

Modifying the R-390A for SSB

June 1963 by Captain Paul H. Lee, USN W3JHR

The R-390A receiver requires an outboard converter unit for satisfactory SSB reception. The simple modification outlined below provides a product detector combined with the BFO circuit at a low cost.

As originally designed, the R-390A HF receiver is usable, to a certain extent, for SSB reception without an external SSB converter, but it performs very poorly because the AM diode detector contributes considerable distortion. The relative levels of signal vs BFO injection voltage are not correct for proper SSB detection. The levels can be made more optimum by reduction of the RF gain, but then the AGC action is lost and weak signals are reduced so much that they are overlooked or unheard. The R-390A was designed to feed an IF signal to an external SSB converter. However, by a simple and inexpensive modification of the internal BFO stage to a product detector, the R-390A can be made to perform as an excellent SSB receiver by itself, with no external converter being required for SSB (For ISB, however, an external converter is required, in the form of 2 CV-591s or 1 CV-157) The modification is very simple, inexpensive, and does not require any contract procurement action, nor does it involve any proprietary designs. The modification requires less than 2 hours work by one man. The parts required for the conversion are few and simple, and cost less than ten dollars.

Conversion Procedure

The conversion is performed as follows:

- Remove the BFO B+ wires from the BFO ON-OFF switch S101. Remove and discard S101, but retain the knob.
- Cut three 20" lengths of single conductor shielded microphone cable. \
- From one end of each of these three pieces, remove the outer plastic jacket and carefully unravel 1" of the shield braid and form a 1" pigtail lead. Twist the 3 pigtails together and solder them together, being careful not to melt the plastic insulation on the inner conductor of each piece of wire.
- Take the new switch, a 2 pole two to six position unit, (only 2 of the 6 positions are used) for S101, and connect these three shielded leads to it to form the audio changeover circuit. See schematic below. Under the head of the machine screw holding one side of the switch wafer to the switch frame install a small soldering lug. Solder the pigtail to it, to ground (at this end only) the individual shield braids of the 3 audio wires.
- Insert the free ends of the 3 wires through the opening at the edge of the IF shelf, pull them upward above the IF chassis, and mount the new switch in the vacant S101 hole in the front panel. Replace the knob. Connect the BFO B+ wires to the other pole of the switch. The BFO B+ is to be on in the BFO ON position, which will become the SSB position of S101. See the schematic below.

- Unplug all plugs from the IF subchassis, mechanically disconnect the 2 control shafts, and remove the IF subchassis from the receiver.
- Carefully remove the cable clamp and cover from multi-conductor plug P112, slipping it back out of the way. There is one spare pin, P112-1 Remove the wire from pin P112-7 and leave it hanging.
- Twist the 3 shielded wires installed in step 2 into a 3 conductor cable, above the chassis. Wrap with plastic tape at 4" intervals. Cut this cable to the required length to reach plug P112 leaving sufficient slack for clearance over the IF chassis and tubes. Strip back 1" of outer plastic jacket and shield braid on each of the 3 wires. Run the 3 wires through the cable clamp and plug cover.
- Connect the shielded wire from the SSB (BFO ON) audio terminal of S101 to pin P112-1. Use an insulating sleeve for protection, as is done for the other wires on the plug.
- Connect the shielded wire from the AM (BFO OFF) audio terminal of S101 to pin P112-7. Use an insulating sleeve as in step 8.
- Slip an insulating sleeve over the free end of the remaining wire, which should be the one connected to the rotary "arm" of S101. This is the "audio input" lead. Solder it to the free end of the wire left hanging in step 6. Slip the insulating sleeve down over the bare connection. Carefully replace the cover and cable clamp on P112. Tape these 3 wires to the existing cable just outside the clamp.
- Turning the IF chassis over, carefully remove the bellows coupling on the BFO PITCH control shaft. Remove the shaft by loosening the panel bearing. This step clears some working space around the socket of V505 BFO tube.
- Remove and discard the V505 6BA6, BFO tube.
- Remove the ground (and all wires) from pin 2 of V505. This may involve shifting several ground leads to other ground tie points on the chassis.
- Move the existing lead from V505 pin 7 to pin 2. (This is the cathode tap on the BFO coil Z502).
- In the following steps, be sure to leave room for replacing the bellows shaft coupling.
- Connect the 11K Ω watt resistor from V505 pin 7 to ground.
- Remove and discard C535.
- Connect the 2.7K 1 watt resistor in parallel with the existing screen dropping resistor R529.

- Connect the 5 mmf capacitor between V505 pin 7 and V506B pin 6. This is the IF coupling into the injection grid of the 6BE6 product detector.
- With a pair of small metal shears cut a $\frac{1}{8}$ " V-shaped notch in the lower edge of the interstage partition near the rear of the BFO coil Z502. Cover the edges of this slot with short pieces of plastic tape.
- Mount the 200 mmf and 500 mmf capacitors on the grounded center post of the V506 socket, letting them be supported in space by their own ground leads (about $\frac{1}{2}$ " long).
- Connect the 56,000 ohm Ω watt resistor between the free ends of the 200 and 500 mmf capacitors.
- Connect the 0.02 mf capacitor from V505 pin 5 to the 500 mmf end of the 56,000 ohm resistor.
- Use 12" of the shielded microphone cable for the SSB audio lead.
- Remove 1" of the plastic jacket from one end, and make a 1" braid pigtail on this end: Slip a $\frac{7}{8}$ " insulating sleeve over the pigtail and ground the pigtail to the center ground post of V506 socket. Connect the center conductor to the 200 mmf end of the 56,000 ohm resistor.
- Lay the shielded wire in the V-shaped slot in the interstage partition, and tape it in position with a 2" length of plastic tape. Cut the wire to length to reach pin J512-1 of the rear cable socket.
- This is the unused pin. It mates with Pin P112-1 of the cable plug. Strip back $\frac{1}{2}$ " of the plastic jacket and braid from this end of the shielded wire. Connect the wire to pin J512-1, using an insulating sleeve over it for protection.
- Carefully replace the BFO shaft and bellows coupling removed in step 11. Make sure the coupling does not accidentally ground any components or wiring.
- Replace the IF subchassis in the receiver. Insert all the plugs removed in step 5. Reconnect the 2 control shafts and replace their front panel knobs. Make sure the BANDWIDTH knob is properly positioned on the shaft.
- Plug in the 6BE6 tube in socket V505. Turn on the receiver.
- Leave the antenna disconnected.
- With the b.f.o. switch S101 in the ON (SSB) position, a hissing sound will be heard in the loudspeaker. With the bandwidth switch in the 1 KC position, rotate the BFO PITCH knob. The pitch of the hissing sound will vary from high to low and back to high again, as the oscillator portion of the 6BE6 is tuned through the center of the receiver IF bandpass. Set the BFO PITCH control for the lowest pitch of the hiss. Without rotating the shaft, loosen the knob set screw, and set the knob pointer to

"0". The pitch of the hiss should now rise equally at the --1 and +1 positions of the control.

- Set the BANDWIDTH knob at 2 KC, and at 4 KC. In each case, the pitch of the hiss will be lowest at the "0" position of the BFO PITCH control, rising an equal amount on each side (-1, +1 or -2, +2).
- The original AGC action is not satisfactory for SSB voice reception.
- It is too fast in the FAST position and produces a "pumping" action. In the MED position it is a bit too slow for fast voice break-in operation.
- From the unused terminal 10 of the AGC switch S107 (FAST position) connect the 1.0 mf capacitor to ground. See the top figure on this page. This may be done most conveniently by soldering one capacitor lead directly to the switch lug behind the front panel, and connecting the other lead to a ground lug placed under the RF section top cover screw just back of the center of the front panel. This places 1.0 mf in series to ground with capacitor C551 (2.0 mf) in the FAST position, making a total of 0.66 mf across C548 in the grid circuit of V506A the AGC time constant tube. The resulting time constant has been found by experimental use to be quite satisfactory, producing SSB voice signals which are pleasing to the ear to copy. For multiplex or composite waveforms of essentially constant amplitude, the MED or SLOW AGC may also be used, as desired. the MED or SLOW AGC may also be used, as desired.
- The receiver is now ready to operate. Connect the antenna.
- With the AGC switch set at FAST, and BFO ON, tune in an SSB signal in the 14 MC amateur band, with the BFO PITCH control set at -2, and the BANDWIDTH control at 4 KC. It should sound very pure, clean, and undistorted (assuming the station's emission is clean and undistorted). The BANDWIDTH control may be set at 2 KC for interference reduction, with the BFO PITCH set at -1 in this case.
- Shift frequency to the 7 or 3.9 MC amateur bands. Tune in signals here in the same way, but with the BFO PITCH set on the opposite (+) side of "0".
- Most 14 MC amateur emissions are upper sideband, whereas those on 3.9 and 7 MC are usually lower sideband. Note that the BFO PITCH must be set to the opposite side of the carrier ("0") for reception of the desired sideband (- for USB, + for LSB). When you do this, you are in effect placing the locally injected carrier from the oscillator portion of the 6BE6 in the proper position for demodulation of the SSB signal and for positioning the signal correctly within the receiver passband. CW may also be received with the BFO switch on (SSB position), using BFO PITCH and BANDWIDTH controls as desired. For AM, the BFO switch is OFF, unless AM reception in the SSB mode is desired in which case it is ON.

The conversion is now completed, and the R-390A may now be used for SSB with no external converter.

This detailed information applies only to the R-390A. A similar conversion can be worked out for the R-390 or any other good superheterodyne receiver. It has been used with success in several Collins R-388 (51J)1 receivers and AR-88 receivers by the writer. In the R-388, the oscillator portion of the 6BE6 has been crystal controlled, with 3 crystals (1 for USB, one for exact IF, and 1 for LSB) selected by a switch in place of the BFO PITCH control. Crystal control is not so practical in the R-390A because of the selectable IF bandpass. A multiplicity of crystals would be required.

1 Lee, P. H. Cdr., "The Single Tube Product Detector," CQ, April 1961, p.50.

R390A Modification to Improve SSB Performance

The major reason for poor SSB performance of the R390A is inadequate AGC, which fails to keep signal strength at the detector below the level of the BFO, thus causing severe distortion. The changes listed below increase AGC action and greatly shorten the attack time while lengthening the release time. BFO injection is also increased slightly. The end result is greatly reduced distortion on SSB.

The changes accomplish the following:

1. Change the AGC rectifier to a voltage doubler and increase AGC amplifier gain.
2. Change AGC time constant resistors for faster attack, slower release
3. Remove AGC voltage from the suppressor grid of the AGC IF amplifier

The following should take about 40 minutes:

1. Remove IF subchassis.
2. Install a diode such as 1N60 across R546 (180K), cathode to tube socket.
3. Remove R546 (180K) and R545 (100K).
4. Replace R547 (220K) with a 10K 1/2 watt resistor.
5. Replace R544 (2.7M) with a 4.7M 1/2 watt resistor.
6. Move C547 (0.1uf) from its present location (chassis ground and pin 2 of V508) to a new location between chassis ground and the tie point to which the anode end of the new diode is connected. This changes nothing electrically but is required for the next step.
7. Locate the jumper wire running from pin 2 of V508 to the tie point mentioned above. Cut it at the tie point and reconnect the free end to pin 7 of V508.

8. Examine R504. If it is not 560 ohms, change it to that value (This is a production change.)
9. Replace the IF subchassis, realign the BANDWIDTH and BFO PITCH knobs.
10. Examine the shield can of Z503. If the top has no alignment hole, remove the can, drill or punch a 1/4 inch hole in the center of the top, and replace the can.
11. Connect a VOM or VTVM to read AGC voltage (negative voltage at terminals 3 and 4 of TB102 on the rear panel).
12. Replace AGC amplifier V508 (6BA6) with a 6CB6.
13. Set receiver to 1 kc bandwidth, tune in a calibrate signal, and adjust the slug in Z503 for maximum AGC voltage. Do not adjust the other IF transformers.
14. Connect a VOM or VTVM to read detector diode voltage (negative voltage at terminals 14 and 15 of TB103 on the rear panel).
15. Turn on BFO. Note detector voltage. Replace V505 (6BA6) with a 6AU6, trying several 6AU6 tubes if available. Select tube with highest reading.

As a final adjustment, the GAIN ADJ control on the IF subchassis should be set for the least usable gain. Too high a setting increases distortion and produces high AGC voltage, which, applied to the front end of the receiver, decreases the signal-to-noise ratio. NNN0EDX VA

Dallas Lankford SSB AGC mod (HSN 23)

Date: Sat, 16 Jan 1999 13:58:50 EST
From: DCrespy@aol.com
Subject: [R-390] R-390A, Real simple SSB

This worked so well, I feel like I need to tell some other users about it!!

I did the Dallas Lankford SSB AGC mod (HSN 23).. the simple one (just two diodes, no parts removed).. last night. Really unbelievable result. AGC actually works on SSB. I can copy all SSB signals with full RF gain, with minimum distortion. The AGC action is evident, that is: as the RF gain is reduced, the signal audio level remains constant until the carrier meter reads '0', then it begins to drop off.

Besides fast attack, slow decay, the mod appears to 'more aggressively' reduce gain with AGC action (per Lankford, each signal produces more AGC voltage than before). Has anyone measured Dynamic Range with this mod. It seems like it would be improved?

Its just two 1n4148 diodes, one in parallel with R-547 (anode to ..diode 'points away from' pin 2 V-506), one in parallel with R-546 (cathode to.. 'points toward' pin 1 V-509).

(I also tried the increased BFO injection mod that Lankford suggests in a later article. I was surprised and disappointed that the added BFO injection did fool the AGC, further reducing gain. I undid the mod and left BFO injection 'stock'.)

I would like to hear from others who have tried this or similar mods.

For the R-390 list: this looks to me like a much better way to spend your time and effort than on 3TF7 mods!

Date: Thu, 06 Nov 1997 20:56:23 -0500
From: "Dennis M. Fox" <foxd@...>
Subject: [R-390] Re: usb/lb Tune Aid

>I just picked up a module ,advertised as "easy sideband for the
>R-390-A",that has helped to tune usb/lb sta's a little easier.The man from
>"RadioFinder" doesn't say this module is a sure enough product
>detector,only an enhancer.I've noticed it cuts down on the distortion quite
>abit.Anyway for \$50 it sure beats shelling out those big bucks for the
>"real thing". :)

Welllll... I looked into one of those little epoxy-encased modules a while back. Looks to me like it is not much more than audio-derived AGC. I never did get any technical information out of the maker, but I did my version of the same mod to one of my 390A's to see how it would work, and amazingly I got about the same results that were claimed for the little module for about \$1 worth of parts (I see flames in my future for that remark....) What I did was bridge-rectify the "line out" audio, filter it, and apply the neg voltage to the AGC connector on back. I will get back with actual parts values if anyone is interested. The mod works well, is attached to the radio only with spade lugs, and makes SSB liveable. Now the CV-591 made it more liveable on R390A #2, but this cheap mod does a pretty good job, and is adjustable via the line audio pot.

Date: Thu, 06 Nov 1997 22:08:47 -0500
From: "Dennis M. Fox" <foxd@...>
Subject: Re: [R-390] Re: usb/lb Tune Aid --(on the cheap)

TOM et al: WHERE does one obtain a CV-591A? I understand I might/probably will wait 'till hell freezes over before I find one. Although I understand my -390A is primarily AM, when we have a GOOD MIL net going, I'd like a little help & want to use mu big gun, if you know what I mean. There might a market for something like this now. Look at the sales of the scanner add-in boards. Thanks,

Date: Thu, 6 Nov 1997 21:19:04 -0800
From: Jim Haynes <haynes@...>
Subject: [R-390] RE: usb/lsh Tune Aid

The thing from Radiofinder is not worth much. The basic idea is a bridge rectifier connected to the audio, and that is filtered and run into the AGC. You use the line audio control to control how much audio goes into it, and listen on the local audio. So it gets you some audio-derived AGC which is a good way to get AGC for SSB reception; and it knocks down the RF gain some so that the BFO has a chance of demodulating the SSB signal with less distortion. But it doesn't work very well; the best thing that can be said for it is that it requires no internal mods to the receiver.

Date: Fri, 7 Nov 1997 08:00:49 -0800
From: Reid Wheeler <reid@...>
Subject: [R-390] SSB adapter

The recent thread concerning the Radio Finder SSB adapter is very interesting but not new. This device, in various forms and under various labels, has been around at least since 1985 when venerable Hollow State Newsletter editor at that time, Dallas Lankford, purchased one and wrote a review - not favorable - in HSN #10. The most recent re-appearance in HSN was in #41 (Spring 1997) in an article by Reinhard Wieschoff-van Rijn who purchased one from an ad in ER. He boiled it down to dissolve the potting material and found essentially what has been described as a full-wave bridge rectifier (AC leads connected across the line output terminals on the rear terminal board - 10 and 13) and filtered (6 microfarad-600V). A schematic is included in the article. His conclusion - not very useful and could be built with junkbox parts or all new for a very few bucks.

Date: Fri, 7 Nov 1997 12:30:48 +0000
From: crippel@...
Subject: [R-390] R390A SSB Thoughts

There has been a lot of activity about putting the R390 series receiver on SSB. I am constantly approached by those who would have me modify the receiver to work on SSB during a restoration. I do not modify the receiver for SSB nor do I recommend it. Here is my opinion why it should be left alone.

The R390(A) were designed before the general acceptance of SSB. The receiver was not designed to receive SSB in any manner. There are adaptors such as the CV-591 which will allow the '390 to detect SSB but they don't work all that well.

The R390 family of receivers were designed to receive AM and CW. Why not leave it at that? If your needs dictate a receiver optimized for SSB, there are plenty around. In fact, there are more of those than any optimized for AM.

Date: Fri, 7 Nov 1997 10:50:07 -0800 (PST)
From: Dave Rickmers <rickets@...>
Subject: Re: [R-390] R390A SSB Thoughts

It is my experience that my stock R-390A works extremely well for SSB monitoring. The receiver must be properly "tweaked" and stable. RF gain should be backed way off. AF gain turned up. The BFO should be set at 1.5-2 kHz. 2 kHz filter. With this configuration, background noise is way down but actual communications are generally loud and clear. If the VFO is properly aligned, it is quite possible to tune the receiver to a frequency and wait for a communication, and have that communication sound very close to natural (very slight readjustment of the KC control may be required). The key here is to not have so much signal (RF Gain) that the BFO cannot produce a enough "carrier". Back-off the RF, turn up the AF. BTW, I use 5574 usb for testing purposes, as comms are pretty regular on this frequency, here on the west coast of North America.

Date: Fri, 07 Nov 1997 13:07:19 -0600
From: Nolan Lee <nlee@...>
Subject: Re: [R-390] R390A SSB Thoughts

Buy an R-1051 for SB, far better..... <running and ducking flames :->

Date: Fri, 7 Nov 1997 15:59:25 -0500
From: Don Stepka <dts4@...>
Subject: Re: [R-390] R390A SSB Thoughts

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>receiver was not designed to receive SSB in any manner. There are
>adaptors such as the CV-591 which will allow the '390 to detect SSB
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>

>The R390 family of receivers were designed to receive AM and CW. Why
>not leave it at that?

As a historical matter, I agree that hacking up a nice 390/390A is not a good thing to do (although hacking up a "beater" doesn't bother me). But the 390 has many virtues that some of us would like to bring to our SSB reception. Also, although I love BAs there is a limit to how many I want to deal with for practical listening. One do-everything radio is an appealing notion.

My solution (still conceptual -- I haven't built it yet) is to use the IF output and some minimal mods to the radio. I'll add a BFO output, so the 390/A's BFO control will still work as expected (could either drill the rear panel, hang a pigtail out, or use one of the antenna connectors). The external box will be a product detector, an AGC detector, and maybe one or more notch filters. Those who like fixed USB/LSB BFOs could add xtal oscillators and dispense with the BFO output on the 390/A. The AGC circuit in the 390/A will need to be modified to accept the external AGC

gracefully, but since I'm not all that fond of the 390A AGC even for AM, I would modify it anyway.

The R390 series are great RF/IF decks. Why not make them do what you need, as long as you're not defacing a historical artifact?

Date: Fri, 7 Nov 97 16:01:22 -0500
From: "Joseph W. Pinner" <kc5ijjd@...>
Subject: Re: [R-390] R390A SSB Thoughts

A very simple but effective and not too invasive mod it to increase the BFO injection level to the detector to make it an exhalted BFO scheme. This merely requires the paralleling of the coupling cap with an additional mica. I forget the value right now, but it was documented by Dallas Lankford (did I spell that correctly).

Date: Fri, 7 Nov 1997 14:26:58 -0800 (PST)
From: ron nash <nash@...>
Subject: Re: [R-390] R390A SSB Thoughts

Around 1980 I modified a R390A with a kit I got from a ham in MARS. It made SSB a dream and eliminated the AGC distortion. I've looked but so far have not found the paperwork for it. It involved using a free triode section and adding a diode. Sadly, I sold that set a while ago. Has anyone heard of this before?

Date: Fri, 7 Nov 1997 15:44:49 -0800
From: anders@... (Greg Anders)
Subject: Re: [R-390] R390A SSB Thoughts

> A very simple but effective and not too invasive mod it to increase the
> BFO injection level to the detector to make it an exhalted BFO scheme.
> This merely requires the paralleling of the coupling cap with an
> additional mica. I forget the value right now, but it was documented by
> Dallas Lankford (did I spell that correctly).
>

>>>>>>>>Its a 47pf mica cap in parallel with the existing 12pf (C535) cap. I added one on my 390A when I installed Lankford's AGC mods. SSB is now much better although I don't really use my 390A for SSB, its an AM/CW receiver. Still, casual listening performance is much better.

Date: Sat, 8 Nov 1997 08:56:59 -0500 (EST)
From: Radiomatt@...
Subject: [R-390] R-390A & SSB

It might be of interest to you guys that think the 390s were only designed for AM/CW is that several of the later manuals show how to interconnect SSB adapters, but more interestingly, some very late radios might have had product detectors installed at the factory with a mode switch that included USB and LSB. A

ham in Italy has one of these very very rare R-390As. I saw a picture of the front panel once, and sure enough, there were extra positions and markings!

The last r-390s were built in 1984 by Fowler Industries on special order for the Pentagon... as I recall only five were made in that production "run", so the cost per radio was rather high ...\$ 34,000 or \$38,000 EACH. if I recall correctly. Maybe these sets had the SSB upgrade installed?

If anyone could get hold of a manual for this series, it might contain some interesting upgrade ideas.

Date: Sat, 08 Nov 1997 09:01:17 -0500
From: Dan Henderson <dandan2@...>
Subject: Re: [R-390] R390A SSB Thoughts

Don: I have been reading each of the items and I agree with you; there is absolutely no reason that the R390A, if can be improved to do a specific thing, shouldn't be improved!!! The US military had the radio built to do many things--and it did it well over it's fabulous history. However, Hams and DXers have also used it for years and have adapted it to do many things. For example--who in their right mind, while living in the South, would leave the PTO heaters connected? Do YOU need that extra heat to heat up the shack? I think not...but that may not be the case if you were in Nome Alaska....Same thing for SSB...Remember, there IS an IF output in the back of the receiver--it's not there for show. Now if there was a sysem that would take an 455 kHz IF, and give you multiple audio detection options.....There just happens to be something built by Sherwood Engineering that does just this..So it is not outlandish to consider SSB operations with the R390A...and you don't have to modify the receiver at all in this case! The same thing can be said about the AGC..Incidentally, why doesn't someone describe some of the AGC mods to make the audio better? After all, that's part of what this group is all about..... I have appreciated each and every one of the entries over the past week or so...Keep up the good participation...That's what makes this group so special!

Date: Sun, 9 Nov 1997 07:16:33 +0500
From: "Chuck Rippel" <crippel@...>
Subject: Re: [R-390] R-390A & SSB

>.....a mode switch that included USB and LSB.....

I have one such radio and it does not work any better than just turning the BFO on. I have heard from those who have tried the CV-157's et al that the performance is not all that great. I have used a Sherwood SE-3 III with mine. Although the AM audio recovery is incredible, the SSB performance is not all that great.

> The last r-390s were built in 1984 by Fowler Industries on special order for
> the Pentagon...as I recall only five were made in that production "run", so
> the cost per radio was rather high ...\$ 34,000 or \$38,000 EACH. if I recall
> correctly. Maybe these sets had the SSB upgrade installed?
> If anyone could get hold of a manual for this series, it might contain some

> interesting upgrade ideas.

The Fowler R390A's did not have SSB installed. I know of a fellow who has one. And yes, they did make just 5.

Date: Sun, 9 Nov 1997 07:48:18, -0500
From: FSWF37A@... (JAMES T BRANNIGAN)
Subject: [R-390] r390a SSB thoughts

The CV-591 /URR is also known as the MSR-1. The MSR-4 or 5 had a AGC take off to control the receiver. I think it was the GSB-1 that is the 50lb monster you refer to. Now that I think of it, the CV- 1982 had the AGC take off....it is a real nice unit... Hammarlund, Central Electronics, B&W and a bunch of others made SSB adapters during the 50's and early 60's. They all had fancy names, but worked pretty much the same. The 455kc IF was converted to 50kc or so, then run through an audio type filter to give it better selectivity. A product detector and audio amp followed. Variations included Q-multipliers, XTAL controlled oscillators, noise limiters, etc. Some history..... When SSB came on the amateur scene in the 50's it was not well understood..... Hams ran their broad IF receivers wide open on AM and relied on a fast acting AGC to keep the diode detectors from overloading. On CW they turned off the AGC, turned down the RF gain, and flipped on the BFO.. for SSB they just flipped on the BFO. This overloaded the Detector, put BFO voltage in the AGC and even if they set the BFO to the correct frequency, made SSB reception almost impossible....also the receivers of the time were not very stable.... Hams could not break their AM habits....Enter the external "signal slicer" to solve the problem...This situation prevailed well into the 60's. What about Collins? Art Collins and his engineers developed SSB gear (with gobs of taxpayer money) for Gen. Curtis Lemay to use on Air Force SAC bombers. When the 75A4 came out in 1955, or so, it cost as much as an automobile.

I'll try to make a copy of the schematic for you.

Date: Wed, 12 Nov 1997 15:50:39 -0500
From: Don Stepka <dts4@...>
Subject: Re: [R-390] R390A SSB Thoughts

A number of people have pointed out in private e-mail related to this thread that a stock R-390 or 390A actually works reasonably well for SSB. For those who haven't benefitted from these comments, I thought I'd post the notion. It is true, at least in my opinion (which is why I haven't built my SSB adapter yet -- I really don't need it badly). For best SSB reception on a stock 390 series radio:

(1) Make sure your BFO is in the center of your IF. (a) Find an AM signal, and carefully center-tune it with the BFO off using the .1 Kc BANDWIDTH position. (b) Turn on the BFO and carefully zero-beat it with the AM carrier using the BFO control (leave the KILOCYCLE CHANGE alone). (c) Pull the BFO knob off the shaft (using a #8 Bristol, #9 Torx, or filed down #10 Torx driver) and carefully replace it pointing directly to zero (straight up). Leave the BFO on for the rest of the procedure.

- (2) Turn the RF gain control way down. It doesn't make much difference whether you use the AGC or MGC position of the FUNCTION switch, because the IF level you will use to match the BFO level won't generate much AGC in any case. I usually use fast or medium AGC for a bit of AGC action. Experiment.
 - (2) Turn the LOCAL GAIN control all the way up. Yes, all the way.
 - (3) Select the appropriate IF BANDWIDTH (usually 2 or 4 Kc, but maybe 8KC if you find an SSB broadcast station or 1 if the band is really noisy).
 - (4) Turn up the RF GAIN control until you hear normal band noise.
 - (5) Tune around until you find an SSB signal. If it is too loud or distorted, turn the RF GAIN control down. The BFO is still at zero, so you want to tune for the most low frequency output (the signal will not be intelligible yet). Now you have the SSB signal in the middle of your IF bandpass. All you need to do is to adjust the BFO (leave the KILOCYCLE CHANGE alone). Depending on whether the signal is LSB or USB, you will need to set the BFO above or below the signal. The BFO is calibrated (approximately) in Kc, so it will end up set to a little less than 1/2 of your selected BANDWIDTH (about + or - 1 for 2 Kc BANDWIDTH, about + or - 2 for 4 Kc BANDWIDTH).
 - (5 alternate) Set the BFO control up or down according to whether the band you are tuning is LSB or USB. Use about + or - 1 for 2 Kc BANDWIDTH, and about + or - 2 for 4 Kc BANDWIDTH. Now tune around until an SSB signal "drops in."
 - (6) Make fine adjustments to the BFO and KILOCYCLE CHANGE controls for best fidelity. Once you find where the BFO needs to be for best fidelity, just set it there and tune around, using the KILOCYCLE CHANGE to get the signal very close and the BFO control to "clarify" it (the BFO control moves more easily and smoothly than the KC CHANGE control, so fine tuning is easier).
 - (7) Adjust the RF GAIN control to control signal level. If the signal is distorted or hard to tune, lower the RF GAIN. If the audio is louder than you want when the detector starts to distort, now you can turn the LOCAL GAIN down a little. You will need to ride the RF GAIN control as the conversation passes from one person to another, and probably tweak the BFO as well. (Freedom from having to adjust the RF gain manually is the primary benefit of a "real" SSB radio or SSB adapter, and as several people have pointed out some of the adapters don't do a very good job. If you want a 390-series radio to do this well, even with an adapter, you really need to modify the internal AGC circuit.) This is all much easier to do than to describe.
-

Date: Wed, 12 Nov 1997 16:09:12 -0700 (MST)
From: BOB RAGAIN <RAGAIN@...>
Subject: Re: [R-390] R390A SSB Thoughts

Hello Don and the R-390 group, (and apologies to Boatanchors to whom I sent this the first time): Thanks for that tuning procedure for the R-390 and R-390A. I use mine for SSB reception all the time and it works well enough that I've not considered wanting a SSB adapter.

Here's another shortcut to getting the BFO in approximately the right place for a particular band and bandwidth:

With BFO off, tune across the band and find a nice strong SSB signal with it's Donald Duck jabber. Peak the signal strength by fine tuning the kHz knob. Turn on the BFO and try one side of center of the BFO control, then the other, to find SSB reception. That's the spot to leave the BFO control while tuning the band for weaker signals. Ditto's on using low RF gain. Interesting comment about turning the audio gain all the way up. I'll have to try it tonight. Mine seldom gets turned up more than about 1/3 of the way.

Date: Wed, 12 Nov 1997 18:24:27 -0500
From: Don Stepka <dts4@...>
Subject: Re: [R-390] R390A SSB Thoughts

>Interesting comment about turning the audio gain all the way up. I'll have
>to try it tonight. Mine seldom gets turned up more than about 1/3 of the way.

It may be that's what's best on your radio. It depends on the particular amount of BFO injection, IF level, and audio gain it has. What you want to do is to keep the RF gain low enough that there's plenty of BFO injection. This keeps the detector distortion down. As long as the detector is not distorting, the RF gain is low enough. By starting with the AF gain all the way up, you know this will be the case. For very weak signals, it will need to be full up to hear them. For stronger signals, the best S/N will be with the IF level (set by the RF GAIN control) a little below the onset of detector distortion and the AF level (set by the LOCAL GAIN control) adjusted for comfortable listening. I have found that leaving the LOCAL GAIN full up is a fine way to work. The S/N is not always maximized, but it is never objectionable either.

From: FSWF37A@... (JAMES T BRANNIGAN)
Date: Fri Jan 9, 1998 11:23 am
Subject: [R-390] Makers of CV-571 Converters?

Technical Materials Corp. (TMC) of Mamaroneck, NY was the developer and prime contractor for the CV-591 It was designed to work with their GPR-90 receiver.. I use one with my R-390A...its OK If you need more info, let me know...

From: WILLIAM HAWKINS <bill@...>
Date: Fri Jan 9, 1998 10:35 pm
Subject: Re: [R-390] Makers of CV-571 Converters?

Maybe you slipped a digit there. The CV-157 is a big brute (over 40 tubes, works are in a drawer). The CV-591 is about a quarter of that size. My CV-157 has Orion filters, but I think they are replacements. Yes, Collins made CV-157's. They did the original design.

Date: Sat, 13 Feb 1999 10:29:31 EST
From: DCrespy@aol.com
Subject: [R-390] Real simple SSB.. promised follow up

Last month I posted a simple AGC SSB mod (the Dallas Lankford SSB AGC mod (HSN23).. two diodes, no parts removed). I promised those who reponded that I'd post my 'final results' back to the list: (Special thanks to Stefano Kd1cf and to Mark K9TR, for their help on this..)

- It is so simple and reversible, and makes such a huge difference in SSB reception, I can't think of a good reason not to do it the next time the IF deck is out! At full RF gain the AGC actually works to provide un-distorted SSB. You can listen to a net without riding the RF gain control. It resulted in no change in AM performance

- Its just two 1N4148 diodes, one in parallel with R-547 (anode to ..diode 'points away from' pin 2 V-506), one in parallel with R-546 (cathode to.. 'points toward' pin 1 V-509).

- On real strong, heavily processed signals, there is a slight 'pop' when the AGC first engages. I was able to minimize this two ways:

- I set the limiter control to 2 or 3

- I increased the BFO injection by adding a 33pf 1kV disc cap in parallel with C-535.

The first attempt fooled the AGC with the increased BFO signal. A tip from Mark K9TR, pointed out that I just needed to adjust the neutralizing cap C-525, on the IF deck for a null on the carrier meter. This trimmer is accessible through a hole on the left side panel of the main frame.

Date: Sat, 13 Feb 1999 16:45:25 EST
From: DCrespy@aol.com
Subject: Re: [R-390] Real simple SSB.. promised follow up

Kd1cf writes:

<< thanks for the update. Did you keep the 33pF in place after you adjusted the neutralizing cap C525? Stefano.Stefano,

Yes, I left it in place. It added some more BFO injection, so I had to do the neutralization to keep the added energy out of the AGC circuits. (I re-read my post, and I was not too clear about this, so I am posting this note back to the list, also)

Again, thanks for all of your input on this throughout the trials..

Date: Wed, 31 Mar 1999 08:11:40 -0400
From: "Jeff Adams" <jadams@mcqassociates.com>
Subject: [R-390] (Fwd) Re: R390A SSB conversion

I got it from from an article by Dallas Langford (actually there were several iterations of the article) in Hollow State News (HSN). It is REAL simple. 90% of the impact of the change comes from the addition of two diodes to make the AGC attack VERY fast but decay at the normal rate. I HIGHLY recommend the mod. I can't imagine why anyone would do a product detector for the radio with this solution available. This works because the R-390A is designed so that the AGC is based on a signal sample taken before BFO injection, so the BFO does not fool the AGC!

The AGC mod is:

- one 1N4148 in parallel with R 547, 'pointing' away from pin 2 of V506A.
- one 1N4148 in parallel with R 546, 'pointing' toward pin 1 of V509A.
- (I soldered both directly to the resistors)

For the last 10% of the improvement, the system could stand a lot more BFO injection. I am not sure this is worth the extra effort. 2 of my 3 radios have it, and there is more variability between the radios than impact from this change, based on how the radios play. But as long as you have the deck out...

The BFO mod:

- add a 47 pF cap in parallel with C 535
- redo the BFO neutralization (this is the trimmer cap on the IF deck that is accessible through a hole in the left side of the main frame near the front panel. Simply adjust it for minimum carrier level meter reading with the BFO on.)

Finally, there are some things you can do to fool with the AGC time constant, but I can not see why anyone would want to do that.. Let me know if you'd like to know more about those changes.

Date: Wed, 31 Mar 1999 10:29:32 EST
From: SBJohnston@aol.com
Subject: Re: [R-390] Re: R390A SSB conversion

For me, it reduced the distortion on the leading-edge of SSB signals, and allowed operation with relatively normal RF gain settings on even strong SSB signals. I found no penalty on reception of other modes.

Last week, while working on the 4 kHz filter problem mentioned earlier, I had the opportunity to try my SSB-modified Motorola at home against the unmodified EAC we use at work, and the difference on SSB was night-and-day. I had difficulty adjusting the EAC to handle the varying signals present on a SSB military net I was monitoring, but the modified Motorola had no trouble. AM performance, using both the built-in envelope detector and my external sync detector, were identical as far as my ears could tell. CW was somewhat better on the modified unit.

Date: Thu, 1 Apr 1999 22:45:04 EST
From: DCrespy@aol.com
Subject: [R-390] Re: Re: R390A SSB conversion

Fraser wrote a good question back to the list:
<<The mod seems relatively easy, but what exactly does it do to SSB reception?>>

The question is about the two diode SSB mod that I described that Jeffrey L. Adams copied back to the list. I wish I was bright enough to have figured this out myself, but the credit goes to Dallas Langford, and about 10 years ago. What does it do? From the operator's perspective, it allows you to copy SSB with the RF gain all the way up. Without the mod, you have probably noticed that you can reduce the RF gain control and copy signals pretty nicely. If you are trying to listen to a net or both sides of a QSO, one hand has to be on the RF gain.. With the mod, just turn up the gain and let the AGC do it's thing! Signals sound as good as on my KWM-2 (which for Collins fans is new enough to have SB 8A from the factory).

I am not an Electrical Engineer, so this is probably an oversimplification, but electrically it just allows the AGC to attack fast enough to reduce the gain to a level where the BFO can mix effectively in a diode detector. It works on the R-390 and R-390A because these radios sample the signal for the AGC ahead of BFO injection. The BFO injection level is not a factor in gain control.

On most Ham rigs without product detectors of this vintage, the BFO is injected where the AGC gets its signal sample. The AGC gets fooled by the signal level presented by the BFO so it is reacting to the BFO not the signal. So this kind of mod would not work for them. Product detectors seem to be very tolerant of widely varying differences in signal and BFO levels, so with them its not an issue.

I hope I have not confused this issue too much. The mod is so cheap, simple and reversible, why not just try it?.. like the late night dicer/slicers.. 'it really really works' (really).

Date: Wed, 15 Sep 1999 23:21:07 EDT
From: DJED1@aol.com
Subject: [R-390] SSB adapter for R-390A

I got quite a bit of interest from the list on this topic, so I'll arrange to post the information. Josh Rovero has kindly offered to post it on his web page, so I'll work with him to get the information out. I'll get a schematic scanned and provide it to Josh. A little more detail to whet the interest of those who asked for more information. The circuits are pretty simple, but the nice part is the ability to use the receiver as if it was all built in. The IF output from the R-390 is fed in parallel to a MC1496 product detector, and to a two transistor AGC amplifier and voltage doubler. The output of the product detector is amplified in one transistor and then fed to the R-390 audio at the diode load. A mode switch allows the adapter to be bypassed and the receiver works on AM and CW just as before. The AGC was to be switched also, but I found it works OK in parallel with the R-390 AGC (the adapter provides the fast attack needed for good SSB reception). So the carrier meter and AGC time constant switch on the radio still work. I had to add a separate BFO oscillator in order to avoid any wiring to the receiver that didn't go to the terminal strip. This doesn't seem to affect the stability significantly. The BFO can be tuned to offset for sideband selection. Pretty simple- the only thing it doesn't do is to select sidebands without retuning the receiver. The audio is smooth and clear. It seems strange to tune across the amateur bands and have the radio sound like my R-4C. Some have asked if kits are planned- I don't have a PC board layout, but if someone wants to undertake that part of the kit I may be able to put together the rest.

Ed WB2LHI

Date: Thu, 30 Sep 1999 22:30:37 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: [R-390] Re: [Collins] Fw: r-390a receiver

There's a conversion using a 6BE6 as a product detector. Was in 73 magazine about July 1970, maybe QST earlier. There's a version of it on one of the 390 data web pages. I don't remember the URL. Its not Chuck Rippel's page, though he may have a reference to it. I can't e-mail the requester directly, there's no address in the inquiry.

73, Jerry, K0CQ

Date: Sat, 02 Oct 1999 17:09:38 -0700
From: dma@islandnet.com
Subject: [R-390] SSB Adaptors

A few weeks back someone mentioned using an HP312B as a SSB adapter with an R-390A. I thought this was an interesting idea and was able to acquire an HP312C at a reasonable price. It may not have tubes (do nixie tubes count?) but it should have honorary status for its weight and size. It's bigger than a 390A and almost as heavy.

Anyway, I've been using it with my R-392 and it is excellent. I ran the IF output of the radio to the 312C input and its audio output to a bench amp. Adjust the 312C

freq to 455 kHz and away we go. The vernier frequency control on the 312 provides excellent SSB and because the unit tunes over the full BW of the radio's IF, you can actually tune in a number of adjacent stations without retuning the radio. The 312C has a big back-lit meter that is great for relative signal strength. Also, it should work with virtually any receiver regardless of IF frequency, as the 312C covers from essentially DC to 18MHz. All in all a pretty good solution - except for the size of the thing - or at least until you can find a nice CV-591 or equivalent. Thanks to whoever suggested this approach.
Jan Skirrow, VE7DJX

Date: Thu, 14 Oct 1999 15:28:18 -0500
From: "Byron & Janie Tatum" <bjtatum@iwl.net>
Subject: [R-390] SSB Adapter

Regarding the R-390A SSB adapters I don't believe I have seen anyone mention the SSB mod by Dallas Langford, published in HSN about 1991 or so. It involved increasing the BFO injection and improving the AGC attack time, along with better AGC release times.

I have done many of these such mods and it is my favorite, although not an actual product detector it is hard to tell otherwise. The mod is done only on the IF deck, and does not affect AM reception. This is a pretty easy mod to do and easy to take back out if you want to later- only involves a few components such as a diode, resistors and a few caps- no drilling or extra tubes, etc. WA5THJ.

Date: Thu, 14 Oct 1999 16:30:43 -0500
From: "A. B. Bonds" <ab@vuse.vanderbilt.edu>
Subject: Re: [R-390] SSB Adapter

Actually, the latest version of the mod involves only two small-signal diodes (e.g., 1N4148) across two existing resistors. I have done it on both a 390A and a 390.

Works reasonably well, clearly lets you run the RF gain much higher before you start to get breakup. It does drop the overall (audio) gain a smidge, but not enough to matter seriously.

Date: Thu, 14 Oct 1999 18:24:46 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] SSB Adapter

It shouldn't be hard to create a module that would plug into the diode or BFO tube socket or both with a cable between. The rub is that the handiest and best performing parts these days are far lower impedance than the existing circuits. Might have to do something separate to control signal levels to them.

73, Jerry, K0CQ

Date: Sun, 24 Oct 1999 10:30:17 EDT
 From: DCrespy@aol.com
 Subject: [R-390] Langford 2 diode SSB mod.. An update

I've noticed some renewed interest on the list lately in this real simple SSB mod (two diodes) to the IF deck (this is NOT the "black box" that makes AGC from the line audio). Initially, I'd thought that there was one compromise. The only real problem I'd had with the mod was a "popping" on attack on real strong signals. I was able to minimize it with the limiter. I'd traded notes with some other list members who had had similar experiences.

BIG DISCOVERY (for me) a few months ago. SSB should be copied using slow AGC (finally read my TS-850 manual. Real men don't...). At that setting the popping is gone. The radios had been as good as my 1964 KWM-2 before SB-8 (the AGC update) now they are as good as the KWM-2 after SB-8. Anyone using this mod at Medium or Fast settings should try this. For those who have never heard a radio with this mod, you should try it before investing in an SSB adaptor. It is VERY reversible, if you decide you do not like it. Contact me for a description if you do not have it.

Date: Sat, 23 Oct 1999 15:40:48 -0700
 From: dma@islandnet.com
 Subject: [R-390] SSB Adaptor

Anyone interested in trying to use an HP312A frequency selective level meter as an SSB adaptor on their R-390A ...I noticed during a recent visit that Electronic Dimensions in Tacoma has one. He also has some really nice brand new C connectors - US made, silver plated, individual serial numbers. I think Glen's email is: eldim@worldnet.att.net

Date: Sun, 24 Oct 1999 15:18:23 EDT
 From: DCrespy@aol.com
 Subject: [R-390] Lankford 2 diode SSB mod

What a flurry of requests for details of the mod. I hope everyone will be OK with my just answering via the list. First, apologies to Dallas Lankford for misspelling his name. Credit for these mods goes to Dallas and H. Cornelius. A similar mod for an R-390 (non-A) is described in QST. Hollow State News Issues 1, 10, 23, 27 and 36 cover various versions of the mod. My notes are based on the version in HSN 23: The AGC mod is:

- one diode in parallel with R 547, cathode as follows
 -----|<-----pin 2 V506A
- one diode in parallel with R 546, cathode as follows
 ----->|-----pin 1 V509A

I used good quality 1N4148's piggy backed to each resistor. Dallas suggested a 1N270 (ECG 109) in HSN 23, and either 1N4148 or 1N914 in HSN 27. He is pretty specific that the diode must have very high back resistance so germanium diodes are out.

This is the simple change. If you want to go a little more sophisticated, get copies of HSN 10, 23 and 27 (the article in 1 is essentially repeated in the others). Back issues are available from Ralph Sanserino (sanser@GTE.net). I cannot, in clear conscience reprint these for you and 'end run' Ralph.

You can also add more BFO injection by adding a 47 pF cap in parallel with C -535. The R-390A derives its AGC signal ahead of the point where BFO signal is injected, so the radio does not get fooled by the BFO signal. I got mixed results with this. It does require readjusting the trimmer nearest the front panel on the IF deck that is accessible through the left side panel of the main frame. The manual tells you how to do it. Have fun.. this mod makes a huge difference..

Date: Sun, 24 Oct 1999 13:35:57 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Lankford 2 diode SSB mod

1N270 is a very high quality germanium diode. Its not silicon. But it has lower forward drop than any silicon but Schottky.

Date: Mon, 25 Oct 1999 18:20:58 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: [R-390] 2 Diode Modification

Wow!! That's amazing! Makes tuning SSB MUCH easier, sounds so much better. Fairly easy to install, too.

Date: Wed, 27 Oct 1999 20:38:05 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] 2 Diode Modification

Awesome! I'll cast my vote for this mod, too. Makes the AGC work great for SSB signals. I'll never have to touch the RF gain again while tuning SSB. Diodes can be found at Radio Shack, part # 276-1122.

