them in the same category as the capacitors. They are a nice thing to swap out, and the radio is better with black shields. I don't think the radios are enough better with black shields to run out and spend hundreds of dollars re-shielding all our radios to make them work better.

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Date: Thu, 05 May 2005 11:51:56 +0000  
From: odyslim@comcast.net  
Subject: Re: [R-390] Wanted to Trade

Now I wonder which should have black shields. I have noticed some tubes in the radio get hotter than others. I do know for a fact the 26Z5's need them. The 3TF7 needs one. I have touched some in the IF that could cook an egg. I also know if tubes cool off to quickly they will fail.

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Date: Thu, 5 May 2005 09:57:45 -0700  
From: "David Wise" <David\_Wise@Phoenix.com>  
Subject: RE: [R-390] Wanted to Trade

IERC and similar shields will take the bulb temperature well below naked.

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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>**

>Audio deck

>Nolan... four washers as a "mini-stand-off"...some heat to leak out.....

Cooler is better, for sure.

>220VAC muffin fans running at 110 <snip>

Again, my crude fan plate for the R-390/URR is shown at: <<http://home.comcast.net/~roysmorgan/ba/FanPlate.html>>

Some changes may be needed for the R-390A. Roy

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Date: Tue, 12 Jul 2005 23:45:09 -0700  
From: "Dan Merz" <djmerz@3-cities.com>  
Subject: [R-390] Fan for 390

Hi, thanks to Roy Morgan for the fan/plate design for the 390 for cooling the 6082's. I finally put it together and it fit perfectly from the template he provided. I ended up cutting the whole center section out after putting the three matching holes in, mostly because it was easier than filing the holes bigger from the 1 3/8 hole I cut. I used a 92 x 25 mm fan from Mouser, which is an inch thick, 120 volt version. Next time I'd use a 220 volt. I dropped the speed on mine by putting 1250 ohm resistor in series in a small box and the noise was reduced adequately. Another good idea from this group,

thanks. Dan

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Date: Tue, 19 Jul 2005 03:45:47 -0500  
From: "Brad Huff" <huffb@avalon.net>

Subject: [R-390] R390 cooling fan

This question is for those with R390's. What size 220V fan are you using to cool the regulator tubes (physical size and cfm would be helpful) and I believe I read earlier about someone having made mounting bracket specs available for this purpose. Thank you in advance.-Brad

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Date: Tue, 19 Jul 2005 11:38:25 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] R390 cooling fan

Whatever you can find that moves air. (the fan I used was a 115 volt unit, but I suggest 220 volt ones for less noise.)

That would be me. The crude pictures and explanation are at: <http://home.comcast.net/~roysmorgan/>

specifically: <http://home.comcast.net/~roysmorgan/ba/FanPlate.html>

The last picture is higher resolution and contains rulers so you can print it and make one of your own easily.

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Date: Tue, 19 Jul 2005 08:44:11 -0700  
From: "Dan Merz" <djmerz@3-cities.com>  
Subject: RE: [R-390] R390 cooling fan

Brad, I used a 92 mm size fan with 35 cfm at the rated voltage. I ran it at half the rated voltage, so the flow was less. I recommend Mouser Orion fan because it worked for me, others would work I'm sure. I think Roy used the 80 mm size with flow probably around 30 cfm - I don't know whether he ran it at less than the rated voltage. I used the 92mm size because it is thinner than the 80 mm size and covers the holes a little better. His arrangement is described: <http://home.comcast.net/~roysmorgan/ba/FanPlate.html>

I think only gentle air motion is needed. Best regards, Dan.

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Date: Tue, 19 Jul 2005 13:17:13 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] R390 cooling fan

>Another nice page.....

Thanks.. glad to know that folks find it helpful.. (It's not very fancy!)

>.....92 mm size fan with 35 cfm .....

The fan I used was a rescue item from some old computer power supply, most likely. It is about 4 or 4-1/4 inches square. No, I just hooked a lamp cord to it and

plugged it in. When I make improvements to the system, I'll power it from the radio and most likely reduce the voltage, or even use a smaller fan inside the radio mounted on a clamp-on bracket for a no-holes addition.

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Date: Tue, 19 Jul 2005 13:03:46 -0500  
From: "Barry" <n4buq@aol.com>  
Subject: Re: [R-390] R390 cooling fan

On the "new and improved" model, you should rig up a spring-loaded paddle that is in the direct path of the wind coming off the fan. Affix the paddle to the shaft on a variable resistor that replaces the ballast tube. A drop in line voltage will cause the fan to reduce its output thereby causing the paddle to move slightly, rotating the pot, decreasing the resistance, and thus keeping a constant voltage to the heaters. The opposite effect will occur when the line voltage increases. Perfect!

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Date: Tue, 19 Jul 2005 13:09:13 -0500  
From: "Barry" <n4buq@aol.com>  
Subject: Re: [R-390] R390 cooling fan

Of course, you could put a rat in one of those circular treadmills that is connected to a fan blade and the amount of food and water it would get would be proportional to the line voltage, but that'd be ridiculous, wouldn't it...

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Date: Tue, 19 Jul 2005 20:47:38 -0600  
From: "Kenneth Arthur Crips" <CRIPS01@MSN.COM>  
Subject: Re: [R-390] Multiple 26Z5 sightings but HURRY

This topic has got me wondering. It goes without saying keeping the power supply in its original configuration is the way to go. But the Military changed out the 26Z5W's with diodes. I have been looking at solid state full wave rectifiers. These solid state modules could be mounted on a heat sink mounted on the power supply module and would be a nice looking as well as very functional change. One thing you could do is to mount the full wave rectifiers on the heat sinks which are mounted on the CPU's in computers, here you have both a heat sink and a mounted fan to cool the whole thing. You could mount this setup on the back panel of the R390 so all of the heat generated by this setup would not be radiated inside the case. Combine this with a solid state voltage regulator mounted in place of the 3TF7 I don't think you could have a better setup. These are just some thoughts on the matter.

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Date: Tue, 19 Jul 2005 23:48:45 -0500 (CDT)  
From: "Jim Shorney" <jshorney@inebraska.com>  
Subject: Re: [R-390] R390 cooling fan

Why use fans? Here's a thought: <http://www.pcpowercooling.com/technology/optemps/index.php>

Sure it's in the context of PCs and sand, but aren't radios "electronic devices" (third paragraph)?

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Date: Tue, 19 Jul 2005 22:32:46 -0700  
From: Dan Arney <hankarn@pacbell.net>  
Subject: Re: [R-390] Re: R390 cooling fan

The shields all were standard silver and not black and they operated for years just fine and the biggest percentage of them still do not have black shields. My guess some nit picking eenggiinnneeriinnng smart ass hole decided after 40 or so years that the Gov. should spend unknown amount of taxpayers money to cool it down maybe 10 or so degrees. IIRC Nolan said in his 5 year test it made no difference. Where is the actual proof of the fans or black shields making the receivers any more reliable. Proof I mean Gov./Collins printed hard copy dated and with the appropriate numbers as a field Mod or SB. That would make TURDS a lot easier to see.

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Date: Wed, 20 Jul 2005 09:27:19 EDT  
From: Llgpt@aol.com  
Subject: Re: [R-390] Re: R390 cooling fan

Aaaah, but the Military did suggest the IERC tube shields and they did replace most of them. Myself, I just tend to remove all the tube shields and not worry.

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Date: Wed, 20 Jul 2005 09:33:10 -0500  
From: "Barry" <n4buq@aol.com>  
Subject: Re: [R-390] Re: R390 cooling fan

Let me respond to my own post here. The sarcastic comment below makes it appear I have a basic distrust of my government which I do not. What I was trying to say is that just because there isn't an official document stating something doesn't mean it's not true. Fifty years ago, the Collins engineers used the information at their disposal and the results were what we have in the form of the wonderfully designed radios we now enjoy. The fact they have held up and performed under the most adverse of conditions attests to the fact that the design is indeed superior to other designs of the era. That doesn't negate the fact that things have changed since then. Given the fact that certain parts are becoming increasingly difficult to find makes it necessary to seek good alternatives. The case in point is the good old 3TF7. While it's true that the function of this tube is not as necessary as it originally was, you can't simply unplug it and expect the radio to keep working so folks have sought out alternatives. As for the present subject of cooling fans, I don't know if there is real hard evidence to support the idea that keeping the tubes make them last that much longer; however, common sense dictates that, generally speaking, the

hotter you get something, the faster it will wear out and it follows that if I keep the tubes a bit cooler, then it's quite plausible that they will last longer. Given the fact that the sources for these tubes is dwindling, cooling them to try and make them last longer is a very logical thing to do. I suppose the real thing to keep in mind is that this is just a hobby. If I want to run a hundred fans on my R390A to keep it cool, and someone else keeps a small heater next to theirs for whatever reason, what does it really matter?

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Date: Thu, 21 Jul 2005 11:51:23 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] Re: R390 cooling fan

Hear, Hear. I seem to remember that the redesign of the R-390/URR into the R-390A/URR involved attention to the series regulator section and the attendant high parts failure rate.

>... Given the fact that certain parts are becoming increasingly difficult.....

The 8082 tubes in the R-390/URR are not cheap to buy normally. The fanplate I cobbled onto the side of my R-390/URR cools those tubes and the rest of the module very nicely. At least one list member has made one for his radio based on the picture I posted with rulers included.. GREAT! See:  
<<http://home.comcast.net/~roysmorgan/ba/FanPlate.html>>

>As for the present subject of cooling fans, .....

I would agree, but in the case of the R-390/URR, R-391/URR and R-389/URR, the series regulator tubes run way too hot, period. I don't need any further evidence to become motivated to put a fan on them.

>... Given the fact that the sources for these tubes is dwindling,.....

At the risk of nudging the thread further along to deadhorsebeat-land, I have a rack mount panel with four fans in it that I plan to install in my rack of R-390A/URR's and related equipment (once I get to that project.) My theory is that modest forced air cooling will help.

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Date: Fri, 22 Jul 2005 19:11:31 EDT  
From: Flowertime01@wmconnect.com  
Subject: Re: [R-390] Re: R390 cooling fan

No we did not run the receivers for years with those silly silver tube shields. We had standing paper orders to take most of those silly hot silver tube shields off. On top of that those hot shields were a full employment opportunity for a lot of maintenance men. We sent about an hour a month just looking around in rooms to find the receivers by serial number. Then we spent some time looking into the receiver for blue glows. Once every six months the receiver come out of the rack

and had all the tubes pushed through a tube tester. Those radios did not just run all those years with silver tube shields. That is some new urban myth. Roger

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Date: Sun, 6 Nov 2005 08:00:23 -0500  
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>  
Subject: Re: [R-390] Tube Shields

Gents, you can get all the IERC tube shields you need from Fair Radio [www.fairradio.com](http://www.fairradio.com) Don't believe the catalog - they have lots more stuff than is listed there, though they may have to dig for it. Send them an email. They have all but a few of the really, really scarce tube shields.

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Date: Sun, 06 Nov 2005 15:36:59 +0000  
From: [odyslim@comcast.net](mailto:odyslim@comcast.net)  
Subject: [R-390] Tube Shields/15 new 6015B's for trade

I have 15 brand new IERC 6015B's that I would like to trade for IERC 5020B's. New would be preferred but used will be fine. The 5020B is made to fit 5749 sized tubes. The 6015B will fit on a 12AU7 but is a little short to go all the way down the tube socket. Scott W3CV

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Date: Sat, 7 Jan 2006 16:41:15 -0800 (PST)  
From: DQ <[greybeard5150@sbcglobal.net](mailto:greybeard5150@sbcglobal.net)>  
Subject: [R-390] Tube Shield Questions\_OT

I am only asking this question here because there are darn few questions that remain unanswered, whenever placed before this forum. Theoretically I suppose that some MIGHT fit a few R-390 tubes, so maybe it really isn't off-topic. That having been said: Today I dug out my hodge-podge collection of tube shields and I've been going through and organizing them. At the bottom of a box, below the IERC's, and all of the various spring loaded ELCO's, EBY's, CINCH's, and what appears to be 160's, there were what appeared to be some cheesy looking cheap tin slip-sleeves. For lack of a better word I will describe them as having small horizontal 'stiffener' beads. Some of them sort of looked like tube shields, and the more conical ones did and didn't at the same time. After getting out the magnifying glass I pulled up a name and patent number: Staver Mini-Shield - Pat. No. 2499612. I looked up the patent and sure enough, they were in fact tube shields, and they were patented May 7, 1950. My question to this esteemed group is this: Were/are these "correct" OEM's for some long gone tube radios, or were they just cheesy aftermarket wannabe stuff? I don't know whether or not to give 'em the heave ho, or if someone might want them for a particular flavor of tuber to make it original. Also, I came across four other medium sized, bottle shaped, tin shields that are two-piece (8 halves total) and are held together via a round circular spring-clip. The same question of origin would apply to these as well.

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Date: Sat, 7 Jan 2006 20:38:08 -0500

From: "Bruce Hagen" <b\_hagen@sbcglobal.net>  
Subject: RE: [R-390] Tube Shield Questions\_OT

I think what you have is a bunch of shields as used in '50's TV sets. As for the two piece jobs it sounds like radio stuff from the '30's that would fit tubes such as a 6F7, 78, 6C6, etc. I'd be happy to have a pair of the bottle shaped ones.

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Date: Sat, 07 Jan 2006 23:11:45 -0800  
From: "Dan Merz" <mdmerz@verizon.net>  
Subject: RE: [R-390] Tube Shield Questions\_OT

Hi, the split, bottle-shaped are commonly called "goat shields", a brand name that made some of that type, very common on early 30's consumer radios. I have several sets that use these beasts, Dan,

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Date: Mon, 27 Feb 2006 01:12:22 -0500  
From: "Bob Young" <youngbob53@msn.com>  
Subject: [R-390] correct size and quantity of IERC tube shields for R390-A

I have an R390-A coming back from Chuck Rippel and would like to know how many IERC tube shields I'll need, what sizes and if possible what numbers I would need, such as TR6-6051 etc. also do these things really work or is it hype?

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Date: Mon, 27 Feb 2006 07:17:01 -0600  
From: "Craig Anderson Ext 1365" <Craig.Anderson@saintpaul.edu>  
Subject: [R-390] RE: R-390 Digest, Vol 22, Issue 30

The correct configuration for the IERC tubes shields for the R-390A can be found at the following link. <http://site298.webhost4life.com/barryhauser/archives/hsn-issue45.pdf>

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Date: Mon, 27 Feb 2006 10:19:57 -0500  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] correct size and quantity of IERC tube shields for R390-A

Which tube shields you will "need" depends on your opinion, I offer two different opinion candidates for your consideration:

- 1) All tubes should have IERC tube shields in place.
- 2) Only the tubes which are mentioned in the military manuals should have tube shields left in place, they should be IERC shields, and all others should be removed.



>what sizes and if possible what numbers I would need,.....

I include below for the record my notes file on tube shields. It contains posts from this list, and lots of detail on the sizes, numbers and heat reducing capability of the black tube shields. It is NOT hype.

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Date: Wed, 01 Mar 2006 14:28:38 -0500  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: RE: [R-390] R-390 fans

That fan plate is shown at: <<http://home.comcast.net/~roysmorgan/ba/FanPlate.html>>

One picture includes a ruler so you can make one yourself easily. As my notes tell, the tubes melted speaker wire insulation with no fan, but I could put my fingers on the tubes with the fan. I have yet to work on a fan inside the radio. I think there is room to put a possibly smaller fan fastened to the front frame near the B+ filter cap with no holed drilled. It would be powered from inside the radio and not need separate turn on/off.

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Date: Wed, 1 Mar 2006 15:23:38 EST  
From: Bonddaleena@aol.com  
Subject: Re: [R-390] R-390 fans

I was fortunate to find 2 miniature muffin fans that run on 24 VDC. I installed one on each side of my 390A. When they are tun on 12 VDC, they are inaudible, but as Roy has mentioned, it really makes for a dramatic reduction in internal temperatures.

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Date: Fri, 3 Mar 2006 22:10:32 -0800 (PST)  
From: Perry Sandeen <sandeenpa@yahoo.com>  
Subject: [R-390] Heat issue continued (resistors)

While you're at it, one should take R617, R618, and R619 from under the audio deck and re-mount them over the "L@@K RARE" squelch plate, perhaps with a small computer fan to stir the air. This will relieve the need for putting spacer washers underneath the mounting screw as some have advocated to reduce the cooking oven temps. One might as well remove FL601 as all it was designed for was 850Cps bandwidth for RTTY. (You could the sell it to PMS Marterin for a "SpecialRARE Collins hemorrhoid cure" He wouldn't know the difference.

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Date: 7 Apr 2006 12:59:12 -0000  
From: "n4buq@knology.net" <n4buq@knology.net>  
Subject: [R-390] DC Fan Noise

I've been working on a project that will power a small fan on the IF deck. I'm using the 26.2VAC supply through a single diode to a 24VDC fan. This yields about 11.5VDC (at least that's what my Fluke meter shows). I realize this is half-wave DC so 11.5 is an "averaging" value. When I hooked it up last night, my

Grundig Majestic nearby picked up noise from the fan motor. It was most evident when the [rather long] ground wire connection was somewhat close to the Grundig. If I moved the wire away from the Grundig, the noise faded, but I could still hear it. Oddly, I couldn't detect it in the R390A. Do DC motors normally generate hash like this? Is it because I'm feeding it a half-wave rippled voltage? I realize the 26.2VAC peaks are over the 24VDC rating but figured the fan would be okay as long as the "average" voltage is well below 24VDC. Should this be a problem, given the "average" value? I tried a small cap (0.1 or 0.01 (not sure)) across the fan, but that didn't help. Placing a "large" filter cap briefly across it causes the rectified voltage to go to well over 30V or more (approximately  $1.414 * 26.2$  (?)). As the fan speeds up, so does the noise. I realize the fan can't be run for long at this higher voltage, but I was wondering if it was more a case of ripple to the fan motor or whether the fan itself was generating the noise and it appears the fan is generating the noise. Any comments? Is it possible the Grundig is just not well shielded against the noise? I figure the extra long leads I was working with were acting as an antenna of sorts so the noise was being propagated in the shack, but I also don't want a little noise generator sitting on the IF deck that could wreak havoc on other gear in the shack either.