Date: Fri, 29 Oct 1999 07:36:10 -0500
From: "Jerry G. Kincade" <w5kp@swbell.net>
Subject: [R-390] Silicon vs. Germanium for SSB mod

Getting ready to do the Lankford 2-diode SSB mod on one of my 390A's. I have on hand both 1N4148 silicon and 1N270 (actually NTE-109 equivalent) germanium switching diodes. Will my ears be able to tell which type was used after I'm done, or is the requirement for switching action at these frequencies so relatively slow it would make no difference?

Date: Fri, 29 Oct 1999 09:22:52 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: [R-390] Re: Silicon vs. Germanium for SSB mod

You have plenty of voltage, the main difference at audio will be the forward drop, the germanium being lower than the silicon. Since you adjust the AGC action by the line level control you can easily compensate for the voltage drop difference. The silicon will last longer if there's a lot of voltage, less leakage and higher voltage rating.
73, Jerry, K0CQ

Date: Fri, 29 Oct 1999 19:34:21 EDT
From: DCrespy@aol.com
Subject: [R-390] Silicon vs. Germanium for SSB mod

While I cannot vouch for it, Lankford says that it does make a difference. Definitely silicon. I have modified three IF decks with excellent success with 1N4148's or NTE equivalents (the NTE's have a slightly higher voltage rating, I like that for BA's).

Please note that this is NOT the mod that makes AGC voltage from the "line output". AGC level is NOT adjustable with the line level control. If you follow the schematic, this mod makes the AGC "fast attack". The diodes permit the time constant cap to charge without the time constant resistors in place, but it must discharge through the resistors. Hence fast attack/slow decay..

Date: Fri, 29 Oct 1999 17:41:19 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Silicon vs. Germanium for SSB mod

Yes that **internal mod needs silicon** otherwise the germanium will leak too much and modify the circuit too much.

Date: Sat, 30 Oct 1999 09:00:58 EDT
From: DCrespy@aol.com
Subject: Re: [R-390] Silicon vs. Germanium for SSB mod

I am a mechanical, not electrical engineer, but I'll try to explain it as best I can. If you have TM 11-5820-358-35, read about the AGC circuit on pages 33 and 34.

The reason SSB sounds distorted with conventional AGC is that there is no carrier to track, so the AGC might have to 'reset' each time a new word is spoken. So the first syllable of a word does not get the benefit of gain control.

The time constant circuits (R546/C547 and R547/C548/C551) must charge their capacitor(s) completely before full AGC voltage is developed. The charging rate is limited by the current that can flow through the resistor. The diodes effectively eliminate the resistor on the charge cycle, and get the AGC voltage up to full level as fast as possible. This REALLY helps track that first syllable! High back resistance diodes keep the discharge cycle function as intended in the original design.

Lankford points out that the AGC rates after the mod are still not optimal, and in the HSN article talks also about improving the rates after the diodes are put in, by manipulating the capacitor values. Lankford also noticed (as I did) that the AGC is now more "aggressive". That is, in addition to faster attack, the absolute voltages are higher. So stronger signals will get more gain reduction than before the mod. This may also be one of the reasons the mod works. Now the level of BFO injection is higher relative to the signal at the detector.

I hope this helps. Maybe this will stimulate some feedback from some of the EE's out there, who understand this better than I do.

Date: Wed, 3 Nov 1999 19:04:15 EST
From: DJED1@aol.com
Subject: Re: [R-390] SSB adapter for R-390A

Glad to hear that you're having fun, Jan. To answer the questions, C32 is just a bypass cap 0.1 mf. The AGC FET is a 2N3819 from Radio Shack. I trimmed many of the bias networks to get the best waveform or dynamic range, so different transistors may need different components. I made a tuning cap by twisting all but one plate off of a small variable cap. You don't need much variation to move the BFO a couple of Kc. Do try the AGC, it's got the fast attack, slow decay characteristic needed. As we've heard on the list, having a good AGC is more than half the battle. I was planning on using a LM565 for the phase lock loop, feeding the LM1496. Haven't had time yet to start on breadboarding that part of it. I believe that the feedthrough of the R-390A BFO may be enough to use the synchronous detector for SSB as well as AM. This would eliminate the separate BFO, and make the adapter less complicated.

Date: Sun, 26 Dec 1999 23:18:36 -0500
From: dave metz <metzd@cfw.com>
Subject: [R-390] Lankford AGC mods, ST. Julians finally finished

Having finally buttoned up a St Julians creek disaster after almost a year of piddling away and some help from this group, I would like to say the hours weren't worth it but the "experience" was everything! I really learned a lot.

To begin, as a matter of principle, I am not one who favors mods unless they get me to the end of being able to use something better. Specifically, I like listening to some of the military freq's such as 11.175 usb. Admittedly, I also have a couple of R1051B's that will do the job quite nicely. However, given that this unit was sort of an experiment to see if I could ever get it running, I felt it might be worth the time to do a little experimenting. So I first disassembled the unit down to the module level and removed the rf deck, took all the cans and racks out, removed the front panel to refinish, and started by getting the modules except the rf deck working in another 390A chassis. As far as cleaning, an aerosol degreaser was used just prior to a hot water washer to clean up everything, especially the rf deck. I covered the cans that couldn't be removed with duct tape. Then I final rinsed with a gallon of

distilled water and then put them in the attic during the summer for a week to dry out. So, finally this fall, it was time to start the reassembly.

Mostly, I wanted to make sure everything was working before I started "jacking" with it. My first attempt was to do the IF mods on the unit per the suggestions of the Electric radio series in #26 using 6jh6's and adding a diode and removing a couple of resistors. My ear told me that this wasn't really satisfactory. (Fortunately, I had not cut the swamping resistors in T501,2,3) So basically, I removed /reversed that suggestion to the Lankford way. This is really simple, remove one resistor add two capacitors and add two 1N4148 diodes. Dr Langford suggested changing C551 to 1.22uf for the slow AGC and adding a .47uf to lug 9 of S107 after lifting the white wire to ground for the medium agc. I did this and found that I only used the medium position so I undid the 1.22 part and only left the .47uf attached to lug 9 of the s107. I just used a dab of clear silicone rubber to glue the cap to the inside of the front panel and the next day it was firmly attached and yet still removeable. Bottom line: I can barely tell the difference between the 1051B and the 390A. However, I did try the trick of changing R541 from 270 ohms to 1000 suggested in the Electric radio series. I felt that I just didn't have quite enough AGC and changing this resistor made a big difference. My feeling was that because I have that "repaired" Z503 using a fixed inductor and cap that maybe it isn't quite at resonance but this seemed to get around the problem. I would sure hate to change Z503, boy would that be a job even if one could find it! The last couple of things involved adding a 47pf cap in parallel with the BFO injection cap per the Lankford way. And..... that ballast tube bothered me. I just hate to spend \$17 when there is less expensive ways that aren't degrading. The first thought was to go 12BA6's and jumper the ballast socket. I really didn't like the look of that hollow spot. So, for another twist on the ballast tube alternative, I used a "pulled" 15DQ8 TV type tube and moved the wires to # 3 and 4. This is so minor and given that I had to remove the BFO shaft to change the injection cap anyway, it seemed a simple and cheap way to go. I tried to use some 12v tubes but found that the low side voltage was a tad high. The 15DQ8 put almost exactly 12.6 volts on the low side headed to the PTO and BFO tubes. I know this sounds significant, but when all was said and done, I had an IF deck that really handled the SSB and still made the BBC sound nice.

Then, I tried the RF deck mods suggested in the ER article. For whatever reason, the bottom line here was that after I had good AGC with almost no distortion, modifying the rf deck to 6HA5's for mixers and changing the RF amp, created unacceptable problems. First, I lost a significant amount of AGC. Secondly, I couldn't open the rf gain completely without putting it into oscillation or having almost no rf gain control with another type tube. So, I reversed the entire rf deck mods and took it back to original. Perhaps there is something else wrong in the rf deck or I missed the obvious when changing the wiring for these mods but after reversal, it again ran beautifully.

In summary, I would highly recommend the IF deck mods suggested by Dallas Lankford. They are simple and easily reversible. There are no holes or drills and they allow a fantastic engineering marvel to copy SSB which was just coming on line during early life and development. Primarily used for copying the fleet/unit

broadcast in it's 8 and 16 mhz bandwidth, R390A didn't see a lot of SSB until the end of it's life when the 1051 series came to replace it in the Navy at least.

The final touch was putting on Tom Marcotte's replacement tag. When the choice is no tag or a \$9 almost authentic one, it isn't really a hard decision. I really take my hat off to Tom for taking the time to develop them and to Dan Arney for the covers. Those two guys deserve a lot of credit for the labor of love to make available the replacement parts. Sorry this ran so long.

Date: Sun, 13 Feb 2000 22:50:29 EST
From: DJED1@aol.com
Subject: Re: [R-390] SSB adaptors

There seem to be several options for SSB: - -modify the AGC circuit in the IF module to speed up the attack time. My R-390A isn't bad once the AGC is improved, even without a product detector. However, it involves modifying the radio.

- -buy a contemporary tube SSB adapter CV591, HC10, GSB1, etc. This tends to be expensive these days.

- -I built a solid-state adapter which provides outboard product detection and fast attack AGC. I'm real happy with this, because it feeds the audio back through the radio. However, this has to be a construction project. I now have an descriptive file which I can e-mail to anyone interested.

- -I saw an ad on the net for an offboard product detector similar to mine, about \$130. No AGC though, so it would require the mod above to provide what I consider satisfactory performance. If anyone is interested, I'll try and track down the web site.

Date: Sun, 13 Feb 2000 20:30:03 -0800
From: "Jim Carrington" <jcall@sirius.com>
Subject: Re: [R-390] SSB adaptors

Another possiblity , I've been thinking of trying , is feeding the IF into an old HP wave analyzer like the **HP 3590**. These are variable bandwidth frequency selective voltmeters with a product detector and usb/lwb selection. Input impedance is about 100 kohms and the bandwidth opens up to 3 kc.

I got lucky and found a pair surplused for \$25 each. They are large, about the size of the R390 but should be pretty cheap because of their age and lack of market for them. The plug in s have a built in tracking generator too , so you can hook a counter on it to see what frequency its set to , if you dont believe the mechanical or nixie display.

Date: Sun, 13 Feb 2000 20:36:36 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] SSB adaptors

Don't forget the two diode mod by Dallas Lankford, cheap, easy, reversible, and most of all it works!

Date: Mon, 14 Feb 2000 10:48:54 +0200
From: <yrjo.hamalainen@thk.fi>
Subject: RE: [R-390] SSB adaptors

Abt 3 months ago I informed this ng list abt product detector DIY project. I received abt 70 requests for the schematics. The project is an external adapter comprising:

- -AM-sync detetector,
- -product detector using tunable BFO for SSB/CW
- - IC audio amp

Its quite simple design using easy to find parts. It plugs to ext IF of r-390x. No mods needed for yor r-390x. I have used it now 2 months and can't live without it. Although it has no AGC, it performs quite well having r-390x set to internal AGC (not MGC). I can send via e-mail the schematics (2 gif files) by request. Yrjo OH2BRY, Helsinki, Finland

Date: Mon, 14 Feb 2000 05:10:31 -0800
From: "Dave Faria" <dave_faria@hotmail.com>
Subject: [R-390] SSB Adapters

If someone on the list has a scanner I have an article from Ham Radio magazine (July 1974) describing a SSB mod for the 390A. I'll copy the article an mail it to u so u can put it on the list.

Date: Mon, 14 Feb 2000 08:07:06 +0600
From: "Ben Hall" <kd5byb@wt.net>
Subject: [R-390] R-390A SSB Adapters really needed?

Are SSB adapters really needed for the R-390A?

I use my Motorola R-390A to receive SSB all the time, and have never found it difficult, once I got the BFO knob set correctly: when pointed at the 0 mark, it really needs to be 455 kHz. This is very easy to set - hook up the frequency counter to the plate of the BFO tube thru a DC blocking capacitor, set to 455.000 kc (with as much precision as you want), and replace the knob pointing at zero. After doing this, tuning SSB on this R-390A works this easy: set BFO to 0, tune signal for zero beat. Turn BFO knob to +/- 2 or 3, until signal is readable. Adjust RF Gain as needed. Works good for me... Am I missing something these converters have to offer?

Date: Mon, 14 Feb 2000 09:50:56 -0800
From: "George Blahun Jr." <ks1u@prodigy.net>
Subject: Re: [R-390] R-390A SSB Adapters really needed?

Hello. In the strictest sense a SSB adapter is not needed for the R-390A. However, because this radio is arguably the finest receiver ever made, many on this list are perfectionists and demand performance consistent with the other functions of the R-390A. The government and Collins recognized this and a sideband adapter was eventually built for use with this radio. The real problem is on strong signals there is a lot of distortion on SSB. Of course you could adjust the rf gain to compensate, but ideally it's nice to just sit back and listen without having to play with the gain. I hope this answers your question.

Date: Mon, 14 Feb 2000 19:08:51 EST
From: DCrespy@aol.com
Subject: Subject: [R-390] R-390A SSB Adapters really needed?

What is missing on the base radio is a way to keep the BFO at a high enough level to decode (insert an adequate carrier RELATIVE to the signal) SSB. Since the R-390A inserts the BFO signal after the AGC amp gets its signal, the BFO is already at a pretty high level. So the problem becomes getting the AGC to react quickly on SSB peaks to keep the signal level down. This is why the fast attack/slow decay AGC mod works.

You have probably noticed that you have to reduce the RF gain to copy SSB. When trying to follow a net, I had to ride the RF gain control. The AGC change eliminates that, you can turn the gain full up and the AGC does the work.

Of course a product detector is a more complete solution, but an AGC change gets you 90% there with just 2 diodes!

Date: Mon, 14 Feb 2000 20:25:09 +0000
From: "B.L.Williams" <B.L.WILLIAMS@prodigy.net>
Subject: Re: [R-390] R-390A SSB Adapters really needed?

The only reason I mention this is that some people make a mistake on tuning the BFO. And, this is something you can test yourself for best reception using SSB on the R-390A. I made the same mistake too before stumbling across the correct procedure per the -10 after a long time of incorrectly tuning SSB stations. I felt pretty dumb about it until I found out that others haven't really looked at the tuning procedure in the -10 either. I mean, it is big letters and the photos look like it is made for someone who has never seen a radio, right? So, I skipped over all that in the beginning.

You offset the BFO depending on your filter setting. If you use the 4 kHz filter then you offset either USB or LSB by 2 on the BFO. The general rule is to half the bandwidth of the filter on the BFO offset. I rarely use anything but the 4 kHz filter.

You can play around with this on your radio and I bet you will find the best SSB reception is using the -10 method. Try it zero beating like you said on a medium strength station. Then, offset half the filter setting. Then maybe offset more and try to retune the best you can. You can hear the difference. Mine is a Motorola too. Anyway, the clearest and most accurate reception is to use that way to tune.

Date: Tue, 15 Feb 2000 00:23:40 EST
 From: Kenneth A Crips <w7itc@juno.com>
 Subject: [R-390] SSB and the R390

I look at it this way I have three good transceivers that do SSB very well. Keep in mind I am looking at SSB reception from the point of view of a Ham Radio operator. The R388, R390A that I have do a fine job on AM and a single transmitter on SSB, such as utility stations. In a round table situation where you are talking to several other people it gets very interesting because of the differences in signal strength I am riding herd on the RF gain to control distortion. As you all know my R388 and R390A sit beside my bed all the controls are in easy reach so in a semi-dream like state Listen to these radios in the dark of night. I started with swl radios beside my bed when I was ten years old in Thermoplis, Wyoming back in 1961. I can't remember what I had, it was either an RCA, or a Zenith. I can remember listening to this radio hidden under a blanket in My basement bed room of my house. I was unable to go out to play in the falling snow because it was contaminated by fallout from the latest hydrogen bomb test from the Soviet Union. Of course I was listening to Radio Moscow while this was happening, it was deliciously exciting.

Date: Tue, 15 Feb 2000 07:03:40 EST
 From: DCrespy@aol.com
 Subject: [R-390] R-390A SSB Adapters really needed?

Credit for these mods goes to Dallas Lankford and H. Cornelius. A similar mod for an R-390 (non-A) is described in QST. Hollow State News Issues 1, 10, 23, 27 and 36 cover various versions of the mod. My notes are based on the version in HSN 23:

The AGC mod is:

- one diode in parallel with R 547, cathode as follows
 -----|<-----pin 2 V506A
- one diode in parallel with R 546, cathode as follows
 ----->|-----pin 1 V509A

I used good quality 1N4148's piggy backed to each resistor.

This is the simple change. If you want to go a little more sophisticated, get copies of HSN 10, 23 and 27 (the article in 1 is essentially repeated in the others). Back issues are available from Ralph Sanserino (sanser@GTE.net).

You can also add more BFO injection by adding a 47 pF cap in parallel with C-535. The R-390A derives its AGC signal ahead of the point where BFO signal is injected, so the radio does not get fooled by the BFO signal. I got mixed results with this. It does require readjusting the trimmer nearest the front panel on the IF deck that is accessible through the left side panel of the main frame. The manual tells you how to do it. Have fun.. this mod makes a huge difference.. Harry KG5LO Saline MI

Date: Wed, 01 Mar 2000 17:58:29 -0600
From: "Terry O'Laughlin" <terryo@wort-fm.terracom.net>
Subject: Re: [R-390] Panoramic Adapter

>Are there any recommended panoramic adapters for the R-390a?

The Communications Electronics Inc (now Watkins-Johnson) SM-8512 and SM-8513 were designed and sold as panoramic adapters for the R-390(a). They came with a kit and instructions for proper interconnection to show 50 kHz bandwidth. They are 2 rack units high and look great with the R-390. The SM-8510 and SM-8511 were designed for the R-388 and are very similar. They can be easily retuned to use with the R-390. Many later model WJ SDUs also do a great job with the R-390.

Date: Sun, 12 Mar 2000 17:13:07 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] SSB for the R390/R390A (and other 455KHz IF's)

As far as the synch detector goes, I think someone on the list has already done that and makes a kit available complete. If I'm not mistaken, that would be Steve Johnston -- SBJohnston@aol.com. I seem to recall that he has web pages which describe the kit which is based on the same IC as used in the Sony ICF-2010 which is noted for very effective synch.

Date: Sun, 12 Mar 2000 17:54:16 -0600
From: "Benjamin D. Hall" <kd5byb@wt.net>
Subject: Re: [R-390] SSB for the R390/R390A (and other 455KHz IF's)

Steve Johnson it is! Check out: <http://www.qsl.net/wd8das/sync.html>

Date: Tue, 14 Mar 2000 19:39:52 -0800
From: "dave faria" <dave_faria@hotmail.com>
Subject: [R-390] SSB Mod for R-390a and other articles

George was nice enough to scan these old articles from the 60's. They can be found: <http://www.koyote.com/users/gah/R-390%20Audio/>

Date: Sun, 19 Mar 2000 12:30:16 EST
 From: DCrespy@aol.com
 Subject: Re: [R-390] VRC runout and PTO alignment question

> 3. I did the Lankford diode mod but I still don't seem to have enough bfo
 > injection. I have to back off the rf gain to get a decent ssb signal. I
 > need a clear, concise explanation of the diode mod and the agc mod to
 > make sure I did it right because I have seen conflicting explanations on the
 > reflector.

> By the way, I peaked the RF deck using the 100 kc calibrator as a signal
 > source as I didn't have a signal generator handy at the time. Seemed to
 > work ok, but is there a downside? I have a URM-25 that will be gone
 > through shortly, so I will be able to do the job properly.

I have had good luck with the calibrator for peaking up the rf deck, including the tracking IF's. The cans on the tracking IF's are marked with their operating frequency, not the frequency the radio is tuned to, so for example, the 0 to 8 mcs band is labeled something like 17 to 27 mcs. Clearly, peak these while tuned to about .9 and 7.9 mcs. May be obvious, but slugs are peaked when "fully in" to the coil and caps are peaked with slugs "fully out".

On the BFO injection, I would also look at the BFO tube. I had one go 'soft' about two weeks ago on a radio with the two diode mod, and it worked as you described. A new tube brought it back to life! On the mods, following is from my notes, taken from the original articles in Hollow State News. At one time (an HSN article) the 1N270 was recommended for this application. Some list members have suggested that it's back resistance is not high enough for the application. My experience using it for a similar 51J mod bear this out. If you used 1N270's, I'd switch to 1N4148's. Notes follow:

Credit for these AGC mods for improved SSB goes to Dallas Lankford and H. Cornelius (Hollow State News #1,10,23,27,36).

My notes are based on the version in HSN 23:

- one diode in parallel with R 547, cathode as follows ---- | <-----pin 2 V506A

- one diode in parallel with R 546, cathode as follows ----> |-----pin 1 V509A

I used good quality 1N4148's piggy backed to each resistor. This is the simple change and it makes a HUGE difference.. If you want to go a little more sophisticated, get the HSN copies via Ralph Sanserino(sanser@GTE.net) You can also add more BFO injection by adding a 47 pF cap in parallel with C 535. With the R-390A's circuit layout this does not fool the AGC. I got mixed results with this. It requires readjusting the lone trimmer on the left side of the IF deck (see the manual).

Date: Sat, 25 Mar 2000 19:23:01 +0000
From: "B.L.Williams" <B.L.WILLIAMS@prodigy.net>
Subject: Re: [R-390] TMC Mod (SSB)

You get USB below 8 mHz only with the 16kc filter. It works fine on USB and LSB on anything above 8 mHz. I only heard this story from one person and that was a long time ago. What would TMC do to a R-390A?

Date: Sat, 1 Apr 2000 20:42:17 EST
From: Llgpt@aol.com
Subject: [R-390] PD-1 SSB Adapter for R-390A

Have been using a unique product for several days now, a solid state SSB Adapter. Electric Radio Magazine has these for sale.....\$129.95 + \$4.50 shipping. Comes with wall wart power supply, connector and cable for connecting to the IF Output. Since the audio is line level output, you will need a amplifier and speaker. I am using an older 70's tuner/ amplifier and a Radio Shack Optimus Pro X-7 speaker. I have never heard such audio recovery from the 2 kc filter. If you think that a 2.1 or 2.4 filter provides great ssb reception, you aint heard nothing yet. The 2 kc mechanical is super. The selector switch has off, am, lsb and usb positions. There are three potentiometers inside for tweaking to your particular amplifier/ setup. I can honestly say, that this is the best ssb I have ever heard from a R-390A. Also works great on my SP-600. Different models are available for the 51J/ R-388 series of receivers also.

Date: Sun, 2 Apr 2000 09:29:19 EDT
From: Llgpt@aol.com
Subject: [R-390] PD-1 SSB Adapter web site

Forgot to include the web site on the mini-review on the PD-1 yesterday.
"<http://www.rdt.net/kk4pk/>">Vintage Radio Products

Date: Tue, 11 Apr 2000 20:56:45 -0400
From: "Dale Hardin" <aiti@gate.net>
Subject: [R-390] Lankford AGC mods...need more info.

I have tried to install the "two diode" Lankford mod. There are at least two versions of the mod I have found:

1.-- I have gotten information from the list that "Dr. Lankford suggested changing C551 to 1.22uf for the slow AGC and adding a .47uf to lug 9 of S107 after lifting the white wire to ground for the medium AGC."

2.--I have also gotten information from the list that "the AGC mod is:

- -one IN4148 in parallel with R 547, 'pointing' away from pin 2 of V506A.
- -one IN4148 in parallel with R 546, 'pointing' toward pin 1 of V509A.
- -disconnect the wire at pin 1 of V 506A (goes to the AGC switch) and ground

- - it, then add a 2uf cap at the AGC switch between pin 8 and ground.
- -add a 1.2 uf (I guess 1 uf would work) cap at the AGC switch, between pin 9 and ground."

It is obvious that these are different versions of the same mod. I am particularly interested in the statement, "disconnect the wire at pin 1 of V 506A and ground it." Which is "it"? From my and Don Frazier's evaluation of the schematic, if I ground the wire, I kill the AGC switch function. If I ground the plate at pin 9, I kill the tube and the carrier level meter. The first version of the mod sounds more like the one I should try. So, what is the AGC mod? Which version is the correct one? I don't think anyone would complain if someone faxed me a copy of the article. Can someone send me a fax of the mod or describe it in sufficient detail for me to accurately implement it?

Date: Wed, 12 Apr 2000 20:45:31 EDT
From: DCrespy@aol.com
Subject: Re: [R-390] Lankford AGC mods...need more info

Some insights: There were several versions of the mod. They were explored in MANY issues of Hollow State News. For the AGC: the BASIC MOD IS ONLY THE TWO DIODES in your paragraph 2 below. All of the articles reference this. It was the subject of a QST article in the late 80's (for the non-A R-390). This is 95% of the effect. The rest of Lankford and Cornelius experiments were about playing with the AGC time constant. The rest of the "noise" is about this, except: for BFO injection: it was just adding a 47 pf cap in parallel with the BFO coupling cap, to increase injection. I would not do anything else until you have put in and tried the diodes ! Good Luck and 73 Harry KG5LO Saline MI

Date: Fri, 14 Apr 2000 17:56:15 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Lankford AGC mods...need more info.

I have done this mod on several R-390A's. IMHO, it is the best there is at this time. The am performance is not altered, and the carrier meter no longer pins when switching to med. (the moment of silence) ssb performance is extraordinary. Lets face it, the attack and release times are ALL TOO SLOOOOOOOW, this mod speeds up all three, and does it correctly. Les Locklear,

Date: Fri, 14 Apr 2000 18:07:57 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Lankford AGC mods...need more info.

Take a look at the National Radio Club reprints at
<http://www.nrcdxas.org/catalog/>

Article R66 is the article by Dallas Lankford on the AGC/BFO mods. Other reprints of interest for R-390A owners are: (with # of pages)

R28 Converting the R-390A Power Supply to Solid State (7)

- R29 R-390A Alignment Chart (5)
- R33 R-390A/URR PTO Alignment (3)
- R34 Inside the R-390A PTO (4)
- R57 Collins R390A, The World's Best Receiver? (6)
- R60 Comments on G Maynard's Synchronous Detector (1)
- R66 R390A AGC/BFO Mods (4)
- R68 R-390A Audio Output Impedance Matching (2)
- R69 Collins R390A - The Original "World's Best" (7)

When I ordered, copies were \$0.20 per page.

Date: Fri, 14 Apr 2000 23:27:51 EDT
From: DCrespy@aol.com
Subject: Re: [R-390] Lankford AGC mods...need more info.

All of the info was first published in Hollow State News (HSN) and is still available. Ralph Sanserino (sanser@GTE.net) handles back issues (\$1 each) and subscriptions. I bought the whole set, and am a current subscriber. It has been worth every penny. I highly recommend it, but I cannot copy it wholesale in clear conscience and end run Ralph. For just the SSB AGC mods you'll need numbers 1, 10, 23, 27 and 36. Seems like the R-390A FAQ site has the complete index. Contact Ralph! The mods each were a development of the previous. It started with Cornelius and was updated several times by Lankford. While they each look a little different, they are actually evolutionary, so if you plan to go 'full boat', just get the last couple of issues. The work is thorough, with complete explanations of why, with experimental results. The text is pages long for most of the articles, so you will get a good feel for where the author started and why he did what he did!

This Journal started years ago as a R-390A users group (before the days of internet mailing lists) and is still rolling. It now covers also the 51J series radios and the SP600s! there are also a few articles on HQ-180s and other high line / high performance commercial grade tube radios... Great newsletter!

Date: Mon, 7 Aug 2000 10:04:03 -0400
From: pbigelow@us.ibm.com
Subject: [R-390] Lankford "SSB" mod

Just for fun this weekend decided to try the Dallas Lankford "SSB" 2-diode mod -- it's cheap and easily reversible. Initial impression: It's not perfect, but it's almost getting something for nothing. Did not notice any deterioration of the AM signal and did not have to ride the RF Gain nearly so much with the BFO on. Only on the strongest of SSB signals was the RF gain reduced back a bit (not nearly as much before the mod) and the weak SSB signals were still audible.

Used the balanced input with the UG-970 (thanks Glen!)

Will do more listening just to make sure of my findings. Have not tried increasing the BFO injection.

Date: Mon, 7 Aug 2000 16:50:07 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Lankford "SSB" mod

I tried the Lankford 2-diode SSB mod, and later added the extra capacitor to increase the BFO injection. I seem to recall that increasing the BFO injection significantly reduced the distortion on the stronger signals. Now I can run the RF gain all the way up on SSB signals and let the AGC action do the rest. Works for all but the very strongest of local signals. I've done this mod on two R-390As, and the third one that's on the bench will get it next. I have not yet done the "complete" Lankford mod that changes the AGC capacitors to change the attack/release time constants. Someone who's modified the AGC capacitor values might comment on how much advantage the faster attack time constants seem to add.

Date: Tue, 8 Aug 2000 11:13:34 -0400
From: pbigelow@us.ibm.com
Subject: [R-390] Lankford SSB, part II

Tried the "Lankford SSB" mod -- results great! Tried increasing the BFO injection with the 47pf cap paralleled with the C535 -- results greater still! Now only the STRONGEST stations have a little distortion (still listenable though), and, if annoying, just back off the RF Gain just a *little* bit. Otherwise, it's almost like having SSB! This is one whale of a modification. What a deal. \$2.00 worth of parts, nothing cut or removed, and IT WORKS.

Listening quality is enhanced by setting the AGC to "SLOW".

Date: Mon, 14 Aug 2000 15:26:20 -0400
From: pbigelow@us.ibm.com
Subject: [R-390] 1N270 vs 1N4148 for "Lankford SSB"

Hello, Any opinions concerning the 1n270 vs the 1n4148 for the Lankford SSB mod? Any reports from the people that inquired about the mod over the past week?

Date: Tue, 15 Aug 2000 09:44:00 -0400
From: pbigelow@us.ibm.com
Subject: [R-390] "Lankford SSB" part 3

First step: 1N270 - works well, some distortion on STRONG stations
Second step: added 47pf - worked further in reducing STRONG station distortion
Third step: 1N4148 - replaced 1N270, virtually eliminated STRONG station distortion

Also, using the 1N4148 seemed to eliminate a momentary "pop" sound heard with STRONG stations when in the FAST AGC position. Still evaluating. So, the arrangement of the 1N4148 and the 47pf cap seems to be best, so far. Any

experimenters out there with results from using other diodes? 1n4448, perhaps? At this point, I see almost no need for an external SSB adapter -- unless slight fiddling with the BFO knob is just too much to bear.

STRONG stations are virtually distortion free and the weak signals are quite intelligible. In no case is the RF GAIN control touched. If the sound seems a bit thin, switch to the 4kc position. Wow! Bandscanning in SSB with an R-390a. Who'd have thought? AM and CW stations seem to be unaffected.

Almost makes you wish there was an USB/LSB engraving at the -1.5 and +1.5 positions on the panel. Has anybody compared the "Lankford SSB" against a CV-591?

Any point to having a CV-591 anymore?

Date: Tue, 15 Aug 2000 09:25:50 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] "Lankford SSB" part 3

The 1N270 is a fine diode but in the AGC circuit its back leakage is probable excessive and limits the development of that AGC voltage, and causes the AGC voltage to leak down.

Once get to the 1N4148 family, the 1N914 or 1N4448 should act IDENTICALLY for this application. Their main differences are in how the package is assembled to the same diode chip. Its a silicon junction diode, the 1N4148 holds it between a couple metal slugs surrounded by glass. The 1N4448 does it the same way in a smaller package, the 1N914 has a cats whisker to make contact on the metalized side of the chip. At least it used to. I suspect today that diodes are made with all three numbers on the same production line from the same parts since all three have the same specifications for speed and reverse voltage. The slugs allow greater current than the cats whisker.

Date: Tue, 15 Aug 2000 12:28:44 -0400
From: rbussier@lexmark.com
Subject: Re: [R-390] "Lankford SSB" part 3

Hi all, I will be trying the diode mod next time I have the EAC apart. Is there any reason why the 47pf cap is paralleled to the original? Since paralleled caps add value, wouldn't it be easier just to put a 62pf (or whatever the original value, + 47 pf is)???

Date: Tue, 15 Aug 2000 12:35:36 -0400
From: pbigelow@us.ibm.com
Subject: Re: [R-390] "Lankford SSB" part 3

Functionally there may be no difference but these are my reasons:

1. Preserve the original part.
2. Make it VERY easy to restore back to original should I ever care to

3. Preserve whatever temperature compensation is in the original part

When I went into this project, I was very skeptical and wanted to be sure that the entire mod could be removed if it proved unsatisfactory. Thus, no parts were cut or removed.

Date: Tue, 15 Aug 2000 12:50:56 -0400
From: "Jeff Adams" <jadams@mcqassociates.com>
Subject: Re: [R-390] "Lankford SSB" part 3

1N4148's are usually epoxy encased. 1N914's are made of glass. When you subject 1N914's to room light the photo-electric currents creep up and sometimes "funny" things can result. Try it if you dont believe me w/ a meter. Use the 1N4148's.

Date: Tue, 15 Aug 2000 12:15:59 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] "Lankford SSB" part 3

Diodes including 1N914 USED to be painted with black or dark blue paint to prevent them being photosensitive. Actually ALL semiconductor junctions (including the old selenium rectifiers) are photo sensitive and applied light will modify their measurements and performance. Somewhere deep in the test specifications for all except those rated for photon reception is the requirement that they be tested in total darkness. Some of the early video chips were nothing more than dynamic ram with a quartz lid instead of solid epoxy in the case... then they used an analog output instead of the digital comparator output to get gray scale.

A layer of scotch #33 or 88 around a glass diode should keep out most of the light.

Date: Tue, 15 Aug 2000 13:25:53 -0400
From: Glenn Little <glittle@awod.com>
Subject: Re: [R-390] "Lankford SSB" part 3

All 1N4148's that I have seen are in a glass case. I just visited the Fairchild web site to verify this. The case style for a 1N4148 is DO-35. This is listed as glass. I thought that there were differences in turn on speed in the 1N914 and 1N4148 as well as PIV differences, but have not been able to confirm that.

> 1N914's are made of glass. When you subject 1N914's to room light the photo-electric currents creep up and sometimes "funny" things can result. Try it if you dont believe me w/ a meter.

I would expect that the real 1N4148's would also exhibit photoelectric effects. I say real because there may be some company out there that places a 1N4148 die into a plastic case. Much like the 2N2222 vs the MPS2222 and PN2222 transistors.

Date: Tue, 15 Aug 2000 15:23:16 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] "Lankford SSB" part 3

Careful there, Jerry, I've had trouble getting photoswitches to come on in daylight with just one layer of 33!

Date: Tue, 15 Aug 2000 19:38:45 -0700
From: eengineer <eengineer@erols.com>
Subject: Re: [R-390] "Lankford SSB" part 3

All semiconductor devices exhibit the problem. That is why most devices are NOT in glass anymore. That is a way to solve it. I have a drawer of 1N4148s that are in plastic epoxy, so they do come in other flavors.

Date: Tue, 15 Aug 2000 22:16:21 EDT
From: DCrespy@aol.com
Subject: Re: Re: [R-390] "Lankford SSB" part 3

> Hi all, I will be trying the diode mod next time I have the EAC apart. Is
> there any reason why the 47pf cap is paralleled to the original? Since paralleled
caps add value, wouldn't it be easier just to put a 62pf (or whatever the original
value, + 47 pf is)???

It is just easier to install (by "piggybacking" it on the original cap...).

Date: Tue, 15 Aug 2000 22:16:20 EDT
From: DCrespy@aol.com
Subject: Re: [R-390] 1n270 vs 1n4148 for "Lankford SSB"

I have used the 1N4148 in 3 decks that I have modified. All worked GREAT, confirming your terrific results! While I have never tried the 1N270 in an R-390A, I have in my 51J-4. It was a similar Fast-attack-slow-decay AGC mod (Orr's from Ham Radio magazine, with a product detector). The AGC action was terrible until I replaced the diode with a 1N4148 (confirming your experience). As Jerry Johnson observed, the 'back resistance' for this diode is apparently not high enough for an AGC application like this. Lankford noted this in later editions of HSN, and recommended the 1N4148 over the 1N270.

> Any reports from the people that inquired about the mod
> over the past week?

I have responded in the last week to another (?) Paul with notes about the Lankford mod, but have heard nothing yet about his results.

Date: Wed, 16 Aug 2000 05:16:12 EDT
From: DCrespy@aol.com
Subject: Re: [R-390] 1n270 vs 1n4148 for "Lankford SSB"

I think it works so well, because the AGC is based on a signal collected before (ahead of) the BFO injection point. This means that the BFO injection levels can be quite high, giving plenty of "carrier insertion". Most designs pick up a signal for AGC at the same stage (at the diode detector) where the BFO signal is injected. This means that if the injection level is too high, the AGC will follow the BFO, not the signal. So designers had to reduce the BFO injection level to an absolute minimum. Product detectors work with AGC because they have little or no BFO signal present at the input to the detector (where signals would be sampled for AGC). Audio derived AGC would of course work with either.

Date: Mon, 18 Sep 2000 09:58:20 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] More SSB problems with R390A

When receiving SSB signal on older radios:

- Turn BFO on

- MGC

- Set audio about 3/4 on

- Use RF gain to adjust the volume often about 1/2 to 7/8 of full.

Date: Mon, 18 Sep 2000 09:58:42 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] More SSB problems with R390A

The standard AGC doesn't have the holding time constant long enough for SSB, nor the attack fast enough and distortion on SSB with the RF gain full up is normal. No receiver made before SSB became the standard works much better. You can do one of several things: Add a product detector, increase the coupling capacitor between the BFO and the diode detector, change the AGC constants, install the AGC diode mod, or run the RF gain backed off for SSB.

Date: Mon, 18 Sep 2000 23:14:40 EDT
From: SBJohnston@aol.com
Subject: Re: [R-390] More SSB problems with R390A

>If I back off the RF gain, the signal becomes clear.

That is normal, in my experience. It is a matter of proper signal-to-BFO-level ratio. If you are trying to demodulate an SSB signal using a diode (envelope) detector, you must provide a local "carrier" signal (BFO) and it must be in at least roughly the right proportion to the level of the sideband. Think of it this way... if you have the RF gain turned up, the sidebands look real strong compared to the "carrier" and you've got the equivalent of AM overmodulation and it sounds bad! Turn down the RF gain and it is as though the "modulation" was turned back down so that you

were back in the 50%-100% range and it sounds good. This is true on many, many radios that try to receive SSB on an envelope detector. Some are worse than others, usually due to attempts to minimize the impact of the BFO signal on the AGC by keeping the BFO injection as low as possible.

Date: Mon, 25 Sep 2000 01:48:09 -0700
From: "GEORGE BLAHUN JR." <KS1U@prodigy.net>
Subject: [R-390] 6BE6 SSB conversion

Hello, I just completed the V 505 conversion from a 6BA6 to a 6BE6. Actually, I used a 5750 tube. I'd be interested in anyone else's experience with this conversion. My observations are as follows. After the conversion, the circuit is definitely functioning as a product (heterodyne) detector. However, it was necessary for me to reduce the i.f. gain to well below the position it was at with the diode detector configuration, to hear undistorted ssb signals. Is this to be expected in this modification? I hear plenty of signals with the i.f. gain reduced, but can no longer set the i.f. gain according to the directions seen on many of the R-390A websites, utilizing the line level meter. The signals seem to stand out on a nearly noiseless background. I have double checked the values of all components as well as the wiring. I haven't had time to take any measurements or retune the receiver. Perhaps this is the way it was intended to perform, but it is not quite what I expected. I thought I could just leave the i.f. gain where it was and crank the r.f. gain all the way up. I can leave the r.f. gain cranked with the i.f. reduced or I can set the i.f. gain where it was and reduce to r.f. gain and still hear all but the weakest stations. Any comments or suggestions would be greatly appreciated. Thanks very much.

Date: Mon, 25 Sep 2000 05:57:30 -0700
From: Craig McCartney <craigmc@pacbell.net>
Subject: RE: [R-390] 6BE6 SSB conversion

There are some adjustments to the component values that Capt. Lee used that were published later. I have done this mod with the modified components and it works better than you describe. I'll have to dig around here to get the details - might be a day or two. Just got home from a trip and am a bit jet-lagged at the moment.

Date: Mon, 25 Sep 2000 12:43:17 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Fw: [R-390] 600ohm to 8ohm

There are synchomous detectors made by Sherwood Engineering in CO. Work great. Chuck recommends them on his web site.

Date: Mon, 25 Sep 2000 13:31:00 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] 600ohm to 8ohm

Depends on what options, mine are full featured rack mount and as I recall came to about \$600, maybe a little less.

Date: Mon, 25 Sep 2000 13:41:27 EST5EDT
From: "William G. Mills" <wmills@gmc.cc.ga.us>
Subject: [R-390] 600 Ohm to 8 Ohm Conversion

I agree with Ronald Reams statement. The Sherwood detector connected to a R-390A receiver works extremely well in both AM and SSB modes. If you can not find a Hammarlund HC-10 SSB converter, buy a Sherwood. The Sherwood detector is not cheap, but performs very well and has great audio output. I have a Sherwood detector and a HC-10 each connected to a R-390A receiver. Both the Sherwood detector and HC-10 have 8 ohm speaker outputs.

Date: Mon, 25 Sep 2000 13:58:04 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] 600 Ohm to 8 Ohm Conversion

I can vouch for the HC-10 used to use one with a R-388.

Date: Mon, 25 Sep 2000 13:36:55 -0500
From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: [R-390] 600ohm to 8ohm

Someone markets a very inexpensive synchronous/SSB detector (I can't find the URL right now). It's not a Sherwood by any means, but is considerably less expensive. Anyone know where these are located (or better yet, tried one of these)?

Date: Mon, 25 Sep 2000 15:29:03 -0600
From: "Steven Springer" <k0sjs@home.com>
Subject: Re: [R-390] 600ohm to 8ohm

I have a link to a unit called a PD1 but have never tried it.
<http://www.kk4pk.com/>

Date: Mon, 25 Sep 2000 16:40:58 -0500
From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: [R-390] 600ohm to 8ohm

Yes, that's the one. My mistake -- it doesn't do synchronous detection, but appears to be a compact, simple unit. Unless I'm mistaken, the Sherwood has its own audio amp as well and this one doesn't.

Date: Mon, 25 Sep 2000 15:13:11 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] 600ohm to 8ohm

The product detector that you are thinking of is the PD-1 by Ron Hankins. The web address is <http://www.kk4pk.com>. Note this is a product detector for SSB not a synchronous detector for AM. BTW I have a Sherwood synchronous detector and they are worth every penny. The lock holds on deep fades and the audio is very good quality. Using high quality speaker it is not uncommon to hear the announcer taking a breath between sentences.

Date: Tue, 26 Sep 2000 20:26:14 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] 600ohm to 8ohm

I have the PD-1 SSB Adaptor, and it works wonderfully. I have never heard such recoverable audio on ssb from a 2 kc filter as in the R-390A. Am is also wonderful. Have mine hooked up to an older Sherwood tube amp, driving a 10" speaker. Also have a Sherwood SE-3MK3 Synchronous detector. Works great, especially when deep fades exist. As far as audio, I prefer the PD-1 and the amp. Les Locklear Gulfport,MS.

Date: Thu, 12 Oct 2000 19:09:25 -0700
From: Craig McCartney <craigmc@pacbell.net>
Subject: FW: [R-390] 6BE6 SSB conversion

I answered this twice privately but then decided I should post it for all (below after =====).

>

>There are some adjustments to the component values that Capt. Lee used that were published later. I have done this mod with the modified components and it works better than you describe. I'll have to dig around here to get the details - might be a day or two. Just got home from a trip and am a bit jet-lagged at the moment. >Craig

Here is the information that I was thinking of:

- - - - -
R-390A product detector mod - errata!

Stan, AK0B asked for feedback on the R-390A product detector mod (using a 6BE6 as a self-excited product detector) as first published in the 1/68 CQ and developed by Capt. Paul Lee, USN, W3JHR. There was also a knockoff of this design published in ER a year or two ago. Both detector designs, if built as published, **WILL NOT WORK CORRECTLY!** Both input excessive 455 kHz IF signal to the 6BE6; when built using the component values specified the detected audio will be distorted due to an overloaded 6BE6. The solution is to reduce the carrier input to the mixer tube. If using a 5 pf coupling capacitor to pin 6 of V506B as the IF signal pick-off as Capt. Lee suggests, then the resistor from the signal grid (pin 7) to

ground of the 6BE6 must be greatly reduced in value from the 11 K specified value. I recommend a value from 1.2K to 2.7K. At 2.7K the detected audio from the product detector almost perfectly matches that of the AM diode detector (no apparent volume change on a zero-beat AM signal when detectors are switched). Using the lower value slightly reduces the detected SSB audio but it's extremely clean.

I'd also suggest those doing this mod consider switching the audio between detectors through the use of a tiny relay installed in the IF chassis switched by the existing front panel BFO switch; instead of replacing said switch and routing new audio wires over to it. This will also allow the subsequent swapping of IF chassis for test purposes. In my own receiver I used a half-wave rectifier & filter cap off the 6.3 volt line to provide DC for one coil lead of a small SPDT reed relay, the other lead is grounded to activate via the existing BFO-ON switch. Just clip the one wire at the switch that has continuous B+ on it (and heat shrink or tape well) and ground that terminal of the switch. This will provide a switchable ground back to the IF chassis through the existing wire (instead of switched B+).

Never saw a subsequent errata msg. published in CQ or ER. Don't know why; I've had to fix three R-390As now where the user complained about raunchy SSB audio. Done correctly, the mod sounds great, is reversible, and is well worth doing.....

Subject: More-R390A product detector mod.

I neglected to mention on my previous post if one uses the switched audio relay option I suggested, the 6BE6 product detector/BFO will need to get its switched B+ via a second section of the added relay..... if a DPDT reed relay with adequate ratings can't be found, try finding a mil or commercial surplus miniature sealed can-style relay. Or, a small power MOSFET with a couple hundred volt rating could be used for the power switching function driven off the same switched low voltage B+ (haven't tried it myself - oughta work - will require some more R&D!)

Bill - de KD0HG / AAR8CC, ex WA9OZC

- -----
I hope it helps you. Craig

Date: Thu, 12 Oct 2000 23:59:37 -0700
From: "George Blahun Jr." <ks1u@prodigy.net>
Subject: [R-390] 6BE6 SSB conversion

Hello. I was one of the people who benefited from Craig's forwarding of the information concerning the product detector mod. Initially I built the circuit using Capt. Lee's values but rebuilt it according to the ER article. In the rebuilt circuit which uses different values for nearly all components I ended up with a 3.3k ohm capacitor from pin 7 of the 6BE6 to ground. I found this value by temporarily wiring in a precision pot and tuning across the bands listening to ssb signals of greatly varying levels. The 3.3k value gives superb audio on even the strongest ssb signals. A value of 4.7k would give somewhat more audio but would produce a slight distortion on the strongest stations. I did use Capt. Lee's suggestion of a 1uf

cap from the fast position on the AGC switch to ground and was pleased with those results. Prior to this modification I used the two small signal diodes added to the IF. I was never really satisfied with this mod and the product detector is really a very worthwhile project which I could probably duplicate (now knowing the errors in the original articles) in about 2 hours. The cost is also very reasonable, about 12 to 15 dollars.

Date: Mon, 6 Nov 2000 20:05:48 -0500
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] TMC sideband converter

> Looking through the Feb. '63 QST, I see an as for a TMC SBC-1

These converters use a PLL circuit to lock onto the pilot carrier that was transmitted along with the ISB or DSB signal. The carrier doesn't have to be very loud as the converter can easily handle carrier suppressions of 10 dB or more. I have a CV-157 (that needs a little work) and it has a massive IF carrier pre-filter that's only a few 10s of Hz wide that helps to strip the carrier from the rest of the signal and improve the S/N ratio of the carrier going into the PLL. It also has another non-PLL detection mode which uses a hard-limited version of this filtered carrier signal as the LO (instead of the PLL generated signal); however when used in this mode it is not able to track a drifting signal. The spec for the PLL performance says that its PLL can track a signal drift rate of 10 cps/sec with less than 2 cps error.

The TMC units are more modern and were designed to replace the CV-157. From what I understand, one big improvement they made was to use a reactance tube to accomplish the VCO function required in the PLL circuit. The VCO in the CV-157 is made with a variable cap driven by a synchro motor through a precision 600:1 reduction gear assembly. The tube driver circuit for this synchro motor is direct-coupled and is quite elaborate in itself. Electric Radio #25 has the only write-up on a CV-157 that I've ever seen.

Date: Wed, 08 Nov 2000 01:01:03 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] TMC sideband converter

>Does anyone own & use one of these TMS SBC-1 units? How does it follow a drift signal?

The CV-157 SSB converter and the CV-116 FSK converters used gear reduction motor driven variable capacitors (one in the CV-157 and two in the CV-116). Once locked onto the carrier, the sets would tune the caps to follow the signal. Clever as hell. Both worked when they worked but were evil sombitches to fix when they puked. The CV-157 never really impressed me. BUT, the CV-116 and a pair of R-390A's (it had two input channels) would copy RTTY great. Both generated heat like mad. Come to think of it, both used the same cooling fan if I remember right. It needed to be about double the size they used. The one for the CV-116 faced upward and I think that the CV-157 faced out the back. The CV-116 was heavy but the CV-157 was about double. I'd guess 90 pounds. The CV-116 with it's five 6X4's

is the primary reason that I can't stand the 6X4 even today. You couldn't keep standard 6X4's in it. The CV-157 used a pair of 5R4's and a couple of 6X4's and a big regulator tube. I don't remember all that many rectifier tube problems but the other 40 or so tubes were fun to replace. I scrapped my last CV-116 last year or so and have no plans to dig around looking for a CV-157. If one appeared at the next hamfest for next to nothing I'd throw it on the had truck and lug it home but if I had to ship one, forget it. ;-(

Date: Wed, 08 Nov 2000 01:27:00 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] TMC sideband converter

>I have a CV-157 (that needs a little work)

I've never had one that only needed a "little" work. <grin>

>and it has a massive IF carrier pre-filter that's only a few 10s of Hz wide that helps to strip the carrier from the rest of the signal and improve the S/N ratio of the carrier going into the PLL.

Yep, I remember that. The CV-116 had about a half a dozen narrow bandwidth IF filter cans. I played with them with a signal generator and a scope. They were very selective but they were all designed for frequencies that nothing else used. I think I may still have a set in a box around here somewhere.

>It also has another non-PLL detection mode which uses a hard-limited version of this filtered carrier signal as the LO (instead of the PLL generated signal); however when used in this mode it is not able to track a drifting signal. The spec for the PLL performance says that its PLL can track a signal drift rate of 10 cps/sec with less than 2 cps error.

Not too shabby. :-) I didn't remember the other mode. It's been fifteen years since I had any. I'd have probably ignored that mode and used the auto tuning just to watch the dots spinning in the indicator window. <grin>

>The TMC units are more modern and were designed to replace the CV-157. From what I understand, one big improvement they made was to use a reactance tube to accomplish the VCO function required in the PLL circuit. The VCO in the CV-157 is made with a variable cap driven by a synchro motor through a precision 600:1 reduction gear assembly. The tube driver circuit for this synchro motor is direct-coupled and is quite elaborate in itself.

I remember that it had a serious reduction but I didn't know it was 600 to one.

>Electric Radio #25 has the only write-up on a CV-157 that I've ever seen.

Interesting, That's the first I've heard of them being written up on anywhere.

John, when you start on yours make sure that you test the tubes for gas. I found a lot a gassy tubes in both the CV-157's and the CV-116's. Maybe due to the heat, I don't know. And don't forget to oil the bushings in the fan. Pulling the AFC unit apart for a good cleaning and lube is a pain and tricky. Email me if you end up needing one of the motor driven AFC units for your CV-157. I think I've still got some good ones. They're hard as hell to find or at least they were 15 years ago.

Date: Mon, 13 Nov 2000 18:07:26 EST
From: TVComlGuy@aol.com
Subject: [R-390] R-390A with product detector

I just picked up over the weekend an R-390A with a built in product detector. I have had many R-390's over the years, but I've never seen one like this before. There is a small plate, the same color as the rest of the panel, that covers the BFO Pitch and the BFO on-off switch. The top control says BFO Upper and Lower, and the bottom control says AM on one side and CW SSB on the other. I have not had time to take the receiver out of the cabinet yet, (yes I was fortunate to get it in it's original cabinet.) Has anyone seen this modification before? Is it a factory mod, or aftermarket? Any help would be appreciated.

Date: Tue, 14 Nov 2000 12:14:18 -0600
From: "Jon & Valerie Oldenburg" <jonandvalerieoldenburg@worldnet.att.net>
Subject: Re: [R-390] R-390A with product detector

Sounds like one the R-390A's that where rebuilt for the Mexican Government. This was documented on the list about a year ago.

Date: Tue, 2 Jan 2001 20:29:40 EST
From: DJED1@aol.com
Subject: Re: [R-390] SSB adapter

Yes, I've done that. I built a (ugh) solid state SSB adapter which feeds both audio and AVC back to the receiver. I take off the jumper between the diode load and the audio input, and feed the SSB audio into the receiver's audio through the input terminal. I built my adapter to provide the proper audio voltage levels, so your mileage may vary. I also included a switch segment so I can switch the receiver diode load back to the audio input, thus restoring normal operation for AM. It works great. I also fed the fast attack, slow decay AVC to the diversity terminal, so the receiver meter is operated by the SSB AVC. I don't think the PD-1 provides AVC. In that case, the simple diode mod is probably the best bet for really good SSB reception. Good luck with it.

Date: Fri, 19 Jan 2001 13:30:49 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Two dips on cap.

Jim you get two dips as the cap goes over center and there are two points where the cap has the same value each side of the max or min location. a normal thing. You will see this in the RF deck caps also. Some times one side or the other will be a

bit better than the other side. Does any one have any good clues on getting a good null? I do not thing my receiver nulls as good as I remember recievers did back in the 60's and 70's. Roger KC6TRU

Date: Tue, 23 Jan 2001 09:57:49 -0500
From: Al Solway <beral@videotron.ca>
Subject: [R-390] R-390A Extrenal Synchronous/SSB Detector

Need some advice and opinions from all you engineering types or otherwise out there. In the 1996 ARRL Hand book, page 15.33 there is a circuit for a synchronous AM detector for 455 Khz. I would like to know if anyone has built one, how does it perform and are there any known problems with it. From an engineering view does the circuit look right, are there any suggested improvements. Are there any other circuits that do the same thing. I Would prefer not to go inside the R-390A to make changes. I installed the Dallas Lankford SSB Mod and it works quite well. A question on it's operation. For best performance the BFO has to be set to about -1 for LSB and -2 for USB. Is this normal? The BFO was adjusted for zero beat against WWV. CW seems normal and if anything works better than before the mod. This could be wishful thinking or hearing what you want to hear. The mod will removed when I get an external detector, purchased (PD-S1) or homebrewed.

Date: Tue, 23 Jan 2001 09:50:32 -0600
From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: [R-390] R-390A Extrenal Synchronous/SSB Detector

Setting the BFO to zero beat on WWV at 12 o'clock isn't necessarily an indication that the BFO is adjusted correctly. At the 12 o'clock position, the BFO should be oscillating as close to 455kc as you can get it. I do this with a good frequency counter, but I suppose there are other ways to do it as well.

Date: Tue, 23 Jan 2001 08:05:38 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] R-390A Extrenal Synchronous/SSB Detector

Check the Motorola IC web pages. There are some synchronous AM detector for 455 Khz chips and audio chips available.

You can put it all together on a Radio Shack IC circuit board.

Pick up a transformer and bridge diode while shopping.

I like to hack dead PC power supplies into rebuilds. The box has the line filter, on off switch and power cord attached. Add a fuse holder, Use the caps from the dead power supply. Inductors too. This would power your new detector and Audio amplifier. Stick the bridge to the metal box for a heat sink.

Use the 455Khz out of the R390 / A. That's what it's there for.

I was looking a synchronous AM detector and found it in a single chip. The application notes with one of them had a complete test circuit. I was looking at a full receiver. The part cost retail price and feature analysis failed and the project was dropped as not profitable for a whole receiver.

Roger KC6TRU

P.S.

For limited production argravation exceeds return on investment. But, would you like to do a design to put a few chips on a Radio Shack proto board and develop a working proto kit and schematic for those inclined to build their own?

Date: Tue, 23 Jan 2001 16:21:35 -0500
From: "Jim Amos" <jimamos@cisco.com>
Subject: RE: [R-390] R-390A Extrenal Synchronous/SSB Detector

The chip is the MC13022A AM Stereo Demodulator. This can be used to build a 455KHz sync detector. AND FAR circuits has a circuit board for an article that appeared in Communications Quarterly about building this circuit.

Date: Wed, 24 Jan 2001 00:27:34 -0500
From: "Barry Hauser" <barry@hauser.net.com>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

I dunno, maybe I missed a post here and someone already mentioned it, but I recalled that a list member offers a synchronous detector prefabbed or in kit form based on the chip they use in the Sony ICF-2010. That's Steve Johnston. Are you out there Steve? Price on his web page is \$139 kit, \$199 assembled. The URL is <http://www.qsl.net/wd8das/syncinfo.txt>

I haven't tried one of these, and have no pecuniary interest in the product, although some have said I'm a pecunary guy. Probably due to the 85 pound gray radios, instead of the normal 1/2 pound ones that take batteries.

Date: Wed, 24 Jan 2001 06:17:35 -0600
From: "J. G. Kincade" <w5kp@swbell.net>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

I know there are a couple of readymade ones available, and I bet they work just fine. But my first impulse on deciding to add synchronous detection was not to whip out the checkbook and send somebody \$200. That kind of thinking is for Collins collectors and people who drive a new Lexus 400 every other year. A \$20 handful of little parts and some perfboard from Radio Shack, plus a schematic was more in line with what I had in mind. :-) However, if these are so complex as to discourage the poor man's method, maybe I'll be rethinking this thing, and will just continue to ride the knobs.

Date: Wed, 24 Jan 2001 09:18:00 -0500
From: Al Solway <beral@videotron.ca>
Subject: [R-390] Ecternal Synchronous/SSb Detector

My original question on Tuesday 20 Jan was, has anyone built or knows anything about the synchronous detector in the 1996 edition of the ARRL Handbook. The detector is described on page 15.33, There has been various suggestions including using a Motorola IC. I will be looking into all these suggestions. I will most likely build the ARRL unit. There is one thing that I would appreciate. Would an engineer out there review this circuit and comment on the design. I am not an engineer. By the way I would rather build than buy.

Date: Wed, 24 Jan 2001 09:06:59 -0500
From: "Bill Marx" <bmarx@bellsouth.net>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

Some years back HR had an article about an AM Detector using a Motorola chip. Also Steve WD8DAS sbjohnston@aol.com sells a kit for about \$139 or \$199(>) assembled. He has a website but couldnt find the address.

Date: Wed, 24 Jan 2001 09:22:21 -0600
From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: [R-390] External Synchronous/SSB Detector

Not an answer to the original question, but wasn't there a Hollow State News article about building a synchronous detector -- presumably a tube version. If so, has anyone built it? Comments?

Date: Wed, 24 Jan 2001 10:53:26 -0500
From: swlchris@juno.com
Subject: Re: [R-390] Ultimate BFO Zero Beat

I have a question. It is dated from awhile back ,but I have a slight problem understanding it. I was reading about zero'ing the BFO. Now I can understand about getting the lowest tone and frequency counter trick *wishing my rat shack freq counter wasn't broken*. What I have a problem figuring out is this. In an early email, someone mentioned about the BFO having a center postion for calibrate and an offset for SSB signals. Usually the offset was at +1 or so for USB and - 1 for LSB . I have the Motorola R390 ,a non A version. So, if I am to get this SSB straightened out to where it works properly,how do I go about doing this?

Date: Wed, 24 Jan 2001 08:07:51 -0800
From: "Roger L Ruskowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] External Synchronous/SSb Detector 1996 ARRL

Back when I was doing a real serious study / review for a receiver design, the ARRL circuits were reviewed. New integrated chips rolled all the parts into a simpler circuit. So there are better designs out there. I can not yet just dump that design here as I do not have permission. I was being paid good bucks to do the research. I have asked and am awaiting a reply. Yea, I have the 20 dollar chip and perf board method in mind. I will put up a schematic. I will do a ASCII drawing and find a web page so we can all share it. I would like to E-mail some one the files and ask them to post it on their existing web pages.

Date: Wed, 24 Jan 2001 11:12:56 -0500
From: "Ray Vasek, W2EC" <w2ec@attglobal.net>
Subject: Re: [R-390] External Synchronous/SSB Detector

The HSN reference points to synchronous detection in volume 17 page 3, V18 page 2, V19 pages 6 & 7 and V27 page 2. I don't have my HSN set here at work so don't know what is referenced in these articles.

Date: Wed, 24 Jan 2001 11:50:57 -0500
From: Al Solway <beral@videotron.ca>
Subject: [R-390] BFO Zero Beat

Thanks a lot for the response. I tried all three methods. The three methods work and yield essentially the same results. That is within the resolution capabilities of the "BFO Pitch" scale. There is also a problem with backlash on the BFO shaft. Will fix one of these days. The original problem with the LSB/USB BFO tuning position after the Dallas Lankford SSB Mod is now resolved with the help of you 3 guys. Thanks a lot. What a great bunch of people on this net.

Date: Wed, 24 Jan 2001 11:26:08 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] External Synchronous/SSB Detector

The series of articles that Ray referenced in Hollow State News Letter is a type of synchronous detection where the BFO internal to the 390A is connected to the AGC amp tube thru a filter. I have never tried this but the articles report varying degrees of success. One thing to note is that this sync detector is NOT compatible with the Langford SSB/AGC mod that has been discussed lately.

Date: Wed, 24 Jan 2001 10:58:10 -0800
From: Leo Jormanainen <lexa@mail.island.net>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

The Sony ICF-2010 uses a AM-stereo chip as a SSB detector.

Date: Wed, 24 Jan 2001 11:31:40 -0800
From: "Roger L Ruskowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] Internal Synchronous/SSB Detector

The series of articles that Ray referenced in Hollow State News Letter is a type of synchronous detection where the BFO internal to the 390A is connected to the AGC amp tube thru a filter. I have never tried this but the articles report varying degrees of success. One thing to note is that this sync detector is NOT compatible with the Langford SSB/AGC mod that has been discussed lately.

Date: Wed, 24 Jan 2001 16:55:54 -0500
From: "Bill Marx" <bmarx@bellsouth.net>
Subject: [R-390] External Synchronous/SSB Detector

Sherwood makes about the best one around but at \$400 I can buy another 390A in fixable condition....

Date: Wed, 24 Jan 2001 16:47:22 -0600
From: "Dale LeStourgeon" <DLESTOURGEON@ci.tulsa.ok.us>
Subject: [R-390] External Synchronous AM/SSB Detection

Seeing recent posts on this subject reminded me that I saved the article from Communications Quarterly (Fall-94 by KB9Y) with the intent to build one. It is a neat circuit, and indeed FAR Circuits still sells the board. You could build it for peanuts. Only problem is finding the MC13022 AM Stereo decoder chip. I found some at a liquidator recently, so more are probably out there.

Date: Wed, 24 Jan 2001 14:54:17 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] USB is -1.5 LSB is +1.5

See the above on how to set the BFO for USB and LSB (provided you had the zero point set at 455). This is from the R-390A operator's manual.

Date: Wed, 24 Jan 2001 17:53:18 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Ultimate BFO Zero Beat

.....BFO having a center position for calibrate and an offset for SSB signals.

Usually the offset was at +1 or so for USB and -1 for LSB .

Actually, put it at -1 to -2 for usb and +1 to +2 for lsb.

Date: Wed, 24 Jan 2001 17:56:34 EST
From: Llgpt@aol.com
Subject: Re: [R-390] External Synchronous/SSB Detector

Place an ad for a Kiwa map Synchronous Detector. I've had one sine the early '90's, works great. They are no longer in production.

Date: Wed, 24 Jan 2001 15:53:44 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

will post the web location of the data sheets just as soon as I can find them all again. There is a hard copy stack 18" high I need to look through. That's just to locate the data sheets. I will list those parts and then look them all up again. I am not finding the MC13022A chip data sheet at Motorola so I have soon hunting to do. There is stuff out there and we should be able to do a cable on project under the \$150.00 level. Of course any one is free to go any way they want. But from the comments about the Evil Bay, I did not think most of you were of the \$400.00 Sherwood mind set.

Date: Wed, 24 Jan 2001 16:52:21 -0800
From: David Ross <ross@hypertools.com>
Subject: Re: [R-390] USB is -1.5 LSB is +1.5

"USB is -1.5 LSB is +1.5" akes good sense, but is this really & truly the same on all R-390A bands? I've heard that, on the R-390A, the BFO sense is 'upside-down' on some 1 MHz bands due to the IF mixing scheme. Had to do with reducing the number of HFO crystals. (Yes, I know I know, and I _would_ check it myself it the poor old A-model was up & running...)

Date: Wed, 24 Jan 2001 18:46:17 -0600
From: "Cecil Acuff" <chacuff@datasync.net>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

I second Jerry's sentiment! It's kinda in the spirit of this whole thing anyway!

Date: Wed, 24 Jan 2001 19:04:40 +0000
From: blw <ba.williams@home.com>
Subject: Re: [R-390] Ultimate BFO Zero Beat

If you are asking about using the BFO during reception, then you do set the BFO to zero for calibration. For receiving SSB signals, you set the BFO to a setting of half the filter setting you are using. In other words, if you are using the 4 kHz filter you should set the BFO to -2 for USB and +2 for LSB. This is per the -10 user's manual.

Date: Wed, 24 Jan 2001 20:06:33 EST
From: Llgpt@aol.com
Subject: Re: [R-390] External Synchronous/SSB Detector

No, there was not...it was a modification to the R-390A and didn't involve adding/subtracting tubes. HSN No. 17, Fall, 1987 pages 3 thru 4.

Date: Wed, 24 Jan 2001 20:47:37 -0600
From: "Paul Staupe" <ptstaupe@comdisco.com>
Subject: Re: [R-390] Synchronous/SSB Detector

I've done many deals with Rob Sherwood over the years, (since the 70's (!)) and although he charges a premium price for his SE-3 mark III, I have to say in all humility that it's the best accessory that I've ever used, bar none. I had Rob rebuild and outfit my R-4Cs back in my contest days, and his outboard filters for the Drake line were an excellent precursor to the SE-3 Mark III. Since Rob is an independent operator and has a day job.... issues about his profit margin on this box should be tempered by the fact that he spent a lot of engineering time on this project and many other projects to further the state of the art in electron tube technology.

Date: Wed, 24 Jan 2001 22:58:55 -0600
From: Gary and Susan <garylandsusanawebb@prodigy.net>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector

Not synchronous but external: One external product detector was described in November 1985 issue of Ham Radio magazine. The article specifically mentions that it was designed to be used with R390A's. Looks easy to build. Haven't tried it myself though.

Date: Thu, 25 Jan 2001 11:56:49 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] R-390A SSB detector

I'm in the process of building an outboard solid-state product detector for my R-390A, if that's of any interest in this sync AM detector discussion. Yes, it can be done with tubes too; anybody got any 7360 sheet-beam deflection tubes laying around? I decided to use the old reliable Motorola MC1496 chip, which I've used successfully in the past as a doubly-balanced mixer and as a modulator in a homebrew QRP single-sideband transceiver. I have chatted with Ed, WB2LHI, about his circuit, which also uses the 1496. He supplied me with a Word file and schematic. His circuit gave me some food for thought, such as the use of a 28 V power source to get enough AGC voltage swing to be "plug-and-play" compatible with the '390. His AGC circuit provides a fast-attack, slow-decay AGC action. I expect to duplicate it. Ed uses a free-running BFO and buffer, but I've built up a crystal-controlled BFO instead (I had the rocks from an RT-718/KWM2-A). The xtals are diode-switched (and I use LEDs so I can see what I've selected from the front panel of my outboard adapter). The oscillator works fine, with a nice 2-V p-p

sinewave output at either 456.3 kHz or 453.6 kHz. I anticipate dropping that level to 300 mV as per Motorola's spec sheet requirement for the LO port on the chip. The 1496 detector chip sub-circuit is almost finished, and I'll test that on the bench soon, so I hope to have a report on that shortly. So far, the chassis packs a transformer-operated full-wave power supply (the xfmr was pulled from a defunct "brick" or "wall wart" [the ol' Dremel tool was used to cut it open]), a 30-V regulator (an LM317), a 12-V regulator (a 7812), an ON/OFF toggle switch, power LED, BNC IF-in connector, RCA phono jacks for AGC-out and audio-out, a DPDT switch for AM/SSB selection, an SPST toggle switch for AGC time-constant selection, an SPST toggle switch for USB/LSB selection, a panel-mounted pot for IF level-set, and an internal pot for AGC level-set. I suspect the Philips NE602 or other improved mixer chips would also work, but I have the 1496s and the experience using them, so that's what I'm using.

Any thoughts? This project is under construction, so changes can be wrought as I see fit. Suggestions and comments are welcome.

Date: Thu, 25 Jan 2001 11:05:39 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] R-390A SSB detector

I like the 28 volt and AGC way. We could use a 9 pin plug into the 3FT7 socket and run the whole thing on a board under the top cover. Pull 28 volt AC from the filament circuit. We could use other pins to bring up the 455 and push the AGC and Audio back into the IF deck.

Date: Thu, 25 Jan 2001 15:02:28 -0600
From: "Tanker" <bloper@ix.netcom.com>
Subject: Re: [R-390] External Synchronous/SSB Detector

I just to see ran my R-390A IF output into an HF8054A set on 455khz and got perfect SSB copy. I guess all in all a product detector is the easiest route though

Date: Thu, 25 Jan 2001 16:41:12 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] R-390A SSB detector

I don't know Ron. What's a PD-1?

Date: Thu, 25 Jan 2001 15:55:43 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R-390A SSB detector

The NE602 is far simpler to use than the 1496 because most of the '602 ports are already terminated internally and it doesn't need external balance adjustments. It is low power and therefore not great at handling really strong signals. 7360s never have been very common and are far less common now. They could be considered rare and very collectable, hence very expensive.

Date: Thu, 25 Jan 2001 19:12:53 EST
From: DJED1@aol.com
Subject: Re: [R-390] R-390A SSB detector

If you want the installation disappear, that's the way to do it. I chose to design the adapter so it connects to the IF output, the AVC terminals on the back, and the diode load terminals. I didn't even have to take the radio out of the case (but I did have to use a wall-wart for 28V)

Date: Fri, 26 Jan 2001 09:34:44 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] R-390A SSB detector

Thanks Ron. I'll check it out--but my 1496 detector is coming alive on the bench, so I guess it's a moot point.

Last night I fired up the BFO buffer circuit, and routed its output into the mixer as well as a signal from my URM-25, and the mixer works.

Got good audio output into my signal tracer. The packaging and AGC circuit continues. I'll keep you posted.

Date: Fri, 26 Jan 2001 08:35:47 -0800
From: "Roger L Ruskowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] R-390A External Synchronous/SSB Detector Planing 001

The NE and SA 602 variants and the NE and SA 612 variants are all good double balanced mixers formed on the Gilbert Cell design. I agree with Jerry the Motorola Chips are not as simple. But if Alex (see below) can debug a circuit that's easy to reproduce, then we could use that chip. Alex AI2Q, in Kennebunk, Maine has a 1496 detector coming alive on the bench. Last night I fired up the BFO buffer circuit, and routed its output into the mixer as well as a signal from my URM-25, and the mixer works. Got good audio output into my signal tracer. The packaging and AGC circuit continues. I'll keep you posted. Alex.

The 1st five chip plan from back to front.

Chip 5 an audio amplifier a LM (your choice .5 to 5 watt 8ohm output)

Chip 4 a NE / SA - 602 / 612 or 1496 double balanced mixer

Chip 3 an AGC IF amplifier between the input and the mixer

Chip 2 a PLL with switched LSB AM USB center free running values

Chip 1 an IF amp and limiter to develop a reference frequency.

Chip 1 accepts the IF signal and amplifies it until the level can be limited to provide a reference signal for the Phase Locked Loop (PLL).

Chip 2 is a PLL that in the absence of a reference signal (fade out of receiver signal) will free run at 455Khz. Three different oscillator tanks can be used. One tuned to 453 455 457. When a signal is present the loop would lock to the reference

and drive the double balanced mixer with a good stable mixer signal of the exact frequency. On receiver signal fade the PLL would free run near the correct frequency. The two offset selections would let the SSB signal be centered in the narrower filter bandwidth of the receiver. With a good receiver signal the PLL output would be locked to the signal frequency and provide for synchronous detection. With a weak signal the PLL would loose lock and free run near the receiver signal and provide pseudo synchronous detection.

Chip 3 is an IF amp with an AGC circuit. This will accept the IF from the receiver and within the AGC range present the mixer with an optimum level of input signal.

Chip 4 is a double balanced mixer. One input is the AGC leveled IF signal. The second input is the PLL output. The output would be the synchronous detected audio.

Chip 5 is a stereo audio amp. One side is the audio out. The second channel would be used to produce the AGC voltage. This could be designed to also provide the AGC for the R390 if we want.

Lab experiment one will be wall wart powered. 455 IF coax input. Radio shack proto board mounted. In line DIP chips. Small speaker (4-8 ohm) output.

Nominations for chips is now open.

Date: Fri, 26 Jan 2001 12:30:54 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] R-390A SSB detector

Thanks Ron, but I don't have the resources to do that. I'm strictly a homebrewer! By the way, as per your suggestion, I looked at the PD-1 product from Electric Radio. It's nice that they provide the schematic for the box. However, it seems to me to sidestep too much of the R-390A's existing circuitry. Also, it makes no provision for AGC, for example, and the on-board op-amp used as an audio output stage looks too meager for my taste. Also, why use the 1496 chip as an AM detector when there's a perfectly good one in the existing radio? Food for thought.

Date: Fri, 26 Jan 2001 12:17:39 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector Planing 001

Except that its impedances are around 50 ohms, the SBL-1 double balanced mixer from MCL is even simpler to use than the NE-602 and has far better dynamic range. Once the PLL locks to the incoming carrier (and it is noise sensitive unless the VCO has narrow range and very good stability), because there's usually a 90 degree phase angle required between the carrier and the VCO, there's a need for a 90 degree phase shift to the AM detector to recover AM. Otherwise you will be recovering the PM of the signal. Precise 90 degree phase shifts are a pain to produce. I think I prefer a narrow filter to the limiting amplifier for carrier isolation.

A limiter can't tell the difference between carrier and tones (e.g. music) in the sidebands or in interference.

There also has to be some sort of low pass filter after the detector to keep BFO leakage and IF leakage out of the audio amplifier.

Except for carrier lock, the receiver boards by KK7B already have everything but AGC built in. Sold by Kanga, I think.

There are possible alternatives, though they may involve more complexity and not just plug onto the receiver. One is a fixed frequency BFO, (crystal for stability), and the PLL moves the receiver LO to affect lock. The TMC receiver out in the garage did that, though when it wasn't trying for pseudo synchronous detection, it had a PLL to lock the LO to a slightly dirty mixed crystal reference synthesizer, so it used alternate phase detectors for different applications. Or the synchronous detector could have an additional IF at some frequency other than 455 Khz and the mixer oscillator for that conversion could be warped.

I've not seen the recent ARRL handbook circuit.

AGC is a real problem because of the frequency dependent propagation effects on AM signals. Controlling by amplitude of carrier can be wrong, controlling by recovered audio doesn't allow for modulation level changes according to the program material, controlling by power level in the IF bandpass can be wrong due to interference. Probably there needs to be a combination of AGC sources. Perhaps the peak value of the carrier or each sideband independently.

There were some very good references on synchronous detection (mostly applied to DSB reduced carrier) in the December 1956 issue of the Proceedings of the IRE, an issue on SSB.

Date: Fri, 26 Jan 2001 13:26:51 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] R-390A External Synchronous/SSB Detector Planing 001

Very pleased to see the activity. If any help is needed from a tech with a lot of mileage on the clock let me know. Looking forward to a schematic and parts count. What a great hobby we have. Working together internationally. To bad some of our politicians could not be the same.

Date: Fri, 26 Jan 2001 14:40:19 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] SSB detector PD1 at \$130.00

Yes available today. you can have one in the mail to you yet today before the close of business. Visit Chucks page and read his review. Betcha Alex in Kennebunk, Maine offers us a do it ourself circuit for less and offers it before we can get a design together ourselves.

Date: Fri, 26 Jan 2001 23:17:00 -0600
From: Doug Walker <dwalker@telepak.net>
Subject: Re: [R-390] SSB detector PD1

PD-1 works well for me. It may not be perfect, but it's quick 'n easy sideband without resorting to modification, such as addition of a product detector. Of course, I've still got an old B&W sideband adaptor (slicer) as one of those "future" projects.

Date: Sat, 27 Jan 2001 21:32:38 -0500
From: Thomas W Leiper <twleiper@juno.com>
Subject: Re: [R-390] External Synchronous/SSB Detector

How about the original boat anchor synchronous detector... the CV-157. It's got the PLL and everything. And, you can find them all over the place, like sheep in a meadow... just go out there and pick them up with a spatula.

Mine was being used as a doorstop at a laundramat, then I found two more being used as entrance piers to my neighbor's driveway.

Finally, I found one being used as a mooring block for the stern line of the Intrepid Air & Space Museum on the west side of Manhattan.

Date: Sun, 28 Jan 2001 03:44:22 +0100 (CET)
From: Herr Demmer <dd8bd_@freenet.de>
Subject: [R-390] improving ssb reception

Hi all, digging around for old articles on the R-390(...)s in order to find information about improving the R-390A agc performance I found an article in the HAM RADIO issue of July 1977, page 88 f, "Improved ssb reception with the Collins R-392" by VE3LF. Has anybody tried this circuit with a R-390A ? What are the experiences? The circuit of VE3LF uses 3 FETs and few more parts and should result in a "dramatic improvement in ssb reception performance" following the author.

Date: Sat, 27 Jan 2001 23:01:09 -0500
From: "Chuck Rippel" <win.308@home.com>
Subject: [R-390] Possible R390A SSB Discovery

Was talking to fellow RF guru Jim Walker up in Stowe, Ohio this evening about a couple of R390A problems he was having. We worked through them and he happened to mention that he and Noland had some Clevite mechanical filters. Clevite was one of the (4?) contractors who built filters used in the R390A which include: Collins, Dittmore-Friemuth, White Water Labs and Clevite. (Did I miss one Les? Who did the crystal filters I hear about?)

I digress.... Together, I think Jim and I may, and I emphasize MAY, have come up with an important discovery: there may be some R390A receivers out there that were intentionally designed to receive true SSB without an external converter. I

suspect it would be a random retrofit v/s a specific build as we would see some different small run order numbers popping up.

Recently, Jim had tested several of the Clevite filters and found them not to be resonant on 455kc but on 458. (feel free to add to this Jim, if you are "listening"). Help me out here list, I am not an SSB theorist, but wouldn't the carrier oscillator frequency or BFO injection frequency of a receiver using a 455kc IF be tuned to 458kc in order to receive upper sideband?

In as much as the military uses USB almost universally, it would make sense that if an R390A variant were designed to truly operate on SSB, it might have the SSB module I have pictured on the WWW site >plus< a suite of ASYMETRICAL (for SSB v/s SYMETRICAL for AM) Collins mechanical filters installed?

Those of you who have asked me "how well do R390A's work on SSB?" Get the standard answer, "not real well, they are (each one I have ever come across, anyway) equipped with symmetrical mechanical filters designed for AM. Yes, you can inject the BFO at increased levels, make the Captain Lee (?) mod (help me on that one Les, I always forget his name despite it being discussed in old issues of The Hollow-State News in detail) that R390A's lack one very important component for effective SSB work, ASYMETRICAL IF filters. Thus, IMHO they are sub-standard SSB receivers, blah, blah, blah.....

Indeed, Collins factory part number tables assembled by the Collins Collectors Association do describe 2 types of filters for A3 emission for many of their receivers and transmitters. The symmetrical for AM reception is assigned one part number and the asymmetrical for SSB another.

Jim and I agree that to find one filter on 458 kc means only that you have a filter resonant on an "incorrect" frequency suggests more than simple coincidence.

Thanks to Jim's phone call to me tonight, together, we informally pieced this puzzle into something that might fit together with regard to this SSB business.

This will give Tom and Les a new tangent to head off on.

Just goes to show you, once you think you've heard it all, something else pops up.

Date: Sun, 28 Jan 2001 00:12:28 -0600

From: "Joe L. Reda" <joer@reda.com>

Subject: Re: [R-390] External Synchronous/SSB Detector

Ha . . if anyone's got a CV-157 that's taking up too much space, I'd be happy to move it out for 'em . . haven't found one yet!

Date: Sun, 28 Jan 2001 01:59:43 -0500
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Possible R390A SSB Discovery

Any connection to the Clevite ceramic filters that were used on a short run (we think) of '60 EAC's? Or is that just a coincidence, i.e. Clevite did mechanical filters as well? Are there any date clues on the receivers you've seen like this, particularly on components that may have been subbed when the alternate filters were installed?

> Recently, Jim had tested several of the Clevite filters and found them not
> to be resonant on 455kc but on 458. (feel free to add to this Jim, if you are
"listening")

Anything special about how the filters are marked? Maybe we have to start compiling filter part numbers to make sense of it. I suppose some pilgrims might have trouble aligning units that were converted. Would this affect alignment, or would you just do the standard stagger tuned job, etc.?

. Help me out here list, I am not an SSB theorist, but
> wouldn't the carrier oscillator frequency or BFO injection frequency of a
> receiver using a 455kc IF be tuned to 458kc in order to receive upper sideband?

Me neither (SSB theorist). Other possibilities might have to do with RTTY, etc.

> In as much as the military uses USB almost universally, it would make
> sense that if an R390A variant were designed to truly operate on SSB,
> it might have the SSB module I have pictured on the WWW site >plus<
> a suite of ASYMETRICAL (for SSB v/s SYMETRICAL for AM) Collins mechanical
filters installed?

Again -- seems like a job for the forensic archeologists digging down to the part number level. Pottery fragment and arrowhead stuff.

> Those of you who have asked me "how well do R390A's work on SSB?"
> Get the standard answer, "not real well, they are (each one I have
> ever come across, anyway) equipped with symmetrical mechanical filters
> designed for AM. Yes, you can inject the BFO at increased levels,
> make the Captain Lee (?) mod (help me on that one Les, I always forget
> his name despite it being discussed in old issues of The Hollow-State
> News in detail) that R390A's lack one very important component for
> effective SSB work, ASYMETRICAL IF filters. Thus, IMHO they are sub-
> standard SSB receivers, blah, blah, blah.....

Hmmm, sounds like a lead in for a follow up feature article.

> Indeed, Collins factory part number tables assembled by the Collins
> Collectors Association do describe 2 types of filters for A3 emission

- > for many of their receivers and transmitters. The symmetrical for AM
- > reception is assigned one part number and the asymmetrical for SSB another.

Of course, the part nos. wouldn't correspond to what you found there, right? That would be too easy, unless something was embedded in the numbers, like "458" vs "455". That would also be too easy I suppose.

- >
- > Jim and I agree that to find one filter on 458 kc means only that you
- > have a filter resonant on an "incorrect" frequency suggests more than simple coincidence.

Only one of the four? There was a thread on aging filters going off spec. from the uh, I guess, vibration. Are they like some resistors which all have a tendency to drift upwards over time? I guess there's no sign of a marking or aluminum self adhesive label in the bandwidth switch area? Which one of the filters is 458? -- same position on both receivers? 'know what I'm drivin' at? Of course, what I'm doin' is like "carrying coals to Newcastle", as you have probably seen the innards of more R-390A's than practically anybody.

- > Thanks to Jim's phone call to me tonight, together, we informally
- > pieced this puzzle into something that might fit together with regard to this SSB business.

Isn't use of the phone cheating? ;-)

- > This will give Tom and Les a new tangent to head off on.

Yup. Actually, tracking down to module level would be the next stage -- if someone really wanted to. That answers the depot dog issue as well. Reconstruction by original whole radio contract tells us what was so originally, but there was a long road after that with on site module swapping, wholesale overhauling at the depots, etc. So, tags don't mean much, as we've learned, and neither do the markings on the back panel, when available -- as far as identifying what we have now. Of course, some might say that'd be picking the flyspecks out of the pepper shaker, but, hey, it's like the mountain climber who climbs mountains "because they're there".

- > Just goes to show you, once you think you've heard it all, something else pops up.

The late "Rosanadannadanna" said it best .. "If it's not one thing, it's another thing, and if it's not that, it's something else, and" While we're on the subject of "something else", I've posted before on another modification that I'm looking for information on. Probably not related to this filter question, but the general situation might suggest something. I have three A's which all came from the same source on the West Coast. They all have regular R-390A tags, all depot dogs, but dogs-with-a-difference. They have extra self adhesive stickers saying "R-1980" and "Contains TMC Mod Kit #375" on their front panels. There's a small metal box on

the back panel, partly covering the Xtal Osc. adjustment access hole, which contains a pc board with SS components -- an IC or two included, as I recall -- sporting two BNC's and one MB connector. Two additional bnc jacks are added to the back panel itself. There are several MB - T-connectors tapping into various points, plus a small metal box under the xtal calibrator which elevates it up to the level of the cutout in the Utah cover. The PTO is definitely involved and it looks like at least part of the mod was supposed to hook up to an external frequency counter (or two), but there are about 5 extra connections all together. Possibly a delta frequency setup to interpret the counts? But also possible for some injection of some external stuff, I guess. What relevance, you ask? These three were in a master crate of surplused out radios along with 4-5 others like them. They had been in storage for at least 8 years. Components seem to range from '60 to '67 -- all mixed, refinished front panels, mixed tags, etc. As if they were taken fresh from depot overhaul for installation of the TMC #375 kit. The "R-1981" sounds like something somebody made up on the fly -- probably in 1981. Soooo. after that shaggy dog story -- and these are a bit shaggy, tho' 2 of three work so far -- If the 458 kc thing was actually a mod, then it probably was done in batches, probably at the depot level and possibly right after refurb. There should be some tell-tale somewhere. However, if the mod was limited to the IF deck, it could have been handled as an on site module swap-out. Even so (the dead horse is still moving), I'd think the module would have a marking somewhere it could be seen by a tech doing an alignment -- sticker or stamp on the filter cover or whatever. It's probably too late to lift fingerprints.

Date: Sun, 28 Jan 2001 03:46:23 -0800
From: eengineer@erols.com
Subject: Re: [R-390] Possible R390A SSB Discovery

Pictures of Clevite filters can be found on my two of my webpages:

<http://users.erols.com/eengineer/clevite.html>
<http://users.erols.com/eengineer/Collins.html>

Date: Sun, 28 Jan 2001 09:01:38 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Possible R390A SSB Discovery

Motorola also made mechanical filters. Not sure i know anything about who manufactured the x-tal filters. Chuck, that sounds reasonable to me. Jim and I spoke about this very problem about 1-1/2 weeks ago. I just figured he had a bad filter when he mentioned only one peak. Yes, it was Captain Lee...of course there have been offshoots and variations of his original modification.

I have always thought that the agc characteristics of the R-390A were poor even for am listening. The Lankford/Chambers agc/ssb mod corrects this problem much easier than Captain Lee's mod. The attack and decay times for all three positions, slow, med and fast need to be speeded up. The Lankford/Chambers mod does this.

Date: Sun, 28 Jan 2001 09:03:05 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Possible R390A SSB Discovery

No, they didn't, the filters in question were Clevite ceramics.

Date: Sun, 28 Jan 2001 10:51:18 +0000
From: blw <ba.williams@home.com>
Subject: Re: [R-390] Possible R390A SSB Discovery

Thanks for deepening the mystery of my TMC #375 kit radio too! I've asked for many years about that tag and nobody seems to know a thing...until you just mentioned it too. That got me curious, and I went and looked at the back. Sure enough, there's 2 small holes drilled into the chassis just left and above the xtal osc adjustment hole. Sure looks like a box would partially cover the adjustment hole if those holes were near the corners of a box like you describe. The other 2 holes are to the right under the IF output jack- so the box would have been oblong. Also, there are 2 mystery BNC jacks. One is between the IF output and unbalanced antenna connector. The other is above the F101 fuse with a stick on label stating, ERROR J1104. The other jack has glue remains where a label was stuck on at one time. There are no marks on the clean chassis where a can cover might have sat for a while. There is no sign of another box under the xtal calibrator like you mentioned. That extra unmarked BNC plug is not hooked up to anything. The extra BNC plug marked ERROR J1104 has a mini coax cable going to the VFO subchassis with a locally made dynamo tag saying, CA 480-1174-17. It goes to the VFO subchassis right next to V701. I can see it going into a grommeted hole between the Cosmos and the S701 wire bundle. That's about all I can see for now.

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We had a discussion on the 67 EAC on the list some time back, and that got me curious on that radio. It was tagged as a Stewart-Warner. The chassis is clearly marked as a 67 EAC. The AF deck is EAC, as well as the power supply. The RF and IF decks are identical in workmanship, markings, sheen, etc and I'll bet anything they are EAC components as well. I'll know when I take

them out soon. Has a new Cosmos PTO. I ended up swapping tags with someone on the list who had a 67 EAC tag and wanted the S-W with contract # just like I had. Got lucky on that one.

Let me know what you find about your batch of radios. This is all very interesting. I didn't find any place where a R-1980 tag could have been. There is a bit of old glue where the freq cards normally were at, but nothing else. There is all evidence this was not a depot dog, but a radio manufactured and then left bagged somewhere for years. No scratches or marks where work was done on it. No rubs or normal dings. The front tag is the only odd thing when looking at all of the radio and the impression you get from it.

Hope you find out more on these radios. I was puzzled by this one, but I'm really curious after reading about your 3 radios.

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 - > three work so far --
-

Date: Sun, 28 Jan 2001 22:56:22 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] Possible R390A SSB Discovery

The talk of symmetrical vs asymmetrical filters for SSB reminded me of an old Collins mechanical filter catalog from the seventies that I have. There have two types of filters listed as Chuck mentions. The symmetrical ones are like what is in the 390's. These can be used to receive SSB by placing the carrier or BFO about 20 db down on either side of the filter passband depending on which sideband you want to receive. Thus by using one filter and two BFO oscillators both USB and LSB can be received. This type of filter work fine in this application as witnessed by all of the Collins S-Line and A-Line equipment and that of many other manufacturers. The so called asymmetrical or sideband filters are still symmetrical filters (by the shape of their pasband shown in the Collins catalog) but the center frequency of the filter is offset to the point of where the BFO frequency would be if a single filter was being used. In this configuration two filters and one BFO oscillator is required to receive both USB and LSB.

This system is used in the Collins 51S-1 and later commercial receivers. By using the two filter system one is able to detect Independent Sideband transmissions where two different signals are transmitted, one on each side band. To receive ISB the receiver also needs to have two separate IF, detector and audio systems after each filter. By putting the BFO frequency some 20 db down the filter passband makes both types of filters asymmetrical with respect to the desired signal because the carrier or BFO is the reference point.

In my opinion, and that's all it is, the 390A doesn't do well at receiving SSB not because of the filters but because of the AGC design in the receiver and the lack of a product detector. I believe the attack time of the AGC is too slow and the delay needs some adjusting. To a large degree this is what the Langford AGC mod addresses.

A product detector is the correct way to demodulate a SSB signal. As to Chuck's possible discovery of a SSB 390 with a filter having a center frequency of 458 KC for USB is entirely possible. In the S-Line difference between the filter center frequency and the two BFO frequencies is 1.35 KC In the 51S-1 the difference between the 500 KC BFO oscillator and the center frequencies of the two filters is about 1.5 KC.