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Date: Fri, 07 Apr 2006 09:19:00 -0400  
From: "Tim Shoppa" <tshoppa@wmata.com>  
Subject: Re: [R-390] DC Fan Noise

I think this is inevitable when you drive a commutating motor (unless your 24VDC fan is decades old, it is probably solid-state commutation). I don't think it has a lot to do with the pulsating half-sine drive.

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An entirely different 24VDC fan may be much better or much worse, hard to say without trying. If you can, try to find a small AC fan. 24VAC units do exist but are not real common. It's vaguely possible that 24VAC may work to slowly turn a 120VAC fan, but even if it'll keep it turning it probably won't start. Big AC fans (I'm thinking of 10" or 14" rotrons etc.) work OK without making a lot of wind noise if you use 120VAC to drive them and a dropping resistor.

A little odd that you're aiming it at the IF deck. Yeah, there's a lot of tubes in a small space there. I honestly do not know if crumbling foam in the mech filters is accelerated or not by "typical" heat on the IF deck.

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Date: 7 Apr 2006 13:37:06 -0000  
From: "n4buq@knology.net" <n4buq@knology.net>  
Subject: Re: [R-390] DC Fan Noise

The reason the IF deck is involved in this project is a replacement for the ballast tube. It is intended as a plug-n-play substitution for the ballast with the added advantage of having a small fan. The fan cools the dropping resistors as well as anything else in its path. If it's going to be noisy, though (these are new fans), then I may just have to forego the fan idea. :

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Date: Fri, 07 Apr 2006 10:31:41 -0400  
From: "Tim Shoppa" <tshoppa@wmata.com>  
Subject: Re: [R-390] DC Fan Noise

Way overkill IMHO. That ballast tube dissipated  $12.6V \times 300mA = 4$  watts or so, through conduction into the socket pins and convection from the tube bulb (or conduction into an IERC shield and the convection from the shield, if you insist.

Shielding a 60Hz AC component seems odd to me though.). Any replacement that doesn't increase dissipation ought to do be able to do this just fine, unless you're insisting on doing it with a TO-92 or a single 1/4-watt resistor!

Now, there have been many half-baked schemes for ballast tube replacement that happen to INCREASE dissipation. My apologies if yours is one of them. And of course the best ballast tube replacements reduce total heat dissipation (in many cases by making the heat dissipated by the replacement be zero.)

Now a ballast-tube replacement that dissipated the extra voltage/power by using that power to turn a fan, that would be interesting. Some sort of mechanical-feedback baffle system could regulate back-EMF from the motor (possibly through a classic two-ball-and-spring speed regulator) to provide a regulated 300mA filament current. Hey, we may have a new scheme here! Add a couple of mousetraps, mice, and cats and Rube Goldberg would be proud!

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Date: Fri, 07 Apr 2006 11:06:20 -0400  
From: "Tim Shoppa" <tshoppa@wmata.com>  
Subject: Re: [R-390] DC Fan Noise

My apologies if I went too far with the Rube Goldberg scheme. I am quite willing to hear Barry out, and the topic of interoperating our radios with modern DC fans must be of interest to many here. I myself am constantly battling RFI sources in my neighborhood. Any thread that deals with RFI identification and mitigation is of interest to me.

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Date: Fri, 07 Apr 2006 12:44:21 -0400  
From: Gord Hayward <ghayward@uoguelph.ca>  
Subject: [R-390] DC Fan Noise

In an application here, we saw humongous spikes from one of the miniature computer fans. suspect it had electric commutation. I put in a pi filter - 2 electrolytics and a choke. That cleaned the spikes a lot.

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Date: Fri, 7 Apr 2006 12:06:52 -0500  
From: mikea <mikea@mikea.ath.cx>  
Subject: Re: [R-390] DC Fan Noise

I was going to suggest that. Ferrite Beads also can help in some situations of

this sort.

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Date: Fri, 7 Apr 2006 10:07:17 -0700  
From: "David Wise" <David\_Wise@Phoenix.com>  
Subject: RE: [R-390] DC Fan Noise

3DW7A or 3DW7D. Tube-size COOL-RUNNING plug-n-play. Schematics on request. I'll sell you a programmed PIC for the latter for \$10.

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Date: Mon, 31 Jul 2006 11:32:48 EDT  
From: Flowertime01@wmconnect.com  
Subject: Re: [R-390] Collins R-390-A Photos sought

<snip> Most receivers did not have the tube shields with the metal sleeve inside. Fellows have done some testing. The sleeve actually runs the tubes cooler than the plain stock tube shield. Standard procedure by directive was to run with a minimum tube shield set. OCS, mixer, Rf amp, and IF tubes got shielded every thing else was run bare. We had boxes of pulled shields because if we shipped a receiver we had to restore its full complement of shields. Any good photo of an R390/A Collins will show the silver tube shields. The black shield and sleeve shields are after market add ons. Shield the VFO, BFO, 6AK5's, 6DC6, 6C4's, the 5814's on the RF deck, 5749's and 6AK6 on the IF deck.

Run the 5814's in the IF bare.  
Run the 26Z5 bare.  
Run the audio deck bare.

If you have the after market better tube shield, cover these tubes first then cover any other tube you have a shield to fit. The sleeved shields do run cooler than the silver cans. If you have the better shields then use them. If all you have is the silver cans, you are better off running the tubes bare. You likely do not run enough equipment in your "shack" to have an interference problem from a radiating ocs tube.

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Date: Tue, 1 Aug 2006 16:41:35 EDT  
From: Flowertime01@wmconnect.com  
Subject: Re: [R-390] Collins R-390-A Photos sought

Black tube shields per se are not bad.

What you are looking for is a sleeve inside the shield. This sleeve is "corrugated" so it contacts both the tube and the shield. This extra chunk of metal carries more heat away from the tube than just the air gap between the tube and the shield. In fact in the production metal shields, the air gap act like a dead air cavity and actually causes the tube to run hotter than when you remove the shield. Some black tube shields radiate more heat away than other black

shields or silver shields. Read some of the Pearls or Wisdom on the R390 page for lots of detail. Once you learn a bit about brands and paint you understand which shields will be useful in removing heat as well as providing RF isolation. Careful about talking about tube shields on the R390 reflector. You may stumble over a dead horse there and it would be beaten again. If there is something you do want to know, Please do ask. Worry not about the dead horse. He is dead and feels little.

Once you get back to the R390/A for cleanup and alignment, you may want to solid state the 26Z5's just because it removes the filament heat of those two tubes from under the chassis.

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Date: Fri, 04 Aug 2006 11:20:23 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] IERC Tube Sheild - Brand New

There is a better list but I can't find it just now: (original author unknown)  
R390A Tube Chart

#### Tube BETTER Function Shields

V201 6DC6 RF Amplifier 5020-B	V202 6C4 6100 First Mixer 5020-B
V203 6C4 6100 Second Mixer 5020-B	V204 6C4 6100 Third Mixer 5020-B
V205 5814A Calibrator Osc 6020-B	V206 12AU7 5814A 100KHz Osc 6020-B
V207 5654 First Xtal Osc 5015-B	V401 5654 Second Xtal Osc 5015-B
V501 5749W First IF Amplifier 5020-B	V502 5749W Second IF amp 5020-B
V503 5749W Third IF Amp 5020-B	V504 Fourth IF Amp 5020-B
V505 5749W BFO 5020-B	V506 5814A Detector 6020-B
V507 5814A Limiter 6020-B	V508 5749W AGC Amp 5020-B
V509 5814A IF Cathode 6020-B	V601 5814A First AF Amp 6020-B
V602 5814A Second AF Amp 6020-B	V603 6AK6 AF out local 5020-B
V604 6AK6 AF out line 5020-B	V605 6626 Voltage Reg 5025-B
V701 5749W VFO 5020-B	V801 26Z5W Rectifier 6020-B
V802 26Z5W Rectifier 6020-B	RT510 3TF7 TJ311M01 Current Reg 6025-B

Above is a little chart I made up of the R390A's tube complement and equivalent tube shield required. The tube shield numbers given are for the IERC black shields - the ones preferred to disipate the heat produced by the R390A tubes. The shiny metal tube shields should not be used because of poor performance and the reflection of heat back into the tube - however, the black IERC tube shields are now hard to find.

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Date: Fri, 04 Aug 2006 11:24:11 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: Re: [R-390] IERC Tube Sheild - Brand New

Here it is: <http://www.amwindow.org/tech/htm/irec.htm>

" ... (1) 6025-B Tall 9 Pin, used for the 3TF7 ballast tube  
(9) 6020-B Medium 9 pin, used on 5814A's and 26Z5W's (6U8A)  
(2) 5015-B Short 7 pin, used on the 5654's (6AL5, 5670)  
(13) 5020-B Medium 7 pin, used on 6BA6's, 6C4, 6AK5, 6DC6  
(1) 5025-B Tall 7 pin, used on the OA2 (6AQ5, 6BF5)..."

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Date: Fri, 04 Aug 2006 10:32:17 PDT  
From: Gary Gitzen <r390a@uwave.com>  
Subject: Re: [R-390] IERC Tube Shield - Brand New

Please do not "reply" to this mail. The sending address has been compromised by someone's machine on the list, and all mail to the sending address gets trashed. Please use an address of user3 at uwave dot com to send me a personal reply. Please do not add the address to your address book. Thanks! Roy wrote giving a list of tube shield model numbers for the various sized tubes in the R-390A. Excellent info!! Thanks! The 9 pin size used for 5814s is the 6020B. Rich says he has model 6015B shields for sale. They are shorter, about 6AK5 height. I've been using some for 5814s (and other tubes in other equipment). Although they are short (and look funny with the tip of the tube sticking out) they seem to work fine. Bob wrote asking what the 6015B was designed to fit. Any 9 pin mini of 6AK5 height. I think the 5842/417A is a 9 pin of that height, and I recently saw an Amperex thyratron in that package. Hope this helps.

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Date: Fri, 4 Aug 2006 14:45:07 -0400  
From: "rbaldwin14" <rbaldwin14@nc.rr.com>  
Subject: [R-390] NOS IERC Tube Shields

I have re-read my initial message regarding the tube shields that I have available. There were several sizes for both the 7 pin and 9 pin tubes types. What I have lots of are the shortest ones, i.e. the TRN6-6015B. Having said that, a purist might say that you need to have the 6020B units for 5814 and 6U8A tube types. These are simply not available in any quantity or NOS from any source that I know. So, I use the 6015B on these tubes with complete satisfaction. The inner corrugated portion of the shield contacts these tubes from top to bottom and they work fine. I hope that I didn't create too much confusion with the group. Try them, I think you'll like them and once these are gone, there won't be any others of any type available.

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Date: Fri, 04 Aug 2006 20:17:22 -1000  
From: "pete wokoun, sr." <pwokoun@hotmail.com>  
Subject: [R-390] IERC Tube Shields

More than you ever wanted to know about heat dissipating tube shields is located here: <http://www.qsl.net/kh6grt/page4/shields/shields.htm>

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Date: Tue, 12 Sep 2006 10:32:18 -0400  
From: "David C. Hallam" <dhallam@rapidsys.com>

Subject: [R-390] Pulling IERC Tube Shields

I have found that spark plug boot pullers make a good tool to pull off those pesky IERC tube shields you can't quite reach to get a good grip on. Some of them are plastisol coated for better grip. Check out the supply at your local auto parts store.

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Date: Fri, 29 Sep 2006 11:02:55 -0400  
From: Roy Morgan <roy.morgan@nist.gov>  
Subject: RE: [R-390] IERC Tube Shields Seen, SemiSane Price

The list is on Chuck Rippel's site: <http://www.r390a.com/> and at: <http://www.r390a.com/html/tubeshields.htm>

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Date: Fri, 15 Dec 2006 16:44:43 -0600  
From: <davkow@charter.net>  
Subject: [R-390] Re: R-390 Digest, Vol 32, Issue 12

> Have 25 never used at 100.00 plus 5.00 ship

Gone to the first person, Thank you R-390 List. These were loose in box and after many moves over past 30+ years pretty scratched up. FOUND Original box, much the worse for wear on the outside but the dividers kept the shields inside nice like new. IERC TRT5-5020B Have couple sets of 20 left at \$100.00 plus 5.00 usps. Also have 30 mixed (4 sizes) atlee, Cool-fin, WPM and 5 noname black with inserts (all have inserts) tube shields, all 35 for 125.00 plus 6.00 usps. These have all been in my possession the past 30 yrs plus. Call or email. leave message with name and number (I hear the voice on machine better than the ringer, too much time next to Fairbanks Morse)

John in SE Minn.  
507-689-0393  
davkow@charter.net

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Date: Mon, 19 Nov 2007 09:51:55 -0500  
From: Roy Morgan <roy.morgan@NIST.GOV>  
Subject: Re: [R-390] Ebay Auction

**<snip>**

> Also mounting an R-389 directly below the R-390Ais going to cook both receivers.

Indeed. The R-389 has the same power supply with series regulator tubes as found in the R-390/URR and R-391. It appears from the auction description that the case being offered is quite well sealed up. Based on my experience with the R-390/URR and a fan, I believe that a modest amount of cooling air does wonders. But it would have to circulate in and out of the case. That fiberglass case may be adaptable to install dependable air movement. It's hard to tell. May your radios run cool and long.

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Date: Mon, 3 Dec 2007 16:09:04 -0600  
From: "Les Locklear" <leslocklear@cableone.net>  
Subject: [R-390] Tube shields? We don't need any stinking tube shields!

This test was done using a Raytek laser digital thermometer. Temperatures were taken from a 6BZ6 1st RF amp tube on a John R. Leary SP-600JX no suffix number, serial number 1262. Ambient room temperature was 75°F. I'm not a scientist nor should this be misconstrued as a scientific test. I have always been curious as to whether the IERC tube shields "actually" prolong tube life. As noted there were several different tube shields used in this "test." Also note there are several different types of inserts inside these tube shields.

The "Real McCoy" IERC Tube Shields have a finger grip type of insert that acts as a heat sink and the test results show that the temperature difference between the shield and the tube itself is little. That should tell us that that type of shield is the "Standard." For your information, I don't use tube shields and my tubes seem to last a long time. Take this information as it's meant to be, strictly informational.

- 1.. Shiny metal Eby tube shield no insert. 94°, bare tube 124°F.
- 2.. Shiny metal Eby tube shield with seven-sided black aluminum insert.  
96°F, bare tube 127°F.
- 3.. Dull metal Elco tube shield no insert. 108°F, bare tube 135°F.
- 4.. Black heat resistant painted Eby tube shield no insert. 104°F,  
126°F bare tube.
- 5.. Black anodized Eby tube shield with "waveform, nine ridges" aluminum  
black heat shield insert. 107°F, bare tube 127°F.
- 6.. Collins black anodized tube shield with "waveform, nine ridges"  
aluminum black heat shield. 100°F, bare tube 122°F.
- 7.. W.P.M. tube shield with five-sided aluminum insert. 106°F, bare tube 118°F.
- 8.. IERC tube shield with "finger grip" type beryllium insert. "The Standard."  
102°F, bare tube 104°F. ( has to be the insert)
- 9.. Bare tube, no shield. 6BZ6 114°F.                      YMMV

Les Locklear  
Gulfport, Ms.  
DX'ing Since '57  
<http://www.hammarlund.info/>

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Date: Mon, 3 Dec 2007 16:29:14 -0600



From: "Les Locklear" <leslocklear@cableone.net>  
Subject: Re: [R-390] Tube shields? We don?t need any stinking tube shields!

I should have noted that immediately after shooting the tube shield temperature, the shield was removed and the tube temperature was shot.

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Date: Mon, 3 Dec 2007 16:31:39 -0600  
From: "Les Locklear" <leslocklear@cableone.net>  
Subject: [Hammarlund] Tube shields? We don?t need any stinking tube shields!

I chose a reference point to "shoot" the temperatures from, then left the shields in place for 15 minutes, shot the shield temp, removed the shield, then shot the tube temp. I should have stated that in my post.

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Date: Mon, 03 Dec 2007 17:40:04 -0500  
From: rbethman <rbethman@comcast.net>  
Subject: [R-390] Re: Tube shields? We don?t need any stinking tube shields!

While I do not have the sophisticated temperature measuring capabilities, I have long suspected that the results you've posted was the case. I long done away with those pesky shields, both in R-390As and SP-600s. They DO seem to run cooler!

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Date: Mon, 3 Dec 2007 16:46:02 -0600  
From: "Les Locklear" <leslocklear@cableone.net>  
Subject: [R-390] Re: Tube shields? We don?t need any stinking tube shields!

If I had a bunch of the "Real" IERC shields, I would use them, but I'm not about to pay the price they seem to sell for these days. No shields seems to work for me.