The 3 KC difference that Jim and Chuck discussed may seem a bit large but the frequency difference is a function of the filter bandwidth. Hopefully this was of interest to someone, but if not there is always the delete key....

Date: Mon, 29 Jan 2001 15:39:30 -0800
From: "Roger L Ruskowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] External Synchronous/SSB Detector 002

Once upon a time the NE561 and SA561 PLL were in production as the one chip AM synchronous detector solution. If we can find these still in production it would be a way to go for about \$3.00 each. These are 26 - 30 volt devices.

A \$15.00 Five chip solution is as follows.
NE604 IF Amp and limiter.
NE562 PLL operating at 1,820,000 hertz (4 x 455)
CD4013 Dual D flip-flop /4 90 degree quadrature signal from PLL
NE602 Double balanced Phase Modulator.
LM 384 5 watt audio amp.

The NE 604 RF section is used as an AGC stage to provide a more uniform (within AGC range) level of signal into the detector. The limiter section is used to provide a limited reference for the PLL.

The PLL would provide a constant out to the detector. On signal fade the PLL offers a better circuit than the changing level of the input signal. The down side is the PLL set up at 90 degree out of phase with the signal. So we run the PLL at four times the 455Khz and then divided it by 4 back down to the necessary 455. the flip-flop gives us the 90 degree shift we need between the PLL and the signal. The PLL should also free run near the 455 AM 453 LSB or 457 USB to provide a better output with weak signals.

The CD4013 is a Cmos 7474 dual D flip-flop. The CMOS just fits with the voltage levels of the NE logic chips better than the five volt level of the TTL chips.

The NE602 is the double balanced demodulator.

The LM384 with 5 watts should be ample audio output.

Now to do a schematic so we can build a circuit for testing.

Date: Mon, 29 Jan 2001 19:50:19 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] External Synchronous/SSB Detector 002

I tried to use a NE561 or 560 more than 20 years ago to "clean" up noise on a WWVB signal at 60 KHz. The quality of the VCO was so bad it took a slightly noisy signal and left it as a very badly buzz modulated signal. The 560 family chips looked like they'd do a lot better than they did. As a practical matter, the VCO would need to be made practically crystal controlled to be a useful receiver accessory.

The CD-4013 making a quadrature signal will have more error than you can allow because of delays inconsistent at rise and fall and output port and still have decent side band rejection. The propagation time is too variable. something in a 74F or 74HC might be consistent enough. Been there tried that too.

The 56x family mostly will run at 26 to 30 volts maximum but will work adequately at lower, like maybe 12, and converting to TLL level isn't a great problem.

Date: Tue, 30 Jan 2001 11:12:42 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] USS Albacore radio room restoration R-1051 progress

Well, I got my 1496-based LSB/USB adapter off the bench and connected to my R-390A, so the ol' workbench was freed up for the next project, the USS Albacore's radio room restoration.

By the way, the SSB adapter works great. It makes it *very, very* easy to tune SSB, and the AGC action is fine. I do have a defective pot in the limiter of my R-390A, and that's causing some hum, but if I can get a replacement pot, I'm sure that problem will be resolved (does anyone have a limiter pot/switch assy. for sale or trade?)

If you want to really see how well a -390A plays on SSB, I encourage you to build up a product detector! Thanks to WB2LHI, Ed for his ideas and encouragement on the product detector circuitry. His uses a free-running BFO; mine uses 456.3 kc. and 453.6 kc. xtals, but either way is fine. It doesn't have to be rockbound to be stable.
<snip>

Date: Wed, 31 Jan 2001 11:47:33 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] BFO position and SSB

Recently, there was a thread about where to set the BFO for proper SSB reception. It is known that setting the BFO to approximately -1.5 for USB and +1.5 for LSB is the correct thing to do as it places the signal in the center of the passband of the filters.

I began to wonder if there was something wrong with the IF alignment, though, as I could place the BFO virtually anywhere between -2 and +2 and still hear SSB by adjusting the kc as needed. I found out last night, though, that there is indeed an audible difference where the BFO is positioned.

I selected a nice, clear, 75M LSB roundtable discussion (a very enjoyable discussion of loop antennae, feeder stubs, etc.) and placed the BFO at +1.5. The signal was nice and clear. I then put the BFO at zero and retuned the signal with the kc adjust. Sure enough, I was able to hear a slight distortion as part of the signal fell outside the passband. Going back to +1.5 and retuning and the signal was very clean again. It takes a good, clear, signal to hear it, but it is definitely different. Using this

method, I found I could even select the 0.1kc filter position and still get a fairly intelligible signal.

It is amazing at how "present" SSB sounds in the R390A, even though it has no product detector. I prefer listening to it rather than my TS440S/AT. Somehow, it just sounds better.

Probably not anything in this message that most don't already know, but I didn't have anymore good boyhood danger stories to share although I did try to make gunpowder one time. It didn't work. I suppose it's a good thing, though, as the quantity I was playing with would have precluded me from sharing my story with the living. Sign me as another happy R390A customer...

Date: Wed, 31 Jan 2001 18:43:25 -0600
From: "Spencer Petri" <wa5jci@flash.net>
Subject: [R-390] Synchronous Detector

June 1957 issue of CQ contains a tube type synchronous detector. Looks pretty interesting. It uses RC phase shifts but with DVMs the values should be easy to fabricate. Anyway if anyone is interested I could send as a series of GIF files.

Date: Wed, 31 Jan 2001 19:42:01 -0500
From: Dennis McLaughlin <dennism2@ix.netcom.com>
Subject: RE: [R-390] Possible R390A SSB Discovery

Go to http://www.logsa.army.mil/etms/find_etm.cfm and look for:

R-1981:
TM 11-5895-288-35 AN/TSC-20,AN/TSC-20A,AN/TSC-25 (2.1Mb)
TM 11-5895-288-24P AN/TSC-25 (16.8Mb)

One of these TM's had a few pictures of the modifications you described below. This was for a R-1981 not a R-1980. I don't know what the difference is. The TSC-20, TSC 20A and TSC-25 use some sort of SSB RTTY decoder that must of monitor and control the oscillators in the R390A to maintain a decoder signal lock. Thanks to Dave Merrill for the link and R-1981, R725 TM numbers.

- ----Original Message-----

From: blw [SMTP:ba.williams@home.com]
Sent: Sunday, January 28, 2001 5:51 AM
To: Chuck Rippel; r-390@qth.net
Subject: Re: [R-390] Possible R390A SSB Discovery

Barry,

Thanks for deepening the mystery of my TMC #375 kit radio too! I've asked for many years about that tag and nobody seems to know a thing...until you just mentioned it too. That got me curious, and I went and looked at the back. Sure enough, there's 2 small holes drilled into the chassis just left and above the xtal osc adjustment hole. Sure looks like a box would partially cover the adjustment hole if

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 Date: 31 Jan 01 17:46:21 -0800
 From: "Richard McClung" <richard_mcclung@tcibr.com>
 Subject: RE: [R-390] Possible R390A SSB Discovery

RE: [R-390] Possible R390A SSB Discovery
 You might also try here for info on your TMC question:
 WebSite < <http://www.geocities.com/tmcvintage/index.html> >
 Reflector < tmc@qth.net >

Tony Faiola, K3WX (ex W2GBS) is a former engineer at TMC and mabe able to help you out.

 Date: Wed, 31 Jan 2001 21:45:12 -0500
 From: twleiper@juno.com
 Subject: Re: [R-390] BFO and other stuff

Maybe I am missing something here...have we forgotten just what a "sideband" is? It is the "product" of the carrier frequency and the modulation frequency, which is why it is best decoded with a..."product detector" ??? If I modulate a 4000 KC carrier with a pure 10KC tone, and then remove the carrier component of the signal, I will have only two frequencies at which energy is present... 3990 KC and 4010 KC. These are the lower and upper "sidebands", and if I remove the lower component, it means that my receiver must be tuned to BEST receive energy at 4010 KC. This means that I would have to DROP my BFO frequency by 10 KC to have it "beat" with the non-existent or suppressed carrier. If all I was going to do was receiver 10 KC tones from people rude enough to transmit them, this would be an excellent way to tune my receiver, in fact, if it weren't for the fact that my detector and audio path can't really do much with it, you could even receive that

signal with 100 Hz selectivity as long as it was dead on. But in real life you have speech, and practical speech communication limits wasted energy over 2 or 3 Kc that adds little to the intelligence, and most of the energy falls more in the 100 hz to 2500hz range. Music requires a bit more, but almost nobody (except for pirates, maybe) is intentionally using more than the 10Kc of bandwidth customary in AM broadcast, and it is more like 8 Kc or less. So to receive your pipe organ and cymbal ensemble broadcast on USB, you would want to dial your selectivity to 8 Kc and tune four Kc above the carrier frequency, and offset the BFO down 4 Kc. BUT...If you decided to use 16 Kc selectivity, YOU WOULD NOT crank your tuning up another 4 Kc and your BFO down to minus eight (if it were possible)...because the signal is still topping out at 8 Kc.

The main tuning and corresponding BFO offset tuning should be in the amount of the AVERAGE MODULATION frequency of the received signal... period.

If you want to receive highly compressed voice modulation such as aircraft communications which fall between about 500 and 2000 hz, you're going to want the tuning and BFO offset to be .5 Kc to 1 kc regardless where you choose to crank the selectivity setting. All that opening the bandwidth up will do is allow more adjacent channel interference, and cranking it down will just roll off the lower and higher audio response.

Or am I wrong? Maybe I haven't the slightest idea what I am talking about...

Date: Wed, 31 Jan 2001 23:49:31 -0800
From: Jack Antonio <dia@dia.reno.nv.us>
Subject: Re: [R-390] BFO and other stuff

I don't think you are missing anything at all, we are actually talking the same language here! For discussion let's assume that the receiver is set up perfectly, the filters are all exactly centered on 455, the BFO calibration is on the money with zero at 455, and that the filters have perfect selectivity(that is their skirts are straight up and down). First, on your 10 kc tone on a 4000 kc carrier, let us assume it is a perfect USB transmitter. If you tuned your receiver to 4000 kc at 16kc selectivity setting with the BFO at zero, you would not know a signal is there, because the 16kc filter will not pass any signal more than 8 kc from the center frequency. But if you tune your receiver up 2kc in frequency, then the 4010 sideband will be just at the upper edge of the filter bandwidth, and now if you tune the BFO down 2 kc to compensate, you will have your 10 kc sine wave at the diode load terminals. Whether or not you hear it in the speaker or headphones will be dependent on the response of the audio channel in the radio. Note that your receiver dial is now saying 4002, the BFO says -2, which means your (suppressed) carrier is 4000.

The only way to recover the original 10kc tone with a selectivity of .1 would be to tune the receiver to 4010, then offset the BFO 10kc.

But you are right, we don't listen too much to 10 kc tones. If we are listening to music, on a USB transmitter, with an 8kc upper limit, then the selectivity should be at 8, and the BFO at -4. This will demodulate audio from the transmitter from 0 to

8000 cycles(if the transmitter has that frequency response). Opening the selectivity to 16 would only open the door to off channel noise and signals.

BUT, if our USB transmitter was transmitting audio with a bandwidth of 16kc, then we would have to set the selectivity to 16, and offset the BFO by -8. The fact that we can't do that on an R-390 is simply because the Army didn't consider that to be a requirement. In fact the 390s were designed to recover signals approaching 16 kc bandwidth like multichannel teletype, and voice, but only with an external converter.

Your statement about offsetting the tuning and BFO by the average modulation amount is right on the money, and if the transmitter had a lower modulation limit of 0 cycles and an upper limit of our receivers selectivity setting, then your statement and my statement agree perfectly. But if the transmitters frequency response is say 300 to 2300, then the selectivity should be at 2 and the offset should be -1.3kc, which is the average of 300 and 2300 cycles.

But, we don't know the frequency response of the transmitter, the filters aren't exactly on frequency, the BFO calibration isn't perfect, filter skirts aren't straight up and down and humans are much more adept at dealing with whole numbers than dealing with adding and subtracting numbers like 1.3.

So, I stand by my statement. Set the BFO at half the selectivity mentally compensate for the offset when tuning in, and once you have found your signal, use the tuning, selectivity and BFO controls to optimize the signal for its modulation characteristics, and noise and interference present. For SSB, 2kc is a little narrow, 4 kc is a little wide, so for general tuning and listening, I use the 4kc setting, dropping to 2 when the conditions warrant.

This is what sets the R-390 and its kin from lesser receivers, the fact that we can adjust these things in a stable repeatable manner.

I hope I haven't bothered anyone with this post, and if I'm in error anywhere please let me know about it!

Date: Thu, 1 Feb 2001 09:56:52 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] BFO and other stuff

I'd like to add a comment that nobody has mentioned. For optimum SSB reception on an R-390A when not fitted with a product detector, advance the audio gain pot all the way, and then adjust overall gain with the RF gain pot (caution: there's no AGC action if you do this).

For CW reception,
I like to set the BFO offset for single-signal reception, and main tuning for desired tone. No use hearing the same sig either side of zero beat!

Date: Thu, 01 Feb 2001 10:02:42 +0000
From: blw <ba.williams@home.com>
Subject: Re: [R-390] BFO and other stuff

I experimented with various combinations of BFO settings, selectivity settings, and offset tuning. I always get the best audio and sensitivity when doing it the way the manual says. Maybe it's just my radio, or maybe mine is working right and someone else's isn't. I've tried all sorts of ways and the standard method always works the best for my PH-56.

Sometimes the audio improves greatly by opening up the selectivity and making necessary offset adjustments. There is a lot of wideband AM out there. I usually use the BFO with AM signals at first, and if it's strong enough I turn off the BFO and see if the signal is good enough then. Getting centered on a weak AM signal is easier for me if I first note the right frequency with the BFO and then turn it off. I then tune down or up to center tune it without the BFO. This works better for me too if there is co-station interference. Using the BFO is the best way to find a weak carrier because there are lots of times you aren't going to hear anything at all when you turn it off.

There is no correct or right solution for tuning FM stations as far as I know. There have been a few pirate FM stations in the past, and if you don't know it's in FM mode it will drive you nuts trying to figure it out. You end up thinking the radio has gone crazy since nothing works like it used to. Sometimes, the BFO will get it. Sometimes the BFO won't work at all. There is no rule to getting a good FM signal. Well, there is one rule. There is a razor thin margin in getting an FM signal. It takes a lot of fine tuning before you get it, but you can.

Date: Thu, 01 Feb 2001 17:08:28 +0100
From: Kurt Brandstetter <kurt.brandstetter@teleweb.at>
Subject: [R-390] AM-SSB/CW Demodulator homebrew schematic

I have on my homepage a page for my "new" R-390A/URR, but it is still under construction. On this page there are 2 pictures (front and inside) from the homebrew AM-SSB/CW demodulator with ZF preamplifier, BFO, S-meter circuit, included power supply and NF stage.

I was asked by some people if I have the schematic diagram for this unit.

This unit was built 10 years ago as a 455 kHz demodulator (I had no R-390A at this time) and I was not able to find the schematic for it. After a long search I found a hand drawn (really !) schematic for the part IF preamp, AM-SSB/CW demodulator BFO and S-Meter amplifier. The NF stage and the power supply (solid state :-(((and the voltage stabilizing part with a OA2 is not included, its common.

The R-390A page is not really ready for view, because it contains only some pictures of my Steward-Warner (all parts of it, exclusiv the filters and the PTO which are from Collins) are original Steward Warner and the receiver is

unmodified. I have not recaped anything but will do it for the "killer-capacitor". But I have scanned the hand made schematic and have made a download link under the picture of the demodulator unit to a ZIP file named SSB1.zip that contains a JPG file with a resolution of 100 dpi and a TIF file with a resolution of 300 dpi for printing.

You can find this page under:

<http://www.swl.net/oe1002419> (NOT under the Austrian web page address !!).

Please look the 1st page that opens, click on Enter and in the left frame that shows up, under "Receivers" you find a link "Steward-Warner R-390A/URR" . Click on this link and you come to the 390A page. In the middle of the page under the picture of the demodulator unit you find a link. Click on it and you can download the zipped files.

If you have any troubles with it, please let me know. I think it could be of some interest for some of you. Please let me know what you think about it. It is possible, that there are not all values in the scheatic really totally exact, as I said, it was built 10 yeras ago and the schematic was drawn last week.

Date: Thu, 01 Feb 2001 11:46:29 -0500
From: chantz@well.com
Subject: Re: [R-390] Synchronous Detector

Incidentally, speaking of Synchronous Detection, is there ANY activity/nets these days with true full DOUBLE sideband? (no carrier). There were some of these both manufactured and homebrew awhile back. Obviously, a USB/LSB diversity receiver on the same center frequency would be ideal for this mode.

(Sorry for the bandwidth, but we ARE talking AM! <g> Thanks for those who already replied - probably, the answer is "not since 1962!")

Date: Thu, 01 Feb 2001 11:19:03 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] BFO and other stuff

Copying FM on an AM receiver can be difficult. It can be accomplished with two methods, providing the FM is narrow. Slope detection requires an IF passband with some slope, at least as much as the occupied bandwidth of the FM. That's not available in the 390 or 390a which is made to have a relatively flat bandpass with steep slopes.

The other technique that works for truly narrow FM is exalted carrier. Just like listening to AM with the BFO on. Set the receiver for SSB and zero beat the carrier. Truly narrow FM has the same amplitude spectrum as AM, just the relative phase of carrier and side bands is different (in phase for AM, 90 degrees out of phase for FM). Received with the exalted carrier method, truly narrow FM can sound better than SSB. Used to run that on 2m in the Dallas Texas area in the mid 60s. W5WXV probably did it for a lot longer than I did.

Date: Thu, 1 Feb 2001 12:50:19 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] AM-SSB/CW Demodulator homebrew schematic

Many thanks Kurt. The schematic is fine, and the photographs on your Web site are a testament to the "professional" construction capabilities of the builder. Very nice. I may have to scrap my solid-state product detector and go with a similar "hot cathode" design. Maybe I'll make the BFO crystal controlled. That would be more fitting with the '390A's design, wouldn't it? -

Date: Thu, 1 Feb 2001 17:54:10 EST
From: TVComlGuy@aol.com
Subject: [R-390] R-390A with product detector

I have an R-390A made by EAC in 1967. It has a plate covering the BFO switch and the Pitch control on the front panel. On the top control it says Upper BFO Lower, and on the bottom control it says AM SSB/CW. I have heard that a small quantity of these were converted to SSB for the Mexican government. Does anyone have any knowledge of these and can help me get a schematic? Any information would be appreciated.

Date: Thu, 01 Feb 2001 19:20:13 -0500
From: Meir Ben-Dror <mbendror@optonline.net>
Subject: RE: [R-390] R-1247/GRC-129, is this it? (name correction)

This equipment was part of the GRC-129 system which had 2 R-1247/GRC-129 (modified R-390A) receivers. The system was a high-stability diversity system. The mods on the R-390A's were done by Manson Labs, which manufactured the associated equipment listed below. Some synthesizers were made buy Hallicrafters, too under contract. I don't know whether Halli was the first designer of the synthesizers for the system or Manson. because the sideband converter is switchable between 2 receivers (A and B). The receiver was modified to accept inputs from the external frequency synthesizers which generated all the necessary LO frequencies. The receiver in this version has small relay boxes by the LO in/out cables/plugs which switch over from internal to external LO operation. The IF output was utilized through an SSB converter (2 channel) which provided the demodulated audio output (the BFO was supplied externally from one of the synthesizers). The CV-1693 is the 1 MHz step synthesizer and the O-1203 is the 1 KHz step synthesizer locked to the same frequency standard. With the 2 synthesizers the receiver is tunable within its normal frequency range in 1 KHz steps. The frequency still has to be dialed in the receiver, because the RF stages and mixers have to be peaked up at the frequency of operation. The receiver can be operated normally, too. I also had another part of the same system which is not built by Manson, (at least my unit), the O-1555/URC which is a synthesizer to set the frequency of a modified T-368 transmitter whose GRC-129 nomenclature eludes me. The component I never had is the SSB generator. I also had some documentation on the synthesizers. I used to have the major components of the GRC-129 system - I still have the receiver which works normally by itself - it has 2

tags: the system tag - R-1247/GRC-129 Receiver, Manson Labs S/N 48, contract # AF30(635)30962; and the original R-390A tag: R-390A/URR, S/N 1832, Motorola, contract 14-PH-56.

Here is the list of the rest of the GRC-129 components I sold a couple of years ago (with documentation):

1. CV-1694/GRC-129 Converter, Single Sideband, Manson Labs S/N 61, contract # AF30(635)30962.
2. CV-1693/GRC-129 Synthesizer, Electrical, Frequency, Manson Labs S/N 89, contract # AF30(635)30962.
3. O-1203/GRC-129 Synthesizer, Electrical, Frequency, Manson Labs S/N 89, contract # AF30(635)30962.

Date: Fri, 2 Feb 2001 08:51:48 -0800

From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>

Subject: Re: [R-390] BFO

There should be a stop washer under the BFO knob on the front panel. The knob should set close enough to the front panel so the knob stop will engage the stop washer. This should let you have about 270 degree rotation of $\pm 3\text{KC}$ of BFO. If you move the Knob forward to clear the stop or the stop is missing, you can get several rotations from the shaft and a whole range of frequency. At the end of the BFO travel you will feel a snug stop.

Do not force this as it will break your BFO coil in the can. Check you flex coupler under the IF deck. The BFO should go end to end with out undue stress on the coupler compression or expansion. At 455Khz the coupler should be at minimum compression or expansion. The BFO shaft changes length out side the can with rotation ie its a threaded bolt.

Normal is to set Zero knob pointer to 455. Then learn where USB and LSB are on your receiver. This is a relative knob location varying with band width, alignment of RF and yada yada yada YMMV. Some people like to set zero where their choice station / mode / band / bandwidth demodulates well. Then they learn where to set the knob when they try to zero the PTO against the cal tones.

As long as you are not forcing it you are ok. Check the IF deck shaft bushing and front panel bushing for good alignment. This will go a long ways to make the BFO shaft operation smooth and easy.

You should get from 452 (-3) to 458 ($+3$) KHz out of the BFO. You will get more. YMMV it will not be exactly the same spread both side of 455 but it will be close. i e you may not see any because of the not exact stop action.

Date: Fri, 2 Feb 2001 21:03:33 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] SSB product detector schematic

The solid-state product detector I've been working on is debugged. It works so well that I almost couldn't tear myself away from my R-390A last night. It just sounds so good. In fact, I have antenna relays connected so that I can switch back and forth A-B style between my Ten-Tec Omni-V and the '390A. The R-390A receives every bit as well as the Omni-V, although the selectivity of the T-T is a bit better. Nonetheless, it's a great pleasure to listen to the full and well-rounded audio of the '390A. It's really pleasing to listen to. I was copying V51AS (weak signal) and 3C1AG (weak, buried in noise) on CW and lots of SSB stations on 160 and 20 meters--all with ease and outstanding clarity and presence, and with nice AGC action. If I try to copy SSB or CW using the 390A's BFO alone, it's okay--but the product detector makes a VERY BIG world of difference. I urge list readers to dupe the circuit, and have therefore drawn the schematic of my circuit in the hopes that some of you will homebrew it.

The circuit is based, in large part, on the work of Ed, WB2LHI. His diagram shows a free-running BFO. Mine is crystal-controlled. I adopted his 28 V AGC scheme and it works great. I copied the 1496 chip's connections directly from the Motorola datasheet's suggested connections. The only thing I did not do was capacitively couple the output of the 1496 to the AF level pot. I may add that over the weekend; it should isolate the pot's action--but the chip works fine with the configuration I'm presently using.

I also employ some LEDs in my xtal switching circuit. That makes for a fancy front panel that tells me which rock is selected. I'll eventually label the LEDs on the panel. You can see this in my schematic. The diode-switched xtal oscillator gilds the lily a bit, so you can use hard switching if you want to live a simpler life.

The schematic is scanned in two sheets (two files). I'd be happy to send these files to anyone who wants them in the following formats:

- (1) OrCAD
- (2) .BMP
- (3) .TIF
- (4) .GIF
- (5) .PDF

I am also willing to fax the prints to anyone CONUS who needs them, as long as it's during the weekdays when my fax machine is on line.

I'm also willing to mail them via US Snail to whomever will send me an SASE to my callbook address.

Vy 73, AI2Q, Alex in Kennebunk, Maine .-.-.

Date: Sun, 4 Feb 2001 16:55:01 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] Product Detector Notes

The response from the R-390A folks on the list for my schematics has been almost overwhelming. So far, I've satisfied almost 100 requests for files and will also be FAXing drawings tomorrow. I hope I didn't miss anyone, but REV B drawings show all the LEDS backwards! I must've been in a late-night Zener-diode state of mind when I drew the original schematics. My latest REV C drawings correct my mistake, showing the LEDS properly forward-biased, as they are in my actual circuit. If you have REV B files, and want REV C files, just let me know and I'll send them. I had a number of queries as to where I got the 455 kc crystals. Mine were FSN replacement parts for an RT-718, which you likely know as the KWM-2A. I've had them in my junkbox in their original MIL wrappers for quite some time after purchasing them at a flea market. I wouldn't know where to get more, but there have to be sources. Also, it may be possible to find 455 kHz crystals and "rubber" them onto frequency with variable padder/trimmer capacitors. If anyone can find a source for more crystals, or wants to see if a crystal manufacturer might be willing to supply some, perhaps a group buy can be arranged. Also, two R-390 list members said they were going to convert my files into router files for circuit board layout. Is there anyone who might be willing to fabricate boards if there's enough interest in the R-390A group?

Date: Sun, 4 Feb 2001 20:41:39 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] Product Detector Notes

The new ISP here is Adelphia--and its service and ability to keep the bits flowing is pathetic. Adelphia bought out my little Mom and Pop ISP and I'm stuck now with the only cable-modem game in town. I'll send you the files in a separate mailing.

Date: Mon, 5 Feb 2001 18:44:43 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] SSB product detector schematic

That's correct Mark. I originally had that that way, and later pulled the LM317 because I needed it in another socket on another project (!), so I substituted a pass xstr and a Zener diode. I guess I simply assumed (you know about that word), that a builder would recognize that i "simplified" the regulator part of the schematic.

I'll post this to the list so others can benefit from your "catch."

Stay resonant es 73, AI2Q, Alex .-..

- -----Original Message-----

From: Mark Pilant [mailto:mpilant@lucent.com]
Sent: Monday, February 05, 2001 2:00 PM
To: 'ai2q@adelphia.net'
Subject: RE: [R-390] SSB product detector schematic

Alex, about the only thing I spotted right off was how you used the pot to set the voltage using the LM317. While it shouldn't cause any problems if the wiper starts off at the grounded end, if it was positioned at the upper end, I think there would be problems.

If I were being cheap with parts, I'd simply add the normal resistor between the adjustment pin and the output and have the pot go from the adjustment pin to ground. The other I've used is to use a fixed resistor to set the coarse voltage in series with a pot to set the fine voltage.

Date: Mon, 5 Feb 2001 19:14:53 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] Product detector notes

(1) Gosh Bill, I didn't even look at the part number for the xstr. I just pulled it outta my junkbox and soldered it in. I assume it's got about the same gain (beta) as a NPN 2N2222.

(2) Small-signal transistors aren't too critical in audio circuits, or even at 455 kc. You may want to look through Rat Shack's shelves, or an ECG catalog to find one that suits your liking. The X29A829 types that I have here work well. They carry an ECG159 equivalent p/n.

(3) The 1496 chips are still available (I think Dan's Small Parts stocks them). I've used old Fairchild uA1496s in projects (in TO-5 cans), and Motorola 1496 chips (in DIP packages), and I think Signetics made them too in DIPs. A Web search might reveal other vendors.

Good luck, and let the group know how you make out. Perhaps someone else will dupe the circuit with a different Gilbert-cell chip (refer to the ARRL Handbook). There's nothing magic about these devices.

(4) One other thing: for the LC circuit, I pulled an old IF-type coil from my junkbox and measured its inductance and Q (it's Q is about 80) on my old 1950s-vintage Heathkit Q-meter. Once I knew that, I used an ARRL Lightning Calculator and determined what capacitance would be needed to resonate it at 455 kc.

Next, I placed the parallel LC circuit in series with a resistor and the output of my URM-25 signal generator. Then I placed a scope across the resistor. At resonance it exhibits a high impedance and the current in the series resistor drops, so the voltage across it drops and I adjust the coil for a null on my scope. You can also place a low-C scope probe directly across the LC combo and adjust for a maximum voltage at anti-resonance, but I prefer keeping my probe off the actual circuit and

measuring indirectly, so to speak, at the resistor. At 455 kc, it doesn't much matter which way you approach that, but I guess the way I do it is a matter of how I was trained. :-)

All you need do is ensure that it resonates at about 455 kHz, and that the coil's adjustment gives enough range to tweak it a bit above and below that. You can also use a variable capacitor, such as a compression trimmer, across the coil, in order to get some adjustment.

Once in the circuit, I adjusted the coil's slug coil for best sinewave shape. It isn't a pure sinewave, but the FET buffer and small-value coupling caps keep the loading on the oscillator light. If you load the xtal oscillator too much, you won't see much of what should at least resemble a sinewave, but judging by the TTL oscillator that's used in the Electric Radio Model PD-1 accessory, it seems like the 1496 might not be too "choosy" about waveshape anyway. My discussion's with WB2LHI, Ed, confirm these observations. By the way, my process of selecting low value coupling caps, and choosing a FET with its high input impedance and low output impedance in a source-follower circuit is the same process Ed used in developing his circuit, and I borrowed heavily from his notebook.

(5) For assembly, I use "ugly" construction techniques. One of the best is called Manhattan construction. Check out <http://www.qsl.net/k8iqy/socket.html> for some tips on this very useful technique. Using it, you can build and tear down and re-vamp circuits quickly, building and testing them in modules, rather than all at once.

-- AI2Q, Alex

PS - If you find out how to reverse the background of the .PDF file in Acrobat, please let me know.

-----Original Message-----

From: Bill Riches [mailto:briches@dandy.net]
Sent: Monday, February 05, 2001 5:59 PM
To: ai2q@adelphia.net
Subject: RE: [R-390] SSB product detector schematic

At 16:05 02/04/2001 -0500, you wrote:

>Bill, I must have been in a Zener diode state of mind when I drew those
>schematics. I drew 'em backwards! Here are correct, rev. c, files. -- Alex

>

>---Hi Alex,

Thanks for the correct files. Just curious - is there a way to print them out with black print with the normal white paper background?? The way I printed them out with the traces in white with the black background sure

does eat up the black ink cartridge!

If anyone decides to make a board available I am good for a few.

What is the complete part number and source for the 1496 chip and what # has worked for you in the "pnp" small transistor category?

In the 60's when I repaired KWM2s I had several sets of xtals and the matching mech filter - now - where did I put them???!

Date: Wed, 7 Feb 2001 09:19:36 EST
From: Tnjent98@aol.com
Subject: Re: [R-390] improving ssb reception

Thanks to Wolfgang for emailing the schematic and technical details.. i would like to try this on the r390a..currently its pictured to run with the r392, getting its input from J615 and feeding AGC out to J614...do any of you fine gentlemen know the equivalent hookups on the r390a?

Date: Wed, 7 Feb 2001 11:57:17 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: [R-390] Sync detectors

There is an in deptth study of these on the AM Window BBS at:
<http://www.thebizlink.com/am/wwwboard/wwwboard.html>
Some of which has been brought from this list, but I don't know enough about it to be of much help.....yet!

Date: Tue, 13 Feb 2001 11:15:25 -0500 (EST)
From: "Paul H. Anderson" <pha@pdq.com>
Subject: [R-390] SSB circuit diagrams available

AI2Q Alex <ai2q@adelphia.net> designed a fairly simple SSB circuit based on the Motorola MC1496 chip. Technical questions should be directed to either Alex or to these lists, as I haven't built the circuit yet. I volunteered to put the circuit diagrams up on my web site, which I have done. I also put a lot of time in trying to find the best compromise between size and print quality. There are two .PDF files (black on white, and white on black), .GIF, .TIF, and .JPG files available for each of the two schematic sheets. I recommend the first .PDF file (black on white, fairly compact). The best resolution is the two .TIF files (but they are large at around 250K each). They are all located at my website: <<http://www.pdq.com/boatanchors/ssb/>>

Any feedback that I get I'll try and incorporate into the web page. Information about vendor sources, printed circuit cards, component sources, and so on, I'll be happy to include, as well as builder reports (problems and successes!).

The parent folder (boatanchors) is far from complete, so don't expect to find anything useful there - thanks!

Date: Thu, 3 May 2001 08:57:44 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] Synchronous Adapter (revisited)

Does anyone have a copy of the June 1957 issue of "CQ" magazine? I have a picture of the cover and it shows a synchronous detector project. I would be interested in finding out more about it.

Date: Thu, 3 May 2001 11:46:22 -0400
From: "Michael Tallent" <mtallent@concentric.net>
Subject: Re: [R-390] Synchronous Adapter (revisited)

I have that issue, the article is about 5 pages, I could scan it if you are interested. Uses 6AN8, 12AT7, 12AX7, 12AU7 tubes.

Date: Sat, 30 Jun 2001 07:40:34 -0400
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] reporting in

Check out my product detector at <http://pdq.com/boatanchors/ssb/> --or--
<http://fly.hiwaay.net/~wb7vdn/>

Date: Sat, 25 Aug 2001 20:43:47 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: [R-390] Connection of CV-591 to R-390

I just brought home a CV-591A, and it's working well with my R-390 so far. Can someone tell me how the CV-591 connects into the R-390 to allow the AGC developed in the CV-591 to be used in the R-390? Are there any other connections between the receivers recommended other than IF to the CV-591 and AGC to the R-390?

Date: Sun, 26 Aug 2001 02:10:38 -0400
From: Thomas W Leiper <twleiper@juno.com>
Subject: Re: [R-390] Connection of CV-591 to R-390

There is only one connection, and that is the IF. The CV-591 has its own internal AGC amp which seems to have excellent range and performance without the need to modulate the R-39*. I usually just set the R-390 to MED agc with the RF gain at max and use SLOW agc on the '591 for perfect SSB. All the extra connections on the CV-591 are for two different levels of line audio and a remote control head.

Date: Sun, 26 Aug 2001 10:25:18 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Connection of CV-591 to R-390

I disconnected the wire from one of the unused terminals on the CV-591, and ran a wire from the AGC line to it. This is connected to the AGC terminal on the R-390A. The fast attack, slow decay characteristics of the CV-591 AGC helps on SSB reception.

Date: Wed, 05 Sep 2001 21:52:48 -0700
From: "Dennis L. Wade" <dlwade@pacbell.net>cd
Subject: [R-390] Variant of a Variant

Thank you to all who took the time not only to take a look at my R-390A pics (at <http://kg6zi.homestead.com>), but also to write with your best wishes and comments. What I gather so far is this: Several have mentioned the Factory SSB info on Chuck Rippels's website. That example uses a 6EA8 in a module located in the same place as the one in my receiver. The IF strips seem to be similar in that each has a cable coming from under the chassis to the same place on topside.

A couple of differences: My radio uses a 6U8 instead of the 'EA8. (This threw me until I realized they are very similar tubes.) Another is that the crystals in the Ripple example are mounted on top of the sub assembly and are below in my example. So it seems I have a variant of a "rare" variant? Maybe its only a cosmetic variant. Anybody know how many of these (generally, not just my just 6U8 example) exist?

I'm sure a circuit tracing exercise would tell me lots of things, but in any event....A couple of questions arise in my mind:

1. To what extent is this "mod" documented? I found no reference to it in the Y2K manual. Is this simply a crystal controlled BFO to provide more appropriate injection levels for SSB reception?
2. What other modifications may have been made in conjunction with this one to improve SSB reception? For example, AGC mods or other changes to the IF strip.

As I dwell on my prior usage of this radio, I recall not being very impressed with SSB on it. Reading other material here leads me to believe that I'll be spending some quality time with the AGC system to address those symptoms. I would REALLY like to know how what I am looking at (in terms of voltage and resistance readings, for example) might be different from the manual due to the nature of the variant and not due to component failure. I'm sure to follow more than my share of dead end troubleshooting trails as it is without throwing that one into the mix..:)

As always, I look forward to your collective wisdom.

Date: Sat, 29 Sep 2001 12:44:11 -0400
From: "JM/CO" <jmerritt2@capecod.net>
Subject: Re: [R-390] SSB on the non a

Been using my 390 (non - A) for over 10 years, and am usually able to rcv SSB ok without any external gear. Requires delicate adjustment of the radio, but I get pretty good results.

Date: Sat, 29 Sep 2001 13:08:52 -0400
From: "rbethman" <rbethman@home.com>
Subject: Re: [R-390] SSB on the non a

I'm a nasty old retired Senior NCO. While I do not have a non "A", I'll describe the methodology on an "A". Turn on the BFO, back off the RF gain just until the SSB signal comes through clear. I happen to suspect that the AGC just doesn't quite handle things the way it ought to. I'm looking at gutting C551 and replacing it's internals - AFTER I put it on the capacitor tester.

Date: Sun, 14 Oct 2001 13:15:21 -0400
From: tim grieco <tgrieco@optonline.net>
Subject: [R-390] BNC connector info

I recently purchased a TMC CV-591A SSB adapter and need connecting cable that goes from IF out to IF input .The 390a j116 is a miniature bnc type connector as the rest inside the rig, but the other end is a standard BNC connector. The cables in the shack are all regular double BNC types.Is there an adapter to buy to reduce down for the 390a or can I purchase the original cable from someone so I can test my new purchase to see if it works? Also-it may be possible that someone changed the one on the 390a, but not familiar enough in this territory.

Date: Sun, 14 Oct 2001 13:56:38 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] BNC connector info

Both connectors on my R-390A and CV-591 are standard BNC's

Date: Sun, 14 Oct 2001 14:57:32 -0400
From: Mike Sullivan <michaels@kc2kj.k2nesoft.com>
Subject: Re: [R-390] BNC connector info

Yes there is, but its hard to get. It's called a mbc connector, I believe and I got mine at the shelby hamfest. Troll through some rf connector catalogs and I think you will find them.

Date: Mon, 15 Oct 2001 20:22:22 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Field Changes on the CV-591A/URR TMC MSR-4

V8 and V9 are the Reactance Modulator and Relay driver/Side tone Gen. respectively. They were used for remote control of the CV-591, with a GPR-90 and are not necessary for shack operation. Pulling them saves a few watts of filament dissipation and does not affect the operation of the radio. Jim

> Greetings to all:

> I've been hanging around the group for a little while now and I can't say enough nice things about the interesting personalities out there and the wealth of info available in the archive. Playing with the R-390/A and the R-392 for the last few years has been loads of fun.

> I recently acquired a CV-591A and have a few questions for the group:

> 1. Does anyone have a copy of the Field Change info? My unit is at FC#5 and has V8 and V9 removed! I already have a copy of the manual.

> 2. Are there any sites with hints, tips, mods for the CV-591/A?

> 3. Will my wife eventually leave me if she keeps tripping over stuff on the way to the washer? ;)

Date: Tue, 16 Oct 2001 12:25:45 -0500
From: "Jon & Valerie Oldenburg" <jonandvalerieoldenburg@worldnet.att.net>
Subject: Re: [R-390] Field Changes on the CV-591A/URR TMC MSR-4

> Do you have the two crystals in the unit? Mine doesn't :-).

I contacted international Crystal and supplied them with the specs from the manual. Cost was about \$30. Unit will function without them but not in the crystal control mode 73's Jon AB9AH

Date: Tue, 16 Oct 2001 23:36:21 -0400
From: Tom Leiper <twleiper@juno.com>
Subject: Re: [R-390] Field Changes on the CV-591A/URR TMC MSR-4

> 1. Does anyone have a copy of the Field Change info? My unit is at
> FC#5 and has V8 and V9 removed! I already have a copy of the manual.

I have the whole Navships 0967-051-2010 (Nov '68) in self executing viewer format if you or anybody else needs it. Has all the FC data and anything else you might need.

Date: Thu, 18 Oct 2001 00:11:53 -0400
From: Tom Leiper <twleiper@juno.com>
Subject: [R-390] CV-591 manual

I just noticed that the manual I have been sending you guys has some duplicate and out of order pages. This is because I had re-scanned some of the pages with half-tone photos for better resolution some time ago and never re-ordered the file. If you are simply printing these things out there is no problem. If you would like to get a corrected copy just let me know.

What would REALLY be nice is if somebody's got an FTP site I can upload it to, or who can post it there. My FTP server is a secure private site that I have let a few of you with mail restrictions use, but I would prefer not to do that for obvious reasons.

Date: Thu, 18 Oct 2001 10:17:55 -0400
From: Tom Leiper <twleiper@juno.com>
Subject: [R-390] CV-591 Manual download

You can download a corrected and zipped version of the manual thanks to Dutch's web site. Just point your gun to <http://users2.ev1.net/~wb7dyw/cv-591.zip> or you can browse into the main web page at: <http://users2.ev1.net/~wb7dyw/> then browse to "manuals" and "download" to fetch it.

Date: Wed, 5 Dec 2001 16:22:42 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Lankford AGC mods

I have the simple version of the Lankford mod documented on my website:
http://www.knology.net/~wewilson/R-390A_Modifications.htm

More extensive versions can be found in Hollow State News reprints.

Date: Wed, 5 Dec 2001 16:33:21 -0500
From: "Joe" <joe.amp@verizon.net>
Subject: Re: [R-390] Lankford AGC mods

For the A model

Place one IN4148 in parallel with R 547, 'pointing' away from pin 2 of V506A.
- one IN4148 in parallel with R 546, 'pointing' toward pin 1 of V509A.

2: IMPORTANT !!

Up the BFO injection Voltage:

Add a 56 pf cap in parallel with the BFO coupling cap (C-535)

Some others suggest fooling with the AGC Time capacitors but I just leave them alone and keep it on Slow for SSB. I also have the (NON A) Langford mod but have to type and draw it out, it's the same but different resistor numbers.

Date: Wed, 5 Dec 2001 16:39:50 -0500
From: "Joe" <joe.amp@verizon.net>
Subject: Re: [R-390] Lankford AGC mods

On last thing on upping the BFO Injection voltage for the Langford SSB mod. The increased BFO signal may fool the AGC. Adjust the neutralizing cap C-525, on the IF deck for a null on the carrier meter. This trimmer is accessible through a hole on the left side panel of the main frame on both the 390 and 390 A. Use the best detector tube you can get your hands on

Date: Thu, 6 Dec 2001 20:25:08 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] KK4PK SSB Adapter

>Anyone have any experience with the PD-1 SSB Adapter advertised in Electric
>Radio? It looks like a nifty X-mas present to myself!

I bought one from Les Locklear, and it is really a nifty gadget. No BFO, don't need the audio section. Just plug the PD-1 into the IF output, hook up phones or amplified speakers, and cruise the bands. SSB comes in clear as a bell; CW comes in clear as a bell. So does AM. Also works with SP-600, I'm told.

Date: Fri, 7 Dec 2001 18:04:37 -0500
From: "Joe" <joe.amp@verizon.net>
Subject: [R-390] OOPS Non A Langford mod THIS ONE !

Sorry folks , I forgot to rewrite V-510 and V-511 the tube pin numbers for non A If someone can scan me a clean snip of the BFO AGC section one I will make a nice page up I have rewrote this simple 100% reversible mod for the (NON A) R-390 with great results. "its is still thanks to Dr. Langford"

"Langford SSB for the R-390 Non A"
Place one IN4148 in parallel with R 557 (220K), 'pointing' away from pin 7 of V511-12AU7 Time constant tube - - Place one IN4148 in parallel with R 556 (180k), 'pointing' toward pin 6 of AGC rect V510-12AU7. (These resistors are located on the terminal strip by V-510) I changed C 544 to a new metal film capacitor got faster AGC attack, in my case it limited AGC "kick in" pops on strong SSB signals. Listen to SSB with AGC on slow

Option:

Up the BFO injection voltage: (some claim unnecessary, personally I hear a difference) the 3 inches of coax does mute quite a bit of BFO injection voltage Coupling cap C-536 (usually a small 10 pf dogbone BFO tube V-608) pin 5 going to a white coaxial cable. Add a 47 or 56 PF mica across it, turn on BFO, if you see a carrier adjust the BFO neutralizing capacitor for a null. (Access trimmer deep in Left side of case with non-metallic tool)

Date: Sat, 8 Dec 2001 19:07:52 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] KK4PK SSB Adapter

I got mine from Les; it works really well. Just hook it up to the IF output and to a soaker, plug the wallwart in, and enjoy. It has a 4-position switch: Off, AM, LSB, USB. All works as advertised.

To: r-390@mailman.qth.net
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Date: Fri, 11 Jan 2002 08:37:49 -0800
Subject: [R-390] Lankford AGC Mod ?

I understand the Lankford AGC mod to be two diodes in the AGC circuit and a cap change to allow more BFO insertion into the detector. I understand what happens when we inject more BFO into the mixer (detector) circuit. I do not understand how the diode mod causes the difference we do hear in single side bands signals.

How does that circuit work?
What is the difference in AGC action of the circuit?
Why does SSB sound better with the change?
What caps should we experiment with to give better time constances?
What would be some target values for those caps?

Other than exceeding the PIV or forward current load of the diodes does the choice of diode make a difference?

Is diode linearity critical for this circuit?

Is diode switching time critical for this circuit?

I know this is all available some where. Does some one have it handy and can you send me some clues.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
To: Roger L Ruszkowski <rlruszkowski@west.raytheon.com>, r-390@mailman.qth.net
Subject: RE: [R-390] Lankford AGC Mod ?
Date: Fri, 11 Jan 2002 10:46:31 -0600

Well, everybody knows that when you insert a diode into an AC circuit, you get more power on one waveform (see previous posts concerning 6080 and RMS) so perhaps that accounts for more injection signal?

From: "fritsche" <fritsche@email.msn.com>
Date: Fri, 11 Jan 2002 16:49:54 -0600
Subject: [R-390] Lankford SSB Mod

Hi Gang, did a while back... Just the diodes and immediately noticed distortion on strong AM broadcast signals. Removed and All is Well. What the hey.... If you want SSB turn on your Ham Rig or if you an SWL just reduce the RF gain like in the old days. My .0002 cents worth

From: DJED1@aol.com
Date: Fri, 11 Jan 2002 18:58:20 EST
Subject: Re: [R-390] Lankford AGC Mod ?

The only thing the diodes do is to shorten the attack time of the AVC to give the "fast attack, slow decay" AVC that we want for SSB. On AM, the carrier is there all the time and the attack of the AVC does not have to be fast. Since all activity is at voice rates, the diodes do not have to be especially fast to perform satisfactorily. I expect any good silicon diodes will do, as long as they have a high resistance when back biased.

From: DJED1@aol.com
Date: Fri, 11 Jan 2002 19:08:29 EST
Subject: Re: [R-390] Lankford AGC Mod ?
To: cbscott@ingr.com, r-390@mailman.qth.net

The AVC is half of the problem with SSB on the R-390s; the other half is the product detector. I would estimate that fixing the AVC is the most important part, because to detector in the radio does OK if you just reduce the IF signal enough. The classic way to do this is to go to manual gain control, and reduce the IF signal enough to have the detector operate in a linear manner. As we know, the SSB signals sound pretty good when the radio is operated in manual mode. So... I believe much of the problem is caused by the fact that the AVC doesn't respond fast enough to the varying SSB signal, resulting in distortion at the detector. The Lankford mod just allows the AVC to increase quickly by changing the attack time constant (it basically shorts the timing resistors in one current direction). Similarly, an audio AVC will help the fast attack requirement. I went the whole way and built an external adapter which provides both product detection and fast AVC-works quite well except my BFO is not nearly as stable as the internal one. Hope this helps... Ed

From: R390rcvr@aol.com
Date: Sun, 13 Jan 2002 10:22:11 EST
To: r-390@mailman.qth.net
Subject: [R-390] PD-1 SSB reception, AM effects

I just got a PD-1, the outboard product detector sold by Ron Haskins. Nice, professional looking unit, construction very tidy internally. No brainer hook up, just patch cord off IF output on back apron, plug it in, and go. The SSB is

wonderful, very simple. Might be nice to have slightly finer tuning on the KC dial to fine tune voice pitch, but overall, it is really nice. The down side is that it tends to overload just slightly on very strong AM signals. I am talking about signals that peg the carrier needle. I am running it through an Alpha Delta VRC console, basically an amplified speaker with notch, peak, variable freq. response, etc. Its possible that the two don't work well together. I am going to hook it up to an outboard stereo amp and check that. I thought perhaps I had a problem in my AGC, so will sub out the three tubes, one by one, and see if that might help as well. Its interesting that the Lankford mod seems to have the same AM problem. I will keep you updated.

From: "Kenneth Crips" <w7itc@hotmail.com>
Subject: Re: [R-390] Lankford AGC Mod ?
Date: Sun, 13 Jan 2002 12:09:52 -0700

This list has had this discussion many times. I have never done this mod' because every time the subject came up it was pointed out basically unsatisfactory this mod is. Changine the time constant of an AGC does not a product detector make.

From: "Kenneth Crips" <w7itc@hotmail.com>
Subject: Re: [R-390] PD-1 SSB reception, AM effects
Date: Sun, 13 Jan 2002 13:04:35 -0700

I was just looking at the CV-591 and it looks nothing like my Eldico SBA-1. It's a little unclear what the controls are on the front panel of the CV-591, except for the obvious ones. The SBA-1 has a notch filter, a noise limiter, and an IF gain, in addition to the usual SSB, audio, and power controls. I am really curious what the military nomenclature might be for my unit it has Signal Corp stamps on it so there must be one. The search continues.

From: "Kenneth Crips" <w7itc@hotmail.com>
Subject: Re: [R-390] Lankford SSB Mod
Date: Sun, 13 Jan 2002 12:00:05 -0700

I find the use of a side band adapter, in my case an Eldico SBA-1, very satisfactory. It so nice not having to ride herd on the RF gain while listening to a round table, or a net.

From: "Joe" <joe.amp@verizon.net>
Subject: Re: [R-390] Lankford AGC Mod ?
Date: Sun, 13 Jan 2002 17:50:09 -0500

Done *the full version* of this modification and found it to work excellent on both my non A models. I will get a popping on strong SSB signals but I just back off the RF gain. Between the PC, shop, heat, insurance rates If run any more electricity / gas Im going to have the sell the radios to keep out of the poor house.

Date: Mon, 14 Jan 2002 12:01:27 -0500 (EST)
From: "Joe" <joe.amp@verizon.net>
Subject: Re: [R-390] Lankford SSB Mod

Something must had something go wrong Ken, you don't have to do that with the Lankford modification. Sounds like you needed to up the BFO injection cap and neutralize. I only need to lower the RF gain with VERY STRONG signals around +60DB. BTW: Your text posts are working

Date: Mon, 14 Jan 2002 08:33:57 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] PD-1 SSB reception, AM effects

The CV-591 has a choice of Xtal or Var. OSC., hence the large "Bandsread" knob. No notch filter or IF gain controls. Otherwise the controls are similar. I have not seen a lot of SBA-1's around so your Signal Corps. model might be an evaluation version.

From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] PD-1 SSB reception, AM effects
Date: Mon, 14 Jan 2002 09:54:04 -0500

With all thus talk about SSB, I remind you that a circuit for a product detector I built still resides at <http://pdq.com/boatanchors/ssb/> as well as at <http://fly.hiwaay.net/~wb7vdn/Download.htm>

Also, I recently glommed an old Hammarlund HC-10 box, and have it connected to my 51J-4, although it will work with my R-390 or -390A as well. It's input can be quickly adjusted to accept IFs from about 430 kc to 510 kc.

I stabilized the free-running BFO in the HC-10 with some high voltage Zener diodes (in series), and replaced the 5Y3 with diodes to offload the filament demand on the power xfmr.

The HC-10 does a pretty good job on SSB. It's kind of fun to have a set with two IF strips, detectors, AGC lines, filters, limiters, and audio stages.

From: "Kenneth Crips" <w7itc@hotmail.com>
Subject: Re: [R-390] CE Sideband Slicer
Date: Thu, 21 Feb 2002 23:13:42 -0700

The Signal slicer (SS) is not a receive sideband adapter it is designed to give SSB to any of a number of AM transmitters. These are phasing rigs and with proper adjustment put our some of the best sounding SSB phone on the air. I have a CE 10B exciter which incorporates the SS with a 6 watt driver section I have had it on the air running through My Heathkit SB-200 which gives me about 65 watts using a monitor scope to adjust the wave form, fabulous sound.

From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: Re: [R-390] CE Sideband Slicer
Date: Fri, 22 Feb 2002 08:10:44 -0500

> A friend has offered me a Central Electronics Sideband Slicer. Will this work as a product detector on my R390A? Should I get it for that purpose (assuming the price is ok)?

It should work!

Here's a pic... http://zeus.ia.net/~wbsorsby/N5BU/CE/ce_acc.htm

Here's a manual..... <http://bama.sbc.edu/central.htm>

Date: Fri, 22 Feb 2002 09:32:25 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] CE Sideband Slicer

Yes it will work. But be careful. The Slicer uses phasing to demodulate the SSB. If the Phasing components are shot it is almost impossible to rebuild the unit.

Date: Fri, 22 Feb 2002 11:07:08 -0500
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] CE Sideband Slicer

I'm not up on all the CE products, but I have a Slicer 'B' and it is made for receivers. Came with a tri-fold green pamphlet explaining how and where to hook it into certain receivers. I've yet to figure it all out, but I have seen one online hooked to a 75A-2 or A-3, just can't recall where. I have the impression that it's probably not up to the standards of the other CE gear in performance, perhaps because it was still a relatively new concept back then. The military adapters that have come along since are undoubtably better in many ways, but this would at least give Joe Ham some amount of functionality.

Date: Fri, 22 Feb 2002 11:53:12 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] CE Sideband Slicer

>The Signal slicer (SS) is not a receive sideband adapter it is designed
>to give SSB to any of a number of AM transmitters.

You mean the "Sideband Adapter". The CE "Sideband Slicer" is indeed a receiving adapter. It operates on the phasing principle with an IF input frequency of about 455 k. The phasing network must be present for it to work.. if that is missing you can duplicate it but it takes components of moderate precision (1%). Other than that, the circuitry is not complicated or hard to understand. The accessory input preamplifier is not normally needed, especially with the R-390 that has plenty of

voltage at the IF output. I can't tell you how well it works because the one I have here it not working right. 'Dont' know why yet.

Date: Fri, 8 Mar 2002 11:35:30 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] Sync Detect Results

Well, I had little to do today as will soon be apparent. I went ahead and made an IF cable for the 390A, and made a coupler out of a piece of foil about the size of the Sony radio, and connected same to the cable. I sat the Sony on the foil to pick up the IF signal. I then connected the Sony's line-out to my regular amp.

Results were excellent.

The Sony locked no problem while sitting on the 455 coupling foil. In fact the signal was so strong it still locked three feet away, so the 390A is putting out gobs of 455 IF. The coupling contraption needn't be very large. The sound through the amp is good from the line out, although I'm sure the Sony could use some audio optimization. You can really tell the difference between the fading on the headphones and the reduction of same through the amp. Lock range is about 3-4 kcs. Allows you to tune around QRM, and select the best sideband. The filters in the 390A are naturally still effective. Radio New Zealand on 17675 will be the test subject tonight.

From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Fri, 8 Mar 2002 09:04:50 -0800
Subject: [R-390] Sync Detect Radio w/R-390A [warning sand word used in text]

Gentlemen? What is the best way to couple the 455 for best S/N??
Pontifications welcome. Great weekend to all!! Tom N5OFF

The 455 output in the IF deck starts as a 50 ohm source from the cathode follower. The deck to back panel is 50 ohm connectors and 50 ohm coax.

I would carry that 50 ohms source from the R390 into the new sync detector box. In side there I would go for a transformer match to the higher input impedance of the detector circuit. Even if it is sand state the input will be more than 50 ohms. I would go for a tuned IF deck transformer and work the winding ratio to get close.

If you can not rework the transformer, Then find a load resistor for the secondary that lets the most power be transfered over to load resistor. This is where the voltage across the load resistor is largest and the transformer will peak up a good 455 signal and by definition let out of band noise be passed to ground.

An inter stage IF that matched 5-10 K plate to a 1 meg grid would only match the 50 ohm up to 5 - 50 K. OK for a bipolar transistor. But still low for a FET or tube. Then you couple off the load resistor with a small cap to the still higher input impedance of the first active device. The small cap and high impedance then looks like a scope probe monitoring the signal at the load point.

Cheap broad band method would be as follows. If the detector input is real high (tube grid / FET) then you terminate the 50 ohm coax into a 50 ohm resistor at the detector end and couple the signal into the device through a small cap.

Terminating the signal into a good load keeps trash on the signal line (distortion SWR noise) down. The small cap and high impedance then looks like a scope probe monitoring the signal at the load point.

Could we pull the 5814 Diode detector, and replace it with a sync detector plug in 9 pin thing. I forget what the other 1/2 of the 5814 does. A FET could go in to function as that triode. Roger KC6TRU

From: "Fraser Bonnett" <fraserbonnett@adelphia.net>
Date: Fri, 22 Mar 2002 00:21:40 -0000
Subject: [R-390] Synchronous AM Reception

Having just recently got my R-390A back out of storage, I find myself interested in MW DX'ing again. I have re-read two articles on modifying the R-390A to achieve carrier synchronous demodulation, and was wondering if anyone has any experience with it, and if it is worth attempting:

An NRC reprint from 1992 uses:

- a coil of wire around the anode of V508
- 100K (or 47K) resistor
- a 5-50 pf trimmer grounded to the carrier meter adjust nut
- a 47K (or 22K) resistor in series and connected to pin socket 1 of V505

Once it's set up, how do you use it, what effects do you observe.

Date: Fri, 22 Mar 2002 05:09:22 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Synchronous AM Reception

I've never used that method, but it sounds too easy to be true. Seems like a true sync detector needs to measure and actively alter the BFO frequency needed to keep things straight. The best way is to use a Sherwood SE-III or similar device, but they are expensive and are getting hard to find. I made a poor boy hookup recently, using a Sony portable with sync detect for a detector, tuning it to 455 khz, couple the IF signal to it with a whort wire nearby, and then route the line output to an amp. Worked well on a 390A and also on a 51J3 (500 kcs IF). Gives you selectable sideband sync detection in a small box with little fuss. I already had the radio. You can probably get a Sony 2010 or 7600G?? on ebay. There is a kit out there offered by Steve Johnson, and the ARRL handbook has a homebrew detector. Bonne chance!

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Synchronous AM Reception
Date: Fri, 22 Mar 2002 11:49:08 -0800

A sync detector needs to control the BFO slowly and continuously, so in between dropouts it remains at least approximately on frequency. I don't think the NRC mod's worth trying. Judging from your description, it's more like a synchrodyne* detector than a true synchronous. The latter contains a PLL, locked onto the IF. The NRC mod locks the BFO to the IF (via "pulling", usually a problem, here used

intentionally), but only when there's signal. On every little dropout it will instantly revert to its free-running frequency. The synchronous detector's PLL drifts too, but so slowly it doesn't make a beat note during most dropouts.

* Uses amplified, amplitude-clipped IF as BFO into a product detector.

If you can't find an SE-3 for a price you're willing to pay, Tom's recommendation holds. Use any sync-detector-equipped radio that can tune your IF. Once in a while you can find one really cheap because it has a blown front-end. It might still pick up the R-390A's `_loud_` IF output.

Date: Fri, 22 Mar 2002 17:26:03 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Synchronous AM Reception

Hello, What is synchronous detection and how is it different from zero beating the BFO against the carrier?

Date: Fri, 22 Mar 2002 17:45:14 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Synchronous AM Reception

Sync detection is mainly for AM or DSB, not for SSB. With sync detection, the supplied BFO signal is phase locked to be exactly in phase with where the carrier should be. During selective fading, or with DSB, the carrier is weak, missing, or phase shifted from where it should be. With the BFO in phase with where the carrier should be, the highest possible audio output results. If the BFO is 90 degrees out of phase with the carrier, cancelation occurs and no signal is heard. That's the deep fades in the audio you get with the BFO on when receiving an AM station, and almost but not quite zero beat.

From: "ea2ig" <ea2ig@tiscali.es>
Subject: Re: [R-390] Synchronous AM Reception
Date: Sat, 23 Mar 2002 23:00:29 +0100

In the book "New Sideband Handbook" by Don Stoner W6TNS. published by Cowan Publishinh Corp. Fouth Printing March 1962 (The publisher of the CQ Radio Amateur, on pages 128 to 132 is a very interesting article about Synchronous Detection.

From: "Jim Amos" <jimamos@cisco.com>
Subject: RE: [R-390] Synchronous AM Reception
Date: Mon, 25 Mar 2002 15:58:14 -0500

There was also a circuit in the 1999? handbook that was both a synchrous detector and external BFO / product detector. It did use a 455KHz IF input as well. This circuit was nice in that it also provided for synchrodyne demodulation. This is a version of synchronous detection that amplifies and limits the carrier before applying to the product detector. It does not, however, phase lock a carrier

generator to the incoming signal as true sync detection does. Interesting for comparison, however.

The drawback to this circuit is that some of the IC's were not as readily available as one would like. I'm working on a version that should be completed some time before the 75'th B'day of my R-390A that uses NTE available IC's. But this project is still in the planning stages and is a result of the following failure:

I was recently experimenting with a circuit originally published in Comm. Quarterly based on a Motorola Stereo Demodulation chip. It however, it not go well. The version of chips that I received would not lock over a wide enough range to make the circuit useful as an add on Sync Detector.

I also have a friend that was selling synchronous detector kits. His kits were based off of the IC used in the Sony receivers. They worked quite well, and provided for sideband selection of the AM signal. They were purely for AM demod however, and did not provide a SSB / CW product detector.

Date: Mon, 25 Mar 2002 23:13:37 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] Synchronous AM Reception

I don't know if you are referring to the same circuit that is in the 1996 ARRL Handbook. From what I can understand from the circuit description this is supposed to be a phase locked synchronous detector. But I am not an engineer, only a tech with a few years experience. So please don't take what I say with as the gospel as written by me. I built this circuit about a year ago on a PCB. It did not work as expected as a synch detector. It worked well as a side band detector. The audio was very good. I put the project on hold when I purchased an R-390 non A that was entitled to my undivided attention. Let me know if the circuit you are referring to is the same one that is in the 1996 Handbook. I did contact the author of the article, Jukka Vermasuori, OH2GF for any changes or updates to the article. He responded with no changes. If you want his email address let me know.

Date: Tue, 25 Jun 2002 08:56:18 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R390 VS 390A

<snip> >where can I find a homemade SSB adaptor for R390?

You can get a solid state SSB converter, the PD-1 from Ron Hankins. Unfortunately, the links/URL's I have for him are not working. About \$100 as I recall.

For homebrew and mods, take a look at <http://www.r-390a.net/SSB-conversion.pdf>

Hope this helps. Barry

Date: Tue, 25 Jun 2002 12:35:16 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] R390 VS 390A

.....work with the CV-591 and the older, bigger SSB converter (CV-157?).

The CV-157 wasn't a simple product detector and audio chain like the CV-591, but designed to phase lock to a reduced level carrier transmitted along with an SSB or ISB signal. It had a motor controlled Automatic Frequency Control loop, and was larger, had more tubes, and required a lot more maintaince than the R390/390A's. There were systems consisting of either one R-390 and one CV-159 or two of each in a cabinet (FRR38 and FRR-39?) We used them in the Navy in the early '60's to receive multichannel RATT (RTTY) transmissions before the WRR-2 or R-1051 were available.

Date: Tue, 25 Jun 2002 17:38:43 -0400
Subject: Re: [R-390] R390 VS 390A Plus CV-157
From: Thomas W Leiper <twleiper@juno.com>

> The CV-157

And you should hear how sweet it is when you hook up a stereo system to the two sideband outputs and enjoy fade free AM reception or tune across the band... I use mine for band cruising with an SP-600 and there is nothing like it.

From: "AI2Q Alex" <ai2q@adelphia.net>
Date: Wed, 14 Aug 2002 09:07:31 -0400
Subject: [R-390] RE: Regarding the R-390A, product detector...

You must be referring to my SSB detector, right? (you didn't say). In any case, to my knowledge nobody has made boards for it. Perhaps it would be something for FAR Circuits to consider. For me, the easiest way to assemble it is using Manhattan construction. Check out <http://www.easystreet.com/~w7zoi/bboard.html> for some ideas, and <http://www.qsl.net/k8iqy/tips.html> for Manhattan pix in particular.

From: "AI2Q Alex" <ai2q@adelphia.net>
Date: Wed, 25 Sep 2002 12:41:55 -0400
Subject: [R-390] Product detector rocks

Hey listers! Any of you wishing to dupe my product detector can now apparently acquire the requisite rocks, brand new, at <http://www.qth.com/inrad/home.htm>

My circuit can be found at <http://pdq.com/boatanchors/ssb/> as well as <http://fly.hiwaay.net/~wb7vdn/Download.htm>

From: "AI2Q Alex" <ai2q@adelphia.net>
Date: Wed, 25 Sep 2002 12:41:55 -0400
Subject: [R-390] Product detector rocks

Hey listers! Any of you wishing to dupe my product detector can now apparently acquire the requisite rocks, brand new, at <http://www.qth.com/inrad/home.htm>

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From: Rodney Bunt <rodney_bunt@yahoo.com>
Subject: Re: [R-390] Product detector rocks - USB/LSB rocks

I contacted "International Radio" people who quoted prices for two rocks at \$35 plus postage, BUT they said they made a minimum of 10 rocks at a time, and I would have to buy them all, as they had no use for 45kHz rocks. So \$350 for them is a bit excessive. Any interest from 9 other SSB / product detector enthusiasts out there ???

Date: Tue, 01 Oct 2002 07:50:48 -0700
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Product detector rocks - USB/LSB rocks

You can get the crystals from JAN: <http://www.jancrystals.com/>

I got a set for about \$14 each (in lots of 2!). It took about 6 weeks. No minimum quantity. The outside sales person was Sue Brick who is very helpful.

Date: Tue, 1 Oct 2002 12:53:50 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Product detector rocks - USB/LSB rocks

Well, \$35 a pair isn't much better than \$20 each for the 453.5 and 456.5 at INRAD, although the 453.6 and 456.3 would be a better match to the 2.0 kHz filter of the R-390. This isn't an application that requires xtal stability - I'd go for either two LC tuned circuits - this would let you adjust the BFO freq relative to the mech filter edge to get the voice sound you prefer - or a large BFO tuning knob like on the CV-591, with an adjustable oscillator circuit tuning 455 +/- 3 kHz. I've got some 455.0 kHz xtals if anyone has need of one. Work great if you have a matched pair of LSB/USB mechanical filters.

Date: Sat, 19 Oct 2002 08:28:42 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] CV-591A question

The CV-591 and variants were made by TMC of Mamaroneck, NY. The best one had an adjustable AGC output. Other "Single Sideband receiving adapters" were made by B&W, Eldico and Hammarlund. The best one is the Hammarlund HC-10

(if you can find one) There are also a number of "home-brew" designs around. They all work on the same principle: A product detector with a crystal and/or variable BFO, additional IF filtering and an audio amplifier. Different models include noise reduction, Q-multipliers, pass-band tuning and S-meters. Jim

Date: Thu, 31 Oct 2002 18:21:31 -0800 (PST)
From: Bruce Bennett <maritimus49@yahoo.com>
Subject: [R-390] SSB reception with R-390A

Hello everyone - I am pleased to be able to say that I will finally be able to buy an EAC R-390A remanufactured by Rick Mish within the next week or so. I am really looking forward to seeing what this wonderful receiver can do on the SW and BC bands. I am also curious about some possible SSB mods and would like to ask what you think the pros and cons are for the following possibilities-

1. The 2 diode mod of Dallas Lankford.
2. The use of the CV-591
3. The older mod from Capt. Paul Lee changing the BFO to a 6BE6.

I would appreciate any comments you have.

From: Llgpt@aol.com
Date: Thu, 31 Oct 2002 21:30:36 EST
Subject: Re: [R-390] SSB reception with R-390A

The Lankford/Chambers agc mod is simple and works great!
CV-591A's work great, need filterelectrolytics replaced, some caps.
The Captain Lee mod is extensive and works no better than the above.

Date: Thu, 31 Oct 2002 21:34:21 -0500
From: Mike Sullivan <vze344qr@verizon.net>
Subject: Re: [R-390] SSB reception with R-390A

I have great experience with the "Lankford mod". I used genuine diodes (1N4148) and increased bfo injection by placing about 50 pf cap in parallel with C535. AM reception was altered a bit - in my case the already strong local am station was distorted (over 100 perhaps 120 on carrier level meter). Others (normal levels up to 100) ok, but seems AM demod audio level was lower. SSB came out good.

Date: Thu, 31 Oct 2002 19:01:10 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] SSB reception with R-390A

I like to rectify the line audio and connect the output to the AGC to push back a bit on the AGC signal. This allows a frequent hands on approach requiring much human intervention.

Date: Fri, 01 Nov 2002 09:25:59 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: Re: [R-390] SSB reception with R-390A

My set came with the Paul Lee mod. It works well - but is too extensive and may be the cause of a change in AVC behaviour. I would have left the set alone and used an external SSB converter out of choice. Preferably a CV-591, but no chance of getting one of those here. Would have done my own using tr*ns*st*rs and ch*ps.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Fri, 01 Nov 2002 17:04:30 -0500
Subject: [R-390] SSB Reception with R-390A

My vote for SSB reception is the 2 diode (Lankford) modification for its simplicity. This method works quite well. A couple of points:

1. Make sure that AGC capacitors are not leaky, especially the large oil filled unit atop IF deck (This should not be a problem for Bruce as his receiver was done by Rick Mish)
2. When increasing BFO injection capacitance remember to adjust BFO neutralization in AGC IF amp.

The 2 diode modification gives good SSB reception even without altering BFO injection. Done this way and with AGC capacitors verified leak-free (by Dr. Jerry's method) I have not found any change to reception of AM and CW signals strong or weak.

Capt. Paul Lee's 6BE6 product detector modification has been mentioned. The National NC-300 uses a 6BE6 as a product detector giving good results; this should perform satisfactorily in the R-390A (although the NC-300's final IF is 85 KHz vs R-390A at 455 KHz). Lee's R-390A mod calls for alteration of mainframe wiring harness to run shielded audio cables to a multisection BFO switch. This accounts for some of the "invasiveness" of the mod.

I would suggest leaving mainframe wiring and BFO switch intact and use a small relay in IF module for audio switching. The relay would be powered by B+ switched to the BFO-turned-product detector when in SSB/CW mode. A quick perusal of Mouser's catalog shows a 24V relay with coil power consumption of 70 mW. A series dropping resistor to operate this relay from the (approx.) 180V B+ line would dissipate only 450 mW. In this fashion modification would be limited to IF module only.

From: "John Warren" <k5qx@earthlink.net>
Date: Wed, 25 Dec 2002 21:52:20 -0600
Subject: [R-390] KC and MC knobs

<snip> By the way, I also did the SSB AGC mod while I was in the IF deck and I am amazed at the difference in the AGC operation on both SSB as well as CW. Thanks to Dallas Lankford for coming up with this and to those who have it included on their web sites. I am really glad I found the thread on it in the archives that are posted on the web.

From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Date: Mon, 13 Jan 2003 08:55:23 -0600
Subject: [R-390] SSB Converters

I know there was a CV-157, but were there other "popular" converters designed for the R390[A]s? I have one of the solid-state jobbies, but would like one of the companions of the era. If there were others, any comments about the differences and/or advantages/disadvantages of them?

Date: Mon, 13 Jan 2003 23:01:04 +0100
From: federico.baldi@virgilio.it
Subject: RE: [R-390] SSB Converters

Hi to all, in my shack I have a SSB Converter CV-1982/TSC-26 made by KAHN RESEARCH LABORATORIES, a very complex object with many nuvistors. This converter works well, but in my personal opinion an R-390A/URR, proper aligned and fitted with a diode bridge on the Diode Load on the rear terminal board, don't need an SSB converter.

Date: Mon, 13 Jan 2003 17:12:18 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: RE: [R-390] SSB Converters

Please tell us how a diode bridge on the Diode Load connector helps receive SSB signals. I have not heard of this method.

Date: Mon, 13 Jan 2003 23:14:54 +0100
From: Kurt Brandstetter <kurt.brandstetter@teleweb.at>
Subject: Re: [R-390] SSB Converters Diode Bridge

Can you explain how the diode bridge should look ? Never heard about this !

From: "Tom Bridgers" <tarheel6@msn.com>
Subject: Re: [R-390] SSB Converters
Date: Mon, 13 Jan 2003 20:02:48 -0500

The diode bridge is sold by Rick Mish, and it has been written about in ER. It is also shown on page 89 of Viappiani's book (in Italian) about the 390A. If you don't

have Viappiani's book, I recommend it. It has A LOT of good stuff. Of course it IS in Italian, but most of the circuits are in English. And those that aren't, I've been able to figure out what is going on. The heart of this SSB module is a traditional bridge circuit of 4 diodes (probably 4148's). The (+) lead goes to term. 16, the ground on the R-390A. One AC leg goes to terminal 13 of the line audio out. The other AC leg has a 600 to 10K ohm resistor (just which value is chosen I don't know) in series with it, between the AC leg and terminal 10 of the line audio out. The (-) of the bridge is connected to terminal 4 of the AGC. All terminals are those found on the back of the R-390A. I have a couple of these "modules" and have not found them to be any improvement over just using standard settings for listening to SSB on a R-390A. I've recently acquired a CV-591A, and the one I have isn't that much better either. Of course, YMMV.

Date: Mon, 13 Jan 2003 17:09:26 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] SSB Converters Diode Bridge

All you need is a \$.99 Radio Shack full wave bridge rectifier. If you've got a junker power supply lying around, there is likely a capable bridge in it ready to use. Refer to the back of the RS package. Route your line audio to the two AC inputs of the part, ground the + pin and wire the - pin to your AGC terminal.

When copying SSB, you simply crank in a little line audio to provide additional AGC action to the set. You may also wire in a little resistance to your liking. When listening to AM, turn your line audio to min. Elegant. Wish I'd have thunk of it. Back in the day, some guy was charging good money for this Cracker Jack prize, selling it as a sophisticated gadget.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] SSB Converters Diode Bridge
Date: Mon, 13 Jan 2003 17:27:19 -0800

Mine will be offered only to discerning listeners, those who can recognize silver soldered joints and oxygen free copper, encapsulated with low dielectric constant potting epoxy, doo-dah, doo-dah, doo-dah...

Date: Tue, 14 Jan 2003 08:56:58 +0100
From: federico.baldi@virgilio.it
Subject: Re: [R-390] SSB Converters

Yesterday evening (late evening) I was in wrong when I spoke of Diode Load, but Tom here describe the scheme and connections of the diode bridge very well. In my experience (I put this little circuits on both my R-390A/URR) you must set the receiver controls as follows:

Line Meter : + 10
Line Gain : 7-8
AGC : slow or medium
Bandwidth : 2, 1, 0.1 kHz as needed

BFO Pitch : as needed -/+ 1
BFO : on
RF GAIN : 10
Function : AGC
Local Gain : for desired volume

You must tune in an SSB signal, line level meter should read 50-75 on audio peaks, you can regulate Line Gain if you put Line Gain to 0 the adapter is turned off, in other words this has the same effect as removing the adapter from receiver. Try, no risk, very low cost, good results (you shall judge), you don't need to regulate RF Gain thereafter. In my personal opinion the SSB converter is a nice object but don't add anything to the results that you can get with this circuits that worth 4 USD maximum (including your time). Federico

P.S. : I agree with Tom an all.

From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: [R-390] SSB Converters Diode Bridge
Date: Tue, 14 Jan 2003 10:25:35 -0600

As long as I've been participating in this list, I don't recall this "add-on" being discussed. It sure seems like a cool thing to try and I plan to. I like "elegant" mods like this one...

From: <whertel@cox.net>
Subject: Re: RE: [R-390] SSB Converters Diode Bridge
Date: Tue, 14 Jan 2003 12:35:59 -0500

Food for thought: Discussion has been about using common diodes, presumably silicon. I believe these have about a 0.6 volt drop across them. Would using germanium diodes, with a 0.1 volt drop, provide more sensitive control? Sounds like a project to try.

From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: RE: [R-390] SSB Converters Diode Bridge
Date: Tue, 14 Jan 2003 11:39:52 -0600

I thought about the same thing. I was going with germaniums.

Date: Tue, 14 Jan 2003 12:37:49 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: RE: RE: [R-390] SSB Converters Diode Bridge

I believe there is sufficient line audio to use just about any diode.

From: "Merle" <lal@metrocast.net>
Date: Tue, 14 Jan 2003 16:27:04 -0500
Subject: [R-390] SSB w/ Diode Bridge

This afternoon I tried the Bridge system on both of my R-390A units. The results were okay. It seems to be a quick way to be able to receive SSB without going into the radio. The other Mod. (adding a couple of 1N4148 diodes) works much better with no fussing around adjusting things! Just my thoughts..

Date: Tue, 14 Jan 2003 18:06:16 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] R-390A & CV-591

With the '390 humming along, I pulled the CV-591, replaced the paper caps and aligned it. (then went back in and found the wire I disconnected when pulling caps.) The CV-591 is working much better, but I am getting a lot of distortion on strong SSB signal peaks (and this is with the 15ft. shop wire) backing off the RF gain takes care of this, but that shouldn't be necessary except on the strongest signals. I added the Ripple 2 diode MOD. to the R-390A AGC circuit, so the R-390A attack time should be OK. Anyhow, I can't tell if the problem is in the R-390A or the CV-591..... I'm looking for some subjective comments from CV-591 users. How does your CV-591 "play" with the R-390A? Are you experiencing SSB peak distortion?

Date: Tue, 14 Jan 2003 18:49:40 -0500
From: MURPH <rickmurphy1001@earthlink.net>
Subject: [R-390] R390a - S.S.B.

Has anyone done the W3JHR Captain John Lee modification i.e. - Changing the bfo to a product detector using a 6BE6 ? It's suppose to fix all the SSB ailments and the AGC problem is addressed by adding a 1.0 mfd cap from pin 10 to ground on the AGC switch S107. January 68 CQ magazine.

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] R390a - S.S.B.
Date: Tue, 14 Jan 2003 19:00:38 -0500

I've worked on a unit that had that modification done. The unit I worked on had problems with the relay that must be added to the IF deck to make this thing work properly. There are several versions of the Capt. Lee mod, so look for the later ones if you plan to do it. It certainly falls into the category of not-easily-reversible modifications, which I tend to avoid.

From: "Jim Shorney" <jshorney@inebraska.com>
Date: Tue, 14 Jan 2003 19:25:15 -0600 (CST)
Subject: Re: RE: [R-390] SSB Converters Diode Bridge

>Discussion has been about using common diodes, presumably silicon. I believe these have about a 0.6 volt drop across them. Would using germanium diodes, with a 0.1 volt drop, provide more sensitive control? Sounds like a project to try.

How about Schottkey or fast-recovery rectifiers?

Date: Tue, 14 Jan 2003 20:47:26 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: RE: [R-390] SSB Converters Diode Bridge

Germanium would not be a good idea here. The idea is to have a diode that goes high impedance when reverse biased and low impedance when forward biased. More or less you are using it like a switch rather than a detector. A germanium diode does not go as high impedance when reverse biased as a silicon part. If you have 1N4148's they should do just fine. Last time I saw them they cost less than a dime each.

From: DCrespy@aol.com
Date: Tue, 14 Jan 2003 22:09:02 EST
Subject: Re: [R-390] SSB Converters Diode Bridge

I have never tried this mod (Diode Bridge), so this is not the voice of experience: But it looks like this is just a way to make the AGC's rate of gain reduction variable. ie. you can make it more aggressive in reducing overall gain, by turning up the Line Gain control. It should do basically the same thing as turning down the RF Gain?? The 2 Diode Lankford mod actually changes the AGC to "fast attack, slow decay" specifically for SSB. (I HAVE tried this one with excellent results 3 times.)
Comments?

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] SSB Converters Diode Bridge
Date: Tue, 14 Jan 2003 22:20:21 -0600

Not sure it is clear to everybody that the diode bridge to AGC is NOT an SSB converter in the same sense as a product detector and BFO. What it does is use the audio level to run the AGC to get better control of the audio volume level because there is no carrier for the original AM based AGC. You still have to tune the R390 very carefully for best reception.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Tue, 14 Jan 2003 21:02:14 -0800
Subject: [R-390] Re:R390(A) - S.S.B.

Years ago, for a special project at the University of Idaho where I work, I added a fairly easily removed mod to an R-390 wherein I used 1/2 of the 12AX7 (IIRC) which fed the IF out to the jack on the back, as a triode product detector. The detector circuit I used, the same circuit used in Heathkit's SB/HW transceivers, actually looks more like an "infinite impedance detector" than a true product detector as such, since it seemed to work equally well for AM as for SSB. In any case, it was much quieter than the diode detector and was pretty effective.

The mod took very few parts, worked quite well, and was easily removed if you wanted to. I didn't bother with changing the AGC time constant. I just kept the RF gain down a bit, and ran the audio gain up. I had used the same circuit back in the 1960s in another R-390 we were using as the receiver for 'phone patching for the troops in Vietnam and Thailand when I was in AFMARS, and in a BC-779 which I used for RTTY. I've never liked the 6BE6 for anything since it is so noisy. The only mixer tube I know of which was noisier was the 6K8/12K8, but I think there are noisier tubes than those. Rambling.....

Date: Wed, 15 Jan 2003 09:34:57 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: [R-390] Re:R390(A) - S.S.B.

Someone put a 6BE6 in my set as an SSB detector - as far as I can tell it is the Captain Lee mod. It can only be reversed with some difficulty, so I wouldn't do it nowadays. The set works well on SSB without any problems other than the carrier level meter calibration being way out. (too sensitive - Which, admittedly, may be a symptom of something else wrong.) Any noise from the 6BE6 is swamped by aerial noise. I've only used 2-diode SSB detectors on home-made sets as a comparison. Can't tell the difference. - Bryce (apologies for long CSIR disclaimer - will attempt its removal.)

Date: Wed, 15 Jan 2003 09:26:10 -0500
From: "Veenstra, Lester" <lester.veenstra@lmco.com>
Subject: RE: [R-390] SSB Converters Diode Bridge

As you have to do in the case of any type of SSB reception that does not involve a detector that tracks or locks to an unsuppressed carrier. Les
K1YCM/3

-----Original Message-----

You still have to tune the R390 very carefully for best reception.

Regards, Bill Hawkins

Date: Wed, 15 Jan 2003 16:59:29 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: RE: [R-390] SSB Converters Diode Bridge

Following Lesters remarks, I was interested in the way a CV-591 tracks the SSB signal: Many (not all) of the amateur SSB transmissions seem to have the carrier totally suppressed. Do units such as the CV-591 work well with all amateur SSB transmissions ? - I guess they must. The nearest thing I have is the sync detector on a SONY. That certainly doesn't work on SSB. Maybe a solid state CV-591 would be a great 2003 project. - Bryce

Date: Wed, 15 Jan 2003 10:43:28 -0500
From: "Veenstra, Lester" <lester.veenstra@lmco.com>
Subject: RE: [R-390] SSB Converters Diode Bridge

The answer is simple: The CV-591 does not track (With or without carrier). You have to tune the SSB with the receiver or with the CV-591 tuning.

Subject: RE: [R-390] SSB Converters Diode Bridge
From: Richard.McClung@Dielectric.spx.com
Date: Wed, 15 Jan 2003 09:25:23 -0800

The SSB Converter that tracks is the CV-157/U

From: "Jon & Valerie Oldenburg" <jonandvalerieoldenburg@worldnet.att.net>
Subject: Re: [R-390] SSB Converters Diode Bridge
Date: Wed, 15 Jan 2003 11:57:58 -0600

The CV-157 tracks using an electro-mechanical mechanism utilizing a servomotor. There was an extensive article in either Hollowstate news, or Electric Radio on this unit. Jon AB9AH

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 15 Jan 2003 17:23:43 -0500
Subject: [R-390] Resistors, SSB

I have found the 2 diode (Lankford) modification to be extremely effective for SSB reception on the R-390A. The addition of these diodes is not an alteration to the detector as some might suspect. Instead, diodes are used to shunt 2 AGC time constant determining resistors. The result is a short negative going time constant (fast attack) and the original positive going time constant (slow decay). Fast attack enables AGC to capture signal peaks and slow decay "remembers" (for a short time) those peaks so that gain is appropriate for future peaks. Result is a tolerable signal to BFO ratio at the detector (minimizes distortion). That time constant alteration accounts for most of the mod's effectiveness.

The Lankford modification also increases BFO coupling cap for more injection, and adds capacitance to AGC line. The mod works well without these capacitor changes.

For good AGC action on all modes using medium and slow AGC switch settings verify that the 2 uF oil filled AGC cap is not electrically leaky. <snip>

Date: Thu, 16 Jan 2003 19:05:15 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] CV-591

Thanks for the comments on the CV-591 and the R-390A. The CV-591 was swapped for an SBA-1 and most of the SSB peak distortion went away. So I dug into the AGC and IF AMP. circuits on the CV-591, replaced a few components and now it is "playing" much better. There is a 10mfd. oil filled CAP in the audio circuit that might also need replacing. This is the first time that I used the Eldico SBA-1 with the R-390A and it is interesting.

The SBA-1 has crystal controlled oscillators and a crystal filter, so the R-390A must be run wide open (8 or 16MC. filter). It also has an IF gain control, notch filter, noise clipper and a BIG S-meter that is fun to watch. The filter in the SBA-1 is better than the '591 filter, so running wide open is not a problem. I'm not sure which one I prefer.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Fri, 17 Jan 2003 17:22:18 -0500
Subject: [R-390] CV-591

With R-390A bandwidth wide open it is possible for strong signals within R-390A passband but outside of Eldico passband to desense the R-390A via AGC action (if R-390A generated AGC is enabled) or R-390A IF overload (if AGC is taken from Eldico and fed back to R-390A). You could close up R-390A's bandwidth and hope that Eldico crystal filter and applicable R-390A "mechanism a philharmonic" (mechanical filter) center frequencies match (in contradiction of Murphy's Law).

You could bypass Eldico's crystal filter and change detector injection frequencies (crystal swap-a pain). If Eldico has enough gain, you could tap R-390A IF ahead of filters and feed to Eldico (involves mod to R-390A).

From: "Tom Warren" <wwarren1@nc.rr.com>
Subject: Re: [R-390] CV-591
Date: Fri, 17 Jan 2003 17:48:13 -0500

There's also another possibility. You know that the 455 kHz output of the RF deck comes as a balanced pair. Only one side of the balanced pair is used for the 2, 4, 8, and 16 kHz positions of the bandwidth switch. Thus you can take the other mini-BNC connector (P518) and feed that to the IF output jack. Then if you have that connection loaded by a high impedance input to the Eldico (if in fact the input impedance of the Eldico is high), then everything works fine. Depends on the

sensitivity of the Eldico also. This technique works just fine with my Siemens D2007 Frequency Selective Voltmeter used in its high impedance mode and as a SSB IF strip and demodulator. Then you can compare the SSB performance of the R390A versus the Frequency Selective Voltmeter -- and the comparison isn't too bad. Yep, my FSV sounds better just like 30-year-later technology should, but not embarrassingly better.

From: "Drew Papanek" <drewmaster813@hotmail.com>
 Date: Mon, 20 Jan 2003 12:40:36 -0500
 Subject: [R-390] CV-591

Good idea! Using one side of the balanced IF feed (and forsaking use of R-390A crystal filter) opens up a large number of interface possibilities, panadaptor comes to mind. Neat, clean, and no mods required. Is the R-390A AGC stock and in good shape (oil-filled cap not leaking)? Or do you have the 2 diode time constant mod (Dallas Lankford) or the much discussed line audio into bridge rectifier into AGC line. Does the FSV have any AGC action?

Date: Wed, 22 Jan 2003 08:01:54 -0500
 From: Jim Brannigan <jbrannig@optonline.net>
 Subject: [R-390] CV-591 Questions

There is a 10Mfd. bathtub capacitor in the audio driver B+ circuit. This has failed open, is this the usual failure mode of a bathtub capacitor? The variable oscillator is VERY touchy to align. Short term stability is OK, but each time the box is turned on, the calibration is off a kc or so. (I removed the reactance tube and disconnected the coupling cap to the reactance circuit.) Any ideas?

Date: Wed, 22 Jan 2003 10:51:15 -0500
 From: Roy Morgan <roy.morgan@nist.gov>
 Subject: Re: [R-390] CV-591 Questions

.....is this the usual failure mode of a bathtub capacitor?

Usually they don't fail. hehe... leakage is more common than open I think, but whatever, yours failed open. You may be able to unsolder the case and fix an open connection.. though at that point a new cap inside is a good idea. (If you use an electrolytic, mark the polarity!) putting a new cap on the terminals of the old one is a fine solution though.

>The variable oscillator is VERY touchy to align. Any ideas?

Is the thing stable on crystal control (assuming you have the crystals installed)? Apply TINY amounts of De-Oxit or Pro Gold to the cap rotor wiping contacts. This thing is operating around 400 kc or so and should not be touchy in any way. Check ground lugs and capacitor mounting frame studs for corrosion. Also pay attention to shields in the same way. Replace all paper caps, if you have a flaky one in a bypass function, it may be wavering in value enough to affect the oscillator frequency. You may have a flaky trimmer cap. Be careful if you are tempted to

force a ceramic trimmer that is stuck. I broke one and discovered that it is a temperature compensated one (N750 perhaps) and was not easy to replace. For our use the temp compensation may simply not be needed. Summing fixed and a variable cap is perfectly fine if you can't locate the right value.. These circuits should essentially stay tuned up forever once set. To save a bit of heat and unnecessary tube aging, removing the reactance tube as you did is a good idea.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] Tightening shaft connection?
Date: Wed, 22 Jan 2003 09:12:51 -0800

My take on the 47pF cap across the original was that there was too much BFO injection and that it did adversely affect the AGC. I couldn't neutralize the BFO. YMMV. I found that the two diode attack time mod was the most effective part. A smaller cap across the original is a reasonable cut and try affair.

Date: Wed, 22 Jan 2003 16:04:15 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] CV-591 Questions

Roy, Thanks for your input.

> >There is a 10Mfd. bathtub capacitor in the audio driver B+ circuit.

Actually the cap. is somewhat redundant. I'm not sure it adds much to the circuit, a replacement is on order.

> Check ground lugs and capacitor mounting frame studs for corrosion...

Crystal control is OK and the trimmer is in circuit in only one position. I put some Deoxit on the variable shaft...Your suggestion to re-check all ground and contact points is a good one.

Date: Sat, 08 Feb 2003 07:53:52 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] CV-591

An update: I've been working on this radio for a while. All the paper tubular capacitors were replaced. The first variable oscillator is unstable so I started to selectively replace by-pass and coupling capacitors. As the "postage stamp" silver micas and tubular micas are pulled, I check them and have found that they are all VERY leaky. I finally realized that this radio will require a TOTAL re-cap to bring it back to spec. This unit has been in use for quite a while and I am surprised at the deterioration of the components.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Sun, 02 Mar 2003 20:32:46 -0500
Subject: [R-390] 2 diode SSB mod

For information on the 2 diode (Lankford) AGC modification try R-390A.net Go to References, Pearls of Wisdom, SSB conversion. You will find pertinent postings gleaned from this list over the past few years. While all stages of the modification can be performed, the majority of its effect is provided by just the addition of 2 diodes (1N4148 or other silicon small signal type).