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Date: Mon, 03 Dec 2007 18:44:40 -0500  
From: Barry Hauser <barry@hausernet.com>  
Subject: [R-390] Re: Tube shields? We don?t need any stinking tube shields!

Originally, it was my impression that the "finger" style inserts were best, but I later thought that the pleated type -- which I suspect you call the "waveform" style should be theoretically better. To be clear, these are sort of accordion folded sheet beryllium copper. They are formed such that they make nearly 100% contact with the glass -- OK, maybe nearly 90% and maybe 80% with the inside surface of the shield. A variable that may be important with this type in particular -- any perforations at the base of the shield and, maybe more important -- the flange, if any at the top of the shield. Ideally, these would provide maximum thermal physical contact between the two, while, at the same time, allow for maximum convection cooling -- vertical "chimney" effect -- from the base of the tube and shield out the top of the shield.

Best Laid Plans of Mice & Men Dept.: If combined with a shield with a large top flange AND the insert located high up, might well block the airflow, resulting in

heat buildup. In many cases, these inserts were retro-fitted to shields that were not necessarily made for them -- i.e. no crimp stop near the top of the shield to keep the insert from riding up too high when the shield is installed.

Another factor, that would be more important with the pleated type -- actual quality of the heat sinking to the glass and the inside of the shield. While it provides for maximum insert to glass contact, it is susceptible to dirt or painted labeling on the glass. If there is raised painted labeling, that could keep quite a bit of it lifted. To maximize, the paint should be removed with solvent.

The shields vary in how they mesh with the shield mounts on the chassis. A standard bayonet mount makes maximum contact, but also closes off venting.

I suspect the finger type are better all around because the fingers either cut through the paint, get around it, etc., and sort of hedge all bets. The pleated type makes greater contact but is essentially double or triple ply and there may be a blanketing/insulation effect with them. However, if the tube is clean, and they are used in a shield that has little or no flange at the top, I suspect they should be comparable to the finger type. Some of the IERC shields have a very narrow lip at the top and some have none at all.

I have one of those gun thermometers -- same brand, but lower model without the laser aiming.

Bottom line though -- if electrical/signal shielding isn't needed (to avoid spurious effects, whatever), the best bet is no shields -- with some form of forced air cooling -- like well-positioned muffin fans. Also, the convection model is a bit upset for all those tubes that are upside down ;-)

Well, I've run out of time. I have to go calibrate my fly-spec-ometer so I can check out some ground condiments, which are suspect due to the country of origin.

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Date: Mon, 3 Dec 2007 17:58:20 -0600  
From: "Les Locklear" <leslocklear@cableone.net>  
Subject: Re: Tube shields? We don?t need any stinking tube shields!

"In many cases, these inserts were retro-fitted to shields... <snip> Exactly the case with the ones tested, the tube shields tested were retrofitted with the "accordion" type (better description than waveform) beryllium inserts.

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Date: Mon, 3 Dec 2007 21:31:51 -0500  
From: "Jim M." <jmiller1706@cfl.rr.com>  
Subject: RE: Tube shields? We don't need any stinking tube shields!

The original purpose of the shields may have been to hold the tubes in place during rough transportation. The military has some tough drop, shock and vibration specs. and tests to pass. The design of the shields may have evolved to try to keep temperature down to the "bare tube" level while still having a

restraining shield in place.

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Date: Mon, 3 Dec 2007 20:26:11 -0800 (PST)  
From: Rasputin Novgorod <priapul@yaho.com>  
Subject: Re: Tube shields? We don't need no steenkin' tube shields!

> I would have thought that most boatanchor afficianados  
> would know all about IERC shields by now.

I bought some IERC shields on eBay a while ago and upgraded my 390A. But I am missing one shield, it fits the big 12BY7 tube. If you have an IERC shield you're willing to part with, I'll happily swap several of my other sizes of IERC shields, or pay cash for it. Please reply privately. I don't know if the IERC shields are better or not; it just really bugs me that one is missing...

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Date: Tue, 04 Dec 2007 03:19:26 -0500  
From: Barry Hauser <barry@hausernet.com>  
Subject: Re: Tube shields? We don't need no steenkin' tube shields!

> .....There is a military study that was pretty widely available <snip>

Yup, Don, I'm pretty sure I read the same study, but I don't recall dozens of types of shields -- more like the IERC vs. standard (stock) shields, which were of the shiny, top spring, bayonet, no-insert type and vs. no shield. Also maybe black painted standard shields. Was there another study? Chuck R. refers to the Collins study which showed tube life increased 53% with the IERC's over standard shields.

> .....So, IERC tube shields do not work by convection, <snip>

Might be so, but Les is getting relatively small differences in temperature, so the convection differences could account for it.

> .....The liner in an IERC shield does two things -- <snip>

There have been discussions about the realities of radiation. It's not that cut and dried. As for the "right bases" -- most of the IERC variants we consider are backward compatible types, not those with the proprietary chassis mounts. I have some equipment that was made for special IERC shields with special "slot & blade" bases. I have a set of IERC special designs with those bases with yet another variant of the insert -- more of a horizontal latticework that does not completely cover the tube envelope. The sides of the shield are cut out -- it's mostly a framework with that particular design. Apparently, emphasis was given to direct venting on this more sophisticated designs -- rather than maximizing radiation absorption or heat sinking the glass envelope. The most preferred IERC style seems to be the minimum flanged, "finger" insert type -- the one that yielded the best results in Les's experiment. The bottoms of these are machined out and shiny where the shield contacts the standard bayonet mount. The bottom forms tabs with punched holes which (hopefully) match up to the nipples

on the bayonet base. They snap into position, they don't twist 'n lock, like the original shiny shields. The area of metal-to-metal contact is relatively small -- even less than with the standard shield. So it's arguable as to how much of the heat conducts out through the base into the chassis vs. into the air from the main part of the insert and shield, which is many times the surface area of the base metal contact area.

Les, being one of the few authorized boatanchor historians of the 20th and 21st centuries, is probably aware of that tube shield study. He may have well been the one who unearthed it. So, I suppose he didn't consider it to be the final word on the subject. Either that or he just wanted to get some use of his Raytek laser-guided thermometer gun. ;-)

BTW -- the variation in top flanges seems to be very deliberate -- as if the designers were trying to minimize blockage of the airflow. Some of the IERC's are made of welded or extruded tubular anodized aluminum with slightly rolled top edge. There are some made of a flat piece of aluminum, rolled into a tube and crimp-finished, and those have no lip/flange at all - just a raw edge. I consider this to be a clue. Even if the convection aspect were a subset of the overall, apparently it was considered worthy of tweaking.

Then there are the black bayonet WPM's which appear to be painted rather than anodized and otherwise the same as the shiny shields. They usually have the five or six-sided insert made of what appears to be black spring-steel rather than beryllium copper, and may also still have the top retaining spring of the standard shiny model. They would have better contact area at the base. They typically do poorly and are considered to be worse than nothing. Is it because the liner has insufficient absorption mojo? Or is it because of other conduction/convection/heat-bottlenecking factors overriding any radiation absorption benefit?

Some have questioned the notion of radiation of heat through the vacuum of the envelope and through the glass into the flat black insert. The attempt to capture/absorb or envelop/conduct/sink involves an immediate and tricky trade-off. First, you have to enclose the thing. There are a number of guys on the list, past and present, that run their '390's 24/7 -- many with no shields and get quite a bit of mileage out of their tubes. At least that's what I've read here.

> .....Airflow through the liner/shield is not a significant source <snip>

For the small differences Les came up with, it could be a factor. He got 104 for the finger type shield which was 14 degrees cooler than the next best one which used the pleated style -- I'm ignoring the five sided one in the WPM shield for the moment. The thing is, the pleated type maximizes flat black absorption area AND area of contact with the glass and inside of the shield. The finger type maybe makes contact with 30% of the surfaces -- I'm guessing. Both are made of beryllium copper alloy -- very nasty stuff - do not ingest particles. So, it would seem the finger type allows for more air circulation around the glass. The whole notion of heat reducing shields is a tricky proposition. You first have to bottle

things up, so you're starting two steps back before you begin. Any small design mishap can blow the benefit.

While the elements are in a vacuum and the primary way the heat gets out initially is by radiation, that radiation first hits the glass and much is absorbed in the glass. What passes through gets to the shield. If it's a shiny shield, much would be reflected back. If it's a flat black insert and shield it would be prevented from reflecting -- but still needs to shed that heat to the surrounding air. If it doesn't, or it is impeded, the insert and shield will continue to heat up, the glass will be hotter, etc and an oven is created. The elements run hotter one way or another -- because the shield/glass is hotter and can't absorb as well? Of course, it's not really a true vacuum. There's quite a bit of material supporting the elements which eventually pass through the bottom of the glass. The elements are not floating in space. Tube designs also vary. Some may radiate heat out directly more readily than others.

> Remember, it is the temperature of the tube elements <snip>

Other than longevity, what we have is the glass temperature to measure as indicative of the operating temperature of the tube. Again, we're looking at 10-15 degree differences in glass temperature as indicative of running temperature differences. Again, heat has to go somewhere and once you get "your hands on it", grab it and toss it out the door. It's more like the second step rather than secondary. Keeps the heat flow going.

I tried to find that study on the WWW, but no luck. Do you know where it is? Would be interesting to take some infrared photos of tubes in action -- can anyone do that?

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Date: Tue, 4 Dec 2007 05:50:56 -1000  
From: "pete wokoun, sr." <pwokoun@hotmail.com>  
Subject: [R-390] Re: Tube shields? We don't need no steenkin' tube shields!

About three years ago I did a study and put out a paper on the effectiveness of these IERC heat shields. It shows the effectiveness of these things with temperatures. Great of Les to do more testing. You can view that paper here:

<http://www.qsl.net/kh6grt/page4/shields/shields.htm>

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Date: Tue, 4 Dec 2007 10:17:55 -0800 (PST)  
From: wli <wli98122@yahoo.com>  
Subject: [R-390] Re: tube shields?

This has been an interesting thread. We discussed this before in some detail. One nice article was published in ER vol 66 page 10 (1994) by Bill Kleonomos entitled Electron Tube Survival Primer. He referenced a study by GE Owensboro in the 50's on tube life vs envelope temperature, and republished the survival curves on observations made employing 6AQ5W's and 6AK5W's.

Here are some salient points of the Klernomos article for this group:

- 1) Number one enemy of tube life is excessive heating of the internal structures
- 2) Number two enemy was excessive heater voltages
- 3) Soda glass used in tubes is 'opaque' to infrared energy, so that heat is not 'paased thru'
- 4) Soda glass has poor thermal conductivity leading to local hot spots
- 5) Heat transfer from the internal elements to the envelope glass occurs by conduction via internal trapped gases and thru the tube pins.
- 6) A thermally conducting path from the tube shield to the chassis is required for cooling

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Date: Tue, 4 Dec 2007 15:18:15 -0600  
From: "Les Locklear" <leslocklear@cableone.net>  
Subject: Re: [R-390] Re: Tube shields? We don?t need no steenkin'tube shields!

The only reason I ran this test was because of the different types of "inserts" in side the various shields. Pete's website page is great reading. Also, Electric Radio Issue 66 had another great article by Bill Kleronomos. If I had a complete set of the IERC types with the finger grip type insert for the SP-600, I would use them. But, I haven't used tube shields for several years and have no tube failure problems.

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Date: Tue, 04 Dec 2007 20:24:44 -0600  
From: Barry Williams <ba.williams@charter.net>  
Subject: Re: [R-390] Re: Tube shields? We don?t need no steenkin'tube shields!

I think the original subject was either started by Chuck Rippel, or it quoted him, on RF isolation for certain tubes in the R-390A. That's why the shields were recommended by Chuck for those specific tubes. Then, the discussion branched off into tube shield types, best heat dissipation, etc. This may have been about 10 years ago from what I remember. Luckily, between 2 A's and a SP-600 from Al Parker who gave me a ham price on it, I have more than enough for the right IERC tube shields.

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Date: Tue, 04 Dec 2007 20:30:35 -0600  
From: Barry Williams <ba.williams@charter.net>  
Subject: Re: [R-390] Re: Tube shields? We don?t need no steenkin' tube shields!

This is what I saved from Chuck Rippel's site, but I think I may find more after

searching an old computer. I had forgotten about the Collins service bulletin.

IERC Heat Dissipating Tube Shields About IERC Tube Shields - (Rippel)

The R390A uses 5 different sizes of heat dissipating, black, IERC or "WPM" labeled tube shields. Installing the correct type and part number shield can dramatically decrease the operating temperature of the vacuum tubes and in turn, increase their service life. Collins addressed this back in the early 50's in service bulletin #303 which graphically compares the performance of various types of tube shields and not using shields at all. The proper tube shields can easily be identified. They are anodized black (or deep purple), have an open top with a series of tabs folded over a thin, octagonal metal tube inserted longways inside the shield. They are also plainly labeled "IERC." There is a unique model number stamped on the outside of the shield denoting which size it is designed to fit. Refer to this number when obtaining the shields. Below is an inventory with individual quantities of the 5 different part number IERC tube shields used in the R390A:

- (1) 6025-B Tall 9 Pin, used for the ballast tube
- (9) 6020-B Medium 9 pin, used on 5814A's and 26Z5W's
- (2) 5015-B Short 7 pin, used on the 5654's
- (13) 5020-B Medium 7 pin, used on 6BA6's, 6C4, 6AK5, etc...
- (1) 5025-B Tall 7 pin, used on the OA2

Black tube shields labeled "WPM" may also be found. While I personally don't feel these are quite as effective as the IERC design, they are far and away better than the shiny types described below.

Radios which still have shiny, nickel-plated tube shields should have them replaced with the above IERC shields as soon as possible. Even if they have been painted black on the outside, these shields have no provision to grip the tube bottle and sink the heat away from it. Also, the bright internal surfaces of the shield actually reflect the heat back into the tube and on to its dark internal plate structure which could then cause the tube to over-dissipate and shorten its service life.

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Date: Tue, 04 Dec 2007 20:32:28 -0600

From: Barry Williams <ba.williams@charter.net>

Subject: Re: [R-390] Re: Tube shields? We don't need no steenkin' tube shields!

I found this:

From: Dr. Gerald N. Johnson, P.E. <geraldj@ames.net>

Date: Sunday, December 5, 1999 3:34 PM

Subject: Re: [R-390] Shields or no shields...

The receiver has two RF stages to keep down radiation. So shielding them should be important for keeping the receiver private. Same thing for the oscillators. It's important to not let signal radiate from the later IF stages because

they can lead to IF oscillation. Some of these IF tubes do have a shield outside the plate, and some don't (6AK5 doesn't). 73, Jerry, K0CQ

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From: Barry <n4buq@knology.net>  
Subject: Re: [R-390] Recon

>Beware of Barry, Barry, Barry and Barry. I can never keep these guys  
>straight. But they know a lot.

I resemble that remark! Welcome Jon. You are extremely fortunate to have the wisdom of the other fellows on this list, Roger in particular. He's like a walking, talking (emailing) maintenance manual for these radios. Barry - N4BUQ

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Date: Sun, 6 Apr 2008 18:05:22 -0400  
From: Bob Young <youngbob53@msn.com>  
Subject: [R-390] RE: R390/A Cabinets

I don't believe those Hammond cabs are ventilated though.

>

> Fair Radio has 6 new Hammond cabinets available for the R390/A on ebay for \$155 plus shipping. Item 170207231154. Not "original" or R@@@re, but affordable.

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Date: Sun, 6 Apr 2008 18:18:04 -0400  
From: "Tracy Fort" <beerbarrel@cox.net>  
Subject: RE: [R-390] RE: R390/A Cabinets

Looks like they are all sold too!

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Date: Mon, 7 Apr 2008 11:54:36 -0700  
From: "David Wise" <David\_Wise@Phoenix.com>  
Subject: RE: [R-390] R390/A Cabinets

Has anyone tried these? They have no cooling slots.

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Date: Mon, 7 Apr 2008 16:13:50 EDT  
From: RLucch2098@aol.com  
Subject: Re: [R-390] R390/A Cabinets

No Lift top cover either that I can tell from those dark pics and description.

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Date: Mon, 7 Apr 2008 16:43:49 EDT  
From: ToddRoberts2001@aol.com  
Subject: Re: [R-390] R390/A Cabinets

To really get those Hammond cabinets working right with an R-390/R-390A you will have to install your own rails at the bottom to support the chassis relative to the front panel. Otherwise if you try to install the R-390/R-390A in those cabinets all the strain will be on the front panel when you tighten the mounting screws.



You can make up rails for the cabinet bottom using aluminum or steel angle stock and spacers to get the height of the chassis to match the front panel screws in the cabinet. Also those particular cabinets can be the basis for an excellent cooling cabinet if you install a couple of thin muffin fans in the bottom and use feet to raise the cabinet bottom about an inch above the table top to allow cooling air to flow under the cabinet to the fans. There is a space or channel under the cabinet of about an inch that is just right to hold some one inch thick cooling fans flush relative to the outside bottom of the cabinet. You would need to punch some 4-inch diameter holes in the bottom for the fans. I made a similar arrangement in a smaller Hammond cabinet for a Racal 6790 and it works great. This arrangement would be perfect for the R-390 as you could place 2 fans directly under the area where the 6082 regulator tubes are located and blow cool air directly across the audio chassis with the regulator tubes. There is space around the sides of the chassis and the top of the radio where the warm air can escape out to the rear of the cabinet.