Date: Sat, 22 Mar 2003 15:03:28 -0500
From: James Shanks <n1vbn@bit-net.com>
Subject: [R-390] Listen in on Military communications

While I realize that the R-390A-R-390 will not receive LSB/USB I have some radio frequencies that I have come across that are busy with military traffic mostly phone patch stuff. Nothing critical. Iraqi war freqs incl - 4709, 4724, 6712, 6739, 8992, 11175 (very active), 11271, 15038 Khz USB

From: "WF2U" <wf2u@starband.net>
Subject: RE: [R-390] Listen in on Military communications
Date: Sat, 22 Mar 2003 15:31:38 -0500

The statement is incorrect. Any receiver with reasonable stability and a tunable BFO will receive LSB/USB. The R-390 and R-390A are in this category. The AGC system and/or the BFO injection level may not be optimum for quality reception but with judicious use of the RF gain control, and proper BFO tuning adjustment either sideband is received with reasonable quality - this applies to the R-39* family of receivers also.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Sat, 22 Mar 2003 20:25:05 -0800
Subject: Re: [R-390] SSB with the R-39*...

> While I realize that the R-390A-R-390 will not receive LSB/USB...

Not true. ANY receiver with a BFO can receive SSB with proper use of the RF and AF gain controls, and tuning knob or BFO "pitch" controls, by the knowledgeable or experienced operator. I am presently using an Hallicrafters S-41G to receive SSB and it does a good job, although I had to add an "RF" gain (actually IF gain) control to reduce the gain a bit on strong signals to prevent overload. If the S-41G can copy SSB, the R-39* series sure as heck can. Perhaps you were jesting with the above statement? If so, I apologize as I am a little dense sometimes.

Date: Sun, 18 May 2003 10:47:19 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Radium dials and 3AT7
'unubtanium" ballast tube--query for the group

SSB can be effectively squelched by turning down the RF gain and raising the AF gain. (the preferred method for SSB reception with an AM radio.) So I'm not sure how much an SSB squelch circuit would add to the process.

From: R390rcvr@aol.com
Date: Wed, 18 Jun 2003 12:51:53 EDT
Subject: [R-390] Differences between CV-591 and CV-1758

Good afternoon all: Can anyone tell me the functional difference between a TMC CV-591 and TMC CV-1758? On the surface they look very similar, and the description on the FAQ site is the same.

Date: Wed, 18 Jun 2003 22:15:26 -0500
From: Don Reaves W5OR <w5or@comcast.net>
Subject: RE: [R-390] Differences between CV-591 and CV-1758

There are some circuit differences. I'd say the CV-1758 is the improved version internally. The CV-591 and CV-591A are based on the TMC MSR-1 and MSR-4, respectively, and the CV-1758 is based on the TMC MSR-9. Those models span a life time of mid 50's to mid 60's. Functionally, they are the same, and the interconnect diagrams are the same to your R-390 or other 455KC IF receiver. The CV-1758 has an additional front panel switch for a limiter on/off and a slightly different scheme to select upper/lower sideband.

Date: Mon, 30 Jun 2003 12:08:17 -0500
Subject: Re: [R-390] R-390 and "headin west.."
From: blw <ba.williams@charter.net>

Try tuning the radio per the A -10 manual. I don't know about the nonA manual, but I bet it is the same procedure.

1. Decide on your filter setting (4 kHz for this example)
2. Put the BFO selector to half of the filter setting (example- 2 kHz for USB)
3. Off tune your desired freq by what the BFO is set for (2 kHz up for USB or 2 kHz under for LSB)
4. Example- you want to tune to 6.955 USB with the 4 kHz filter. You would set the BFO to -2 kHz, and tune to 6.957 MHz. This should put you real close to the freq of 6.955. You probably won't need verification of your frequency as this is reliable. Learn your particular radio. My USB is a few kHz off, so I fudge that error in every time and I get dead on when I check frequencies. I can get accurate logs every time

If you try it all of the variations you can with tuning/off tuning, BFO adjustments, etc, you will probably find the best audio and very accurate tuning using the -10 manual directions.

From: "Jim DiMauro" <jfd@warwick.net>
Date: Thu, 10 Jul 2003 08:30:40 -0400
Subject: [R-390] SSB-Modified R-390A

I have a Collins-made R-390A S/N 756 from the very first contract (14214-PH-51). It was modified to add SSB capability. The BFO switch was changed from the "Off-On" to "LO-UP-AM-BFO" and the dial lock was removed and replaced with a "VFO Vernier" control.

The mod was very nicely done and works well, with screened lettering on the front panel, and there are no immediately obvious circuit additions from looking at the top of the chassis. I don't know exactly what type of mod was done, but it's certainly not a typical hack job normally associated with military radio conversions by amateurs. I have three questions: where can I find a list and descriptions of known SSB conversions for the '390A so I can identify the mod? Also, were there commercial conversions done by/for the government? This radio came from an estate which included equipment from a US Army experimental SSB station AN/GRC-108 XC-1, so perhaps this radio was modified for the Army and not by a ham. Finally, does a "professional" SSB conversion add to or lessen the radio's value? I guess it depends on the type of mod and who did it, but some thoughts along those lines would be appreciated.

From: "federico" <federico@dottorbaldi.it>
Subject: Re: [R-390] SSB-Modified R-390A
Date: Thu, 10 Jul 2003 14:12:15 +0100

Hi Jim and friends, very interesting. I agree with you that a MOD done (well done) by factory or from Army Lab can add value to the receiver in the same way of some strange contracts (for example I have a 51J-4 manufactured from Collins for Yougoslavian Press Agency TANJUG silkscreened in yougoslavian language). Can you put on the web (or send by mail) a photo of your R-390A/URR for a better evaluation.

Date: Thu, 10 Jul 2003 21:44:29 -0700 (PDT)
From: Rodney Bunt <rodney_bunt@yahoo.com>
Subject: [R-390] SSB-Modified R-390A - factory or not ?

I recently aquired a National HRO-Senior, it has 'factory' installed a miniature tube for the Oscillator, and a Collins filter (2.1kHz) in place of the 1st IF can. It is so neatly done, soldering, components, mounting etc. if it wasn't factory it sure does look as good as. Very good on CW/SSB but too narrow for BC listening. Am looking to 'retro' the original IF can back in, anyone out there with a HRO IF can, T2 to be exact. Circuit is pretty simple, maybe a change over switch Collins Mechanical Filter / IF filter.

Date: Thu, 10 Jul 2003 23:24:49 -0700
From: David Ross <ross@hypertools.com>
Subject: Re: [R-390] SSB-Modified R-390A

Does this describe the LSB-USB-AM-CW mod for the R-390A?

"Mounted on a small L-bracket chassis, it consisted of circuitry featuring a 6U8 tube with two crystals and a USB/LSB selector switch. The original BFO switch was removed and the new assembly installed in it's place. A short cable fit into an 8-pin connector added near the front of the IF deck for power and signal output. The front panel was refinished, repainted and silk screened with new lettering for the USB/LSB switch"

This is from the February 2003 issue of Electric Radio, page 32, article titled "Dick Walser Remembered". Dick is apparently the fellow who came up with this SSB mod. The article mentions Dick's company, Airborne Electronics and further states: "In all, Airborne remanufactured about one thousand R-390As. A large number of them were shipped to radio dealers in the (Los Angeles/North Hollywood) area. Not all of them went to the dealers.

Todd Shipyards purchased ten radios that were to be installed in five destroyer escorts being built in the 1970's, and in the 1980's a mysterious Japanese entrepreneur purchased twenty R-390A's for his well-heeled clients in Tokyo. Most of their rebuilt radios were shipped to well-known 3-letter Government agencies.

Some were shipped to countries in South America. R-390As that were under contract to Columbia Electronics received a new nameplate that reflected 'Columbia Electronics' as the manufacturer." Columbia Electronics does show up as an R-390A manufacturer on an R-390A FAQ at:

<http://www.r-390a.net/faq-manuf.htm>

Date: Fri, 11 Jul 2003 02:40:25 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] SSB-modified R390A

How may you be correct on frequency indication, if you replace the normal use Zero knob w/BFO vernier? The BFO will still do better with any of several old mil. zero methods, for SSB. BFO can vary quite a lot due to hard to control factors, I always found.. Saw NO mil. variations for SSB during my time, But I was not in the Sig Corps..However I saw a lot of these units, and observed them closely, and learned the old method for SSB reception from a few in Sig. Corps. What I did see were TMC converters...

From: Llgpt1@aol.com
Date: Fri, 11 Jul 2003 14:32:38 EDT
Subject: Re: [R-390] SSB-Modified R-390A

A not uncommon modification. Several variations of this particular mod are around. Some have the 6U8 and the USB & LSB X-tal on the audio deck, some are inside the front panel, others as in your pics. The article in ER covered it. Also covered in Paolo Viappiani's R-390/URR R-390A/URR Handbook with photos and schematics.

Date: Fri, 11 Jul 2003 13:50:05 -0700
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] SSB-Modified R-390A

I have about 50 of Dick Walsers panels, the 6U8 module and instructions and schematic in Italian. If I can ever get the info translated to English. I am going to look at the possibility of making a complete kit available. The panels are not for sale at the present time.

From: "Jim DiMauro" <jfd@warwick.net>
Date: Sat, 19 Jul 2003 20:03:13 -0400
Subject: [R-390] SSB Conversion Photos

Hi All: For those interested, I shot a couple of photos of the SSB conversion on my Collins R-390A. Here are the links:

<http://webusers.warwick.net/~u1016524/r390afont.JPG>
<http://webusers.warwick.net/~u1016524/r390assbadapt.JPG>

You can see on the front panel that the Mode switch positions are "LO-UP-AM-BFO" and the dial lock control is now a "VFO Vernier," which provides kind of a fine tuning of the SSB signal, although in my opinion it's not really necessary, since SSB signals are easily tuned in with the main tuning knob.

The subchassis on the underside of the radio supports a 6U8 and associated circuitry. Near as I can tell from the photographs it looks identical to the rare factory SSB conversion described on R390-A.com, but since my radio is a Collins-made unit from the first contract in 1954, it's almost certainly a later addition. So there you have it.

From: Llgpt1@aol.com
Date: Sat, 19 Jul 2003 21:19:11 EDT
Subject: Re: [R-390] SSB Conversion Photos

That is basically the same conversion as pictured in Paolo Viappiani's R-390 - R-390A Handbook. The Schematic is printed in it also, schematic is in English, noted as an EAC conversion.

From: "federico" <federico@dottorbaldi.it>
Subject: Re: [R-390] SSB Conversion Photos
Date: Sun, 20 Jul 2003 09:34:37 +0100

Very interesting. A question : the front panel is silkscreened or engraved?

From: "Merle" <lal@cyberwc.net>
Date: Sun, 20 Jul 2003 07:41:10 -0400
Subject: [R-390] SSB

Very interesting pictures and write up about the SSB Conversion. Would anyone on the list be able to scan the schematic and put it up here? Sounds like a nice winter project.

From: "federico" <federico@dottorbaldi.it>
Subject: Re: [R-390] SSB
Date: Sun, 20 Jul 2003 14:05:59 +0100

I have already done the scan of the EAC circuit for SSB conversion, I shall try to put on the web or I can send by mail to the group.

From: "Dennis L. Wade" <dwade@pacbell.net>
Date: Sun, 20 Jul 2003 09:29:54 -0700
Subject: Re: [R-390] SSB Conversion Photos

Thanks for sharing the pictures. I'd agree...probably the same or very similar electrically to the EAC 6U8 mod already discussed. Considerably different though in some cosmetic/front panel details. Maybe an earlier implementation? Different layout of the 6U8 subassembly. You can compare your pics with my SSB mod pics at: <http://kg6zi.homestead.com/>

Note the lack of a VFO vernier on my version. For my tastes, I'd like to have some kind of vernier for SSB, and especially for CW when I use an outboard audio filter. Is the vernier electrical or a mechanical type? My panel is silkscreened by the way in case anyone is interested.

From: "Jim DiMauro" <jfd@warwick.net>
Subject: Re: [R-390] SSB Conversion Photos
Date: Sun, 20 Jul 2003 16:25:58 -0400

Thanks to all for your responses and information on the SSB mod. I'm looking forward to seeing the EAC schematic, since it seems to be the type I have. Federico: my panel is silkscreened. Dennis: the VFO vernier is electrical; the control that replaced the dial lock is an air-variable capacitor, connected to a line that seemingly connects to the PTO. I didn't trace it carefully.

Date: Sun, 20 Jul 2003 16:34:28 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] SSB Conversion Photos

To the group concerned with this conversion: I would be most happy to receive ANY photos that go into detail on this modification, AND any and all schematics of this.

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] SSB Conversion Photos
Date: Mon, 21 Jul 2003 14:13:32 -0400

Jim, very interesting! Can you see what the "VFO Vernier" is controlling behind the panel? Probably a variable cap or a pot?

From: "federico" <federico@dottorbaldi.it>
Date: Mon, 21 Jul 2003 22:04:17 +0100
Subject: [R-390] SSB Conversion Scheme

Hi to all friends, I succeed to put the scheme of SSB EAC Mod, please follow the link : www.dottorbaldi.it/militaryradio and there you shall find the scheme and some photo of my shack. Let me know if there are any problem.

Date: Mon, 21 Jul 2003 17:20:52 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] SSB Conversion Scheme

Federico: Many thanks fer the schematic. It is very similar to the product detector I installed in the FM socket of a 75A3 many years ago. Very nice pictures of the shack.

From: "Tony Angerame" <tangerame@earthlink.net>
Date: Tue, 22 Jul 2003 22:07:33 -0700
Subject: [R-390] Dallas Lankford SSB Mod(AGC) Vs. Carr Level Mtr

I installed the two diode SSB AGC mod with great results. However, I noted the carrier level meter reading seems to be much greater after the mod. I checked this out with my URM-25 and the chart of microvolts/db in the manual. As I suspected the meter was reading way high i.e. a 20 over S-9 nearly pegs the meter. I don't intend to remove the mod because it works so well but I would like to know if anyone has gotten similar results. Perhaps there's even a way around the increased s-meter sensitivity. BTW the IF gain is adjusted properly (Down).

From: DJED1@aol.com
Date: Wed, 23 Jul 2003 21:25:37 EDT
Subject: [R-390] R-390A SSB adapter

I've finished a new solid-state SSB adapter, and thought I'd share my results with the group. As some may remember, I built a product detector and AVC circuit which could be added to the R-390A without any mods. My first version used a variable BFO, so you could tune it to either side of the R-390A filter. This worked well- it was much smaller than a CV-591A, and was able to feed fast AVC to the receiver, making operation of the radio as if it had a built-in product detector. However it had a couple of drawbacks: First, the receiver needed to be recalibrated whenever you retuned the BFO to switch sidebands; second, my BFO circuit drifted some. So I built a new version around a 100 Kc crystal filter I picked up. Uses a 100 KC BFO, and switches sideband by switching the downconversion crystal oscillator. So its function is similar to the CV-591A. It's much more stable now, and no recal is needed when switching sidebands (or bypassing the unit for AM reception). However, it needs to work with the 4 KC bandwidth of the R-390A, in order to allow a passband of 2 KC with the 100 KC filter. The disadvantage is that the receiver AVC is open to all 4 KC of bandwidth, and so the gain can be affected by signals on the opposite sideband. Guess there is no perfect solution- I'm going to modify the old SSB adapter for crystal BFO, then I'll have to decide which one to use. I may hang the other on my SP-600.

From: Llgpt1@aol.com
Date: Wed, 23 Jul 2003 16:24:49 EDT
Subject: Re: [R-390] Synchronous AM Detector Kit

Here is how I have done it for many, many years. Take the 455 kc if output, connected to a Kiwa Map 1.0 Synchronous Detector. This gives two bandwidths that are derived from cascading 6 ceramic filters. Bandwidths are 6.8 kc and 2.8 kc. When combined with the 8 kc filter, whistles, hets. etc are gone. The, I connect the 455 kc if output from the Kiwa and feed a Sherwood SE-3 MK3. What audio, and no fading problems. Also has a product detector, and, it works with my SP-600 too!!!

From: ToddRoberts2001@aol.com
Date: Thu, 24 Jul 2003 08:18:41 EDT
Subject: Re: [R-390] Synchronous AM Detector Kit

Some folks here have mentioned using some of the available sand state radios with a built-in AM synchronous detector to tune in the 455 KHz I.F. of an R-390A as an "outboard" AM sync detector. Why hasn't anyone mentioned using a similar scheme for an "outboard" SSB detector? Just hook up a Sony 2010 to the I.F. output tuned to 455 KHz and enjoy SSB? You could even hook up a cheapie radio like the Radio Shack DX-440 for a product detector? Why bother to build an SSB adapter? Inquiring minds want to know!

Date: Thu, 24 Jul 2003 07:32:48 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Synchronous AM Detector Kit

I suspect it's because, for some of us at least, the trip is as much fun as the destination.

Date: Thu, 24 Jul 2003 08:40:28 -0400
From: "Veenstra, Lester" <lester.veenstra@lmco.com>
Subject: RE: [R-390] R-390A SSB adapter

Assuming you want to keep the use of the 2 KHz filter as a basis for the SSB adapter, I do not see a solution around the mechanical dial indication not giving you the SSB carrier freq as you shift from USB to LSB.

These thoughts occur:

(1) Assuming that you do have a true SSB filter(s) in the outboard unit, and that you derive the AGC signal past these filters, and assuming that your outboard product detector has sufficient gain (actually, input sensitivity) that you your AGC feedback to the R-390 will keep its internal IF levels lower than are typical; With this assumption of low IF signal required , you reduce the chance that strong adjacent channel signals passed by a 4, 8 or even 16 kHz position will be a problem, with problem, in this case, meaning intermodulation products generated in the IF chain after the 455 mechanical filter and before the IF output to the external detector.

(2) Heresy? While you are building an external product detector, and want to use the internal 2 kHz filter, why not simply also tap the PTO output and build a pic based counter that can then have it's displayed value shifted for both USB/LSB and for front end offsets, just as you mechanically offset calibrate the PTO readout.

(3) Heresy and Blasphemy? O... Go ahead and simply build an outboard fixed LO frequency I and Q detector, A/D the I and Q channels and hand it to a simple DSP chip to do the heavy lifting.

From: DJED1@aol.com
Date: Thu, 24 Jul 2003 09:34:40 EDT
Subject: Re: [R-390] R-390A SSB adapter

Thanks for the comments, Lester. One original requirement I set out when I started the design was to avoid heresy- the SSB adapter had to connect only to existing connections on the rear of the radio. So it uses the IF output, the AVC terminals, and routes the audio back into the radio via the diode load terminals. This way the radio doesn't know its hooked up to a sand-state device. I've thought about some of the other items you mentioned, but I decided not to try and make the radio into something its not. Ed

From: "Dennis L. Wade" <dwade@pacbell.net>
Date: Thu, 24 Jul 2003 07:59:10 -0700
Subject: Re: [R-390] Synchronous AM Detector Kit

>I suspect it's because.....

I could not have expressed it better. Getting there is as fun as being there. And for those of us who are thinking about what path to get there on (excuse the extended metaphor), anyone have any/know of any good designs to homebrew? For those interested in experimenting, I found this in a Google search: Note: If you print this from your browser, be sure and check the schematic for completeness... especially on the right margin. Go to: http://home.att.net/~wa1sov/technical/sync_det.html

Date: Thu, 24 Jul 2003 15:18:47 -0400
From: AdamAnt316@aol.com
Subject: [R-390] Re: Crystal calibrator issues on some bands

An update... I turned on the 390A to test Glenn's theory, and for some strange reason, the calibration points have somehow reappeared on those bands from which they were formerly missing. The only difference in operation was that I had my 390A plugged directly into the wall when I wasn't getting the calibration points on those bands, and had it plugged into a variac device when they came back (to go along with the recent variac discussion, I have so far been almost exclusively powering it up by variac with the function switch in the AGC position). I did seem to notice that those bands weren't getting any reception during the time that there were no calibration points, though I wasn't sure if there was supposed to be anything on at least some of them (usually, when listening this radio, I tend to stay below 10MC). If anything else comes up with this issue, I will report it.

Date: Thu, 24 Jul 2003 13:14:26 -0500
From: "Dave Kamp, KW0D" <kw0d@netexpress.net>
Subject: Re: [R-390] Crystal calibrator issues on some bands

--Oh- I know this one! You're not getting markers 'cause the radio's out of INK!
hee hee hee... sorry, I couldn't resist! DK :-)

Date: Thu, 24 Jul 2003 16:17:20 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] SSB on the 390 series

I have posted the method I was taught many years ago, and, If YOU have the patience to do it right, you will receive excellent SSB. Its all in getting the BFO at true "0", and understanding what SSB actually is, as far as pitch deviation is concerned, and what the ear is able to determine in change of loudness and pitch. These turn out to be minute indeed (Aprox 4 cents change can be detected by 90 % of people, for example, in pitch concerns...). I suspect many people really enjoy both building additional equipment, and having an operating system that doesn't require the care in prep. and use, that the BFO requires...However, I use the

standard system for SSB, from ham, official, pirates, and unknown, and always am able to obtain full voice characteristics. Best Regards, John (JLAP)

Date: Thu, 24 Jul 2003 23:59:03 -0500
From: Joe Reda <joer@reda.com>
Subject: Re: [R-390] Synchronous AM Detector Kit

<snip>anyone have any/know of any good designs to homebrew?

I found this one: http://www.radio-electronics.com/info/receivers/sync_det.htm

I'd be curious to know what y'all think of this. I'd always wondered if you could send the signal through a limiter or two to surpress the modulation, and then use that as your input to the mixer or product detector and so achieve sync detection. This idea (near the bottom of the page) seems to be just that. What would you use for the limiter? FM-type limiter circuits, such as those that use 6AU6's beloved of so many receiver designers?

From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Synchronous AM Detector Kit
Date: Thu, 24 Jul 2003 22:28:59 -0700

This technique is sometimes called "quasi-synchronous" detection. It works just fine as long as the carrier doesn't fade out. Using a PLL is generally preferred because it will "coast" over a momentary fade of the carrier.

The 2001 ARRL Handbook discusses this, starting on page 15.30. There is a circuit there that allows you to switch between synchronous and quasi-synchronous detection. It uses a chip that is normally used for FM reception, so it has a square-wave limiter output that can be used to drive the detector. I haven't built that particular circuit, so I don't know how well it works, but I enjoyed reading the article.

Date: Fri, 25 Jul 2003 08:23:08 -0400
From: Sheldon Daitch <sdaitch@ibb.gov>
Subject: Re: [R-390] Synchronous AM Detector Kit

I believe there was an article in Popular Electronics for a solid state synchronous AM detector add-on unit. This was many years ago, and I have a copy of it in storage. Date of the article, unknown, sorry.

Subject: RE: [R-390] Synchronous AM Detector Kit
Date: Fri, 25 Jul 2003 10:02:50 -0700
From: "David Wise" <David_Wise@Phoenix.com>

I have heard this referred to as "Synchrodyne" detection. That has a nice 1920s sound to it :) The Sherwood SE-3 can go synch or quasi-synch only; it has no envelope detector. In quasi-synch mode, it does exactly as described above.

Date: Fri, 25 Jul 2003 17:50:42 -0700 (PDT)
 From: <jlap1939@yahoo.com>
 Subject: [R-390] SSB on the R-390 series

Had a couple req. for the method I have given, and exploited..Happy to send... however, it is given in basics in the Ops. Man. (TM 11-5820-357-10 ..for 390, and TM-11-5820-358-10, for the 390a I believe). My additions relate to furthur set-up, as I learned from my past ARMY friends..and a better understanding of the width of the sideband signal. I am really writing all this in regard to my past experience with the deviation + or - for the upper and lower sidebands. Mine is now BETTER. Where in the past I used + or - 1 to 1.5 hz, I now find since getting my receiver back this last time, that I just never vary from the figure of either +1 or -1. I believe because it is devoid of any probs in alignment and backlash at present...Does that seem reasonable? It would seem to be best in using a two hz filter width on my 390. The 390a should use a 4 for filter usually...Seemed to me in mil. practice that the 2 width was very hard on the hearing, due to the sharpness of the mech filter...Anyone else comment??? I would add, it is the same all the time, hot, after 3 hrs. or at 68 degrees after being off for several hours...WHAT A RADIO...

Had a note asking about the SP 600...I find it works fine on the 600; however it is simply not as accurate or effective for my man. read-out....Might be much better with an added ele. read-out. As I have said, effectivness will vary from receiver to receiver..but it should work pretty well on any. The biggie is to be patient and learn the method. (Probably easier to get an SSB conv. if you are not interested in using the old method...)

Date: Mon, 18 Aug 2003 21:37:30 -0700 (PDT)
 From: John Kolb <jlkolb@cts.com>
 Subject: Re: [R-390] R-390a/SSB Convertor

On Mon, 18 Aug 2003, Tony Angerame wrote:

- > I am using an R-390a and feeding the if output to a Rycom Selective
- > Voltmeter. The Rycom has a product detector with selectable USB/LSB,
- > bfo, am and fm detectors. I works well on all modes but I am skeptical
- > that I actually have the received ssb signal centered in both the
- > passband of the r-390a mechanical filters and the Rycom crystal filters.
- > Right now I simply peak the Rycom on receiver noise, select the
- > appropriate sideband and tune the r-390 for intelligibility but this
- > cannot guarantee the ssb signal is centered in the r-390a passband. I
- > was thinking of using my xmter as a generator and injecting, say a 2.0
- > khz audio and centering it in the 4kc passband just by carrier strength.
- > I have a feeling that because of this I am tuning signals on the r-390a
- > at one end of the filter passband.

If using the 4 kHz filter in the R-390A, exact centering shouldn't be necessary. If using the 2 kHz filter, centering would be rather critical. How close can you set the Rycom? If a perfect 2 kHz filter in the rx, filter corners at 454.00 and 456.00, setting

the Rycom to 453.70 for USB or 456.3 for LSB would give you an audio bandpass of 300 Hz to 2.3 kHz for . I assume the Rycom has xtal controlled BFO's of the correct freq for it's filters, which are probably about 3 kHz wide. Of course the R-390A filters won't be perfect. The 2 Khz filter is spec'ed at 2.1 kHz +/- 0.2 kHz at 25 deg C, +/- 0.3 over -55 to +85 deg C. A couple of 2 kHz filters I plotted recently

<<http://members.cts.com/king/j/jlkolb/site/curves/F455N201.PDF>>

<<http://members.cts.com/king/j/jlkolb/site/curves/F455N202.PDF>>
are a hair less than 2.0 kHz. 4 kHz filter at:

<<http://members.cts.com/king/j/jlkolb/site/curves/F455N40.PDF>>

At any rate, the perfect BFO freq for a 2 kHz filter will vary slight depending on the voice you're listening to, lower or higher pitched. Tune for what sounds most natural. You can also use the Rycom as an awkward passband tuning by offsetting it high or low from the perfect location, using the sholder of one filter to cut into the bandpass of the other filter and thus reducing the bandwidth below 2 kHz.

John KK6IL <<http://members.cts.com/king/j/jlkolb>>

Date: Tue, 30 Dec 2003 08:33:44 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] More CV-591

I started working on my CV-591 last winter. It required so many replacement resistors and capacitors in the RF circuits that I depleted the junk box. When the box of new parts arrived from Mouser there was no time to work on the unit. I just got it back on the bench. The first variable oscillator was making me crazy. It was veery touchy to adjust and it drifted constantly. I finished replacing all the capacitors in the circuit and it was still drifting. The resistors checked out OK, so I tried some chill spray. The last culprit was the cathode/feedback resistor. On to the mixers!! I don't advocate wholesale replacement of parts, but if I was just starting this project I would remove the all vertically mounted "circuit" boards and replace all the components.

From: "Dallas Lankford" <dallas@bayou.com>
Date: Thu, 1 Apr 2004 15:48:44 -0600
Subject: [R-390] Wally Chambers (K5OP) Audio Derived AGC

Quite a long time ago Wally told me about a very simple audio derived AGC mod for SSB consisting of one bridge rectifier and one 10K ohm resistor. I tried it, didn't think it did much of anything for the R-390A, so I put it in a box and was going to mail it back to Wally. But somehow it sat for years on my kitchen counter, and never got mailed. Eventually I moved it to one of my parts storage closets. A few months ago I noticed it and decided to try it again.

The AC leads of the bridge rectifier (a 1.5 amp 50 volt Rectron RB151, also Radio Shack 1151) are connected to the balanced line out terminals, the positive lead to the ground terminal, the negative lead to a 10K (later corrected to 1000 ohms... ed.)

resistor lead, and the other resistor lead to the AGC jumper (either screw #3 or #4) on the rear panel terminal strip.

As I had done before, I turned the LINE GAIN knob to about 3. (Wally never told me what setting to use, and I never thought to ask.) And as before, I could tell that the mod was providing additional AGC voltage because of increased Carrier Level meter indications. And, yes, as before there was no noticeable improvement in the SSB quality. I still observed "pops" and "clicks" on some first syllables. For some reason I decided to increase the audio derived contribution by increasing the LINE GAIN setting. When I increased it to 4 and 5, SSB sounded a bit better. So I upped it to 6, and eventually 7. Above 7 it seems that the R-390A begins to be desensitized.

My opinion now of the K5OP audio derived mod is completely reversed. It is a great SSB mod when used in conjunction with my well-known AGC mod. It is also simple to do. I soldered terminal lugs (available from Radio Shack) to the AC and + leads of the bridge rectifier, and a short insulated wire from the "other 10K resistor lead to a terminal lug so that the mod can be implemented merely by unscrewing 4 screws on the terminal strips, sliding the lugs onto the screws, and tightening the screws. No soldering to the R-390A is necessary. Try it. You'll like it. It, together with my BFO vernier fine tuning mod, makes the R-390A a truly world class SSB receiver.

From: "Dallas Lankford" <dallas@bayou.com>
Subject: Re: [R-390] Wally Chambers (K5OP) Audio Derived AGC
Date: Thu, 1 Apr 2004 17:34:16 -0600

----- Original Message -----

From: "Roy Morgan" <roy.morgan@nist.gov>

> Dallas, Is the BFO vernier fine tuning mod just a mechanical vernier on the BFO
> shaft, as "the guvmint" folks used? I have more than one of those vernier
> knobs around here but not on an R-390A yet. Roy

No. My BFO vernier fine tuning mod is done with a voltage regulator, voltage variable diodes, and a 50K ohm pot (the pot added to the front panel in place of the DIAL LOCK mechanism). It was mentioned recently on the "qth" R390 reflector, and is described in detail in a file that can be downloaded from the FILES section of the YAHOO r390 reflector. Best regards, Dallas

From: "Dallas Lankford" <dallas@bayou.com>
Subject: Re: [R-390] Wally Chambers (K5OP) Audio Derived AGC
Date: Thu, 1 Apr 2004 19:56:56 -0600

----- Original Message -----

From: "John KA1XC" <tetrode@comcast.net>
> sounds interesting. Which AGC speed do you use, Slow?

I use whatever AGC speed band conditions (including QRM and QRN) dictate. But as you guessed, I normally use SLOW, and the audio derived AGC mod improves the SLOW AGC the most. I haven't looked at the audio derived mod yet with my scope, but I presume it substantially speeds up the SLOW attack time, which is very slow in an unmodified R-390A, about 10 milliseconds. To eliminate "pops" and "clicks" on initial syllables of SSB transmissions, I have found that attack times of about 3 milliseconds or less are needed. Remember, too, that the SLOW AGC of an unmodified R-390A uses a Miller effect AGC, which has an amazingly slow attack time of 200 milliseconds. I would be surprised if this audio derived AGC mod worked with SLOW AGC in an unmodified R-390A. Bur who knows? Maybe someone will try it and report back to us.

From: "Dallas Lankford" <dallas@bayou.com>
Date: Fri, 2 Apr 2004 13:16:25 -0600
Subject: [R-390] Correction To "Chambers Audio Derived AGC Mod"

Well, I don't know how I botched it so badly. The 10K ohm resistor should be 1K ohms. And instead of being in the path to the AGC line, it is in one (either one) of the AC lines of the bridge rectifier to either one of the LINE OUT terminals.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Correction To "Chambers Audio Derived AGC Mod"
Date: Fri, 2 Apr 2004 13:25:12 -0600

Is this very effective without other SSB mods? I think I'll try this as it's so easy, but was wondering what I might expect with it. I know it's pretty simple and words pretty much describe it, but is there a schematic somewhere online?

Date: Fri, 02 Apr 2004 12:15:32 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"

Hi, well, I wondered why it didn't work and was pursuing the cause. I found the mentioned RS rectifier in my junk box, still in the orig. package, probably 20 years old. But I got no effect with your described hookup - I'll try the corrected version shortly. But aside from that I found another quirk ?? in my 390a. I've never been happy with agc on the set - it has the two diode mod in the agc circuit. I began to wonder if the C551 cap was bad and tried the suggested test of switching between fast, med and slow setting to see if the indicated carrier level changed as an indication of leakage.. In doing this I noticed the quirk?? - when I switched from slow (which has B+ on one side of C551) to med or fast , the carrier meter pins to the upscale direction then drifts back to a level that is about 20 db higher. It stays at this level until I turn the rf gain down and back up, then it goes back to the lower level, about 20 db down from where it went went it drifted down from the meter pinned state. While all this is going on, I put a VTVM on the agc line and don't see this happening with the agc voltage. It didn't reflect this quirk, except it did go far upscale negatively when I switched from slow to med but returned to a level that was the same as before the switch. It there some kind of latching of the i.f. tube on the other side of the carrier meter, or is this likely a bad carrier meter. It seems to

do it regardless of what the signal carrier strength is and shows no quirks when I move it up and down with the rf gain control. When I switch from fast to med to slow, in that order, the carrier level stays the same. Only when I switch back up to med or fast does the quirk occur, Dan.

From: "Dallas Lankford" <dallas@bayou.com>

Date: Fri, 2 Apr 2004 21:53:36 -0600

Subject: [R-390] Attack Time Of K5OP Audio Derived AGC

This evening I measured the attack time of the K5OP audio derived AGC. It was about what I expected. With the LINE GAIN set at 7, and SLOW AGC, the attack time was about 1.5 milliseconds. A slight amount of "overshoot" (strictly speaking, undershoot) was observed. I can't hear it either in the lab, or when receiving actual SSB, so it is not worth getting excited about. A resistor (value to be determined) in the AGC line would probably fix it, and I may do that eventually. As the LINE GAIN is decreased (not recommended), the attack time increases. At LINE GAIN 3 the attack time is about 5 milliseconds, and as I said before, some pops and clicks are observed on initial syllables. I should add that the LINE GAIN pots in my R-390A's (and, in fact, all pots) have been replaced with new AP Type J pots (formerly Allen Bradley, but now Clarostat). If you have an R-390A with a well worn LINE GAIN pot, there is no telling how the K5OP mod will work in your R-390A.

From: "Dallas Lankford" <dallas@bayou.com>

Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"

Date: Sat, 3 Apr 2004 06:28:28 -0600

Sorry about the mistakes. Your account of the CARRIER METER hanging rings a bell, but my memory just isn't what it used to be. Maybe it will come to me later. Unless you did the two diode mod yourself, my first guess would be that it was done wrong. When I get a "new" R-390A, the first thing I do is restore it to original. That has saved me a lot of grief in the past. If the problem remains after restoring it to original, you need to swap out the IF deck to determine if the problem is due to your IF deck or not.

The K5OP Audio Derived AGC probably won't work anyway for your R-390A because from your description it appears that your SLOW AGC is the original Miller effect circuit. The attack time of the original SLOW AGC is painfully slow, about 200 milliseconds according to my Hollow State Newsletter article. I'll stick my neck out on this one and say that the K5OP ADAGC just doesn't move enough electrons to charge a SLOW Miller circuit fast enough.

From: "Dallas Lankford" <dallas@bayou.com>

Date: Sat, 3 Apr 2004 08:30:13 -0600

Subject: [R-390] Duuuuhhh (K5OP Audio Derived AGC)

First, let me say how much I appreciate the stimulation questions I have been asked about the K5OP Audio Derived AGC mod. Sorry about the mistakes, and I hope you will be patient with any of my misunderstandings.

Anyway, I was asked, several times I think, if the K5OP mod would work with an unmodified R-390A. I said "probably not," thinking the question was about the SLOW AGC. But I forgot all about the MED and FAST. For all I know it will work just fine with them. I would do my old 2 diode AGC mod, though, (and remove R547, or unsolder one end of R547) because it is so simple to do, and it provides longer release times for FAST and MED (which is desirable).

Removal of R547 may cause the SLOW AGC to "hang" for a while and only slowly drop back to normal. I'm not sure on this, though. It has been too long since I studied the R-390A AGC variations. I have an unmodified IF deck that I will try with the K5OP Audio Derived AGC and report on that later.

Date: Sat, 03 Apr 2004 09:11:49 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"

Dallas, I changed the K5OP audio agc gadget to the corrected config and it seems to help a bit on the reduction of distortion on initial attack. But that aspect wasn't too bad without it with the diode mod in place. I did the diode mod myself and I'm pretty confident that it's installed the way it should be. My story is a little more complicated than I stated since I'm using a 390 i.f.

chassis in my 390a radio but I've convinced myself that this is not the cause of the quirk that I see. I'll probably wait to see what characteristics you observe with your unmodified i.f. chassis as far as carrier meter hang goes since my 390a i.f. chassis also has the diode mod in it and I'd rather not undo the mod at this point and stick it in to see its characteristic. I would be interested in the observation of anyone else on absence or presence of this quirk of meter hang and whether or not the carrier meter is pinned in a set with or without the diode mod when switching from slow to med on agc. Dan.

From: "Dallas Lankford" <dallas@bayou.com>
Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"
Date: Sat, 3 Apr 2004 11:52:42 -0600

Dan, You have two diodes (and I don't know what else you added, or what else you removed) in (to/from) your IF deck. Whatever results I get with my unmodified IF deck won't tell you anything about your IF deck possible problems. A lot of people have written about my AGC mods, and some of them have gotten it/them wrong. Maybe you were unlucky and stumbled across one of those versions. I would have to dig through my archives, but I believe there were two (possible three) "Lankford 2 diode AGC mods." Which one are you using? In these recent postings to the QTH R-390A reflector, when I referred to "my AGC mod" I meant my final one, the one which appeared in HSN #27. If you don't have that mod, then K5OP Audio Derived AGC mod probably won't do anything for you. Finally, you have only belatedly told me that your IF deck is not an R-390A IF deck, but a modifier R-390 (non-A) IF deck. It is likely that is why you are having those problems.

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"
Date: Sat, 3 Apr 2004 13:50:33 -0500

> quirk of meter hang <snip>

I've only seen this in a mechanically defective meter. You could disconnect it and play around with it on the bench to find out.

>and whether or not the carrier meter is pinned in a set with
> or without the diode mod when switching from slow to med on agc.

The meter pinning is a normal characteristic of stock R-390x's when switching from the SLOW to either of the other speeds. Theoretically my guess it the AGC-diode mod would behave the same way, but in reality the diode junctions may be breaking down to the large negative pulse generated when the AGC speed is switched. Might be a good idea to hook up a scope and take a look.

From: "Dallas Lankford" <dallas@bayou.com>
Date: Sat, 3 Apr 2004 13:04:25 -0600
Subject: [R-390] K5OP AGC Mod & Unmodified IF Decks

I put an unmodified IF deck in my R-390A a little while ago and measured its attack times with a scope using the K5OP AGC mod. SLOW is awfully slow because of the Miller effect circuit it uses. The SLOW attack time was about 200 milliseconds with or without K5OP. Unacceptable for SSB. The MED attack time with K5OP was unmeasurable because it was an awful looking curve, not the exponential curve (or approximately exponential) that we need to assign an attack time to. It probably sounded bad to, but I didn't bother to listen. The FAST setting is unsuitable for SSB. So there you have it. The K5OP isn't a stand alone AGC for unmodified IF decks. It is a helper which provides more electrons to give the optimal FAST attack needed for the SLOW AGC setting of my (last) AGC mod. When I have referred to my AGC mod, I meant the last one. I don't recall exactly how many AGC mods I published. Two or three. (And there is another one that I haven't published yet, but it is just a minor variation of the "last" one.) A lot of different people have written their versions of my AGC mods, some right, and some wrong. So you won't have to find out the hard way that you have a wrong one, I have uploaded my last AGC mod to the FILES section of the other R-390 reflector.

<http://groups.yahoo.com/group/r-390/>

The access the file you have to register with Yahoo, and then you have to join the group. After you have joined the group, you can click on FILES in the side bar, then click on the Dallas folder, and then download the file (there are two others, the SSB filter file, and the BFO vernier fine tuning file). The AGC file is BIG, about 3 Megs. It takes a while to download. It also contains a simple mod to increase the BFO injection voltage. The BFO injection mod may negatively effect the AGC voltage. In that case you should re-neutralize the BFO. This is discussed somewhere on Chuck R.'s web site, I think, and probably elsewhere. I haven't checked this out myself because I never had any problems. The K5OP mod may

work with one of my earlier (and simpler) "2 diode" mods. But I probably won't look into that immediately because I have other irons in the fire.

From: Llgpt@aol.com

Date: Sat, 3 Apr 2004 14:00:51 EST

Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"

Having applied this modification many years ago, I would say, it it without a doubt essential to the proper operation of an R-390A, either for AM broadcast/SWL listening or SSB listening. It (the two diode Lankford mod) eliminates the s-meter hang when switching to med agc from slow and improves listening in the am mode. Of course, It vastly improves the listening in ssb. I fully realize that many do not care to "modify" a R-390A, but that is their problem, not mine. Having known K5OP, and Dallas for many years, I can say without reserve, that those who haven't chosen to make these modifications are living in the dark ages. Les Locklear

Date: Sat, 03 Apr 2004 16:51:00 -0800

From: Dan Merz <djmerz@3-cities.com>

Subject: Re: [R-390] Correction To "Chambers Audio Derived AGC Mod"

Dallas and others, thanks for your patience - hard to tell from the reprint of your article that I have whether it's HSN 27 or not - it's titled " R390A AGC/BFO Mods... By Dallas Lankford published June, 1990 if I'm reading their reprint format correctly - I obtained it from Nat. Radio Club R66 reprints quite awhile back, and I think the only thing I didn't do was take out the 220k resistor that one of the diodes bridges. I just added two diodes 1N4148's. In some 390 postings, this was referred to as Lankford HSN 23. As far as I can tell from other comments, the pinning of the meter is typical 390a or 390 action when switching from slow to med. The quirk of hanging at a higher level may be something else, which I'll pursue. I apologize for not mentioning the 390 i.f. chassis earlier but was really after information on what was normal for the 390a agc carrier meter when switching the slow/med/fast.

At this point, I'm thinking of trying another mod for agc published in Electric Radio Nov 2001. I corresponded about a year ago with Ron Deeter and he suggested a variation of this that he put into both a 390a and the 390 i.f./390a combination. These mods do away with the suppressor grid connections. For the most part, I dislike extensive mod's because I mostly like to appreciate the old sets for what they were. But I can always stick my original 390a i.f. back in for that purpose or for the next guy that gets it. Perhaps someone else has tried the Electric Radio mod. I'm not sure it'll be worth the effort beyond what the two diodes accomplish. My biggest desire is to accommodate ssb signals with big strength differences without turning the rf gain up and down constantly. I did take a look today through the archived FAQ's on the Lankford agc mod subject under 390 ssb mod's to refresh my memory on where I got the mod I made. All the info that originally lead me to make the diode mods was there, along with comments of others at the time on this reflector. There's a lot there on the subject. Thanks to all for the comments, Dan.

Date: Sat, 03 Apr 2004 20:32:42 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] K5OP AGC Mod & Unmodified IF Decks

Dallas, I took a look at the posted agc mod you put on yahoo. It's the same article I have as a reprint from Nat. Radio, called out as R66, only cheaper this time since I think I paid them per page. It took about 25 min with a 56K modem. You did add a note about the difficulty of putting the complete mod. in an EAC chassis, located on the page of the schematic. I didn't put in any of the time constant capacitors mentioned in this article, just the diodes, so I guess my mod would count as an earlier type, as I left the grid/plate Miller effect circuit on the slow position in place. I recall that I did add the 47 pf BFO coupling cap. And to my embarrassment, I find you mentioned the pinning of the carrier meter when switching from slow to medium for an unmodified circuit, which goes away with removal of the Miller effect circuit. So if I did read this completely earlier, I forgot it. But it's good reading - maybe I'll remember it longer this time. best regards, Dan.

Date: Wed, 07 Apr 2004 07:55:05 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] CV-591 Audio

I just completed a substantial re-build and alignment of my CV-591 SSB converter. The audio output is still low. The Audio gain must be fully open to get any reasonable audio output. Is this a drive problem from the R-390A? Has anyone else experienced this problem?

Date: Wed, 7 Apr 2004 08:22:38 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] CV-591 Audio

That's interesting. There are a couple of things I'd look at in this situation:

- o Scope or use a good RF voltmeter to measure the IF level from the R-390A; and
- o Use a good calibrated signal generator (HP 8640B, AN/URM25, etc.) to see what input to the CV-591 is needed to get good output level.

This should tell you which piece of gear to look at. After that, it's a matter of chasing signals from stage to stage until you find where the gain is lower than it should be, something is misaligned, etc. Good luck and happy hunting!

From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] CV-591 Audio
Date: Wed, 7 Apr 2004 07:06:02 -0700

Last time I saw this: (1) C26 had shorted, which (2) burned R34 and C25.

I replaced these and all was well. Anything that causes extra current to flow through the 6AQ5 (V6) will stress R34. It is a 2W 560 ohm cathode resistor. Also, if C25 opens, it will reduce the audio gain quite a bit. I had already determined that there was plenty of signal getting to the audio stage.

Date: Wed, 07 Apr 2004 10:29:04 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] CV-591 Audio

There are various arrangements of the audio output and rear panel jumpers. Study the manual to see if you have the thing set up right. If I remember right, one output arrangement delivers 10 milliwatts or some low power, and the more normal arrangement delivers rated output. The normal output is not very high. I suggest you run the line output to a small external amplifier.

From: "D. ball" <ke1mb@hotmail.com>
Date: Thu, 06 May 2004 19:51:20 -0400
Subject: [R-390] R-390A IF and AGC

I have been having great success by using the IF section of a SSB CB to demodulate the RF coming from the 390A's IF out. I cannot say how much fun it was to do this and watch it work so well. I can also feed the audio back into the 390 by using the diode out. Now that I can hear SSB much better than the product detector mod someone installed I am considering reversing the mod to stock. Question 1: Does anyone think a tube diode makes for better AM audio than a diode?