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Date: Mon, 07 Apr 2008 23:58:35 -0500  
From: Dave Mayfield <wrl@gwltld.com>  
Subject: Re: [R-390] R390/A Cabinets

I bought one two months ago, and I'm happy with it. Other than it's black. I plan to repaint mine this summer.

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Date: Tue, 8 Apr 2008 08:34:45 -0400 (EDT)  
From: Phil <tubesareking@yahoo.ca>  
Subject: RE: Hammond R-390A cabinets through Fair Radio and other sellers

I bought one of the unvented black Hammond tabletop rack cabinets for my R390A two or three years ago, back before Fair Radio started carrying them, back before they were carrying those white microwave oven type cabinets for the R-390A. I very much like my Hammond cabinet. I bought it through Digikey. A good Canadian made cabinet to put a great American made receiver in. I installed two 3 inch, 32 cfm cooling fans in the upper rear corners to draw warm air out. Noisy, so I don't run the fans most of the time. Sometime I will make a control box to lower the voltage to them so they run quieter - based on experimenting with my variac - about 70 to 80 volts is ideal. I tried wiring them in series, but they wouldn't start by themselves - you had to spin the blades to get them going! Regarding rails - what works superb is to use two large hardwood dowels as rollers. There is a spot in the bottom that will loose fit each one if you cut the dowels long enough. I forget the diameter. I think it may have been an inch and a quarter, but do your own measuring. If I can find the leftover piece, I'll measure and pass this along. Best thing is to measure. Use the bottom cover so it will roll properly - otherwise the bottom edges of the R-390A will quickly saw into the dowels.

The bottom cover is well vented, except for around the PTO - and given that we all run the ovens off - having a draft shield of sorts around the PTO is probably a good idea. Don't use the top cover as the vents are certainly not very ample.

There is ample clearance at the bottom, sides and top of the Hammond cabinet for decent cooling for a R-390A. The cabinet is powder coated in a nice, strong, pebbly finish and seems to enjoy sinking and dispersing heat pretty well considering that it is thick steel, not aluminium. But, like IERC tube shields, the inside and outside is black and that seems to help.

For my use, the R-390A being on two or three hours an evening for hard core broadcast band MW DXing [great on transatlantic stations when used with the 2 KC bandwidth - for example, Croatia on 1134 KHz, Virgin Radio on 1215, Germany on 1422 and Switzerland on 765 KHz are regulars here on my R-390A], no fans are required.

If one were to run it for extended periods of time, or in hot weather, the fans are a good idea. For a R-390, with those hot regulator tubes, a fan would be a must and I do like the bottom mount fan idea for that application.

The downside - the cabinet weighs about 30 pounds, so this takes the 75 lb net weight of the R-390A and gets it over 100 lbs. To lift my R-390A, I have to take it out of its cabinet first. But, it is easy to do so with the rollers. Plus, the rollers support the chassis so there is no strain on the front panel. I am careful not to over-tighten the 8 front screws attaching the R-390A to the Hammond cabinet.

The black colour looks great, especially with the repro KC and MC knobs and with the smaller knobs nicely repainted.

Even my wife, who thought my incomplete, non-working, super dirty ebay R-390A was the ugliest thing she ever saw, now thinks it looks pretty good in that cabinet - of course now it is clean, works great and is very complete.

I had the R-390A clean and working great before the cabinet, but she still grumbled about "that thing". With the round side holes, metal edges etc. it has a bit of an unsafe look to the non-enthusiast. The cabinet gives it a finished, child friendly, spouse friendly look and the complaining stopped after it was in the cabinet.

My kids, daughter age 5, son age 2, enjoy using the R-390A, and my R-392, under my close supervision. So far, the front panel may have got one tiny scratch from this. It might have been there before though. A very small price to pay if it means either or both of them end up sharing my appreciation for radios in general and boatanchors in particular.

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Date: Tue, 8 Apr 2008 07:45:48 -0500  
From: "Craig Anderson Ext 1365" <Craig.Anderson@saintpaul.edu>  
Subject: [R-390] RE: R-390 Digest, Vol 48, Issue 8

I bought one from from Allied or Newark a few years ago. I had a local custom hot rod shop use their louver punch to place louvers in the top and bottom of the cabinet and it worked great. Without louvers on the cabinet the radio it too hot!

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Date: Tue, 08 Apr 2008 17:16:06 +0000 (GMT)  
From: triodes@optonline.net  
Subject: [R-390] R-390 (Non A) For Use With CY-979A Cabinet???

I am restoring a Motorola R-390 (non A) receiver, and it will be installed within my restored CY-979A cabinet. With the 6082 series regulator tubes (as used in the R-390) and the attendant heat load they create, will this receiver run the risk of overheating within the CY-979A? I do not know if the R-390 was designed to be installed in the CY-979A from a thermal standpoint. I have seen mostly the R-390A receivers installed within this cabinet. Hopefully, the engineers who designed the CY-979A designed this cabinet with sufficient vent area and an efficient convective cooling path to be used with the R-390, again from a purely thermal/heat load standpoint. Any guidance here would be appreciated!

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Date: Tue, 8 Apr 2008 14:51:28 -0400  
From: "David C. Hallam" <dhallam@rapidsys.com>  
Subject: RE: [R-390] R-390 (Non A) For Use With CY-979A Cabinet???

The R-390 needs absolutely all the cooling it can get. I don't know whether it was intended to operate in that cabinet but I would never operate mine in it. I have mine mounted in a cabinet some what taller then the radio with a muffin fan mounted on the side of the cabinet blowing air up on the regulator tubes. Both the bottom and top covers are off.

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Date: Tue, 8 Apr 2008 17:39:49 -0400  
From: Roy Morgan <k1lky@earthlink.net>  
Subject: Re: [R-390] RE: Hammond R-390A cabinets through Fair Radio

Try some capacitance in series with the fans. You may quickly find a value that is just right (as is the ~75 volts). The nice thing is that the cap contributes no heat as a resistor does. Not that the heat is very much.

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Date: Tue, 8 Apr 2008 17:55:14 -0400  
From: Roy Morgan <k1lky@earthlink.net>  
Subject: Re: [R-390] R-390 (Non A) For Use With CY-979A Cabinet???

>  
> The R-390 needs absolutely all the cooling it can get.

Well, sort of.

> ... I would never operate mine in it.

A VERY good policy!

> I have mine mounted in a cabinet some what taller then the radio with a  
> muffin fan mounted on the side of the cabinet blowing air up on the  
> regulator tubes. Both the bottom and top covers are off.

I hacked a piece of aluminum to hold a 4 inch square muffin fan on the side of

the radio blowing in against the regulator tubes. I had been testing the receiver with 6080's, filament fed from an external filament transformer. I used speaker wire to get the 6.3 volts in to the tubes, and the insulation on it MELTED against the tubes. "BAD", I thought. The plate I made fastened under one of the bottom cover screws (which can be installed without the cover installed) and two of the frame-to-deck fastening screws. The trouble is that a normal fan cannot be mounted before you slide the radio into a rack or cabinet. Thin fans may work fine. I came up with screw slots that let me slide the fan onto the screws after the radio is installed, and it "works a treat" as the Irish would say. I have a good picture of the plate with a ruler included to let folks get an idea of what the thing is like. My fan plate is kind of a hacked up ugly thing but it works so well I can put my fingers on the tubes and hold them there. The picture is not posted online now, so if folks want to see it, I'll either post it or email it to those who ask.

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Date: Tue, 08 Apr 2008 22:15:28 +0000 (GMT)  
From: triodes@optonline.net  
Subject: [R-390] R-390 (Non A) For Use With CY-979A Cabinet???

Thank you for all of the comments and replies with regard to my inquiry. I guess the real question here is as follows: was the CY-979A designed for use with the R-390, or only the R-390A receiver? If it was designed for use with the R-390 (non "A" version), I think we can safely assume that the engineers at the time did think through the heat load and related thermal considerations in the design of the CY-979A, so as to provide a safe operating temperature without jeopardizing the long-term reliability of the receiver. Yes, the R-390 runs hot, hotter than the R-390A. But objectively, if indeed the CY-979A was designed for use with the R-390, there should be no issues.

Does anyone know when the CY-979A was first introduced to the military? If the introduction date was during the original R-389 or R-390 production period, that may conceivably mean something here. If it was introduced during the run of the R-390A, perhaps that would indirectly infer that it was designed for use with that receiver unit only.

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Date: Tue, 8 Apr 2008 19:51:59 -0400  
From: "David C. Hallam" <dhallam@rapidsys.com>  
Subject: RE: [R-390] R-390 (Non A) For Use With CY-979A Cabinet???

Again I can't don't know if that particular cabinet was designed with the R-390 or not. Even if it was, IMHO you are making an unwarranted assumption that the "engineers got it right". If you are not operating the proverbial 24/7, there may be no issues. Me, I prefer lots of air. After I had to replace the cathode resistors and the 26Z5's a couple of times, I put the cooling fan in place. That was about 20 years ago and I have had no problems since.

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Date: Tue, 8 Apr 2008 21:10:50 -0700 (PDT)  
From: Perry Sandeen <sandeenpa@yahoo.com>  
Subject: [R-390] Case Comments -Long post

There is no such thing as a louvered or un-louvered case that can properly cool a R390, R390/A or SP600 without fans unless you're outdoors at the north or south pole. There are several problems unique to case mounting.

For the R390 the first solution to the regulator heat problem is to install the SS regulator designed by Dr. Jerry in the HNS that has been mentioned before. (I can't find it in my perusal of the index. Someone please jump in.) The next thing is fans. The cheapest bang-for-the-buck are 12 volt computer case fans. The most common size that is sold by Newegg is 120MM (about 4 3/4 inches. For a little over \$10 a pop you have a choice of CFM and noise levels. They have customer reviews that are very helpful.

I don't have any experiences with the R390 but the following comments are relevant to the "A" and most SP 600's.

First the "A". Because of it's fold-over design it is more important to get good airflow to the bottom than the top. People have reported putting spacers under the audio module because of the heat generated by the dropping resistors in the closed space. Why no one has suggested putting the resistors on top and the filter caps inside the audio module is a mystery to me.

On most of the SP 600's I have there are two 20W dropping resistors underneath the power transformer. A SP600 may need to have all IIRC three power resistors remounted to the top side in order to have reasonable temperatures underneath. One needs to channel a lot of air under the case bottoms of each. The "A" is easier to cool because of the larger holes in the side as well as an empty interior space where a small fan may be installed. So each will require different sizes of air ducting from fans.

We must remember that the receivers first had to meet a volume and front panel specification. Then they had to meet performance specifications and a reparability requirement. With the "A" especially, module swapping could be done fairly rapidly by not very skilled techs. Receivers could be turned around faster. If module swapping or techs that joined the AF to avoid the Army in Viet Nam and weren't good at troubleshooting didn't fix at Karmursel AS (A huge intercept base near Istanbul), they trashed them out. There was never, ever any specification for receivers to last 25 years or longer.

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Date: Wed, 9 Apr 2008 18:43:04 -0700 (PDT)  
From: "Drew P." <drewraille807@yahoo.com>  
Subject: [R-390] Case Comments

<snip> On heat generation in the R-390A, Perry went on to say:  
>People have reported putting spacers under the audio module because of the heat generated by the >dropping resistors in the closed space. Why no one has suggested putting the resistors on top and >the filter caps inside the audio module is a mystery to me.

I made that suggestion in this forum about 5 years ago and it was met with the same type of indifference that suggestions of any other type of hack-em-up mod would receive here. I never actually tried it in my R-390-A. How many of us here went so far as to attempt the kielbasa-for-ballastube substitution?

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Date: Thu, 10 Apr 2008 08:42:20 -0400  
From: "Tim Shoppa" <tshoppa@wmata.com>  
Subject: Re: [R-390] Case Comments -Long post

My one comment about the \$10 computer case fans, even the fancy-pants ones, is that they rarely last more than a couple of years. That's great for a computer case - after all, the computer is going to be obsolete before the fan goes bad - but the industrial-duty fans and blowers that cost a whole lot more than \$10 are really and truly better than anything I've ever found in a computer shop. That doesn't mean they'll outlast the radio. I fully expect that even the best fans to die long before the radio does.

My personal solution was a 240VAC 10-inch Rotrons that don't spin fast at all at 120VAC. Slowing it down was not done to push the life but instead to drop the acoustic noise! In terms of life the fans had already had 15 to 20 years service in industrial racks by the time I got to them.

>People have reported putting spacers under the audio module because of the  
> heat generated by the dropping resistors in the closed space. Why no one  
has  
>suggested putting the resistors on top and the filter caps inside the audio  
>module is a mystery to >me.

In fact others have. But I've never seen a 390A audio module with "bad" dropping resistors or failed/charred components around the dropping resistors. In my limited experience it's a case of "ain't broke - don't fix it".

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Date: Tue, 14 Apr 2009 20:26:40 -0500  
From: <wb5uom@hughes.net>  
Subject: Re: [R-390] R-390a AGC Issue/Observation

A 5749 is the military designation for a 6BA6 is it not? I am keeping this thread as a reference for if/when I have this issue.

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Date: Tue, 14 Apr 2009 22:12:18 -0400  
From: Roy Morgan <k1lky@earthlink.net>  
Subject: Re: [R-390] R-390a AGC Issue/Observation

> A 5749 is the military designation for a 6BA6 is it not?

Yup. More accurately 6BA6W (the Wruggedized version.) My GE spec sheet for the 5749 mentions intermittent duty. There may be a list of cross-types used in the R-390's. Ah yes. Here it is.. Sorry I did not record who it was who compiled this useful list (not me). The "shields" column tells the IERC black heat

dissipating shield number for that size tube:

#### R390A Tube Chart

Reference Tube	BETTER Function	Shields
V201	6DC6 RF Amplifier	5020-B
V202	6C4 6100 First Mixer	5020-B
V203	6C4 6100 Second Mixer	5020-B
V204	6C4 6100 Third Mixer	5020-B
V205	12AU7 5814A Calibrator Osc	6020-B
V206	12AU7 5814A 100KHz Osc	6020-B
V207	6AK5W 5654 First Xtal Osc	5015-B
V401	6AK5W 5654 Second Xtal Osc	5015-B
V501	6BA6W 5749W First IF Amplifier	5020-B
V502	6BA6W 5749W Second IF amp	5020-B
V503	6BA6W 5749W Third IF Amp	5020-B
V504	6AK6 Fourth IF Amp	5020-B
V505	6BA6W 5749W BFO	5020-B
V506	12AU7 5814A Detector	6020-B
V507	12AU7 5814A Limiter	6020-B
V508	6BA6W 5749W AGC Amp	5020-B
V509	12AU7 5814A IF Cathode	6020-B
V601	12AU7 5814A First AF Amp	6020-B
V602	12AU7 5814A Second AF Amp	6020-B
V603	6AK6 AF out local	5020-B
V604	6AK6 AF out line	5020-B
V605	0A2 6626 Voltage Reg	5025-B
V701	6BA6W 5749W VFO	5020-B
V801	26Z5W Rectifier	6020-B
V802	26Z5W Rectifier	6020-B
RT510	3TF7 TJ311M01 Current Reg	6025-B

Above is a little chart I made up of the R390A's tube complement and equivalent tube shield required. The tube shield numbers given are for the IERC black shields - the ones preferred to dissipate the heat produced by the R390A tubes. The shiny metal tube shields should not be used because of poor performance and the reflection of heat back into the tube - however, the black IERC tube shields are now hard to find. I looked in the Tube Data Sheet Locator <http://tdsl.duncanamps.com/tubearch.php> for a substitute for the 6AK6 and did not find an american industrial number for it.

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Date: Tue, 14 Apr 2009 22:17:15 EDT  
From: Barry711@aol.com  
Subject: Re: [R-390] R-390a AGC Issue/Observation

Black Tube Shields - How about having the shiny tube shields coated with Black Oxide at a metal heat treat facility. I have steel coated with Black Oxide frequently - it will also add a degree of corrosion protection.

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Date: Fri, 17 Apr 2009 12:09:01 -0500  
From: Tisha Hayes <tisha.hayes@gmail.com>  
Subject: Re: [R-390] Black Tube Shields, IERC

A few years ago I went through the process of measuring envelope temperatures on a wide range of tubes in a SP-600 with different tube shields. It did turn out that the black IERC tube shields did make a difference in envelope temperature. Generally speaking I was seeing 20-60 degrees F difference across the range of shields. I had tested with the following; Factory default, silver cam-lock tube shields with the loading spring to keep the tube down in the socket. No shield at all, just using ambient air and radiative cooling from the tubes.

IERC tube shields

IERC tube shields with a dab of thermally conductive paste applied to the finger-stock grippies inside of the IERC shield (to improve thermal conduction between the envelope and the shield).

I had strictly controlled air-flow and room temperature and would let the radio stabilize for an entire day before making measurements. This was also in a room where I was not moving around in so there was a bare minimum of air movement. Room temperature was at 70 F. I measured temperature with an optical pyrometer and had put a dab of flat black paint on the top of the tube (so I could get consistent temperature readings without gluing thermocouples everywhere).

By far the worst was the silver tube shields. If anything these kept the heat on the envelope with some temperatures well above 250 F

When I used the IERC's I could get the temperatures in the 150 to 160 range. If I used the thermal paste it would knock the temperature down another 5-10F on average. Interestingly the chassis temperature went up when using the IERC shields due to the mechanical connection at the base of the IERC shield and the radiative cooling off of the shields. If you have a concern about capacitor/resistor aging this may offset your worries about tube temperatures.

In every instance, the use of a small computer-fan to move air across the chassis really helped out in lowering the temperature of the tubes and the chassis. This does not need to be a gigantic fan.

If someone was really interested I could dredge up my notes and put them into a human-readable format. At the time I was doing my little experiment to justify the cost of the IERC shields. (I did end up finding IERC shields for every tube operated device I have)

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Date: Fri, 17 Apr 2009 13:34:14 -0400  
From: Jon Schlegel <ews265@rochester.rr.com>  
Subject: Re: [R-390] Black Tube Shields, IERC



Great post. It sounds like your dab of flat black paint was key in getting the measurement consistency needed to use the optical pyrometer. I'd be interested to hear more detail if decrypting your notes wasn't too much of a task. Thanks for the info.

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Date: Fri, 17 Apr 2009 13:37:23 -0400  
From: Jim <jbrannig@optonline.net>  
Subject: Re: [R-390] Black Tube Shields, IERC

Interesting results. Has anyone tried painting the silver cam-lock tube shields with black paint? BBQ flat black paint should work, but is it worth it?

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Date: Fri, 17 Apr 2009 14:38:41 EDT  
From: Barry711@aol.com  
Subject: Re: [R-390] Black Tube Shields, IERC

How about a little carbon black on the shields. Costs nothing-no insulating properties.

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Date: Fri, 17 Apr 2009 14:20:14 -0500  
From: Tisha Hayes <tisha.hayes@gmail.com>  
Subject: Re: [R-390] Tube Shields

I think what confuses many is the design of the IERC tube shield (and others of the same family) where the shield has a mechanical attachment (albeit by spring pressure) to the glass of the tube. Transferring heat by conduction cools the tube much more efficiently than trying to remove the heat by radiation. Whenever there is a tube shield that does not contact the glass, the only heat transfer mechanism is radiative with maybe a small amount of convective heat transfer by the random air currents inside of the shield.

Depending upon radiative cooling alone would be similar to disconnecting all of the cooling fans on your car's motor and sitting in traffic for a few hours. While some heat will be transferred by radiation (as the motor gets smokin-hot the hood heats up) the motor will seize up quickly (unless you believe Castrol television commercials). In a car, the cooling comes from moving a much cooler fluid through the hot motor, then giving that heat energy a place to go in the radiator (where it becomes forced convection transfer to the air) where the cooling fans or driving can dilute the heat into the atmosphere.

Air is a pretty good insulator of heat, look at how close your finger needs to get to a soldering iron tip before you get burned. You may feel the heat at less than an inch (radiative) but there is a dramatic temperature difference from being 1/4" away and touching the iron (conductive). Tubes suffer from the same problem where there is this tiny air-gap between the glass and the metal. The IERC tube shields actually touch the glass in several places and the spring fingers are under slight compression. The heat transfer is from the contact. My crazy experiment was to slightly increase the thermal conduction of the spring contact area by using a small dab of thermal grease (what they use on CPU's,

commonly sold at Radio Shack) to increase the contact surface area. Ideally the glass envelope and the IERC shield would be at the same temperature (yea, glass does not conduct heat evenly, that makes my brain hurt). BTW, the thermal grease idea makes a mess if you are constantly pulling tubes and has a tendency to remove tube lettering.

Where the IERC fingers come down and imperfectly "dock" with the bayonet-socket (from the silver shields) gives another conductive escape path for the heat to the chassis. To remove heat further would be to passively remove it from the radio by natural convection (heat rises) or forced convection (fans).

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Date: Fri, 17 Apr 2009 15:44:42 -0400  
From: "David C. Hallam" <dhallam@rapidsys.com>  
Subject: Re: [R-390] Black Tube Shields, IERC

They may look nice painted but it won't help heat dissipation at all. The primary method of heat transfer from the tube to the shield is still radiation. Maybe the black color would dissipate heat from the shield marginally better. The problem is still getting the tubes heat to the shield.

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Date: Fri, 17 Apr 2009 14:30:24 -0700 (PDT)  
From: Steve Toth <stoth47@yahoo.com>  
Subject: Re: [R-390] Black Tube Shields, IERC and cooling fans

I don't have enough IERC shields (yet) for my two R390A's, so I'm running selective tubes with IERC shields and the rest without any shields. I've been contemplating installing a fan or two on the receivers to circulate the air. What diameter fan(s) did you use and what was the placement. I was considering 12volt fans with approximately the same blade diameter as the side panel hole - maybe one fan per side to pull air out of the chassis. Bottom left side rear (AF deck) or upper left side front (IF deck) combined with a bottom right side front (Pwr Supply)?or upper right side rear (RF deck). I'm tending towards the IF deck and power supply placements. Any input is appreciated.

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Date: Fri, 17 Apr 2009 14:35:49 -0700 (GMT-07:00)  
From: "Richard W. Solomon" <w1ksz@earthlink.net>  
Subject: Re: [R-390] Black Tube Shields, IERC and cooling fans

The original owners ran these 24/7 in most cases. Why fix what ain't broke ??

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Date: Fri, 17 Apr 2009 17:54:11 -0400  
From: Jim <jbrannig@optonline.net>  
Subject: Re: [R-390] Black Tube Shields, IERC and cooling fans

You are right, but as this stuff gets older I feel that 20-30 years of running hotter than H is enough and the radios deserve a break. I use small fans on all my tube rigs.

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Date: Fri, 17 Apr 2009 19:39:15 -0500

From: "Barry" <n4buq@knology.net>  
Subject: Re: [R-390] Black Tube Shields, IERC and cooling fans

The original owners had a nearly endless supply of new tubes so they weren't worried about burn-outs.

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Date: Fri, 17 Apr 2009 21:20:41 -0400  
From: Roy Morgan <k1lky@earthlink.net>  
Subject: Re: [R-390] Black Tube Shields, IERC and cooling fans

The radios are not really "broke". But we operate (most of us) under quite different conditions than the military did with respect to a number of different aspects:

- The military folks had relatively unlimited supplies of spare tubes. Most of us do not.
- The military had a regular schedule of operational checks and maintenance - radio overall performance was checked periodically, as were the tubes.
- For most operational radios, there was a ready maintenance capability - folks trained and experienced to make the things work right quickly.
- If a radio quit, there was likely another one to use in its place upon patching of the antenna and output. Not all of us R-39x owners are lucky enough to have ready spare radios handy.
- Some installations (as in aboard many ships) had lots of air conditioning running and the spaces were quite cold.

With all of the above going for them, the military folks who ran these radios had pretty much a single goal for it all: keep the communications channels running (or keep the intercept operators happy with nice clear signals to copy). We, on the other hand, have a different set of goals that may include the following:

- Have a fun time discussing the things and how to keep them running
- Copy some CW or other signals on the ham bands from time to time
- Actually mess about with the radios and do things to and with them that seem like fun.

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Date: Sat, 18 Apr 2009 17:37:35 +0000  
From: Gene Dathe <dathegene@hotmail.com>  
Subject: [R-390] Black Tube Shields, IERC and cooling fans

Amen to your list, Roy. One addition: Some folks Forget: -Just because a radio was USED 24/7 does not mean it LASTS 24/7. The system, as a whole, was MANNED 24/7 with all the things Roy describes. The system, as a whole, provided reliable, effective communications for a very long and distinguished service life. How long YOUR individual radio will survive without that support system behind it is going to depend on YOUR individual support system. Keep those tubes warm!

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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...

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Date: Sun, 16 Aug 2009 15:41:40 +0900  
From: "Osamu Hazawa" <pomerol@mocha.ocn.ne.jp>  
Subject: [R-390] Alternative to IERC tube shields?

I found this heat dissipating tube shield originally prepared for audiophiles.  
<http://thetubestore.com/eat-cooldamper.html>  
The heat reduction is just 10% so it must be just waste of money.

Considering the increased price for the IERC tube shields, can it be an alternative?

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Date: Sun, 16 Aug 2009 09:42:39 +0200  
From: sigmapert <sigmapert@gmx.de>  
Subject: Re: [R-390] Alternative to IERC tube shields?

- 1) Availability: Out of stock
- 2) EAT-COOLDAMPER: \$34.95 Price is for a single (!)

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Date: Sun, 16 Aug 2009 17:03:27 +0900  
From: "Osamu Hazawa" <pomerol@mocha.ocn.ne.jp>  
Subject: Re: [R-390] Alternative to IERC tube shields?

Some sellers in Japan still handle them. About \$37 a piece :-)

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Date: Sun, 16 Aug 2009 14:06:15 -0400  
From: "David C. Hallam" <dhallam@rapidsys.com>  
Subject: Re: [R-390] Alternative to IERC tube shields?

I don't know what you have to pay for IERC shields but I find all the time at ham fests for a dollar or two each. The type I can't find are the ones used by Johnson and some others that snap on to their socket.

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Date: Mon, 17 Aug 2009 01:16:51 -0400 (EDT)  
From: larrys@teamlarry.com (Larry Snyder)  
Subject: Re: [R-390] Alternative to IERC tube shields?

Right up there with hand-turned wood preamp knobs to reduce the microphonics and increase the 'sonic purity' of your system. I usually spell it audiophool.

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Date: Mon, 17 Aug 2009 08:59:28 -0400

From: "Shoppa, Tim" <tshoppa@wmata.com>  
Subject: Re: [R-390] Alternative to IERC tube shields?

Perhaps if IERC's are not available, a better alternative for the vast majority of tubes that don't actually need shielding, is no shield. I agree that the IERC's are great if you've got them. I've picked some up over the years from hamfests etc. but that can be a painfully way slow to get to the quantities needed for a 390A.

I am slowly learning sheet metal techniques and have worked my way up to "make a chassis box". While I lack the skill, I think the thermal and moral equivalent of an IERC tube could be reproduced by a sufficiently enthusiastic hobbyist. As it is, though, it's usually way more fun to mess around with radios and electronics than it is to do sheet metal stuff (although it is highly satisfying when I actually get the round tuit and do sheet metal stuff.)

IERC cans appear to be seamless, so they were probably deep drawn? Is this likely the same process used to make the deep unseamed metal capacitor cans?

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Date: Mon, 17 Aug 2009 10:07:44 -0500  
From: Robert Nickels <ranickel@comcast.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

> vast majority of tubes that don't actually need shielding, is no shield.....

Agree, Tim. And while I haven't done any testing to prove it, I would think that adding a bit of forced convection cooling would help a lot. Thanks to cheap and quiet brushless muffin-type fans it is easy to try at least.

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Date: Mon, 17 Aug 2009 12:30:33 -0400  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

A source for quiet muffin fans would be from an older computer for scrounging purposes and method. The SPECIFIC one I have in mind is the CPU mounted fan - NOT - the power supply fan. If you cannot scrounge and are forced to purchase, try Office Depot, or if you must, a computer store that sells mother boards, CPUs, and the rest. These will be 12 V.

The typical brushless type muffin fans that most of us use are indeed the 4" X 4" (approx), 120VAC fans that "normally" scream. One puts a large sand encapsulated resistor in the hot leg feeding it. The dropped voltage provides a BIG drop in RPM, and works wonders in quieting it down. I've added these to transmitters and receivers.

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Date: Mon, 17 Aug 2009 12:49:26 -0400  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

I pointed our friend Osamu, in Japan, to the Evil Place. There was a full set going for the price of the Audiophool Single. They were specifically for R-390A or audio amplifier. The set finally went for \$51. Considering that he doesn't have access to our hamfests, if it was him that took the bid, then he made out just fine. I have more than enough for my R-390A. My SP-600 has gotten a "few", the remainder are going bare! It sits in a rack with neither a top nor a bottom. There is enough room in the rack for the R-390A when it comes off the bench, and still have space for the power supply and 4-1000A amplifier. Oh yeah! I forgot to mention that an R-42 reproducer is the top element in the rack! Switchable between the two different receivers!

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Date: Mon, 17 Aug 2009 13:46:55 -0400  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] WAS Alternative to IERC tube shields - NOW fans

I responded directly: If Someone writes directly, I provide them their privacy as a courtesy! To keep from worry regarding resonance with a cap, I place the resistor with its body against the body of the fan. That is actually its duct, as these are based upon close clearance to maximize flow. So it essentially cools the resistor also. It becomes a trade-off. I had one of these already installed on a tube radio in my pre-Amateur days. I was licensed as a General in the fall of 1980. I had been, [Horrors!], a Chicken Bander prior to that.

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Date: Mon, 17 Aug 2009 13:19:37 -0500  
From: mikea <mikea@mikea.ath.cx>  
Subject: Re: [R-390] Alternative to IERC tube shields?

An alternative is to put two of these in series; this also drops the RPM nicely, but since you have two fans, you're moving twice as much air and not having to put up with the heat from the resistor.

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Date: Mon, 17 Aug 2009 14:32:31 -0400  
From: Barry <n4buq@knology.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

A thermister, a couple of tubes, transformers, and an assortment of other components, and I'll bet someone could design a variable-speed fan that would regulate the temperature within a degree or two. Maybe it could use another 3TF7 to regulate the filaments on the circuit so that changes in the line voltage would not affect the temperature regulation.

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Date: Mon, 17 Aug 2009 13:49:56 -0500  
From: "LEE BAHR" <pulsarxp@embarqmail.com>  
Subject: Re: [R-390] Alternative to IERC tube shields?

My alternative is to use a solid state rice box, and use a R-390 for special occasions. I am not going to get an ulcer or let the lack of IERC tube shields in the world suck up 90% of my waking hours. I have better things to do with my life. A R-390 is a radio, not a divinity! If a tube's life is reduced 10% because of

no IERC, plug in a new tube. You will then again be good for another 30 years. Buy some extra tubes. Then you don't have to worry about all this. <snip>

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Date: Mon, 17 Aug 2009 15:00:13 -0400  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

Lee, I belong to the same society. It is based in being retired military, having been a Sr. NCO. With that said, while I've been willing to talk about the shields, and additional cooling methods, NEITHER my R-390A NOR my SP-600 has absolutely ANY cooling that has been added. I was only providing suggestions. I don't sweat it. I've only had one tube go bad on the audio module. It was the 560 ohm resistor that gave up the ghost with it. So about ten years or so of running these radios is under my belt. I do have spare tubes. <snip>

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Date: Mon, 17 Aug 2009 14:03:22 -0500  
From: "William J. Neill" <wjneill@consolidated.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

While lurking and reading the many comments about tube shields, I've been running my R-389, two R-390s, five R-390(A)s, three R-391s, one 51J4, and one R-725, as well as three CV-116( )s, three CV-591(A)s, and one CV-157, without tube shields for 35+ years, just as I did in the US Army between 1966 and 1969. We took 'em off for cooling purposes.

All my stuff is mounted in five CY-1119(U) racks with three inches between each piece of equipment as specified by TM for ventilation purposes and have never had any problems. Plus, during the horribly cold (50F) winter months down here in the Great Dismal Swamp, two receivers turned on will keep about 45% of the house warm.

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Date: Mon, 17 Aug 2009 14:49:53 -0500  
From: Tisha Hayes <tisha.hayes@gmail.com>  
Subject: Re: [R-390] Alternative to IERC tube shields

If it was a choice between using the evil silver shields (for mechanical protection from shrapnel, or clumsy techs) and using no shield at all I would rather have no shield but add forced air cooling. A couple of surplus computer fans will do wonders to circulate air through the chassis, also helping the transformer, chokes and resistors in their efforts to dissipate heat. Just gotta remember to let convection work for you and to force air in at the bottom, out through the top (as much as practically possible). The shiny silver shields with the metal spring and the bayonet style base does provide a minimal amount of RF shielding between closely spaced tubes. The mechanical connection to the chassis is definitely not finger-stock grade RF proof but it does help some. The worst thing about those shields is that they act sort of like a dewar flask to keep the hot tube envelope from dissipating heat to the freely moving air. Of course in the days of endless supply depots and every Allied Electronics, Radio Shack or corner drug-store with a tube tester (and a supply) is long gone. Other than very questionable

Russian or Chinese new(er) manufactured lots we are stuck trying to glean good tubes out of an ever diminishing reserve. We have two forces working against us;

1. Evil audio-phools who think tubes are the shiznat and decide to mis-apply tubes to different applications and look at the data-sheet and think the B+ values are the recommended minimum voltage.

2. Our own usage, albeit from a fairly small pool of folks (us) who restore and use boatanchors or survivalist types who have decided that every solid state device will go up in a big poof when NKorea NEMP's our country out of spite. I guess you can make the distinction between an enthusiast and a survivalist by how many hundreds of spare tubes you have and if they are stored next to your 7.62 mm ammunition (I keep them in separate rooms myself).

It is cool to be cool (our generation said that first, the heck with the iPhone generation). As it has been mentioned before, you may be putting more stresses on your gear by turning it off and on. (the transformer momentarily tries to become a motor and rotate by the evil forces of EMF), Instant on filaments where we drop 6.3 V across a dead short until the filament resistance rises to some semblance of stable and the horrors of capacitors. The trade-off is a bizzare form of calculus where the cost of leaving the power on vs. pranging the ballast, tube filaments, etc vs. How often do you use your gear all need to be considered. I have a housekeeper who comes over a few days a week to do the cleaning. To keep her on her toes I just leave the radio on, tuned up to an EAM frequency, with a moderate amount of volume. She cannot get into that room but the sound of EAM messages resonate through the house on an irregular basis when I am not home (also scares the cats, gotta keep them on their toes). I think she is afraid to ask what weird emanations are coming from that locked room upstairs.

All told, with the SP-600's, R-390A's and R-220 running continually (and the fans) it adds about \$50 to my electric bill a month. In the winter the room is nice and toasty, in the summer it can be uncomfortably warm even with the air conditioning on.