The other is the ACG mods.

Question 2: Would the stock AGC work better when the radio is used as a down converter rather than the typical AGC mods found in these radios? The CB has it's own AGC in the IF stage. <snip>

From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] R-390A IF and AGC
Date: Thu, 6 May 2004 22:25:21 -0400

Back a couple cycles ago I took a stock SSB CB and used it as a tunable IF for a 15 Meter Transverter Mobile Rig - worked great.

R390A SSB

The 6BE6 product detector mod is something I am working on right now with my R390A. I built the circuit using the Electric Radio article (ER-58) parts and am finding that it works pretty good. The injection is low and distortion occurs during high signal conditions however. Before this, I did the "competition grade" AGC mods that Ray N0DMS published in ER along with the stock diode detector mod. The 6BE6 product detector easily beats that (I kept using Rays AGC mod). Instead of fooling around, I intend to build the product detector stage up externally and characterize it "outside the box". I have collected a spare R390A BFO PTO coil assembly, tube socket, IF can etc.. and am mounting them on a small BUD box. I also collected a variety of pentagrid converter candidates which may outperform the 6BE6.

Date: Thu, 06 May 2004 22:27:12 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-390A IF and AGC

Oddly enough there are two ways to do a tube diode and the equivalent in solid state. A triode grid will work as a diode and it often does a better job than a straight vacuum tube diode. The main advantage is that its "forward voltage" is a bit lower so it makes a more efficient detector. The same thing turns out to be true with the base emitter junction of a transistor. It makes a lower leakage diode than a normal silicon diode. You can also get low barrier hot carrier diodes in solid state.

An AM detector has a bunch of characteristics. The first is the ratio of RF power in versus the audio power out. Solid state diodes are lower barrier but also lower impedance. That makes things a little hard to compare directly. The next characteristic is signal to noise. Here lower impedance is generally better. I suspect the combination comes out in favor of the solid state diode. Assuming the IF strip has enough gain and that signal to noise is set before the detector neither of these things probably are a big deal in a properly designed real radio.

If you swap parts back and forth in a radio without redesigning it I would bet the difference might be more noticeable.

What probably is important is the linearity of the diode. Most grid based tube detectors have a noticeable non-linear component to them. The solid state diode may be a bit more linear but it's a toss up.. Neither one of them is as linear as some other ways to do the rf to AM conversion process. What is for sure is that each will have a different distortion characteristic. Most people like the tube distortion better than the solid state distortion

No matter how you look at it the fast attack / slow decay that the common AGC mods add to the radio work better than the stock AGC

Date: Mon, 14 Jun 2004 10:08:28 +1000
From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Subject: [R-390] Filters

I have converted an IF module to selectable sideband by replacing the 2khz and 4khz filters with assymetrical upper & lower side band filters that I bought for 50\$ for the pair on E place. I used a 455.000 crystal out of the 1khz filter to crystal lock the BFO and I put a 6BE6 in the BFO and converted to a product detector as per HAM RADIO article; it works beautifully: the audio lines are switched when you turn on the BFO on the front panel and the only conversion is in the IF module ,Of which I have the odd spare, hope this is of interest, I have three 390A rxs and they perform better on 40 meters among the broadcast stations than my late model 51S1 or my 8054A recievers

Date: Wed, 23 Jun 2004 12:00:35 +1000
From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Subject: [R-390] 390a Ham radio article

I have scanned the ham radio article on 390A product detectors ect into PDF format if anyone needs it send me an email

Date: Thu, 24 Jun 2004 22:14:50 +1000
From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Subject: [R-390] Product det

I have sent the scanned HAM RADIO article to 35 respondents so far, the circuit works well but I havn't tried the noise limiter mod, also I have used a 12AU7 double triode prod det circuit and it works even better. I mounted it in the 3TF7 socket and substituted 12BA6 tubes for VFO&BFO: this also works well. I used a subminiature relay to switch the audio lines; it had a 9K coil and I put 22K in series to HT. When you switch off the BFO the circuit reverts to the original fer receiving AM , I had a few spare IF modules so I can unmodify it pretty easily,

Date: Mon, 22 Nov 2004 10:55:04 +0000
From: Charles B <ka4prf@us-it.net>
Subject: [R-390] SSB unit

someone told me that there's an outboard unit that allows one to receive LSB & USB better with his R-390A. He said that it was made by Barker & Williamson. Anyone know the email or URL of B & W? I would like to investigate the unit mentioned.

Date: Mon, 22 Nov 2004 12:44:58 +0000
From: Charles B <ka4prf@us-it.net>
Subject: [R-390] Baker and Williams

Someone told me that they obtained a SSB outboard unit for the R390A from Baker And Williams. I went to B&W's web page and couldn't find anything there

concerning this? The fella who mentioned the unit has a problem answering email, so I was wondering if anyone out there on this reflector has any information about this unit?

Date: Mon, 22 Nov 2004 11:39:27 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Baker and Williams

The B&W unit is the "Model 370 Single Sideband Receiving Adapter:" It operates on the frequency conversion principle, with its low IF frequency at 17 to 20 Kc. Upper or lower sideband is selected by changing the mixing frequency. A filter at 17 Kc selects the desired band of frequencies. There is a 17 Kc injection oscillator to re-inject the BFO signal for SSB, CW, or enhanced am operation. The thing contains an audio amplifier (6V6) and speaker. These units seem quite hard to find. I have one, one other fellow I know of has one also. I also have an original manual, and will be happy to provide copies of it to anyone who needs one (it is not on the BAMA site - When I get the time, I'll scan it and send it in for all to have.) Other sideband adapters that can be used with the R-390A or other radios with 455 kc IF frequencies include:

Hammarlund HC-10: quite rare and expensive
Hammarlund SPC-110 rack mount equivalent: even more rare and expensive
Military CV-591 (aka MSR-4) made by TMC sideband adapter
Any modern rice box that will receive SSB and tune to 455 Kc.

Date: Mon, 22 Nov 2004 10:48:57 -0600
From: "klycotek01@mchsi.com" <klycotek01@mchsi.com>
Subject: [R-390] Re: B and W SSB Adaptor

I sold those when I was a B and W dealer and later a lot of used ones came through the doors when fully SSB receivers came along. There were several similar units popular in early 60s and prior. B and W was a no nonsense unit that worked very well and was a companion to the 5100B transmitter and 51SB SSB Adaptor. Add one to a 75A3 or similar and you had a great receiver. Lakeshore, Eldico, and Central Electronics made various models with various results. Most of the Central units were in kit form and I had to rework so many I quite taking them in trade as did my friend Bob Henry.

The jewel that people wanted but was rather expensive was the Hammarland HC-10 and SPC10....SPC was rack mounted. It was literally the whole front end, IF strip and all from a HQ-170/180 with the excellent SSB system, stagger tuned IFs, and other features. Being a Hammarlund dealer I sold them as fast as I could get them....many went on NC300s and 303s. I put one on an AR-88 and it is still there. Also used others on a my R388 and R390A and a couple of commercial receivers.

But when all is said and done the TMC strip rack panel adaptors were a terrific bargain when several surplus stores were selling them for \$50. I bought four and three had off freq crystals (they had your choice of variable tuning or

crystal controlled USB/LSB. I bought a handful of crystals from International and made them do what they were supposed to do. Still have one and like it for it's simplicity. A natural with the R390A.

Sooo it is all in what you are looking for in additional features beyond just adapting to SSB.

There were lesser units on the amateur market but the didn't last long. One great thing about the B and W was a front mounted speaker of high quality.... But then all their gear was great!

Date: Mon, 22 Nov 2004 12:42:20 -0500
From: "AI2Q" <ai2q@adelphia.net>
Subject: Re: [R-390] Baker and Williams

I have a Hammarlund HC-10 hitched to my 51J-4. If someone's interested, and makes me an appropriate offer, I might be persuaded to part with it. I even have the original owner's manual.

Date: Mon, 22 Nov 2004 12:42:23 -0500
From: N4BUQ@aol.com
Subject: Re: [R-390] Baker and Williams

...and the little PD-1 solid-state unit. I have one and it works pretty good.

Date: Mon, 22 Nov 2004 12:49:41 -0500
From: "Veenstra, Lester (N-IntelSat)" <lester.veenstra@lmco.com>
Subject: RE: [R-390] Baker and Williams

Finally, a use defined for a ricebox !

Date: Mon, 22 Nov 2004 12:58:11 -0500
From: Sheldon Daitch <sdaitch@ibb.gov>
Subject: Re: [R-390] Baker and Williams

Let us not forget the CV-157 series units.

Date: Mon, 22 Nov 2004 12:41:37 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Baker and Williams

>Baker And Williams. I went to B&W's web page and couldn't find anything

Might be better to try Barker and Williamson.

Date: Mon, 22 Nov 2004 14:12:43 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Baker and Williams

Why not just do the Lankford agc and product detector modification? I have that on my 51J-4 and it works spectacularly! The agc mod takes care of the crappy audio when listening to fading sw broadcasters and the product detector is superb. No need to vary the bfo, as it is a true product detector, center the bfo in the passband and listen away to USB or LSB with equal ease! The articles were in HSN 26 and HSN 28.

Date: Mon, 22 Nov 2004 14:13:55 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Baker and Williams

I had one of those connected to a R-390A and used a tube Sherwood amp, great sound and a great product detector!

Date: Mon, 22 Nov 2004 11:22:27 -0800
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] Baker and Williams

And the General Electric YRS-1 rack mount

Date: Mon, 22 Nov 2004 15:32:25 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Baker and Williams

>And the General Electric YRS-1 rack mount

I've only seen one of those rare birds, several years ago.

Date: Mon, 17 Jan 2005 21:45:12 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-390 sideband adapter

Probably the biggest single thing that needs to be done for any SSB adapter to work well is the (dare I bring it up ...) Dallas Lankford AGC mod. Without a better attack / decay ratio on the AGC SSB will be a problem. To work properly the AGC needs to be applied to the full receive chain and not just the IF. If you don't mod the radio internally then you need to derive the AGC externally and feed it back into the radio. Another interesting challenge is that the output level from the R-390 is a bit lower than the level that comes out of most modern radios. That makes matching up the radio with just any adapter a little tough. Do you really think this SSB stuff will be around long enough to make it worth setting up for?

Date: Mon, 17 Jan 2005 16:48:12 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] R390 Sideband Adapter

I added an outboard dual product detector with the crystal BFO fed to the two in quadrature (90 degrees out) and listen to the two in stereo. It does nothing to the SSB signal but seems to make the noise three dimensional and almost pleasant. Later I'll extend this into an ISB detector but I haven't got the time right now. So far the AGC hasn't been an issue.

Date: Tue, 18 Jan 2005 10:57:43 EST
From: DJED1@aol.com
Subject: Re: [R-390] R-390 sideband adapter

I certainly agree. In the 70s I bought several CV-591s (\$35 each from DOD-wish I had kept them as an investment), which helped, but they didn't have a convenient speaker output, and took up a lot of space on the desk. I tried my own version of Dallas' AVC mod, and the audio driven version. However, none were really satisfactory without a product detector, and so I built the solid-state product detector and external fast attack AVC. The AVC voltage is derived from the IF output, and only requires a couple of transistors and diodes. The AVC characteristic is not as flat as my R4C, but the R390 was never specified to have a real flat AVC characteristic. I can listen to widely different signal strengths now without any distortion. I've been pretty happy with it, although my BFO is not as stable as the internal BFO. I picked up a couple of BFO crystals which I will add to the unit one of these days.

Date: Mon, 14 Feb 2005 00:07:54 EST
From: DJED1@aol.com
Subject: Re: [R-390] Product detector kits

Jan's detector is a variant of a circuit I offered to the board several years ago. I have one problem with his circuit in how it differs from mine. As best I can tell from his published notes, he has included the product detector, but not the auxiliary fast attack AVC which I included in my circuit. He says in his writeup that you need to reduce the RF gain for strong signals, while my AVC allows full gain on signals up to 80-100 dB. His detector may work well if you have modified the radio's AVC with the Lankford modification.

Date: Mon, 14 Feb 2005 07:44:22 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Product detector kits

AGC is a pretty darn important item. Audio derived AGC is about the only way to go with SSB. One way or another the radio has to have AGC to make a product detector work well for band cruising. Matching the AGC to the detector is an important part of the design. Manual gain control works, but it's a pain as you tune through a crowded band. That said just about any kind of product detector is going

to work better than the BFO in a stock R-390. A lot of this comes down to outboard boxes versus internal modifications. Maybe Jan will offer a product with the full circuit in it ...

Date: Mon, 14 Mar 2005 03:02:54 -0600
From: "Brad Huff" <huffb@avalon.net>
Subject: [R-390] Lankford 2 diode agc mod problem

Has anyone experienced failure of one of the ssb diodes used in the Lankford mod when switching between Med and Slow positions of the agc switch? I saw a reference to this on a web site that suggested this possibility and recommended placing either a mov or back to back zener diodes in the circuit. I've never heard of this before, any thoughts?-Brad

Date: Mon, 14 Mar 2005 07:28:05 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Lankford 2 diode agc mod problem

You are dealing with fairly high voltages in the circuit. Depending on the diodes you use this may be an issue. It's probably easier to just use diodes rated high enough to withstand the transient than to monkey with more parts in the radio.

Date: Mon, 30 May 2005 21:01:04 -0400
From: Dave or Debbie Metz <dmetz@ntelos.net>
Subject: [R-390] FS: Jan Skirrow SSB detector Kit

I recently purchased the Jan Skirrow SSB kit for the 390A. I am positive I will never find the time to assemble this kit. He sells them for \$76 plus shipping. This one, just like I got it from him: \$50 shipped lower 48. see item

Date: Thu, 9 Jun 2005 08:25:23 -0400
From: "AI2Q" <ai2q@adelphia.net>
Subject: Re: [R-390] re cost reduction ect ect

For your reference, you can see my R-390A product detector circuit at this URL:
http://users.adelphia.net/~alexmm/Prod_det/detector.htm

Date: Sun, 26 Jun 2005 15:52:06 -0700
From: "Dennis L. Wade" <dwade@pacbell.net>
Subject: [R-390] Re capping an IF Deck

<snip> This is an EAC unit, the only non-MOTO module in my rig. This one was factory(?) mod-ed to use a product detector module mounted behind the function switch. A new connector was added to feed the new module. <snip>

Date: Sun, 26 Jun 2005 21:32:42 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re IF Deck Product Detector Add On

Do you have any pictures of the product detector as installed in your receiver? I am exploring product detectors in general and looking specifically at what has been done to R390's.

Date: Mon, 27 Jun 2005 00:07:00 -0600
From: "Kenneth Arthur Crips" <CRIPS01@MSN.COM>
Subject: Re: [R-390] Re IF Deck Product Detector Add On

There have been discussions on this list for years about adding a product detector to an R390A. My feeling is why bother with it. The R390 series are all fine radios but for whatever reason they didn't build them with product detectors. As you know I have the Eldico Electronics SBA-1 SSB adapter this unit vastly improves the side band performance of My 1967 EAC R390A, it adds a notch filter and a good 2 watt audio amp. If you want to improve the side band performance of the R390 get one of the many side band adapters that were made instead of modifying the receiver. For SSB reception There are so many good receivers and transceivers out there with product detectors as part of their original design I can't see adding one to the R390

Date: Tue, 28 Jun 2005 14:56:06 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Tell me about Single Sideband Converters

>Currently there is a CV-591A/URR model MSR-4 on ebay

I cannot find it. Can you send an item number, or correct text from the listing title?

>... probably doesn't work. Bid is now at \$300 and will probably sell higher.

>Looks like a hint of blue paint on the face. Doesn't look like a good buy to me.

Nope, it does not, But.. most of them need their caps replaced big time, and often have bad relay contacts that need attention. Nothing impossible, but any CV-591 that works right off the bat has had SOME attention lately.

>...several different Single Sideband Converters were used with the

>R-390A.... which one works the best and what is the going price for one in

>working condition?

They all work more or less well, but others have had more experience with a variety of them and can tell you more. I've not followed prices lately but here are some guesses on the ones we hear most about:

- CV-591, complete and working or restorable: \$300 and up
- HC-10 Hammarlund separate box: \$400 and up
- The SPC-10 (rack mount - meant for use with the SP-600): \$600 and up

That's all pretty discouraging, BUT, if you have a rice box that covers 455 kc, use a 60 db pad and run the IF output from your R-390 into the receiver. Folks who've done this report good results. All you need is a bit of wire and a couple of resistors.

Date: Tue, 28 Jun 2005 15:27:11 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Tell me about Single Sideband Converters

I used a pair of balanced modulators (Motorola chips) and a crystal BFO as a product detector on the IF out. The two modulators get the BFO 90°degrees apart and run into left and right amplifiers. The stereo effect on noise is neat - sounds like water drops rather than a hiss. It becomes almost pleasant. Beats a rice box.

Date: Tue, 28 Jun 2005 13:38:33 -0600
From: "Kenneth" <crips01@msn.com>
Subject: RE: [R-390] Tell me about Single Sideband Converters

This should be an interesting thread. In all of the years I have been on this list I do not remember an in depth discussion of these hollowstate Side band adapters. I only have experience with my Eldico SBA-1. I would like to learn about the other such units manufactured. The CV-591A/URR is a Collins made unit. As you know most anything Collins puts a premium on the price working or not. The only unit I can comment on is the Eldico Electronics SBA-1 adapter I have. The bottom line is works great it makes the tuning of SSB on an R390A just like any modern rig. I am sure the engineering on the Collins adapter might be better; I have not been able to do an A-B comparison. Being able to tune a side band phone round table without having to ride herd of the RF gain is really nice. The SBA-1 has a 4 watt audio amp, a noise blanker, which isn't as good as the one on the R390A which really is no surprise, a notch filter, and a AVC setting fast/slow, as well as the usual controls for audio volume, mode, IF gain, standby/receive. On the back panel there are connections for AVC, muting, speaker connections For 4 and 600 ohms, and IF signal inputs for hi and low impedance.

>From a boatanchor pilot mind set I like these units because they where a contemporary hollowstate solution to the SSB deficiencies of the R390A. As I have reported the when you place the SBA-1 on top of the R390A the controls on the SBA-1 match the flow of the controls on radio.

Date: Tue, 28 Jun 2005 12:58:08 -0700 (PDT)
From: Michael Melland <w9wis@yahoo.com>
Subject: RE: [R-390] Tell me about Single Sideband Converters

Mine is TMC... aren't they all ?

Date: Tue, 28 Jun 2005 16:03:33 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Tell me about Single Sideband Converters

They were designed and manufactured by TMC = Technical Material Corp.
Les Locklear

Date: Tue, 28 Jun 2005 14:11:49 -0600
From: "Kenneth" <crips01@msn.com>
Subject: RE: [R-390] Tell me about Single Sideband Converters

I have never seen one but the info I have on them is they where at least a Collins design, however my info sources might be flat wrong.

Date: Tue, 28 Jun 2005 23:40:45 +0200
From: "federico" <federico@dottorbaldi.it>
Subject: RE: [R-390] Tell me about Single Sideband Converters

Hi to all, my is a CV-1982/TSC-26 by KAHN LABORATORIES RESEARCH INC. with manu nuvistors on board. You can see on my website. 73 de Federico IZ1FID Visit my website entirely devoted to military radio and aircraft clocks :
www.dottorbaldi.it/militaryradio

Date: Tue, 28 Jun 2005 17:56:12 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Tell me about Single Sideband Converters

Mine CV-591A/URR serial 3082 was manufactured by The Technical Materiel Corporation, Mamaronek NY contract 81020. Have had it for many years and after replacing all of the capacitors with orange drops and some resistors that looked a little overheated has worked wonderfully, it is a pleasure to use it.

Date: Tue, 28 Jun 2005 20:00:04 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: Re: [R-390] Tell me about Single Sideband Converters

I have a CV-571A/URR serial # 3323 that I bought a little over 30 years ago. I have done nothing to it since and it is working fine.

Date: Wed, 29 Jun 2005 10:30:01 +1000
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: [R-390] ssb converters

The Collins SSB converter is a BEHEMOTH ,it has twin motor driven BFO s driven by phase discriminators ,FORESTS of Tubes, and I have seen smaller power transformers in 2KW linears the unit also weighs MORE than a 390 ,BUT they do work ,I have repaired lots of converters for people in OZ and the best and simplest unit is the TECHNICAL Material Corp MSR 591 , with this unit and using the 2KHZ

filter in the 390A the Signal to noise ratio is the best I have heard on any receiver EVER ,my personal Bias is towards the IF module conversion as per HAM RADIO Magazine ,BUT using a 12AU7 double triode in the Ballast tube hole as a product detector, I also have removed the 2KHZ&4khz filters from a module and substituted dedicated asymmetrical USB&LSB filters and Crystal controlled the bfo with a 455.00 khz crystal from the 1khz filter can , I use a High resistance relay to switch the Audio line either through the product detector or for AM it reverts to the original circuit using the supply to the BFO ,so only the module needs to be modified and the unit can be transferred from one RX to another [I have 3 receivers the 390a type and quiet a few spare modules] my favourite RX is this 390 a with SELECTABLE Sideband , the agc has also been modded to give attack and decay times more compatible with ssb I use the Slow switch position for this , Hope this info is of interest Regards to ALL

Date: Tue, 28 Jun 2005 20:12:12 -0500
From: Craig <westerman@cableone.net>
Subject: Re: [R-390] Tell me about Single Sideband Converters
To: R-390 List <r-390@mailman.qth.net>

Hey guys. Thanks for all the replies. I see Rick Mish works on these models - CV-591A, CV-657A, CV-1722A and CV-1758A. Is there a big difference between them in ease of use and reliability? I was told that the CV-157 was "the best", but that they are impossible to find. Looks like the CV-591A is the most common and probably easiest to find parts for. Anyone have a picture of the inside of one of these?

Date: Tue, 28 Jun 2005 19:01:08 -0700
From: W6GER <w6ger@uci.net>
Subject: [R-390] CV-591A/URR Manual

Well I can tell you about the CV-591A/URR Manual... It is available for download from my web page at:<http://www.qsl.net/w6ger/pdffdocs/docs.html>
Hope this is a help.

Date: Tue, 28 Jun 2005 19:01:08 -0700
From: W6GER <w6ger@uci.net>
Subject: [R-390] CV-591A/URR Manual

Well I can tell you about the CV-591A/URR Manual... It is available for download from my web page at:<http://www.qsl.net/w6ger/pdffdocs/docs.html> Hope this is a help.

Date: Tue, 28 Jun 2005 22:14:40 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Tell me about Single Sideband Converters

The CV-157 is the best? Well, that depends on your tolerance for heavy equipment, about 110 pounds. I have one from a guy who shipped it in a paper towel carton packed with peanuts, stuffed with random tubes. Cost me \$300, but I was young

and foolish. Guy seemed to have stopped taking his meds when I told him that one corner of the works in a drawer looked like someone had stepped on them. Completely unreasonable. So here I am with a complete CV-157 with a rebuild tag and mostly the wrong tubes. I have lost my fascination with the servo controlled carrier centering device, but it's all there. I started to unhook wires to the drawer in order to remove it and fix the squashed 100 KC amplifier. I did isolate the filters and check them with a scope and HP 200CD, all looked good, made by Orion. Yes, there's a copy of the manual. Anybody want to make an offer over \$150 plus shipping? Hate to see a rare piece of gear languishing in a corner of the warehouse. Preference to pickup in Bloomington, MN 55438 but can ship it.

Date: Thu, 30 Jun 2005 10:15:43 +1000
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: Re: [R-390] ssb converters

Ok Todd Most of the CV 157 s that I have repaired for people have lots of faults due I think mainly to the heat build up causing component deterioration, also they were designed for SSB with pilot carrier so that the discriminator can lock on. In the fifties, in the days before frequency synthesis, this was necessary to stay on frequency for SSB as we know it today. There is a lot of redundant electronics in the CV157, I have a similar unit designed for the Racal RA17 and it only has about 10 tubes, is very reliable, takes 4 inches of rack space, and only weighs 25 pounds. So you can see what I mean about over engineering. The TMC device is an elegant little gadget and works really well and has a low component count making it VERY reliable, and you can tune about in passband of what ever mechanical filter you have selected, I have never owned one but I have repaired them and always been impressed with their simplicity operation, Regards to every one.

Date: Wed, 29 Jun 2005 22:10:52 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Tell me about Single Sideband Converters

The CV-157 wasn't really intended as a voice SSB converter - it was intended for applications where a pilot carrier was transmitted. By phase locking to the pilot, the transmitted audio frequencies were recovered within a couple of hertz of error. We had a couple aboard the USS Providence in the Navy for use in receiving multiplex RTTY transmissions. These had, as I recall, an 85 hZ shift, so the receiver had to be pretty exact. I believe a set of two CV-157 and two R-390s in a single rack was known as a FRR-39. The production numbers for these would have been very low. No the other hand, many of the R-390's I saw aboard ship (early / mid 60's) were in a cabinet along with TWO CV-591's.

Date: Fri, 01 Jul 2005 09:31:40 -0400
From: Sheldon Daitch <sdaitch@ibb.gov>
Subject: Re: [R-390] Tell me about Single Sideband Converters

I might disagree slightly about the CV-157 not being designed as a voice SSB converter, in fact, I'd say that was probably one of its design parameters. John is correct in regards to the pilot carrier operation, but I'd further say that if the CV-

157 were phase locked to the pilot carrier, there would be little or no frequency error. One of the systems applications for the CV-157 was four channel ISB operation, 16 kHz bandwidth, with two 4 kHz audio channels on each sideband. And usually one of the four 4 kHz audio channels was devoted to a 16 channel AFSK tone pack. I suspect the tone pack was always one of the "inner" audio channels to eliminate a frequency translation on transmit and receive.

If this isn't readily clear, let me try to explain. The upper sideband, for instance, would be modulated with one voice channel roughly 4 kHz wide, that was not translated in frequency. The second voice channel, also roughly 4 kHz wide, was translated upwards by 4 kHz, so that in the side band, it occupied the sideband bandwidth of 4 to 8 kHz. The same for the lower side band. Since the AFSK TTY frequencies are critical, the AFSK channel would be on the lower portion of the sideband, to eliminate that 4 kHz shift. I don't recall what units were typically used for the 4 kHz shift, maybe it was a TD-97/98 combination, but the brain cells aren't working too well as I type this. Whatever the nomenclature was, they weren't normally part of the transmitter or receiver set. When VOA ran the ISB/SSB feeders, we ran a pilot carrier, about 20 dB down from the PEP power rating of the transmitter, and our RCA SSB-3A receivers were capable of ISB reception, and used a motorized AFC system very similar to the CV-157 AFC loop.

Date: Fri, 29 Jul 2005 03:06:04 -0400
From: "AI2Q" <ai2q@adelphia.net>
Subject: [R-390] More about the SSB prod detector

>Alex, thanks for reply. You might want to fix the schematic in case someone
>else wants to use it. The polarity is wrong on the cap at the emitter connection
>on the pnp. A bypass cap (0.1 mfd) on the source resistor of the 2n3819 was
omitted in your schematic. I've been in communication with Ed Newman and >got
a tip on reducing the 1000 ohm in the source circuit of the 2n3819 to get >more agc
voltage out if needed. best regards, Dan.

> For your reference, you can see my R-390A product detector circuit at this
> URL: > http://users.adelphia.net/~alexmm/Prod_det/detector.htm

Finally got some time (it's 2 AM and I couldn't sleep) to look over my product detector circuit, and you're (almost) 100-percent correct about the circuit details.

Gosh, I'm embarrassed, and a bit nonplussed, when I think about the possible souls out there who may have flushed the circuit down the proverbial tubes when the AGC amp didn't work due to my drawing errors!

Did that back in the year 2000. In any case, I have already corrected my schematic print, and hope to scan it soon and update the Web posting. I also plan on crediting you with sharp eyes and much patience, if that's okay with you.

My actual circuit certainly does have a gain-boosting source bypass cap across the 1-kohm source resistor in the FET pre-amp stage. However, as I indicated in my previous note, the rule of thumb I follow is that the reactance of the capacitor

should be about a tenth of the source resistor's value (or cathode resistor in the case of a tube, or the emitter resistor in the case of a common-emitter amplifier using a bipolar transistor). The actual cap in my circuit is a 0.01-uF Mylar type. Using the formula for reactance $X_c = 1/2\pi fC$ yields a reactance of 34.9-ohms.

While that's not exactly 1/10th, it's close enough for government work, using standard parts from the junkbox. Using a 0.1-uF cap, as you note, would drop the reactance at 456-kHz to 3.49-ohms, which seems far too low. The approximate 35-ohm value is close. A 0.001 would provide 349-ohms (likely too high). As for the polarity error on the follower stage, I can only wonder why I didn't spot that as I drew and scanned the diagram. That PNP stage could have just as easily been implemented with an NPN device, and then I probably wouldn't have made that error.

My cap is indeed inserted with the plus end at the highest point of potential, high (obviously, now) is the Vcc line. Its purpose is to ensure that the emitter is close to ground impedance (low). It probably ideally should be connected from the emitter of the PNP follower stage to ground, and then the polarity would be okay as shown, if it were drawn that way. But that's not the way I hooked it up. In any case, you want the PNP stage's emitter to have no 456-kHz energy there, thus the bypass's function. You can poke your scope probe there to verify that.

Please feel free to punt this e-mail over to Ed if you wish to. My sincere apology for your inconvenience! Regards, AI2Q, Alex .-.-.

Date: Sun, 7 Aug 2005 23:14:38 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: [R-390] Product detector for 390

Hi, a short report on my success constructing the product detector designed by Ed Newman/ modified with xtal control and posted by AI2Q, with reference noted earlier on this list. I deviated somewhat from the posted diagram and Ed's design by using a Hartley oscillator with a National NC-100 bfo coil but more or less the same configuration otherwise. The detector requires no mod's to the 390 (or 390a) and is an external box connecting to the diode load terminals, the i.f. output and the agc terminals on the back of the 390. With the oscillator I used, one of the buffer stages following the oscillator was unnecessary and a 300 mv signal to the 1496 IC pd was accomplished with an MPF-102 oscillator followed by the MPF-102 stage to the product detector.

The product detector improved the clarity of ssb signals and more importantly the design provides agc that works nicely with the rf gain control turned all the way up, or slightly reduced. The agc is a big improvement over what I accomplished with the simple two diode addition. The 390 noise limiter does not operate in the product detector mode. However, the unit has a single switch to revert to normal 390 operation with the 390 diode detector/ noise limiter if desired. I hardly use the noise limiter so I haven't missed it yet.

I'll probably build a second one and use an R-392 bfo coil for the oscillator and make it compact enough to fit below the 390a in its cabinet. A nice unit, thanks to Ed and Alex for revealing their handiwork to the list, best regards, Dan.

Date: Thu, 25 Aug 2005 11:49:16 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] SSB adapter for R-390A

>Would a 455 KHZ Central Electronics Sideband Slicer Model B, do a good as
>a product detctor on a R-390A?

Yes, but you may have to reduce the IF signal going into the Slicer.. the signal from the IF OUT of the R-390A may overload the Slicer. Especially if your slicer has the little amplifier module on it.

Date: Tue, 6 Sep 2005 12:56:36 -0700
From: "Ziegenbein, Randy" <rziegenbein@volcanotherapeutics.com>
Subject: [R-390] R-390 rf gain

I'm new to the R-390A world and have a couple of questions.

My 390A is a Collins first production run and has a mod so it supposedly receives SSB better by a couple of 4148 diodes in the agc ckt (one in parallel with R-547, grid of the AGC time constant, one in parallel with R546, grid and plate of the AGC rectifier ckt, and finally a 47 pf in parallel with C535, which is the coupling cap between the BFO and the Detector. Is this a good mod? Next, the RF gain control seems to only be effective the last 1/4 turn clockwise (man or agc modes). Is this normal or do you think the pot is bad or some other problem in the rf gain control circuit? Or is it a result of the AGC mods above?

Date: Tue, 6 Sep 2005 14:25:05 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] R-390 rf gain

Randy, this mod is well known to be an easy "fix" to improve fast attack on ssb signals and does improve the set (so-called "Lankford mod"). The connections you describe are what I have in my set. It doesn't eliminate the need to ride the rf gain control to accommodate weak and strong ssb signals, which is somewhat inherent with the relatively weak bfo injection relative to strong signals. I only conquered this situation by attaching an external product detector with its own agc circuit. There are other fixes, involving on-board product detectors etc. and another somewhat more elaborate mod similar to the one you describe.

I'm not sure what you mean by "effective"... Does it affect the meter response on am signals over the whole range or just for the last 1/4 rotation? I think normal is for the meter indication to drop over the whole range of rf control rotation for a strong am station, such as a strong broadcast station. But on weaker stations, the effect of the first part of the rotation from lowest gain may not be apparent.

Date: Fri, 28 Oct 2005 19:09:29 -0700
From: "Bill Feldmann" <n6py@qnet.com>
Subject: [R-390] R-390 Langford SSB Mod

Some of you maybe considering or have the Langford SSB modification in your R-390's and be interested in my experience installing it in my non-A R-390.

I'm very impressed with this simple and easy to do modification which is easily reversible if you are not happy with its performance. On very strong SSB signals it does have a very slight tendency for overload but is a great modification if you plan to mostly use your R-390 for AM reception but occasionally to monitor SSB. If you experience any overload just back off the RF gain a bit. If you are planning to mostly work SSB than a full blown product detector maybe a little better, but not much. Also if you are using a non-A R-390 like mine and the SSB station your receiving has poor opposite side band or carrier suppression there will be a slight distortion due to the beating effect due to the less steep shape factor of the LC filters compared to the mechanical filters of the A model.

I did run into one little bug that degraded the audio of AM signals but only with fast attack AGC. This was caused by some audio getting onto the AGC line due to the decreased impedance between the AVC rectifier tube and the AGC circuit by adding the diodes across the 180K and 220K resistors. It was most noticeable when listening to music by a reverb type sound on low pitched instruments such as drums.

I easily solved by adding a 0.5uf cap of at least 25 volt between pins 1 and 2 of the AVC switch, S104 on a non-A or pins 9 and 10 of S107 on a A model. This completely by passes audio off the AVC line and only slightly slows down the fast AVC, which I think is too fast to begin with. I put the cap on the AVC switch to not affect the time constants of the medium or slow AVC which I didn't want any slower. After adding the cap the fidelity of AM is excellent in all AVC modes. This was the only change to the original Langford modification I found necessary.

For those of you not familiar with this simple and effective modification let me summarize it here. Carefully remove the IF module after unplugging the power and BNC signal connectors, loosening the two clamps and uncoupling the band width and BFO shafts, then loosening the three green screws securing the module to the chassis. Add a 1N4148 diode across each of the 180K and 220K resistors between the AGC rectifier tubes anode and the AGC circuit, R556 and R557 on a non-A or R546 and 547 on a A model. Install the diodes so their cathodes are toward the plate of the AGC rectifier tube. This will convert the AGC circuit to fast attack slow decay.

Add a 47pf, at least 300 volt, dipped mica cap across the 10pf output cap for the BFO that is connected to the BFO tubes plate, C536 on a non-A or C535 on a A model. This increased value of 57pf for the coupling cap will increase the BFO injection to the audio detector.

After checking your work reinstall the IF module and test the radio on AM and SSB stations. Offset the BFO +1 to 2kc for LSB in the 2 or 4kc selectivity positions. For USB offset the BFO -1 or 2kc. Adjust the BFO and main tuning dial for best audio sound. Then if you also notice the slight distortion of AM signals in the fast AGC mode, add a cap to the AGC switch pins as described above. Physically installing the cap was the hardest part of the modification on my R-390 because of the BFO bellows covering the area of the cap but using a small soldering tool hemostats and some patience was possible. Installing the diodes was easy on my R-390 because the two resistor are easy to get to on TB502 located on the back wall of the IF module.

Hope my experience is helpful,

Date: Fri, 11 Nov 2005 22:25:22 EST
From: Bonddaleena@aol.com
Subject: [R-390] Y2K Manual

<snip> I do have a couple of questions on the 591A.....

1. For some bizzare reason, the USB and LSB positions appear to be reversed. I had to switch xtals to get it to detect the SSB signals as indicated on the front panel. According to the 591A Manual, the xtals were in the correct position, but I had to switch them, to get it to function correctly. Could the 390A be THAT far out of alignment? The audio sounds great with the xtal swap, but..... somethin' ain't right.

2. Never having used this combo before, I was VERY disappointed with the audio output of the 591A. I have to use an outboard audio amp to get decent volume. Tubes are good, been recapped, voltages normal etc. Any thoughts? I do have a junker 591A I picked up because the filter choke in mine was fried. I don't mind using the outboard amp. In the same rack, is a 51J-3 with a solid state (Ron Hankins?) SSB adapter. Of course, this one absolutely needs an outboard amp. I just thought the 591 with it's 6AQ5 audio tube should provide as much volume as my other boatanchors which use the same tube..... thank you in advance!!
ron

Date: Mon, 14 Nov 2005 11:24:13 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Y2K Manual and CV-591

>I intend to start 'going through' my working and very mint '67 EAC.

Good for you. I also have a nice EAC-67 here. Mine is kaput, but I'll get it working nicely when I get to it.

>...if anyone has an 'erratta' list for the Manual.....

First, make sure you have the "Release 2" version. It is here: <http://www.r-390a.net/Y2K-R2/> On that page is a set of errata for the Release 1, but as far as I

know they have all been accounted for in Release 2. There may well have been some errors detected in Release 2, but I don't know of a list of them.

> ... the 591A.....1. For some bizzare reason, the USB and LSB positions appear to be reversed.

This is an oddity but not unexpected. The thing can be used with receivers that either reverse the sideband sense or do not reverse it. This comes from the local oscillator being above or below the mixer input frequency. The manual for the 591 talks about this situation. You may have discovered that the way to "switch" the thing is to reverse the bulb covers on the two indicator lamps!

>I had to switch xtals to get it to detect the SSB signals as indicated on
>the front panel. According to the 591A Manual, the xtals were in the correct
>position, but I had to switch them, to get it to function correctly.

Good if it works for you, fine. The whole thing is a bit of a puzzle for me, at least, even though you'd think it was easy to understand and keep straight.

>Could the 390A be THAT far out of alignment? The audio sounds great with >the
xtal swap, but.....somethin' ain't right.

I suggest you get a signal generator and do a little experimenting. Think slowly. Turn the knob slowly. Get clear in your head where the signal generator is with respect to the passband and the local oscillator(s) For example: if you tune your signal generator from ABOVE the frequency the receiver is tuned to, and the first audio you hear it HIGH frequency (like 2-3 kc) and decreasing, then your signal generator signal is above the tuned frequency and you are in the upper sideband.

> 2. Never having used this combo before, I was VERY disappointed with the
>audio output of the 591A.

I think you are not the only one. I suggest you make VERY sure that the coupling caps in the 591 are replaced: especially the ones in the audio section. ALL, repeat ALL EACH AND EVERY ONE of the coupling/bypass caps in my CV-591 are leaky. In the audio section, this causes excessive plate current in the audio output tube. In particular, C20 and C24, both 0.01 uF may be leaky. C24 especially may be leaking and driving the 6AQ5 plate current way up, causing lots of distortion and weak audio. Test also C25 and R24, cathode bypass and dropping resistor for the 6AQ5. Measure the cathode voltage to be sure nothing is amiss. replace all three of these caps, unless C25 is a paper oil (2 uF) and is not leaky or defunct. Try feeding audio into the thing at the appropriate place to see if the whole audio section is working. Modulated 455 kc from the signal generator will tell you a lot, too.

> I have to use an outboard audio amp to get decent volume.

Notice that the audio output section is configurable for "low level" output (150 mW) or "high level" (2 W) and also can drive 8 ohms or 600 ohms. Dope that out in

your mind and get it set up straight. The switch that does this is on the chassis near the rear terminal strip, I think.

> Tubes are good, been recapped, voltages normal etc. Any thoughts? I do
>have a junker 591A I picked up because the filter choke in mine was fried.

Of course you don't need the junker now, so send it to me.. thanks. (heheh)

> I don't mind using the outboard amp. In the same rack, is a 51J-3 with a
>solid state (Ron Hankins?) SSB adapter. Of course, this one absolutely
>needs an outboard amp.

You mean the 51J-3 absolutely needs an outboard amp, or the SSB adapter needs it? I have an R-388 that I have not yet got running, so that's why I ask.

> I just thought the 591 with it's 6AQ5 audio tube should provide as much
> volume as my other boatanchors which use the same tube.....

That makes sense, but it may simply be lame by design. How does it sound with good earphones??
Roy

Date: Wed, 28 Dec 2005 22:34:37 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] 390A SSB "Stock Mod" info search

This may or may not be fodder for some of the latest info updates or what have you, but I've not seen it online, not on Pearls.... There seem to be several 390A's around with SSB mods, some are said to have come from mil surplus in that condition. Over the years folks have posted pics here and there, and there was a good writeup on a book by an Italian fellow that went over that mod. Not sure if that book is still in print, etc. (if it is, I'm broke, etc.)

Many of us have seen the product detector mod that's in Cap't Lee's "Mars" mod series, but this is a different sort of thing, for those that aren't sure what I'm talking about. This lashup has a small box that mounted just behind the headphone jack, apparently there were assorted different versions, some may indeed have followed the mars mod. There was at least one modded radio discussed in the distant past on this list (ten years or so ago, more?) that supposedly "came that way" though I can't find the messages I'm looking for in the archives about it. May have been discussed on Boatanchors.

If nothing else, does anyone still have a copy of the book I'm thinking of?

Date: Thu, 29 Dec 2005 00:02:12 -0500
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] 390A SSB "Stock Mod" info search

I have not seen it Tom. I installed a Cap't Lee /N2NIR type circuit in mine a couple of years ago and the 6BE6 product detector does a fine job. I understand that there are better circuits out there.

Date: Thu, 29 Dec 2005 05:26:21 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] 390A SSB "Stock Mod" info search

Chuck has some info on this at:
http://www.r390a.com/html/r390a_factory_ssb.html

Date: Thu, 29 Dec 2005 07:36:04 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] 390A SSB "Stock Mod" info search

The book was R-390/URR - R-390A/URR Handbook written by Paolo Viappiani. It was originally published in 1996. Written in Italian. Over the years I have been in touch with Paolo and he is finally going to have it printed in English. He is editing the book and adding some newer information. Some of those modifications had the product detector mounted on the audio deck. Several of those modified R-390A's were in the St. Juliens Creek pile.

Date: Thu, 19 Jan 2006 03:54:38 -0600
From: "Brad Huff" <huffb@avalon.net>
Subject: [R-390] Single Sideband reception with the R-390/R-390A

I would like to thank all of the people that responded to my signal generator question a few days ago. I received responses within minutes of my posting. Unbelievable! That is what makes this group so great. I would now like to open a discussion about single side band reception with the R-390/R-390A series receivers. For the purpose of this discussion let us assume that the radio has been altered such that the AGC has been modified for proper SSB reception. I have had experience with:1) the radio with no external adaptors and increased BFO injection.

- 2) a CV-591A SSB adaptor.
- 3) a Hammarlund HC-10.
- 4) a Central Electronics Sideband Slicer.
- 5) a Sherwood Engineering SE-3
- 6) a PD-1.

I have not had any experience with the Capt. Lee onboard product detector mod or a couple of the home brew units that are out there. I have schematics and have ordered parts for one of the home brew units I just have not had the time to build it yet so I can not comment on these. The adaptors that I have mentioned are not

necessarily in any particular order as far as favorites, I just listed them as I thought of them. They all work. Some work better than others, and some folks can probably detect differences in the various units better than my tin ear. That is where you guys come in. I am curious as to your experiences and what you feel are the best units. Maybe we could rank the units that I have mentioned. Some units require external hardware to operate, that is, external amplifiers etc.. Some units will allow the audio to be fed back in to the receiver at the rear of the unit. Much has been written about the quality of the stock audio but I have found that the audio is quite acceptable if the audio deck is altered using Mike Murphy's suggestions. Any thoughts? Please respond to the entire group, it will be interesting to see what everyone's experiences are.-Brad

Date: Thu, 19 Jan 2006 09:56:30 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Single Sideband reception with the R-390/R-390A

I have a PD-1 but thinking of selling it because I just don't use it. Nothing wrong with it, but I find it easy enough to tune sideband with the existing, non-modified radio. The other thing I've done is feed my Kenwood TS/440SAT with the 455kc output, tune the 440 to 455khz, and listen to sideband that way too. Of course I have to remember to tune to 455khz because I can't find 455kc on the 440 ;)

Date: Thu, 19 Jan 2006 10:04:37 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Single Sideband reception with the R-390/R-390A

Well, I have used several of those listed. None will work the way they are intended to unless you address the attack and release times of the stock R-390A. My personal favorite was the PD-1 using an older receiver/amplifier and large speaker. The SSB capabilities of the R-390A using the 2 kc filter are superb, and the audio was fantastic for SSB! The best AGC mods can be found on the Hollow State Newsletter website. Dallas Lankford published those mods years ago and they work great.

Date: Thu, 19 Jan 2006 12:55:46 -0600
From: Larry Strong <l.strong@mchsi.com>
Subject: [R-390] Sideband slicer

Could someone explain how to hook up a Model A Central Electronics sideband slicer with a R390A or R388? Since they have IF's out the back to you have to some wiring changes? Any help would be appreciated. If who ever helps doesn't want to do alot of typing email your phone number and I will call you.