For a winter project I may add some ductwork to pull cold outside air into the radio cabinet when outside temperatures are lower than inside. Of course in the south, if it gets down to 50 degrees we are looking for parkas and the glaciers coming over the Smoky Mountains as we think the northern half of the country is covered under two miles of ice.

I did a short write-up on the temperature differences between silver shields, no shields and IERC around a year ago. I need to redo the experiment and add another variable for with/without forced air cooling. This time I will put it in a spreadsheet and share it around. Give me a few weeks on that as I have other eggs to fry right now. Tisha

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Date: Mon, 17 Aug 2009 16:36:24 -0400  
From: "David C. Hallam" <dhallam@rapidsys.com>



Subject: Re: [R-390] Alternative to IERC tube shields?

According to TM11-856A "when operating fixed table-top installation in a well ventilated case the top and bottom dust covers are to be removed along with the tube shields on V201, V202, V203, V204, V205, V206, V505, and V701.

This will reduce the bulb temperature of the tubes and will prolong tube life."

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Date: Mon, 17 Aug 2009 16:40:08 -0400  
From: "Patrick" <brookbank@triad.rr.com>  
Subject: Re: [R-390] Alternative to IERC tube shields?

Thank you David for closing the discussion with facts.

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Date: Mon, 17 Aug 2009 19:39:27 -0400  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

The specified reference includes MANY things that was intended to enlighten those whose life was almost intimate with these wonderfully designed pieces of equipment. Not to be flippant, I also did not read the segment about destruction to prevent the equipment from falling into enemy hands. I did not pay any attention to FSNs, as when I retired they had been renamed to NSNs, or National Stock Numbers.

This does not mean I didn't read the necessary information to properly manipulate the controls and make use of the radio. It means that there are portions that simply did not get read. It is like the "Unpacking" segment of my BC-610. Neither the BC-610 NOR the R-390A came packed.

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Date: Tue, 18 Aug 2009 00:25:19 +0000 (UTC)  
From: odyslim@comcast.net  
Subject: [R-390] Fwd: Re: Alternative to IERC tube shields?

I have not been following this thread so please excuuuuuse me if this has already been discussed. I think it is better to leave some tubes unshielded to see the condition of the tube itself in service. I was pondering the thought of using a special metal tape used on heavy truck exhaust systems. It is the perfect width to wrap around a 6082 for example and then tape it to the chassis. Let the heat dissipate onto the chassis and everybody is happy. This is a very heavy metal tape. It then dawned upon me that I rely on looking at that 6082 to see what is going on inside that hot tube. I have often HEARD something odd in the R390 audio, then looking over to the 6082's to see a blue storm blasting away inside one of the tubes. Then suddenly a quick glance over to the left and the same is happening to one of the 26Z5W's. After spending a weeks lunch money on new tubes, I have learned to let those tubes go NAKED.

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Date: Mon, 17 Aug 2009 20:29:02 -0400  
From: "John Vendely" <jvendely@cfl.rr.com>

Subject: Re: [R-390] Alternative to IERC tube shields?

When noise is a primary concern and a modest volume of air suffices, a simple expedient is running a 220VAC muffin fan at 110V. It's simpler and more efficient than the cumbersome "solution" of a dropping resistor, which adds heat when you least want it. It's quiet, and in many situations even a small airflow will provide a worthwhile temperature reduction. One occasionally encounters a fan which simply won't run at such reduced voltage, but in most cases, it's no problem. I've employed this simple trick on several occasions with adequate results.

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Date: Mon, 17 Aug 2009 18:13:02 -0700  
From: Ren?e Deeter <k6fsb.1@gmail.com>  
Subject: Re: [R-390] Alternative to IERC tube shields?

If you desire to run an AC fan at reduced speed place a capacitor in series....1 to 3uf at 400V works great...no heat...and it preserves the impedance of the fan.

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Date: Tue, 18 Aug 2009 01:15:39 +0000 (UTC)  
From: odyslim@comcast.net  
Subject: Re: [R-390] Alternative to IERC tube shields?

These days there are some computer fans that are almost silent. If you can find one that runs on DC, one could power a fan with a small gel cell for weeks.

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Date: Sat, 22 Aug 2009 22:38:08 -0400  
From: Roy Morgan <k1lky@earthlink.net>  
Subject: Re: [R-390] Alternative to IERC tube shields?

It's so. I was working on an R-390/URR with the two 6082 series regulator tubes. I'd lashed up an external 6.3 volt filament supply and substituted 6080's for the 12 volt 6082's and fed them with common thick speaker wire. The tubes melted the plastic insulation on the wires. So I made a fan plate to hold a 4 inch muffin fan against the side of the radio, using existing screws for the frame and bottom cover. With the fan running, I can hold my fingers on the tubes and not get burned. The fan cools at least the whole bottom of the radio, and likely some of the top too. I have a picture of the thing with a ruler included so you can make one for yourself if you like.

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Date: Mon, 22 Nov 2010 11:13:18 -0800 (PST)  
From: Tom Langpap <tomlangpap@yahoo.com>  
Subject: [R-390] R390a cabinet

Does anyone have any idea where one could get a deal on a metal cabinet to fit the R390a?

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Date: Mon, 22 Nov 2010 14:39:19 -0500  
From: Roger Gibboni <rgibboni@dulye.com>  
Subject: Re: [R-390] R390a cabinet

Fair Radio did sell them as recent as a year ago. They are made by Hammond Mfg

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Date: Tue, 23 Nov 2010 09:15:54 -0800 (PST)  
From: Richard Green <k7yoo@yahoo.com>  
Subject: [R-390] Hammond Cabinets

The Hammond P/N for cabinets to fit R-390, R 274, etc is : RCBS1901017GY2  
19" x 10.50 panel, 17" deep This comes with some blank panels, hardware and is a semi-gloss gray.

There are other finishes available but this is the one that I would consider the easiest to either leave as is or repaint. I have purchased at least 6 of them for various receivers.

They look good and are around \$160. They can be ordered from any Hammond distributor, including Fair Radio I'm sure.

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Date: Tue, 23 Nov 2010 13:29:02 -0600  
From: "Ron.K3PID" <ron.k3pid@sbcglobal.net>  
Subject: Re: [R-390] Hammond Cabinets

I may be all wrong on this but I think the "real" R-390 cabinet has louvers on both sides and on top with screen covered holes in the bottom. All of this presumably for ventilation. At least mine does! If you use the Hammond unit, I would watch for internal temperature rise!!!

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Date: Tue, 23 Nov 2010 12:55:43 -0700 (MST)  
From: Richard Loken <richardlo@admin.athabascau.ca>  
Subject: Re: [R-390] Hammond Cabinets

The R-390 is confusing just like so much of life. I think that if I took an R-390 and ran it without a cabinet but with the top and bottom covers in place then I would have similar heating issues (or worse) than if I ran an R-390 in a Hammond cabinet without but with the top and bottom covers removed.

As far as I recall, the manual told me to remove the covers if I put the unit in a rack. What does it say about installation in the official government issue cabinet?

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Date: Tue, 23 Nov 2010 14:41:41 -0500  
From: Barry <n4buq@knology.net>  
Subject: Re: [R-390] Hammond Cabinets

Yes, the CY-979A is the cabinet of choice albeit a little hard to find these days. Not sure about the ventilation in the Hammonds either.

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Date: Tue, 23 Nov 2010 15:17:27 -0500

From: "James Young" <YoungFamily@glwb.net>  
Subject: Re: [R-390] Hammond Cabinets

The proper cabinet for an R-390A is a CY-979/URR and it has louvers on the top and the sides as well as shock absorbing feet. I bought a brand new one from Frank Krize a number of years ago at Dayton. The radio covers need to be removed for the receiver to slide into the cabinet. I don't know, and have wondered myself, if the CY-979/URR is an appropriate cabinet also for an R-390 or R-391. Any ideas?

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Date: Tue, 23 Nov 2010 16:55:06 -0500  
From: Jeff Adams <physicist@cox.net>  
Subject: Re: [R-390] Hammond Cabinets

Both of my CY-979As are vented as described. - Jeff

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Date: Tue, 23 Nov 2010 16:18:52 -0600  
From: Randy and Sherry Guttery <comcents@bellsouth.net>  
Subject: Re: [R-390] Hammond Cabinets

Sherry's R-391 is in (best we can tell) a CY-979/URR... which is the single "Mobile table-top" cabinet called for in the manual. The manual also lists the CY 917/URR for "desk-top" use. Then goes on to also list the CY1119/FRR rack (i.e. AN/FRR-39) -- and the CY-1216/U - but I'd always thought of those used with the R-388s (i.e. AN/GRC-26). The book says to remove the top and bottom dust covers when in the CY-1119/FRR cabinet; but interestingly enough does not mention that with the other cabinets (each cabinet has a paragraph). Even so, I'd think it prudent to pull the covers - and in the case of the R-390/1 a small fan wouldn't be overkill.

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Date: Wed, 24 Nov 2010 10:05:54 -0800 (PST)  
From: wli <wli98122@yahoo.com>  
Subject: Re: [R-390] Hammond cabinets

Yes, heat build up is definitely an issue best addressed up front. To this end, I elected to go a cheaper route: remove top and bottom covers, stack units one on another using a pair of grey-painted 2x4's placed fore-aft and with shallow kerfs cut to lock on the front panel edges.... and have the entire receiver stack enclosed in a short 19 inch rack. The front panels have zero stress applied to them, and are bolted in. Each front panel is separated from its neighbor by an pen half inch seam. Obviously, taking out the lowest unit is a real pain!

Ran into a nifty temp monitor among the thousands out there for under \$4. Check them out at sureelectronics.net. Runs off 5vdc and is the prettiest one I have come across. I went kinda crazy and ordered 6 for misc PC's and my Macs and my 390's.

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Date: Wed, 24 Nov 2010 12:23:04 -0600

From: Richard <theprof@texoma.net>  
Subject: Re: [R-390] Hammond Cabinets

I have my Dittmore-Fremuth R-390A in an custom build oak cabinet with equipment slides. There are ventilation slots on the top and bottom near the front and a 5" fan with a filter on the rear drawing air into the cabinet. IERC tube shields are on all the tubes. Airflow is very good top and bottom. Everything runs cool according to my thermistor probe. The fan and filter are Mil-Surplus. I also added a metal bulkhead on the back with pass-through connections for the audio, IF, and antenna. The same done to a Hammond cabinet may not be authentic but would still look MIL-SPEC. These things are getting old and just like me don't like extreme heat anymore (I grew up on the edge of the desert in West Texas.)

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Date: Wed, 24 Nov 2010 10:45:19 -0800 (PST)  
From: Richard Green <k7yoo@yahoo.com>  
Subject: Re: [R-390] R-390 Digest, Vol 79, Issue 24

With CNC and plasma cutting equipment available for adding ventilation holes I never really thought to mention them. Obviously they would be required, and I rightly assumed everyone in the group was smart enough to realize that. I have also used Heathkit cabinets from the Mohawk/Marauder/Apache/DX100B series. They look great but take a fair amount of modification to the mounting area, removal of spot welds/rear panel, and rear support for the receiver chassis. NO R390 should hang from its panel. My mention of the Hammond cabinet was merely to provide an attractive and economical option to the \$350 originals. I currently have an SP600 in one of them and it works and looks well. Probably the best area to cut vents is on the bottom. A plasma cutter with a carpenters square for a guide makes neat undistorted cutouts and barely scorches the paint.

Most body shops have these, and we have one in our plant for doing window and vent cutouts for machines and electrical boxes. Mods that used to be expensive and difficult are now easy and affordable. I even made an engraved SX73 panel from scratch--a chunk of aluminum and a little programing. I think generating the measurements took more time than it did to machine.

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Date: Fri, 26 Nov 2010 09:53:14 +1100  
From: "bernie nicholson" <vk2abn@bigpond.net.au>  
Subject: Re: [R-390] R-390 Digest, Vol 79, Issue 25

I have three 390A Rx s and I have used AR88 cases, ARR88's are still relatively cheap in the order of 200\$ , I have kept the cases and resold the receivers as RACKmounts, and got the cases for 20\$. There is a bottom panel which I remove and the 390 s get good ventilation, all the screw holes line up for the case mounting and they work and look good

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Date: Sun, 28 Nov 2010 02:03:17 -0500  
From: Roy Morgan <k1lky@earthlink.net>

Subject: Re: [R-390] Hammond Cabinets

Here's my idea: NO ONE should run an R-390/URR (the "non-A") without a fan.

I made a metal plate to mount a 4 inch square computer fan against the side of the radio using the existing screws: two frame screws and two bottom cover screws. I have a picture of the somewhat crudely made plate including a ruler to other folks could make one too. 'Glad to send the picture to any who are interested. OR: maybe some one could post the thing with my comments on some web site. In rack mount and cabinet installations, the fan needs to be mounted after the radio is in place. (Does the CY-979 have a lift-up-top? Maybe not.) Cut-out slots for the screws make this do-able if you can get the the side of the radio from the top, bottom, or rear.

- A Thin fan might slip past the rack or cabinet rail.
- A fan inside the frame would be better.
- Modest air flow can cool the B+ regulator tubes from literally blistering hot to touchable.
- A capacitor in an AC fan power line can slow it down.
- A 12 volt DC fan run on rectified filament power (6.3 volts, not found in the non-A) runs quiet and does not need to be switched on/off.

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Date: Wed, 01 Dec 2010 13:53:42 -0600  
From: Randy and Sherry Guttery <comcents@bellsouth.net>  
Subject: Re: [R-390] R-390a/URR parts for sale

Well - there is a solution - two actually- one is a fan - the other is a solid-state regulator that outboards the heat. We tried the regulator in one of mine - while it worked OK - it was bulky and well - just didn't seem "right"... Sherry's fan solution is better. <snip>

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-  
Date: Sun, 28 Nov 2010 13:54:16 -0800  
From: "Dan Merz" <mdmerz@frontier.com>  
Subject: Re: [R-390] Hammond Cabinets

Hi, I used Roy's fan design on my R390 with a 115 vac fan. I think a 230vac fan run on 115 vac would be my choice at this time. I slowed my 115 vac fan to reduce the speed/noise by putting a resistor in series to get about half the line voltage on the fan. If I were doing it again, I'd just use a 230 vac fan operating on 115 vac and avoid the extra small outboard box with the resistor. As I recall, the small fan I bought was a little too noisy for me at full speed. My 390 isn't in a cabinet so I didn't have to deal with finding a fan thin enough to fit between cabinet and radio. I'll deal with that aspect when I find a cabinet that costs less than I paid for the radio (i.e. probably never). The fan is very quiet, and I

appreciated Roy's design because it doesn't modify the radio with extra holes.

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Date: Tue, 27 Dec 2011 19:39:49 -0500 (EST)  
From: frankshughes@aim.com  
Subject: [R-390] IERC tube shields for my R-392

I want to replace the silver tube shields in my R-392 with IERC. I have read all the info I could find (or actually Google could find) in an 1998 ER and also some web sites. As far as I can tell, the 5015 is 1.5", which covers the majority of the 7 pin "short" tubes in the R-392, and the 6020B covers the medium 9 pin @ 2.5". Before I buy these things, does anyone know if there are any other variables like ID variations or other tricks to this?

QUAN	IERC P/N
19	5015B
5	6020B

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Date: Tue, 27 Dec 2011 19:26:48 -0600  
From: Jerry K <w5kp@hughes.net>  
Subject: Re: [R-390] IERC tube shields for my R-392

Here's all you need to know:  
<http://www.amwindow.org/tech/htm/irec.htm>

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Date: Tue, 27 Dec 2011 22:57:11 -0500  
From: "Charles P. Steinmetz" <charles\_steinmetz@lavabit.com>  
Subject: Re: [R-390] IERC tube shields for my R-392

The 6020 is the medium 9-pin shield, but it is 2" tall. The last two numbers are simply a pair of digits representing tenths of inches -- "15," "20," and "25" for the short, medium, and tall heights of 1.5, 2.0, and 2.5 inches. One question -- does the 392 have the tall shield bases necessary for the IERC shields (about 1/2" tall)? (The IERC shields work by conduction, sinking the tube heat to the chassis via the tall shield bases. Putting IERC shields on tubes that lack the tall bases will make things worse, not better.)

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From: Roger Ruzzkowski <flowertime01@wmconnect.com>  
Subject: Re: [R-390] Tube shields

Back in the 1960's a directive come out to remove most of the tube shields. Leave the RF amp, mixers and oscillator shields on. Remove every thing else.

It was understood that the stock tube shields held in more heat and did nothing to reduce spurious radiation from tube stages that had no inherent spurious radiation. The better shields were known of but the military was not going to pop the bucks for them. Never did. In my day 1968 - 1975 the receivers were run with only the minimum set of shields on the RF deck, BFO and VFO. they were all shiny and had no conductive inserts. Back in the R390 archives are whole seasons of threads on tube shields and test being conducted. Tube shields are

not all equal and if you feel the need to have them, then by all means collect some good ones and use them.

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Date: Mon, 3 Dec 2012 09:10:10 -0800 (PST)  
From: wli <wli98122@yahoo.com>  
Subject: Re: [R-390] Tube shields

Couldn't agree more! These units run fine with bare tubes. Genuine IERC shields look and work swell if you can find them. Folklore says most ended up in landfills... a real shame. Look under the tables at hamfests, as one day you may find a box of them as I did once 15 years ago. W. Li

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Date: Mon, 3 Dec 2012 13:00:34 -0500 (EST)  
From: Roger Ruszkowski <flowertime01@wmconnect.com>  
Subject: Re: [R-390] Tube shields

Let me be exact. The United States Army security Agency between 1968 and 1975 did not buy IERC tube shields to go back in the R390/A or R390's for which the directive was written to remove the shiny tube shields. I am happy to hear you saved a nice stash of good tube shields from be coming lost and are helping them find useful homes.

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Date: Mon, 3 Dec 2012 14:48:23 -0500  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Tube shields

The reasoning behind wanting to add the IERC shields was that tests had shown they actually reduced bulb temps over a bare/open air approach since the inserts and overall design worked well at wicking away the heat. The recently-depart Bill Kleronomos/ KD0HG wrote an article on this for ER and, IIRC, also posted info here a few times related to these shields.

I think some of the newer folks at the time got wrapped around the fear of greatly diminished tube life as a result of \*not\* using the IERC types and, like the never-ending 3TF7 issue, obsessed over it. Just a guess on my part. Reminds me of the horror or radioactive meters, black cap innards, etc etc etc. Some things just keep coming to the surface. The archives must be bursting at the seams.

IERC shields are still out there to be had. I think the problem is, too many folks look for the quick way out, i.e. convenience of logging onto the internet and buying an answer. As with most other older, now-desirable technology, it requires a bit of digging and self-application to procure them. Though they are available, as W. Li says, not in the numbers they were even a decade ago. Old avionics and test gear are still a great source. I recall purchasing a piece of gear at a hamfest a few years back that was h-e-a-v-y and annoying to handle, for \$10, which yielded over 20 IERC shields, tubes, and other goodies. Well worth the effort expended.

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Date: Mon, 3 Dec 2012 15:38:31 -0600  
From: Tisha Hayes <tisha.hayes@gmail.com>  
Subject: [R-390] Heat Death

Somewhere in my collection of lost postings I did a scholarly write-up on the temperature differences of tube bulb temperatures with no shields, shiny shields and IERC types. There was even some comparative literature on MTBF and component aging with temperature increases.

Generally, get the heat out of the radio. The IERC shields did lower envelope temperatures from 10-60 F. The same tube type would have significant variations, depending upon the application and circuit design. Not all 6BA6 tube applications were created equal. The IERC tube shields had a disadvantage of transferring heat to the chassis as the bottom edge of the shield would grab the tube collar. Bad shields acted like an insulator and kept the heat from convective transfer to the air (hot air rises and cools the tube).

Applying even a little bit of forced air to the chassis made a tremendous difference. At first this caused me considerable headaches in recreating the measurements as the slightest change in airflow around the receiver would throw things off. I ended up painting flat black dots on the tube envelopes and the chassis so I could use an optical pyrometer for measurement. It would take more than a day for temperatures to finally settle down as the entire chassis had to heat-soak.

Interestingly there is one application where I found the IERC tubes were a very bad idea. On the Hammarlund SP-600, any of the JX models that have the crystal deck, there is a tube on the backside of that module. It is sideways mounted. IERC shields make that tube run almost hot enough to melt solder (it will definitely melt the skin off of your finger).

I suggest using surplus computer fans running at half voltage to move air. At half voltage you can find fans that are virtually silent. In my radio console (6' x 3' x 7') I have about twenty fans running constantly and I can still use a boom mic without the fans being audible. In that mass of radios the R-390A runs at around 120 F on the chassis. Without the fans things get hot in there real fast. Ironically it is a Cubic R3030 that approaches nuclear reactor melt-down temperatures, the tube stuff is fairly benign. The R-390A (and the 390) have nice "portals" to blow air in from the sides of the receiver, and I have the fans mounted in the racks.

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Date: Mon, 3 Dec 2012 17:32:13 -0500 (EST)  
From: Barry <n4buq@knology.net>  
Subject: Re: [R-390] Heat Death

I would think that's to be expected since the chimney effect of the shield can't work that way.

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Date: Mon, 3 Dec 2012 16:39:37 -0600

From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death

I posted information to this group several years ago when I used the IERC shields, shiny shields and bare tubes, It varied, IERC were way better than the original shiny tube shields, but the IERC shields vs. bare varied..... At this point in time, it has become irrelevant to me, as the tubes will certainly outlast me. We worry too much about inconsequential crap things these days. There are enough tubes out there to last all of us no matter how long we may live. YMMV

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Date: Mon, 3 Dec 2012 22:53:54 +0000 (GMT)  
From: chuck.rippel@cox.net  
Subject: [R-390] (More) R390A Tube Shield-ness

I had or currently have, a very nice advertising piece from Collins which was included with the KWS-1. IERC type tube shields were optionally available for the "A Line" products from Collins and the brochure I have (or had) details their benefits. The main benefit was, as noted here by several, was to lower the bulb temperature AND as the metal envelope in the shield which wrapped around the bulb was black, it also kept heat from being reflected back into the tube structure as with the shiny nickel shields tend to do. There was a graph showing the drop in bulb temps and increased tube life if the shields were installed. If I can find where its been safely placed, will scan it and put it..... hmmm, seems the www site is gone for now. I'll put it somewhere where everyone can read it. For those of you with the shiny nickel plates shields, fire a couple shots of flat black paint into the the shield. At least, that will stop heat from being radiated into the tube structure. Pulling heat OUT of the radio helps also. I had an R390 and in those radios, the compartment where the 2 regulator tubes turns into an oven. Took a small computer fan which would approximately fit over one of the ventillation holes, mounted it on the inside of the radio so it would exhaust out. I then closed off the vent holes on the side such that when the fan pulled air into that compartment from outside, it came in on one end of the compartment which held those tubes and exhausted out the other. The idea was to fully change the air in that compartment. That R390 certainly ran a good bit cooler..... Also, painting shiny PA compartment surfaces which surround a glass tube black is an old trick used in PA's. Keeps the tube structure cooler by helping to absorb radiated heat thrown off by the tube(s).

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Date: Mon, 3 Dec 2012 17:18:14 -0600 (CST)  
From: Jim Haynes <jhhaynes@earthlink.net>  
Subject: Re: [R-390] Heat Death

And another point is to only shield the tubes that need it. Altho I've read that well-fitted IERC shields can actually make the tube cooler than running without a shield.

Years ago I was in industry and got a customer complaint about a 6X5 rectifier tube having short life. I told the customer to remove all the tube shields from the product and bag them somewhere, because they were only there to hold the

tubes in their sockets when the equipment was being shipped. There was no circuit in that equipment that needed the tubes to be shielded. (These were the shiny-type shields. I guess we just didn't think to include in the installation instructions that all the shields should be removed once the equipment was in place.)

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Date: Mon, 3 Dec 2012 21:08:15 -0500  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Heat Death

That's exactly right, and why the later IERC shields with the open/tabbed tops work best, and why you don't want to use a short shield on a tall tube. But I'm a bit confused as to the original post. Wasn't that particular tube on the SP-600 crystal module a metal octal based tube anyhow, not a 7 or 9-pin miniature? Even if IERC shields for that type of tube were available, it would seem redundant even in vertical service.

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Date: Mon, 3 Dec 2012 21:08:15 -0500  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Heat Death

That's exactly right, and why the later IERC shields with the open/tabbed tops work best, and why you don't want to use a short shield on a tall tube. But I'm a bit confused as to the original post. Wasn't that particular tube on the SP-600 crystal module a metal octal based tube anyhow, not a 7 or 9-pin miniature? Even if IERC shields for that type of tube were available, it would seem redundant even in vertical service.

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Date: Mon, 3 Dec 2012 20:59:01 -0600  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death

The original tube for the FCU (frequency control unit) was a metal tube, a 6AC7, later versions used a 6AH6 7 pin miniature glass tube.

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Date: Tue, 4 Dec 2012 00:52:54 -0500  
From: Tom Bridgers <tarheel6@msn.com>  
Subject: Re: [R-390] Is your R390A Power Cord Connected Correctly ?

This is excellent info ... easy to follow, and very important. Thanks, Chuck, for your posting.-Tom KE4RHH

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Date: Tue, 4 Dec 2012 14:54:49 +0000 (GMT)  
From: chuck.rippel@cox.net  
Subject: [R-390] Heat Dissipating Tube Shields: Collins KWS-1 Service Bulletin #2

This was not exactly the document I was looking for but "Part C" of KWS-1 Service Bulletin #2, dated 01/25/1957 speaks to the benefits of heat reducing

tube shields and documents a production change in KWS-1 transmitters to begin including them. Older products can be retrofitted with Collins part number 542 3177 00 for the princely sum of \$17.25 per kit. The document I spoke to in an earlier post was the promotional cut sheet

for the kit, above. To put \$17.25 in perspective, the 312A-1 ("A" line speaker with the Luma-Line lamp) was only \$37 in the KWS-1 sales brochure. A scan in .pdf format of the "Part C" from the original Service Bulletin, is linked below:

<https://www.box.com/s/8kgs13h6pi0wdetaie46>

I have a LOT of original documents and will keep looking for the cut sheet for the shields. It was pretty interesting reading.

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Date: Tue, 4 Dec 2012 10:50:01 -0800  
From: David Wise <David\_Wise@Phoenix.com>  
Subject: Re: [R-390] Heat Death

Issue 6 and JX-21A Issue I are 6AC7. JX-17 is 6AH6.  
Was the JX-17 the only version updated to 6AH6?  
Is anyone actually using the FCU today?

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Date: Tue, 04 Dec 2012 13:55:11 -0500  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Heat Death

My SP-600 is the '51 Contract one by Northern Radio.  
It is a J-11, NO X. It is a diversity model.  
It has some of its own particular quirks.

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Date: Tue, 4 Dec 2012 14:36:08 -0600  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death

JX-28/R-620 used it as did the VLF-31. Possibly some later production models also. I no longer have all those manuals available.

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Date: Tue, 4 Dec 2012 13:05:36 -0800  
From: David Wise <David\_Wise@Phoenix.com>  
Subject: Re: [R-390] Heat Death

Thanks, Les, I didn't even know about the JX-28.

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Date: Tue, 4 Dec 2012 16:35:30 -0500  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Heat Dissipating Tube Shields: Collins KWS-1  
Service Bulletin #2

Somewhere I have a sales slick of the Collins heat-dissipating shields. Might be in one of their old product catalogs. They had their own Collins-branded version of what looks to be the typical EBY/ELCO type twist-lock. Painted black with a

black corrugated sink inside that resembles cardboard. But the key piece that is often missing is the small strip that fits into the socket base to contact the envelope around the pins.

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Date: Tue, 4 Dec 2012 16:07:06 -0600  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death

The JX-28 is an interesting receiver, dual voltage regulators, an OA2 and a OB2 and a different agc control circuit. Not much known about it. Not many built.

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Date: Tue, 4 Dec 2012 16:27:39 -0600  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death

Well, the JX-28/R-620/FRR is quite rare. 100 built. Obviously a purpose built receiver for the Signal Corps on this contract, Order No. 25693-Phila-53 . Only reference to it in manuals is an addendum to the TM 11-851 dated October, 1953. George has the feelers out on it, we talked about it, I know of two of them. Interesting, that John Leary also used dual voltage regulators on most of his re-engineered SP-600?s. Very stable receivers.

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Date: Tue, 04 Dec 2012 19:11:46 -0500  
From: Al Parker <anchor@ec.rr.com>  
Subject: Re: [R-390] Heat Death -JX-28, Leary

I just sent Dave some info and a link to my JX-28/R-620/FRR, I know you've seen it before: <<http://www.boatanchors.org/SP-600-JX-28.htm>> it's pretty grubby looking there, it's getting better, slowly. Todd knows I have it, too. BTW, my Leary is very stable after 5-10 min. warmup. Easy to listen to a SSB net on 20m for an hour with rarely touching it. <<http://www.boatanchors.org/LearySP-600.htm>>

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Date: Tue, 4 Dec 2012 20:56:40 -0500  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Heat Death -JX-28, Leary

I tried not to drool too much when viewing this at Shelby. It was hot and dehydration, an issue. But what a COOL receiver. It's always nice to see the visually-tamer Leary example. I think the pair of NC-400s he combined would make my eyes bleed. I bet he would've had fun with a -390A!

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Date: Tue, 4 Dec 2012 20:01:36 -0600  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death -JX-28, Leary

A pair of 390A's would Leary have made it a 780B? Those NC-400's he made into a single chassis was dubbed a NC-800..... He had an imagination. Some of his receivers worked perfectly, others needed lots of diagnostic work

and tweaking. He wasn't much on a good rf alignment on the SP-600's, nor the dial indexing.....

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Date: Tue, 4 Dec 2012 20:03:17 -0600  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: Re: [R-390] Heat Death -JX-28, Leary

I have a Pdf copy (6 pages) of the JX-28/R-620/FRR if anybody is interested.  
Not much information.

Date: Wed, 17 Apr 2013 15:49:07 -0500  
From: "Ted Breaux" <tbreaux7@comcast.net>  
Subject: [R-390] R-390A Tube Shields

Instead of using the IERC "black" tube shields why cannot we use the ones that came with the receiver and paint them inside and out with High Temp flat black paint?

Date: Wed, 17 Apr 2013 17:02:48 -0400  
From: Nick England <navy.radio@gmail.com>  
Subject: Re: [R-390] R-390A Tube Shields

That should help, but the advantage of the IERC shield are two-fold - one it contacts the tube glass envelope and efficiently conducts heat away like that. Two it has a tight fit to the chassis and conducts heat from the shield to the chassis that way. Somewhere I have a Navy tech report comparing all the tube cooling techniques and need to scan it.

Date: Wed, 17 Apr 2013 16:37:08 -0500  
From: Raymond Cote <bluegrassdakine@hotmail.com>  
Subject: Re: [R-390] R-390A Tube Shields

Yes Nick. a scam of that would be useful. I'll keep my eyes open for that.

Date: Wed, 17 Apr 2013 17:12:00 -0500  
From: Les Locklear <leslocklear@hotmail.com>  
Subject: [R-390] IERC Tube Shields Information

Here is a great website with lots of good info.  
<http://www.qsl.net/kh6grt/page4/shields/shields.htm>

Date: Wed, 17 Apr 2013 19:56:46 -0400  
From: "KR4HV" <kr4hv@numail.org>  
Subject: Re: [R-390] IERC Tube Shields Information

By the way, he asks in the linked article what the "50" & "60" in the IERC tube shield numbers might mean. At first glance the 7 pin ones have the "50" numbers and the 9 pin ones have the "60" numbers. Ha!!

Date: Thu, 18 Apr 2013 11:21:53 -0500  
From: Tisha Hayes <tisha.hayes@gmail.com>  
Subject: [R-390] Tube cooling

There are really three mechanisms of tube cooling; convection (airflow), conduction (contact) and radiation (emission of heat).

The effectiveness of the tube in cooling is a function of a bunch of things, the physical shape and size of the tube (number of square inches either in contact with another object (conduction) or exposed to the air where convection can do it's thing).

The old style tube shields were really more for the mechanical aspects of keeping the tube mechanically stable in the socket with some benefit for it not getting whacked and broken. Thermally they are pretty awful as they prevent cooling by convection (the shield prevents airflow around the glass bottle), conduction (only that little compression spring actually touches the glass) and radiation (most of those shields are like wrapping the tube in tin-foil, it reflects the heat right back at the tube).

Along came the IERC and IERC-like tube shields, by virtue of their contact fingers with the glass bottle they increase the surface area of the tube to allow for greater cooling due to convection and conduction. If they are done right (flat black) they enhance cooling by radiative means (look up "black body" and what that means in thermodynamics).

Date: Thu, 18 Apr 2013 11:32:43 -0500 (CDT)  
From: Jim Haynes <jhhaynes@earthlink.net>  
Subject: Re: [R-390] Tube cooling

I once handled complaints from the field for a company making electronic products. One complaint that came in was short life of a 6X4 rectifier tube in one of the components. My suggestion to the customer was that they remove all the tube shields from that component, as there was no electrical reason for shielding; the shields were just to hold the tubes in their sockets when the equipment was being shipped. I recall seeing some things that were made like the nickel-plated bayonet-base shields, except they had big windows cut in the sides; they were specifically tube hold-downs and not shields.

Date: Thu, 18 Apr 2013 13:45:52 -0400 (EDT)  
From: Gordon Hayward <ghayward@uoguelph.ca>  
Subject: Re: [R-390] Tube cooling

I wonder about the idea of painting shields to make them black. Wouldn't the thickness of the paint polymer act as an insulator? The black IERC shields look like they've been anodized black which is a lot thinner.

Date: Thu, 18 Apr 2013 14:16:35 -0400

From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Tube cooling

Painting a chrome plated or other plated shield won't help a single bit.

The IERC shields are "more" than simply anodized black.

They have an internal sleeve that contacts the glass. Additionally, they have bases that are mated to the chassis. The entire design is all about taking the thermal energy, heat, and to dissipate it to the surrounding air and through the chassis.

There is "some" debate as to whether to simply leave the tubes without shields \*if\* IERC ones aren't available. The simple reasoning would be that it may be better to let the tubes radiate the heat directly into the air in lieu of trapping it inside a shield that basically was simply meant for the purpose of keeping the tube from coming out of its socket during transport or in a mobile installation. Heat is the biggest killer of tubes other than a component failure taking the tube out. If the radio is rack mounted, you are probably better off using some cooling means such as a muffin fan or two.

Date: Thu, 18 Apr 2013 17:50:07 -0400 (EDT)  
From: Roger Ruszkowski <flowertime01@wmconnect.com>  
Subject: Re: [R-390] R-390A Tube Shields

The wonder of old mail and Qth archives. The advantage of the IERC shield are two-fold - one it contacts the tube glass envelope and efficiently conducts heat away like that. True.

A whole bunch of studies have been done on the subject. The silver metal cans run the tubes hotter than no shield at all. Nothing moves heat away from the glass like metal contacts inside the shield to conduct better than air. It was practice to only run the shields on the mixers RF and oscillator tubes in the R390/A You run every thing else bare in the receivers.

The Army was not going to spend money on IERC shields. But If you have some can find some use them. They do run the tubes cooler than no shields. And much cooler than bad shields. The operative factor looks to be the contacts that move heat better than an air gap does.

Date: Thu, 18 Apr 2013 18:05:54 -0400  
From: "quartz55" <quartz55@hughes.net>  
Subject: [R-390] Tube Cooling

I remember painting some tube shields on some old piece of equipment years ago and it seemed to run cooler. But..what I'm going to do since I have some of the IERC shields is take one and put my Fluke thermocouple in it against the tube to measure the temperature. Then tape the thermocouple right on the tube without a shield, and then also paint a standard crappy tube shield and measure



the same thing, same tube same RX and see what the results are. I might even cut the top out of a crappy standard shield and see what that does.

I would posit that if you cut the top out of a standard tube shield, painted it mat black inside and out, so it was not containing the heat and let it convect better, it may do some good. The thing is the IERC shields do contact the glass better, but there is minimal contact to the shield, so there is not much thermal transfer to the outer shield, thus not much radiation. I would think the best thing is to have mat black inside the shield, open top, and mat black outside the shield, I'm not sure the cad plating will make any difference to the mat black paint color, it's mostly about radiation, not convection. Best convection would in my opinion be best with no shield. If you cut the top out of a IERC shield, it would probably work better too.

Painting the tube black may work too, hmm, maybe wrap it in a matte black tape? Give me some time, I'm in the middle of spring here and there's too much to do.

Date: Thu, 18 Apr 2013 20:41:38 -0700 (PDT)  
From: Norman Ryan <nnryann@yahoo.com>  
Subject: Re: [R-390] IERC Tube Shields Information

Nice link, Les! My two cents on shields: I think the WPM shields work better when the top opening is widened. I do that on mine by way of a smooth tapered reamer. I simply press it into the shield and push down. The shield top is thereby curled downward and doesn't harm the heat-dissipating innards that contact the tube. I feel this slightly improves the WPM shield's performance in a manner similar to the IERC type.

Date: Fri, 19 Apr 2013 10:30:54 -0400  
From: Steve Hobensack <stevhobensack@hotmail.com>  
Subject: [R-390] Hommade Tube Shields

I have rolled my own heat radiating tube shields using some copper foil that I found at a hamfest. Just pleat fold a one inch wide length of copper foil. Measure, join the ends with a seam of solder to fold it into a springy circle. It beats being ripped of by over priced junk.

Date: Fri, 19 Apr 2013 17:10:20 +0000 (GMT)  
From: chuck.rippel@cox.net  
Subject: Re: [R-390] Tube Shield Painting

Painting the INSIDE of the nickel shields flat black helps. Its an old trick used in RF amplifiers which employ glass tubes. The idea is to paint the surfaces around the tubes flat black so that infra-red heat from the tubes is absorbed and not reflected by what may be shiney metal surfaces back into the dark structure of the tube itself. Its not an IERC or WPM shield which actually wicks heat off the tube bulb itself but better than nothing.

Date: Fri, 19 Apr 2013 13:20:11 -0400  
From: Nick England <navy.radio@gmail.com>  
Subject: Re: [R-390] Tube Shield Painting

And painting the outside of the shield flat black actually helps too. Black surfaces both absorb IR better from heat sources (tube) and emit IR better to heat sinks (surrounding chassis/components). It's like low SWR....

Date: Fri, 19 Apr 2013 12:44:35 -0500  
From: "Ted Breaux" <tbreaux7@comcast.net>  
Subject: Re: [R-390] Tube Shield Painting

Remember from thermodynamics, a good absorber is a good emitter.

Date: Fri, 19 Apr 2013 14:00:18 -0400  
From: rbethman <rbethman@comcast.net>  
Subject: Re: [R-390] Tube Shield Painting

Just remember to etch or sand the surface to get the best adhesion. Do it OUTSIDE - especially if it cadmium plated! You sure don't want to inhale the plating dust! Otherwise you'll end up with it flaking off.

Date: Fri, 19 Apr 2013 18:11:32 +0000  
From: <kirklandb@sympatico.ca>  
Subject: Re: [R-390] Tube Cooling

Seems to me Tisha did some of these experiments awhile back.

Date: Fri, 19 Apr 2013 19:21:31 -0400  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Tube Cooling

And somewhere in the archives should be the report posted by the late Bill Kleronomos/KD0HG with the actual temps from the different types of shields. This is the report that shows the bulb temperature is actually reduced by the IERC type shields over an open glass envelope. It made a believer out of me.

Date: Fri, 19 Apr 2013 19:37:38 -0400  
From: Bob Young <bobyong53@hotmail.com>  
Subject: Re: [R-390] Tube Cooling

This is also pretty good, shows the amount of temperature decrease with IERC shields as compared to bare bulbs.

<http://www.qsl.net/kh6grt/page4/shields/shields.htm>

Date: Sat, 20 Apr 2013 12:27:03 -0700 (PDT)  
From: wli <wli98122@yahoo.com>

Subject: Re: [R-390] thoughts on tube shields

Thinking about thermal issues, it occurs to me that we must recognize that half the tubes are up-side-down once all the modules are mounted inside the R-390A.

So for the tubes that are on the top deck, heated air from the tube shields will rise through convection, and conducted heat could go to the chassis. Heat conduction to the chassis frame is why IERC shields were designed to be mated to an IERC mounting collar held to the chassis by the tube socket bolts. At hamfests, these collars are rarely found, as uncommon as any IERC tube shield. Its importance is often overlooked. Without the collars, heat dissipation through conduction is small.

For tubes on the bottom deck (audio deck and power supply) convectional currents will also rise... to the chassis frame itself and the large power transformer case, both which act as kind of a heat sink. Here, for conduction to work optimally, the IERC mounting collar is required. It is designed to conduct heat directly to a chassis. Without the collar, the only way for heat from the shield to dissipate is through convection. Note that the 26Z5's are real heat producers and are underneath. Conversion to silicon rectifiers should reduce heat production.

We agree that for best heat conduction from the tube to any shield, some mechanical contact to the glass envelope is required. Shiny shields are bad as they reflect heat back into the tube, as Chuck and others have noted.

Compared to high-end audio amplifiers or transmitters, these receivers do not produce all that much heat. The R-390 with its 6082's are another matter. Heated trapped air inside the cabinet can also be detrimental, making the addition of a small quiet muffin fan logical.

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Date: Sun, 21 Apr 2013 19:40:09 +0200  
From: "Prof. Johannes Fischer" <prof.johannes.fischer@t-online.de>  
Subject: Re: [R-390] R-390 Digest, Vol 108, Issue 15

I remember the lot of CV-157/URR converters I have seen with bristled wire insulations, because of the heat. The build-in ventilator was just too small to manage the heat from the tubes, tube shields or no tube shields. Johannes.

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Date: Sun, 21 Apr 2013 15:45:09 -0400 (EDT)  
From: bonddaleena@aol.com  
Subject: Re: [R-390] R-390 Digest, Vol 108, Issue 15

When I put my 390A into it's cabinet, I added 2 small 12 VDC muffin fans. One on each side, one blowing in and one out. Made a huge reduction in heat and you cannot hear them run. I started down this road when I put my forearm across my Drake TR-6 that was being used for a long MS session. 19 tubes in that small package makes a great shack heater... ha ha

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Date: Sun, 21 Apr 2013 17:28:20 -0700 (PDT)  
From: Perry Sandeen <sandeenpa@yahoo.com>  
Subject: [R-390] IERC Substitute

The problem with modifying any of the original shiny tube shields is that they are made of steel which has a very poor heat transfer rate as compared to copper or aluminum. (Tisha can give us the correct thermodynamic terms). And as they do not have a \*wick\* against the glass going to the shield I personally have serious doubts that painting them black will really provide much of an improvement.

A very practical solution might be to by the aluminum shield/socket 9pin and 7 pin combinations sold by the Chinese on ebay. IIRC the come in different colors including black. Around a \$1 each in quantity of 10 or more. They are made for the J lock socket but have a hold down spring one might want to remove.

Then go to your local box store and get a roll of aluminum window screen replacement. You can then cut off enough to make a flexible \*wick\* to touch both the tube glass and the aluminum shield. You will have enough aluminum mesh left over for the entire BA society.

For about the same money one can get to McMaster-Carr and get copper mesh screening which is sold by the square foot. 16 X 16 mesh copper screening is around \$8 per sq. foot. A little experimentation will be needed to find the \*right\* amount to use inside each shield.

If one can't get the black color from Carswell electroplating in miniature, Lyons N.Y. (Thanks Tisha).

So for about \$50-\$60 one can make enough shields for a complete BA receiver. The last going price for an IREC set for a R 390A receiver was close to \$200.

Note: six years ago I was able to purchase all the IERC shields that I will need for the rest of my life for a very low amount from a surplus dealer so this is a theoretical thought but I think the physics principle is sound.

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Date: Mon, 8 Feb 2016 02:27:38 -0500  
From: Roy Morgan <k1lky68@gmail.com>  
Subject: Re: [R-390] Newbie Question Rack or Cabinet

> I have a very nice Collins R390 and EAC R390A. I have the cabinets but due  
> to space constraints I am thinking of stacking them in a small tabletop  
> rack. Does anyone see any operational problems such as more susceptibility  
> to temp drift, etc.?

Do you intend to stack two radios in a single rack cabinet, or stack two separate R-390 type single radio cabinets on top of each other?

No problem either way, but do remove the top and bottom radio covers if they are present. (Store them carefully - they are expensive to replace.)

Temperature DRIFT is not likely a problem, but heat buildup should be avoided - allow for plenty of air circulation and install even a very small fan to move the air around if you can.

If what you have is an R-390/URR, the "non-A" radio, then I STRONGLY urge you put a fan on or near the side of the radio that has a the 6082 series regulator tubes in there making WAY TOO MUCH HEAT.

I cobbled up a fan plate that mounts on the existing frame and bottom plate screws that will hold a 4-inch computer muffin fan against the holes at the regulator tubes and makes a HUGE difference in the temperature. I have a picture with scales that will help you make one for yourself if you like. I'm glad to send that to anyone interested.

If all you do is sit a muffin fan next to the side of the radio in the cabinet to move some air DO THAT. It is the single most important thing you can do for an R-390/URR or R-391 radio.

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Date: Sun, 16 Oct 2016 12:11:52 -0400  
From: "Jerry O. Stern" <jsternmd@att.net>  
Subject: [R-390] Thermal Stability and Top and Bottom Covers

I am rack mounting my R390A and R390 and have always read that covers should not be used in cabinets. My cabinet has a wide open rear, do I need to install a fan for circulation Would a fan create too much thermal fluctuations to affect performance noticeably

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Date: Sun, 16 Oct 2016 12:22:55 -0400  
From: Bob Camp <kb8tq@n1k.org>  
Subject: Re: [R-390] Thermal Stability and Top and Bottom Covers

The 390 runs hotter than the 390A so it is a bit more happy with a bit of moving air. Spacing the radios about 3 apart in a normal open back rack is fine for the 390A. Maybe a bit more space is better on a 390. It also depends a bit on how many you are stacking. If you have three 12 racks full of radios all next to each other, that will require different cooling than two radios in an otherwise empty rack.

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Date: Mon, 17 Oct 2016 06:23:25 -0400  
From: "David C. Hallam" <dhallam@knology.net>  
Subject: Re: [R-390] Thermal Stability and Top and Bottom Covers

I have never had a 390A, but I have always run my 390 with a small muffin fan on the underside directed at the the series pass voltage regulator tubes. Between the rectifiers and the regulators, a lot of heat is generated. I don't know about thermal stability, but the components will be a lot happier.

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Date: Mon, 17 Oct 2016 11:39:42 -0400  
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>  
Subject: Re: [R-390] Thermal Stability and Top and Bottom Covers

Pretty sure the covers were meant as dust covers used only for rack mounting. The side holes would permit ventilation to pass through the receivers and up through the top louvers via forced air convection. Remove for cabinet use.

I recently scrapped out an old AF rack used for R-390s, it had a dual squirrel-cage blower system at the bottom and exhaust fan on top (both of which I kept). They moved a lot of air through the multiple receivers. I'm guessing that a single receiver wasn't considered a problem for cabinet mounting with the cabinet louvers and overall heat sink effect. Then again, changing tubes or swapping out a defective module was considered routine maintenance and spares were plentiful.

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Date: Mon, 17 Oct 2016 12:19:53 -0500  
From: kc9ieq <kc9ieq@yahoo.com>  
Subject: Re: [R-390] Thermal Stability and Top and Bottom Covers

FWIW, the CY-1807/G rack cabinet (part of the AN/GRC-26D shelter-- The 2 1/2 ton truck mounted radio system with generator in tow) used a pair of R-390/390A receivers, a dual channel FSK adapter, dual speaker, and blower. The receivers and FSK unit have a 1U spacer between them. The R-390A receivers in my CY-1807/G rack both have the covers and do not appear to have been messed with, which goes against what has been written about covers in rack cabinets. These still had the original spline tools attached to the back, which was a pattern for my reproductions before tracking down the original drawings. Same '55 Collins contract number, serial numbers 111 apart, so I'd like to believe they were born together in this rack and have remained virtually untouched. Not sure if this will help any, but just an insight how this cabinet was built with two receivers within.

PS I am still looking for the CY-116 FSK adapter if anybody has one kicking around! This is the only component missing from my rack.

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Date: Mon, 17 Oct 2016 13:58:14 -0400  
From: Bob Camp <kb8tq@n1k.org>  
Subject: Re: [R-390] Thermal Stability and Top and Bottom Covers?

The covers \*do\* add electromagnetic shielding to the radios. In an environment with co-located transmitters and antennas a few feet away, they are a pretty good idea. The military was more worried about that sort of thing than keeping the radios running for 5 decades?. Even in military service, it was quickly found out that the maintenance load went down when the covers were tossed out. A lot of systems lost the radio covers once they made it to the field.

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Date: Mon, 17 Oct 2016 17:57:11 -0400

From: Charles Steinmetz <csteinmetz@yandex.com>  
Subject: Re: [R-390] Thermal Stability and Top and Bottom Covers?

>The covers \*do\* add electromagnetic shielding to the radios. In an  
>environment with co-located transmitters  
>and antennas a few feet away, they are a pretty good idea.

I've never compared a 390 or 390A with and without covers side-by-side for shielding (in)effectiveness, but they are so bad with covers it's hard to imagine them being much worse.

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Date: Tue, 18 Oct 2016 08:17:22 -0500  
From: Tisha Hayes <tisha.hayes@gmail.com>  
Subject: [R-390] Thermal Stability and Top and Bottom Covers?

Eight or nine years ago I went through the exercise of measuring internal temperatures with thermocouples on the chassis with the covers on, covers removed, no tube shields, shiny tube shields and IERC tube shields.

I kept the radio in a room with no airflow at a steady 22 C with the doors closed and nobody in there moving air around. It is amazing how something as simple as walking past the radio and creating a draft would lower the temperature a few degrees.

For temperature, the best combo was IERC tube shields and no covers. The heat would rise through convection and radiation off of the tube shields.

The covers did bottle up the heat and then the only thermal exchange was through the air flow over the chassis. The radio did run hotter by 6-8 C.

While the chassis with covers is in no way a perfect Faraday cage to keep interference out (or in), it does make a difference in providing some level of EMI shielding.

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On my "golden" radio I modded and added beryllium-copper fingerstock on the base chassis between the IF deck and the chassis and between the RF deck and the chassis. There "may" have been a difference but it was below the level of detection (maybe a dB or two of SNR). I had better luck with conductive elastomer U shaped gasket material along the edges of the modules.

I even went a little crazy and patched up chassis holes with adhesive copper foil (I have a 50 meter spool of the stuff) and it too did not make that much of a difference.

At the end I pulled off the fingerstock as it changed the spacing dimension between the chassis and the modules, removed the copper foil as it blocked up air flow but I left the elastomer U shaped gaskets as they made the modules a bit snugger fitting when bolted down with the green screws.

What you really cannot improve upon is the radiated RF coming off of the tubes. The

IIRC covers help some but to make it any better you would need to defeat the cooling advantage of the shield by covering the top of the shield with a circle of copper foil. I did not go that route.

Somewhere in my collection of USB storage sticks I have the test information and numbers/ methodology that came from this boondoggle. (I am sure it is hidden with my other set of car keys). At one time I did post it on the forum so it may be in the archives.

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I have not made any further improvements or mods on my R-390A's for a few years. I took them about as far as I wanted to go and now spend most of my time working with Harris RF-590's. The R-390A is still a fun radio to use but is lacking in some of the refinements like integrated SSB capability.

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Date: Wed, 19 Oct 2016 21:24:43 +0000 (UTC)  
From: Perry Sandeen <sandeenpa@yahoo.com>  
Subject: [R-390] R390A dust covers

When I worked at the base receiver site at Karamusel air station in Turkey 1964-1966 all the R390A's we had were IIRC racks of four.

All the dust covers had been removed and in each rack there was a large plate where about a dozen muffin fans were mounted. We had very few failures as the A/C was set for hanging meat from about 9 PM to 6 AM.

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