Date: Thu, 19 Jan 2006 11:55:07 -0800
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] Single Sideband reception with the R-390/R-390A

Hi, I was pretty happy with the Lankford mod using a couple of diodes on my 390a but this didn't handle range of signal strengths without riding the RF gain control. I built an outboard product detector ala Ed Newman WB2LHI/Alex AI2Q

that uses a LM1496. I've been happy with this and I never have to touch the RF gain control, which remains at the highest gain position. The unit has built-in AGC and is attached with no mods to the set, with 4 connections (i.f., diode load, audio, agc) at the back of the 390a or 390. My version was built using some old National NC 100 coils for the BFO and tuned output circuit for the BFO. It is set to the appropriate sideband with a knob on the front of the coil can and exhibits no drift of the setting. I can easily switch the unit out and compare original performance without it. The biggest advantage is the improved AGC, with some slight improvement in signal quality, compared to the original detection scheme in the 390. I use it all the time on my 390. I was dedicated to the idea of an outboard unit without modifying the innards of the radio. Mine uses the original audio circuit of the 390, though one could feed the output of the PD to an external amp. A small audio preamp is included in the circuit to adjust the level going back into the 390. I have no experience with other auxiliary ssb detectors so can't offer anything on relative performance. I prefer listening to the 390 compared to my unmodified NRD-525 because the audio is better. Best regards, Dan.

Date: Thu, 19 Jan 2006 23:10:48 EST

From: DJED1@aol.com

Subject: Re: [R-390] Single Sideband reception with the R-390/R-390A

Thanks for the comments on SSB adapters, Dan. I'm really happy with my outboard SSB adapter for all the reasons cited (I did add the crystal BFO, per AI2Q). As Les indicated, you haven't solved the problem unless you've solved the fast attack AVC part of it- a product detector is not enough. My outboard SSB adapter does that, and it is integrated with the receiver so all controls and the carrier meter still work as intended. It always aggravates me to read Jan Skirrow's description of his outboard box, which copied my design, then says how mine never worked. But he left out the AVC circuit, and so needs to ride the RF gain to keep from overloading the detector. \$150 and no real improvement over how the stock radio operates! I've continued to play with the concept. I've breadboarded a circuit for synchronous detection, and will add that to the box if I ever finish my wife's "to-do list" for this winter. Incidentally, I built another version with a downconversion and 100 Kc filter for sideband selection, kinda like the CV-591. It worked well, and doesn't require offsetting the BFO to change sidebands (BFO is fixed at 100 Kc). However, the radio must be set at the 4 KC bandwidth, and so signals bleed through into the IF and meter circuit. I didn't like it as much as the original, so reinstalled the original box. I think the audio is better than my R4C, although the AVC is not as tight as the Drake. Ed

Date: Fri, 20 Jan 2006 09:12:56 -0500

From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] Sideband slicer

The R-390A has an IF of 455 kc. The Model A Sideband Slicer had an IF of 455 KC more or less, so it will work. The R-388 has an IF of 500 KC so the slicer may not work. You would have to change the frequency of the oscillator in the Slicer. I don't know if this is easily done or not.

>Since they have IF's out the back to you have to some wiring changes?

No, the IF Output of the R-390A is all you need to run the Slicer. HOWEVER.. the slicer may not be meant for the relatively high signal level provided by the receiver. You'll have to try it out. Some slicers were equipped with an IF Preamplifier. If I remember right, this is a little chassis with one tube that plugs onto the back of the slicer. If I remember right, the slider audio is routed back to the radio and connected to the audio gain pot or some such thing. I suggest you use an external amplifier and speaker for that. OR: you can run the audio back to the diode load terminals on the R-390A. Do you have a manual for the slicer? I think BAMA has it.

Date: Fri, 20 Jan 2006 08:09:40 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Sideband slicer

If you do route the slicer audio back to the radio, don't forget to remove the diode load shorting link, else you'll get slicer + radio. But you knew that, Dave

Date: Fri, 20 Jan 2006 15:47:03 -0600
From: Larry Strong <l.strong@mchsi.com>
Subject: [R-390] Sideband slicer Model A

wanted to thank Roy and Dave for the help hooking up the Sideband slicer. I did hook it up to a SP-600 and it worked pretty darn good. Had a little hum so I think I will wait to hook it up to my R390A after I replace some caps. Very nice forum you guys have especially for someone like myself not being to knowledgeable on electronics.

Date: Sat, 21 Jan 2006 10:46:33 -0600
From: "Paul Staupe" <pstaupe@qwest.net>
Subject: Re: [R-390] Sideband slicer Model A

I'm glad your CE Sideband Slicer Model A works well with the SP-600. I haven't had a chance to play with mine much, but I'm hoping it will do the trick with my SP-600 and R-388, since it has the variable IF input unlike my Sherwood SE-III. I was lucky enough to get a model A with both the IF interface and an internal audio amp and speaker, so it is a self contained unit..

Date: Sat, 18 Mar 2006 09:06:08 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] SSB R390A on eBay

Something strikes me odd here about the mod...I don't think it's original or factory. Why would the BFO switch be labeled "LSB OFF ON BFO"? Strange..did they decide to crystal control/fix the LSB side but let the operator hunt for the USB side? I think this is a fixed (sorta) frequency BFO mod..not necessarily a SSB mod. For it to be a SSB mod it needs to have (IMHO) the extra module between the front panel and audio deck with a 6U8 or 6EA8 product detector (or modern equivalent of

course), and the associated switching to preserve the AM/CW modes. My Motorola has this extra module. The pics don't give a clear view so I can't say for sure, but I think we just have a BFO mod here.

Chuck Rippel says the extra module is quite rare...I've seen/heard of a few...I don't have a feel for how rare they actually are. Comments? Seems to be in reasonable physical shape though.

Date: Sat, 18 Mar 2006 11:11:28 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] R-390A help

Barry you are absolutely correct...I was confusing my work on the R-390/URR with that of the "A". Tom sorry for the confusion. I told you guys I would have to go look. After checking three R-390A's that have the three fuse rear panel all are indeed connected and should be again! On the selenium rectifier....is it mounted on the power supply module or to the rear panel? The rear panel mounted one is factory...beyond that it's probably a mod! They say your memory is the second thing to go.....I can't remember what the first is! :-)

Date: Sat, 18 Mar 2006 11:16:21 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] SSB R390A on eBay

If it's not factory who ever did it did a pretty good job. Used a PTO type connector to interface with the IF deck as seen in one of the photos showing that area. I would guess that's not a 3TF7 in the socket to the right of it either.... Is the schematic of the factory mod documented anywhere? I wouldn't mind taking a look at what was done.

Date: Sat, 18 Mar 2006 09:53:09 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] SSB R390A on eBay

Well I missed that connector on the front of the IF deck. Now I think its pretty likely there is a product detector mod somewhere in that radio. That BFO switch labeling still throws me however. Odd. As far as a schematic Cecil...there is a discussion (in Italian) and a diagram in the book written by a gentleman whose name escapes me at the moment (also Italian). Someone was kind enough to copy the diagram and send it to me. I will see if I can scan it into a PDF and send it to you.

Date: Sat, 18 Mar 2006 10:10:16 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] SSB R390A on eBay

The book is (from the R-390a website): R-390/URR - R-390A/URR Handbook by Paolo Viappiani, 1996, ISBN Number 9-789705-648898, published by Editrice Il Rostro, Milan, Italy

Date: Sat, 18 Mar 2006 14:07:53 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] SSB R390A on eBay

I think the labeling is understandable. Whoever did this substituted a 4-position switch and added LSB and BFO to the left and right of the existing lettering (perhaps because it is an engraved panel?). I would guess that "LSB" is just that, "ON" is USB and "BFO" is "regular" bfo operation. Just a guess, though. Either way, it's too rich for my blood.

Date: Sat, 18 Mar 2006 15:58:17 EST
From: TVComlGuy@aol.com
Subject: [R-390] re R-390A SSB

I had an R-390A a few years ago that had the same type plug on the IF strip and the same switch arrangement. Mine had a metal overlay on the front under the switch that was the same color as the receiver with the USB, AM, CW, and LSB letters silkscreened on it. The pictures don't show if this one, has the extra box behind the front panel. The story I got at the time I had mine was that Imperial Radio converted about 50 of these. Ron, KB0WAR

Date: Sat, 18 Mar 2006 18:06:43 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] re R-390A SSB

There were a couple of versions, some with the two x-tals and tube on the blank end of the audio deck and some behind the front panel. The tubes used was a 6U8A. Not real R@RE either.....:-)

Date: Wed, 29 Mar 2006 08:59:43 -0500
From: "Tom Bridgers" <Tarheel6@msn.com>
Subject: Re: [R-390] SSB R-390A?

Columbia Electronics modified a bunch of R-390A's for the government, including putting the selectable upper and lower sideband mod on them. The SSB mod Dick Walser showed me was on an L-bracket, much like the one pictured in the auction, but they also repainted the front panel so that the BFO selector (upper, lower and on, off) looked original.

Every (most) R-390A they remanufactured received a new Columbia Electronics tag. I have several of them that Dick gave me.

Columbia Electronics (also known as Airborne Electronics) was owned by Dick Walser and his partner (whose name I cannot remember right now). I met Dick about 8 years ago and was a super person who knew EVERYTHING there was to know about R-390As. I wrote an article about Dick and ER ran it. Sadly Dick passed away about 2 years ago

Date: Wed, 29 Mar 2006 08:07:07 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] SSB R-390A?

Airborne, that was it. Thanks Tom! I hadn't had enough coffee before replying and I had a senior moment.....:-) That wasn't a "Depot" job, depots didn't do modifications except for factory approved field mods. All the ones I have seen (they aren't rare at all) have the HC-6U? smaller x-tals, looks like somebody had a bunch of surplus FT-243's to use up. Maybe he had Martyn write up that "hype" for him?

Date: Wed, 29 Mar 2006 09:34:18 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] SSB R-390A?

So, has anybody documented this mod, say schematics?

Date: Wed, 29 Mar 2006 09:16:08 -0800
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] SSB R-390A?

I met Dick about 2 years or so before he died and we became close friends. I wound up buying his radio stuff from his estate after he became a Silent Key. The last time I saw him he was redoing the roof on his house in No. Hollywood at 86 years young as he said. When I left that day he asked if I wanted some Tangerines from his tree. I said sure, so he grabs a three legged orchard ladder and sprints up it to pick me some off of the tree. Anyway to the point. Yes he did the mods for the SSB on the R-390-A and had about 100 panels refinished with the SSB mods silk-screened on the panels. At that point in time I posted to a few of the reflectors that I had the components to make up the complete kit if there was enough interest. I received about 4 or 5 replies to the affirmative. I also had a bunch of Columbia tags also. Unfortunately in my move from CA to TX while I was laid up with a broken shoulder and a foot infection my brother in law decided that most of the parts and a lot of my radios were pure junk after I pointed out to him that they were salable parts, which he promptly sold for .10 a pound to a local junk dealer. Three 2 1/2 ton stake bed loads plus what the helpers carted off as scrap metal. Which also included nearly complete R-390A and some frames plus lots of modules. He was judge, jury and executioner all in one. That is the end of Airborne Engineering sadly to say.

Date: Wed, 29 Mar 2006 13:46:50 -0500
From: "Tom Bridgers" <Tarheel6@msn.com>
Subject: Re: [R-390] Columbia Electronics tag & SSB mod

The Columbia Electronics tag, I have #2043, reads as follows:

RECEIVER, RADIO R-390A/URR
serial no 2043
supplied by
COLUMBIA ELECTRONICS INT'L. INC.
Los Angeles, California U.S.A.
115/230 VAC 48-62 ~ 220W

The USB/LSB mod is documented in Paolo Viappiani's book, R-390/URR - R-390A/URR HANDBOOK, published by Editrice Il Rostro. See pp 55-56. The book is written in Italian; however, the circuits are in English. Paolo also covers the AGC mods, the Kleronomos audio mod, and several 3TF7 mods.

I heard the book was available now in the US, but unfortunately I don't know from whom. Maybe Amazon?

Date: Thu, 31 Aug 2006 08:47:43 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: [R-390] Use of CV-591 SSB Converter

I use my R-390 (non A) with a CV-591 converter for SSB reception. My normal operating procedure is to use the AGC medium function of the R-390 and the AVC fast function of the CV-591. Do I use both the AGC in the R-390 and the AVC in the CV-591 or leave one off and use the other? If only one, which one and which mode? Any one have any opinions?

Date: Mon, 18 Dec 2006 20:34:17 -0500
From: "Dave Maples" <dsmaples@comcast.net>
Subject: [R-390] Slowing main tuning for SSB

All: With NOMEX inners and Kevlar outers, I bravely ask the following: I have paired my 390A with a Johnson Valiant II with SSB adapter. With 100 kHz per knob revolution, the main tuning for the 390A is a bit fast for SSB. Using an external SSB adapter doesn't solve this issue unless one uses the 8 or 16 kHz filter and uses the external adapter to move around within the filter passband. That kinda defeats the purpose of the narrow filters in the 390.

Has anyone ever added any sort of reduction gearing for the main tuning to slow it for SSB? I'm curious to see how other folks have handled this. I am thinking about a metal bracket secured to the front of the 390A using the three Phillips screws that are (a) above the LOCAL GAIN control, (b) to the lower left of the LOCAL GAIN control, and (c) to the right of the RF GAIN control. This bracket would stick out from the front of the 390A far enough to allow a Jackson Bros 6:1 or similar gear

reduction device to be used on the main tuning shaft. The LOCAL GAIN and RF GAIN controls would have to be extended (no big deal there, I don't think).

By doing this this way, the modification could be completely removed if I choose to sell the rig. It's a fair amount of metalwork, but I don't see another way to add any sort of reduction in a way that can be easily reversed.

Date: Tue, 19 Dec 2006 10:28:36 -0800
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Slowing main tuning for SSB

One way is to center the tuning of the desired signal in the center of the passband of the filter of choice by "S" meter, then use the BFO pitch control to tune to the correct voice sound. Another way is to favor one side or the other in the filter passband, upper side of the filter for LSB and lower side for USB, and THEN use the BFO pitch control as above. Your problem is ONE reason certain R-390s had a vernier control on the BFO pitch control.

Date: Tue, 19 Dec 2006 13:53:43 -0600
From: "Dave Faria" <Dave_Faria@hotmail.com>
Subject: [R-390] Slowing main Tuning for SSB

I have what I believe is a SSB tuning assembly for the 390. What it entails is an extension shaft with a gear was mechanically coupled by a sleeve to the main tuning shaft. Over the additional shaft there was a small machined box that was mounted I think by 1 machine screw??? to the outside of the front panel.

A small knob came out the bottom of the new attached box. The small knob was attached to a worm gear which engaged the gear on the new extended shaft. Normal tuning could still be done by disengaging the worm gear by snapping the small knob to its second position. Fine tuning using the worm gear was like snapping a light switch into the engaged position. The old tuning knob just mounted on the end of the extended shaft. I have one of the assemblies. Contact me if you r interested after Dec 28th and I'll try to find it for pictures. It's Mil. Green - it looks great with gray.

Date: Wed, 28 Feb 2007 16:24:54 -0600
From: "Phil M." <pmills7@houston.rr.com>
Subject: [R-390] Need help -- direct me to 6BE6 product det mod info

I've just acquired a Collins manufactured R-390A that someone has supposedly installed a product detector mod that involves replacing the 6BA6 BFO tube with a 6BE6. I seem to remember reading an article about this mod in some magazine, perhaps an Electric Radio article. I would appreciate it if someone could point me toward a reference. I am not concerned with reversing the bfo tube socket mods as they should be obvious but I do have a disconnected and possibly jumpered pin on a plug in the wiring harness and would like more info before trying to set this straight.

Date: Wed, 28 Feb 2007 19:47:50 -0800
From: "Dennis Deaton" <d.a.deaton@roadrunner.com>
Subject: [R-390] Re: Need help -- direct me to 6BE6 product det mod info

The mod that you've got is probably the "Capt. Lee Mod" originally published in the June 1963 issue of CQ magazine. I have a copy of the article in Microsoft Word format if you want it.

Date: Wed, 28 Feb 2007 19:51:50 -0800
From: "Dennis Deaton" <d.a.deaton@roadrunner.com>
Subject: [R-390] Re: Need help -- direct me to 6BE6 product det mod info - error

I hit the SEND button too soon. It was in the June 1963 issue of 73 magazine, not CQ.

Date: Thu, 22 Mar 2007 08:10:12 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] R-390 AProduct Detector

There are several available, depending on how much modification you want to do. The limitation of the R-390 and R-390A for high-quality SSB reception are in two areas. First is that the BFO injection level is too low. The second is that the AGC is not optimized for SSB. Paul Lee was probably the first to address this. It involves adding a switch, replacing a tube, and some extensive wiring.

The second, and probably most popular is the 'Lankford' mod. Developed incrementally by several people, it does not involve extensive re-wiring, and addresses both the BFO Injection issue and the AGC issue.

A third one is a little black-box unit that a few R-390A's were fitted with. The wiring is unknown to me (anybody out there know?), but it fitted behind the front panel, and provided fixed BFO and, possibility a detector and AGC.

A fourth one is to add a separate SSB detector/BFO at the IF Out. Several Mil-Surplus detectors do this, as well as the Hammarlund HC-10. The latter has the advantage of providing notch filters and bandwidth filters, though it is expensive at about \$300. The latter option just got a lot cheaper if you have access to a reasonably fast PC. A lot of Hams are playing with a little device called a SoftRock. What this is is a IQ mixer/Detector that feeds a wideband (96 kHz) signal to your sound card. Designed originally as a direct conversion receiver for the HAM bands, several have experimented with it as an IF detector. At about \$20 per kit (and there is one designed for 455 kHz), you can connect it to either the IF Input, or the back panel IF Output through an attenuator. The result is a detector that with the help of your PC will do AM, CW, USB, LSB, ISB, FM, and about a thousand filter combinations, including notching. Add a diode and buffer circuit, and you can generate AVC to feed the R-390. I have documentation for all the above.

Date: 22 Mar 2007 12:38:03 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] R-390 AProduct Detector

Considering selling mine because I just don't use it. I can listen to SSB by fiddling with the BFO easily enough.

Date: Thu, 22 Mar 2007 10:25:21 -0400
From: "AI2Q" <ai2q@adelphia.net>
Subject: Re: [R-390] R-390 AProduct Detector

Keith, take a look at mine at:
http://users.adelphia.net/~alexmm/Prod_det/detector.htm

Date: Thu, 22 Mar 2007 10:35:56 -0500
From: "Keith Densmore" <densmore@idirect.com>
Subject: Re: [R-390] R-390 AProduct Detector

I just got a letter from one of the list members (VE3EOS) requesting that you post the info on the Softrock onto the list (I believe he thinks I have it). I use a HP 3586 Selective Level meter and feed its last IF directly to a soundcard using free SD Radio software. Spectral Display, infinite choice of filters and lots of modes including ECSS are a couple of the advantages. But for the good old '390 I think I'd be satisfied with a 6BE6 product detector and maybe an AGC improvement.

Date: Thu, 22 Mar 2007 09:18:27 -0700
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] R-390 AProduct Detector

Hi, I built and use the ss PD that Alex posted - works fine with better agc than standard and a little better sound. It's not going to make a big difference in your 390 enjoyment unless you encounter strongly varying signal strengths and don't like fiddling with the rf gain. The agc in the ss unit does much better than the normal 390 on ssb and the detector itself can handle a bigger range of signal levels.

Date: Thu, 22 Mar 2007 10:30:03 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] R-390 AProduct Detector

The very BIGGEST problem with installing any sort of internal product detector in the R-390(*) is the completely crappy original AGC system. Although it was probably adequate for the service for which it was intended, it is no longer adequate at all. As I mentioned here a week or so ago, there is an article in a recent issue of ER magazine (www.ermag.com) detailing an absolutely magnificent, simple, AGC system that completely rectifies all the known deficiencies of the stock system. Attack is almost instantaneous (611 microseconds), overshoot is completely non-existent, and audio distortion is very much reduced. The matter of low BFO injection can be taken care of very easily by the simple addition of more

capacitance in the right place. At one time about 30 years ago, I installed a simple triode product detector circuit (stolen almost verbatim from Heathkit as used in their SB/HW transceivers) in an R-390. I used that 1/2 of the dual triode (12AX7?) that was normally used to feed the IF signal out to the BNC on the back panel. Despite the crappy AGC system, my mod worked quite well for SSB, and didn't seem to effect AM.

Date: Thu, 22 Mar 2007 22:22:51 -0500
From: "Richard" <theprof@texoma.net>
Subject: Re: [R-390] R-390 AProduct Detector

I picked up an HP312A Selective Level Voltmeter for \$50. The old model doesn't seem to be as popular as the HP3586C for VLF work. I have one of each. What is nice is that it will do a great job as a SSB detector (AM/USB/LSB) plus you can adjust it +/- of 455. The A model has Nixie display and weighs almost as much as the radio. Does need an external speaker and amp.

Date: Fri, 23 Mar 2007 00:30:30 -0400
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] R-390 AProduct Detector

One issue with outboard detectors is that they often don't feed an AGC signal back to the radio, so the AGC won't be based on the signal you are listening to. This is easy enough to do with the 390A, and I believe some of the Mil units do it. It's not necessarily a horrible problem, but it's not optimal, either, particularly if the outboard detector has its own IF filters. I have always intended to design an outboard IF section with its own IF filtering, selectable upper, center, and lower BFO injection, 2 or 3 tunable notch filters, a product detector with synchronous detection capability, and an AGC feed. The ideal implementation would switch the BFO offset with the IF bandwidth, so the upper or lower BFO would always be just outside the selected passband. But I have always had other, more pressing projects....

Date: Fri, 23 Mar 2007 09:40:11 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] R-390 AProduct Detector

Not sure this is such a problem as you think. Two ways to generate AGC is (1) RF Voltage at the Detector. (2) AF voltage after the Detector, often called AVC. For AM, Nr 1 is considered best, as it is not affected by the modulation level because it acts on the received carrier wave. For SSB, however, there is no received carrier wave. Instead, Nr 1 often will be driven by the BFO injection level. Thus Nr 2 is the preferred way of controlling receiver gain. You can get around this by tapping the RF level before the BFO injection, but older receivers not designed to receive SSB had no reason to do this.

With an External detector, however, things are different. If you set the receiver for normal AM reception, with a slow AGC time constant, the receiver AGC will act normally, substituting the sideband RF for the Carrier RF. It will be choppy and

constantly varying in level as it is the modulation, but the Slow AGC time constant smooths this out. It would be the same as more modern receivers tapping the AGC voltage before the BFO Injection point. Attack time on the first syllable may be improved. And you have to have a long enough decay time to cover pauses between sentences. And you will have to use the receiver's filtering for most of the selectivity.

The beauty of the Softrock solution is that it has its own AGC, implemented in software, with a range of greater than 60 dB (dependent on the dynamic range of your sound card). Taking a worst case example of two closely spaced signals a hundred Hz apart, and ignoring the 0.1 kHz position of the Bandwidth control. Receiver AGC will be controlled by the stronger, unwanted signal, the wanted signal suppressed, say 30 dB by AGC action. By setting your external detectors bandwidth to, say 100 Hz, and off-tuning the external detector frequency (can you say 'Passband Tuning :-) '), the external detector's AGC will easily recover the suppressed signal. Or we can use an alternate technique not seen often any more. Set up a notch filter in software to take out the offending signal. Where the Receiver AGC is set by the unwanted signal, the Softrock AGC is set by the wanted signal, the unwanted signal not affecting the Softrock AGC.

This is much like the excellent Hammarlund HC-10. In Hammarlund's case, they literally took a Hammarlund receiver, complete with bandpass filters, Q-multiplier, Detector, AVC, and Audio Amplifier and boxed it up. 455 kHz (430-520 kHz, set by a trimmer inductor) is taken in. Converted down to their 60 kHz IF whose gain is controlled by its own AVC, and detected it. I believe the AVC is available, but seldom used in practice.

I remember seeing someone who had a Drake 2B laying around unused. With a few wiring changes, he implemented an HC-10 clone. and Drake 2B receivers are going for about \$180 on EBay. The HC-10 is going for +\$300 on EBay. The softrock is by far the most expensive solution. \$20 for the Softrock, and \$700+ for the computer/Display/Sound card to use it. Of course, if you just happen to have a reasonably new computer sitting beside the R-390 that you use for logging/etc., the solution drops tremendously in price to about \$40 in parts (connectors, box, power supply, cables, and kit). Plus it adds passband tuning, linear detection, a multitude of filter options, limited scanning capability, digital recording, CW and Digital Mode decoding, Propagation prediction, even an Atomic Clock(if it is connected to the Internet). Heck, with a little breadboarding and some programming, you can do away with that pesky Zero knob by counting the three oscillators and sending the count to your PC via the serial port! An eight-input mux, three 74HC4046's, and a PIC will do that. Tap the oscillators with #30 wire-wrap wire wrapped around the tube under the shield.

Date: Fri, 23 Mar 2007 08:03:57 -0700
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] R-390 AProduct Detector

Could you provide a little more detail about implementing the Softrock solution? My quick look on the web says those kits haven't been available for a while now...but it was a quick search. Computers don't seem to be a problem here...lol.

Date: Fri, 23 Mar 2007 12:53:48 EDT
From: DJED1@aol.com
Subject: [R-390] R-390 product detector

I've played around with a variety of product detectors- so here's my .02 for what it's worth. I started using the R-390A alone, and found I could copy SSB pretty well just by using the medium AVC speed. I then put in the pair of diodes to speed up the attack time, and that helped. Probably OK for casual listening. I picked up a bunch of CV-591As for \$35 each (ah- those were the days!) and used one for a while. The passband tuning was nice, as was the ability to switch sidebands. As I recall it didn't feed AVC back to the receiver, so the radio's AVC was still operating. But I didn't really have room on the desktop for the converter, and I didn't like the lack of a speaker output, so I sold it off in the 1970s. A few years ago when I rekindled my interest in the R-390A I decided to design my ultimate SSB adapter, and set the following criteria: -no modifications to the radio- connect only to available rear connections -provide fast attack AVC to the radio -small and unobtrusive

I built an adapter using a 1496 chip, an amplified AVC circuit, and a tunable BFO. The unit takes the IF from the back panel of the radio, generates AVC voltage, and demodulates the SSB, providing audio. The audio is fed back to the radio via the diode load jumper, which is removed. A switch in the adapter allows the radio to operate normally for AM and CW. I was going to open up the AVC jumper and use only the adapter's AVC, but found the signal strength meter didn't work properly, so I just feed the adapter voltage to the AVC buss, leaving the jumper intact. The adapter provides the fast attack, and I set the radio to "slow" AVC. This is the best solution, in my opinion. The radio operates using all the normal controls, and the meter works normally, except you can see the fast attack and slow decay on the signals. Audio is controlled by the local gain knob. As with the normal radio operation, you need to offset the BFO depending on which filter bandwidth you are using, and you need to recalibrate when you shift the BFO. Audio is clean and clear for all signal levels, with a nice low frequency response because the adapter's audio is not band limited. I've added Alex's crystal controlled BFO, but since the frequencies are not set exactly for each filter bandwidth, it's a more stable solution but not as convenient for different bandwidths. Next, I undertook to do what I thought would be the ultimate adapter, somewhat similar in function to the CV-591. I had a surplus 100Kc crystal filter, so I downconverted the 455 Kc IF to 100 Kc, built a 100 KC crystal BFO, and added the same AVC circuit. The downconverter had two oscillators to switch sidebands. No more recalibrating when I switch sidebands. However, it was a disappointment. The

receiver IF filter had to be set at twice the passband of the adapter, in order to pass both sidebands. However, the radio's AVC circuit operated at the receiver bandpass, so strong signals in the unselected sideband drove the AVC. I tried running the AVC through the sideband filter, but then the meter didn't work right. That was when I added the crystal oscillators to my original design, and have been using that now for a couple of years. Alex, AI2Q, has a clean schematic of this adapter for those who want to roll their own. Jan Skirrow sells a similar product detector, with a synthesized BFO, but, regrettably, without the AVC circuit, which is essential to good operation. I've lusted after a HC-10, but never have had the opportunity to try one. Having notch tuning would be nice, but I don't know what they do with the AVC. Ed

Date: Fri, 23 Mar 2007 20:28:18 -0700
From: "Greg Werstiuk" <greg_werstiuk@msn.com>
Subject: RE: [R-390] R-390 AProduct Detector

If I'm not mistaken, the site also indicated they were working on the next generation version.

Date: Sat, 24 Mar 2007 14:42:23 +1100
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] SSB adaptors-R-390

One swallow doesn't make a summer, but looking over the flock that flew around a few years back, -one bird with potential stood out in my evaluation of SSB adaptors. I settled on the details of the box written up in ER by Mike Bohne KG7TR--- sorry I don't have the issue date as paper work I have didn't show it. . it is a 6BE6 prod. det, but its great performance on my subjective evaluation lies in the way AGC is derived, the efficient selectable hang time, and the levelling ability of the audio which is fed back into the R-390A. I would say that a read of the technical details would clarify some of the AGC problems that have been aired recently. The fact that NO mods are made to the rx is a plus but 4 tubes and attendant P/S make for a sizable package.-- so what--- so's the receiver !.I used a spare BFO from a R-390A as the injection oscillator which is easily reset for LSB or USB as the fancy takes you and with what ever filter bandwidth you select. Input is via the 455 khz output on the back panel. Mike makes the comment in his piece that the RFgain system works just like the ones used on most Collins and Drake xcvs. As a side issue I found that putting the P/S xfmr in the same box as the PTO cause FMing of the detected signal which I attributed to magnetic field from the xfmr influencing the permeability characteristic in the PTO.... probably no effect with a more conventional L/C circuit which Mike used. Like I said, it's the only aadaptor I've ever used yet appears equivalent in performance to any I used in ham gear over years. I commend the article and adaptor which I currently use . Someone on the list might have a reference to the issue number for those who dare ! Cheers

Date: Sat, 24 Mar 2007 15:19:14 -0700
From: "Greg Werstiuk" <greg_werstiuk@msn.com>
Subject: RE: [R-390] R-390 AProduct Detector

You and I probably hit the same web site (AMQRP) which originally sold the Softrock-40. It states the project is sold out. Beyond that, it has some issues. The page has a link to the "upcoming version 5" which (now incorrectly) points one to another useful and interesting software defined radio website (<http://www.hamsdr.com>).

Due to an email I received from Mark Huss (Thank you, Mark!) which indicated the existence of a version 6 of the Softrock, a lot of digging eventually led me to a Yahoo group for the Softrock project and it's users. That group is "Softrock40" and includes information on the current version, product availability, and purchasing instructions.

Date: Sat, 14 Apr 2007 20:22:16 -0700 (PDT)
From: Masters Andy <nu5o@yahoo.com>
Subject: [R-390] W0BT and N6PY mods in ER Magazine

Good evening list. Recently, I decided to modify my R-390A based on the September 2006 issue of ER magazine. I made the following mods: <snip>

3. W0BT AGC mod. A big step but also well worth the effort. My R-390A came to me already with the Rick Mish SSB AGC Mod on the back terminals and the Langford AGC mod. Removing the Mish mod was no big deal but moving from an undocumented Lankford mod to the new circuit was tedious. There is a typo on page 32, item 6 (should always read 0.1uf) but the article is very easy to follow and mine worked the first time. <snip>

Over all result is a much better AGC system, a noise limiter that functions better, and a nice SSB product detector that sounds really good. <snip>

Date: Sun, 15 Apr 2007 19:35:25 -0700
From: Renee Deeter <k6fsb.1@gmail.com>
Subject: Re: [R-390] W0BT and N6PY mods in ER Magazine

good evening all, nice to be back..... I just finished doing the W0BT mod in my R725. wonderful, thanks to N6PY for the diodes so there are no wiring changes! Tnx to both it works better than my AGC mod!I'll give the prod det a shot in a 390A....already running dual triode prod det in my 725 with a similar switching scheme.so folks the answer is it should works in a 390! probably need to change the TB102 values for the front end.73 Renée, K6FSB

Date: Sun, 3 Jun 2007 15:55:54 -0400
From: "TChirhart" <sparks@codepoets.com>
Subject: EAC R-390 factory modification that incorporates USB/CW/LSB

Does anyone know any any R-390's that were modified under contract that removed the BFO on/off switch and replaced the BFO pitch control with one control? I saw an R-390A, EAC contract that had this modification. A vertical 1 inch by 3 inch matching grey panel plate was installed over the two switches and only one control remained. It had a LSB CW USB position where the BFO pitch control previously was located. The owner indicated that this was a rare factory modification. Sorry no photos were taken. So was there ever a modification of this nature that was not an aftermarket add on?

Date: Sun, 03 Jun 2007 17:33:38 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: REAC R-390 factory modification that incorporates USB/CW/LSB

If this has a 6U8 added as well behind the front panel, isn't this the "Mexican Military" version by Columbia Electronics?

Date: Sun, 3 Jun 2007 14:47:41 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: EAC R-390 factory modification that incorporates USB/CW/LSB

I think there is a schematic of that in Paolo's R-390A book.

Date: Sun, 3 Jun 2007 17:49:58 -0400
From: "TChirhart" <sparks@codepoets.com>
Subject: RE: EAC R-390 factory modification that incorporates USB/CW/LSB

I did not see the interior of the R-390 as it was packed away with other items stacked on top and on all sides. I could recognize the front panel if someone has a photo of this type.

Date: Sun, 3 Jun 2007 22:00:21 -0700
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: EAC R-390 factory modification that incorporates USB/CW/LSB

I have a Motorola that has the 6U8 module behind the front panel. Don't know about the "Mexican Military" story. The IF deck is EAC though. My version still has the BFO knob for CW, but has USB/LSB/AM choices as well. The IF deck has a new connector up by the ballast tube which connects to the module and the expanded mode switch. I've had mine for almost 15 years now. Works reasonably well. If it wasn't a factory job, it was a very well done depot mod. I'm not sure how rare it is or isn't though. That would be interesting to know. I think Chuck Rippel made mention of it on his website.

Date: Mon, 4 Jun 2007 16:55:37 -0500
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: EAC R-390 factory modification that incorporates USB/CW/LSB

Some months ago I contacted Paul Keys of Columbia Electronics to see if they still had the circuit diagram on file and received this reply:

11-18-06

Dave,

I looked for the diagram of the SSB Modification and could not find it.

I remember that it was a small one tube chassis with a crystal that mounted behind the front panel. The mode switch also had an extra position.

Sorry that is all that I can provide.-- Best regards, Paul Keys, President

Date: Tue, 5 Jun 2007 09:37:05 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: [Re: EAC R-390 factory modification that incorporates USB/CW/LSB

A few years back this issue was raised. I have scanned the archives and came up with these msg's, that might help you out finding the schematic.

Date: Thu, 10 Jul 2003 23:24:49 -0700
From: David Ross <ross@hypertools.com>
Subject: Re: [R-390] SSB-Modified R-390A

Does this describe the LSB-USB-AM-CW mod for the R-390A? "Mounted on a small L-bracket chassis, it consisted of circuitry featuring a 6U8 tube with two crystals and a USB/LSB selector switch. The original BFO switch was removed and the new assembly installed in it's place. A short cable fit into an 8-pin connector added near the front of the IF deck for power and signal output. The front panel was refinished, repainted and silk screened with new lettering for the USB/LSB switch" This is from the February 2003 issue of Electric Radio, page 32, article titled "Dick Walser Remembered". Dick is apparently the fellow who came up with this SSB mod. The article mentions Dick's company, Airborne Electronics and further states: "In all, Airborne remanufactured about one thousand R-390As. A large number of them were shipped to radio dealers in the (Los Angeles/North Hollywood) area. Not all of them went to the dealers. Todd Shipyards purchased ten radios that were to be installed in five destroyer escorts being built in the 1970's, and in the 1980's a mysterious Japanese entrepreneur purchased twenty R-390A's for his well-heeled clients in Tokyo. Most of their rebuilt radios were shipped to well-known 3-letter Government agencies. Some were shipped to countries in South America. R-390As that were under contract to Columbia Electronics received a new nameplate that reflected 'Columbia Electronics' as the manufacturer." Columbia Electronics does show up as an R-390A manufacturer on an R-390A FAQ at: <http://www.r-390a.net/faq-manuf.htm>

From: Llgpt1@aol.com
Date: Sat, 19 Jul 2003 21:19:11 EDT
Subject: Re: [R-390] SSB Conversion Photos

That is basically the same conversion as pictured in Paolo Viappiani's R-390 - R-390A Handbook. The Schematic is printed in it also, schematic is in English, noted as an EAC conversion.

From: "federico" <federico@dottorbaldi.it>

Date: Mon, 21 Jul 2003 22:04:17 +0100

Subject: [R-390] SSB Conversion Scheme

Hi to all friends, I succeed to put the scheme of SSB EAC Mod, please follow the link : www.dottorbaldi.it/militaryradio and there you shall find the scheme and some photo of my shack. Let me know if there are any problem.

Date: Tue, 05 Jun 2007 13:48:09 -0500

From: Dan Arney <hankarn@pacbell.net>

Subject: Re: EAC R-390 factory modification that incorporate USB/CW/LSB

I bought Dick Walser's estate That had around 75 to 100 refinished R-390A front panels with the SSB position silk screened on them along with about ten 1-ton van loads of stuff that my A**HOLE Brother in law sold as junk at .10 a pound to APES or S**t canned it in six 20 yd dumpsters. I have/had the complete bracket and schematic somewhere and think I saw it since I was relocated to TX. I am no longer talking to my control freak sister or her A**hole husband. I was going to make up some kits until I moved. ApeX may have the panels.

Date: Wed, 6 Jun 2007 20:13:23 -0400

From: "Keith Densmore" <densmore@idirect.com>

Subject: [R-390] EAC SSB Mod

I followed with interest the discussion about a modified R-390A with a crystal controlled SSB product detector and front panel mod. Maybe I missed it but if there exists a schematic and/or pic of the silk screened front panel, I'd be eternally grateful to be directed to such a site.

Date: Wed, 6 Jun 2007 20:32:51 -0400

From: "TChirhart" <sparks@codepoets.com>

Subject: RE: [R-390] EAC SSB Mod

Keith, I'm in the process of contacting the owner and if it moves into the shack with me I'll take lots of photos. I'm still trying to determine if it's one of the modified EAC's reworked for the Mexican military and what it would be worth.

Date: Wed, 4 Jul 2007 16:47:32 -0400

From: "TChirhart" <sparks@codepoets.com>

Subject: Update: EAC R-390 factory modification that incorporates USB/CW/LSB

The R-390A that I mentioned in previous emails back on June 4th has followed me home. I have photos of the unit but it does not appear to be the modified Mexican military version. An engraved panel has been added that covers the BFO Pitch and BFO switch and is 2 inches wide, X 4 inches tall. The markings for the plate that cover the Pitch control show "UPPER BFO LOWER" and the Switch shows AM CW/SSB. I do note

that on the nomenclature plate, after the serial number 182X that the letter "A" has been stamped next to the SN and appears to have been added later. The SN on the rear of the chassis does not match the nomenclature plate. The rear number is 31XX and since the zero adjust knob and dial lock knobs have the marker lines I would say it has been to the Depot at one time or another. I have not fired it up but did test it prior to getting it. The previous owner used a light zip cord taken from a clock radio to power it up. Other than missing the top cover it is intact.

The PTO is a Cosmos, the other modules are EAC and the previous owner pulled the filter caps and have replacements taped in their place. I'll have to find a pair of caps and do it right. (Does someone on the reflector sell remanufactured cap kits or rebuilt caps?)

Does anyone on the reflector know of an aftermarket plate as described above that was marketed in the past? It really looks commercially manufactured and not the work that would come out of a trophy shop. This unit is of the same contract that is mentioned in the email excerpt I received below but is not the same mod. I would like to see a front panel photo of one of these 390's for comparison.

Quote: In November, 1998, Mike, KC8CU reported finding a R-390A where the BFO control had been replaced by a 4-position switch marked LSB-USB-AM-CW. A 6U8 product detector circuit had been added behind the new mode switch. This specimen appeared to have been based on a modified 1967 EAC unit from contract DAAB-05-67-CO15 (CO155) by Columbia Electronics, Inc. of North Hollywood, CA. Columbia Electronics' owner confirmed that they had indeed modified 30 R-390A receivers for SSB for the "Mexican Military". Unquote

Once I put on a proper power cord I'll fire it up and check it out. I'll try to post some photos when I get a website up and running, but if anyone knows of an area where you can post photos for no cost I'll upload them.

Date: Sun, 29 Jul 2007 10:01:11 -0400
From: "TChirhart" <sparks@codepoets.com>
Subject: [R-390] 1967 EAC with SSB modification Photos

I loaded some images of the EAC R-390A that found its way home with me a couple weeks ago as reported on the reflector. I did receive various email responses to my inquiries that gave me some thoughts on the history behind this particular receiver, but it does not appear to be one of the Mexican military receivers. The additional front plate looks to be professionally manufactured. I will load additional photos shortly. As I mentioned in previous emails, the nomenclature plate has the S/N engraved and the letter "A" stamped to the right of it which indicates that the letter was hand stamped into the plate. Thanks to all that sent emails and particularly to Les Locklear for taking time to provide scans of photos and some potential sources of information on this particular receiver. I hope to have more time to go into this receiver in depth once the honey-do's subside. Has anyone out there in R-390 land seen a similar EAC in this configuration? Thanks 73 Tom K4NCG

<http://i181.photobucket.com/albums/x64/k4ncg/R390A7.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A6.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A5.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A4.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A3.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A2.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A.jpg>

<http://i181.photobucket.com/albums/x64/k4ncg/R390A1.jpg>

Date: Sun, 29 Jul 2007 14:17:46 -0400

From: Bob Camp <ham@cq.nu>

Subject: Re: [R-390] 1967 EAC with SSB modification Photos

A few quick observations:

- 1) The electrolytics obviously were done after the radio left military service. I would take care of them before I did much else.
- 2) The "ssb mod" appears to have been very nicely done, but I 'm betting it's not an official conversion. My guess is that it's a well done amateur modification. The gray jacket wire looks a lot like Belden. It's not something you see in a mil. spec. mod.
- 3) The radio is a bit dirty on top, it's doing just fine on the bottom. The power transformer seems to be missing some markings though.
- 4) Everything that should be there seems to be present. That's including the black tube shields. Looks like a nice radio - congratulations !!

Date: Sun, 29 Jul 2007 21:01:11 EDT

From: Flowertime01@wmconnect.com

Subject: Re: [R-390] RE sensitivity below 8mHz

You are correct about there being little reference to aligning the first IF slugs and caps. The circuit is assumed to work just fine. Thus it needs little attention.

In the RF deck alignment procedure there is one paragraph.

Z213 gets tweaked at 1250 and 7250.

Z216 gets tweaked at 1900 and 1100

L215 gets tweaked at 1100

C205 gets tweaked at 1900

C213 gets tweaked at 7600

As you do the RF octaves, you just remember to stop on the 1,100 1,250 and 7,600 as you go by and do the IF stages.

We just used the RF into the antenna input. Used the same generator level we used for the RF octave adjustments. Stop on the needed frequency and peaked the proper coils or caps.

You tweaked T207 once any where under 8Mkz
You tweaked T208 once any where under 8Mhz.

Any time you change the tube in the first mixer or oscillator you need to peak T207.

If your receiver does not perform as well under 8Mhz then the first mixer and oscillator needs a look at. The receiver should have the sensivity under 10uv for all frequencies. But the receiver does have better sensitivity above 8Mhz. That extra conversion stage under 8mhz takes its toll on the signals.

Date: Sun, 29 Jul 2007 21:09:47 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 7 Meg low sensitivity

After the switch contacts are cleaned with some deoxit and if the problem persists consider pulling the crystals and doing their contacts as well.

Back when (68-75) we did have crystals go weak and would replace them. Just cleaning the contacts would not always bring a band back up to par but a new crystal would fix the problem. I can believe the crystals are still going weak and causing problems. We just all cannot have a spare set of crystals around to swap out and try just to see if that's the problem. If you have a one band problem ask here to see if you can get a known good replacement to try. Postage and packing will cost more than the part.

Date: Sun, 29 Jul 2007 17:34:51 -0800
From: "Tom Elmore" <tom@telmore.com>
Subject: RE: [R-390] 7 Meg low sensitivity

I often wonder if crystals can go weak? I have a Collins KWS-1 that shows quite a bit of difference between the USB & LSB crystals positions. I have checked all the caps and coils associated with the crystal oscillator with my bridge and they check out.

Date: Mon, 10 Dec 2007 19:57:11 -0500
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] TMC MSR-1

Hi, I have an TMC MSR-1 SSB adaptor with no manual. The audio is pretty low. I wonder if anybody knows which tube effects the audio volume? Would it be the 6AQ5?

Date: Mon, 14 Apr 2008 13:44:50 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] AGC mod

I haven't studied the one in the Navships manual, but there is one in the September 2006 issue of Electric Radio. And there are some others that have been done with the intention of making the R-390A good for SSB without an external SSB converter. The general principle of these is to make the AGC fast on attack and slow on decay, so it holds the gain down in response to the envelope of the SSB signal. Then they greatly increase the BFO injection level. If you have strong enough BFO in relation to signal you can detect SSB fairly undistorted with a diode detector. This is a lot simpler to do than putting a product detector into the R-390A. Some guy used to sell an SSB modification kit that required no internal changes. Consisted of a rectifier connected to the line audio output, and feeding into the AGC line. The idea was you would listen with local audio, and turn up the line audio gain to get some audio AGC. This was fairly ineffective.

Date: Mon, 21 Jul 2008 20:53:54 -0400
From: PeterWittenberg <k2lrc@k2lrc.com>
Subject: [R-390] R-390 SSB Product Detector mods?? Not A

I am looking around for any modifications that have been done to add a SSB product detector to the R-390, not the A version. Anyone have any info??

Date: Mon, 21 Jul 2008 21:12:59 -0700
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] R-390 SSB Product Detector mods?? Not A

Peter, I use a solid state SSB detector unit with my 390. It's outboard and requires no modification of the receiver and connects to the terminal strips and IF output on the back of the receiver. It has an AGC control built into it which is the main reason I went with this particular version in contrast to a more commonly available version without AGC. I couldn't see going to the trouble of adding such a unit unless it provided some AGC that alleviated knob twisting to handle strong SSB signals. My unit was designed by AI2Q, and I believe I have a schematic on file that I could look for if you are interested and contact me off the group direct. It uses 5 transistors and a 1496 IC with built in power supply, all built into a 5X9x2 1/2 inch box. The unit could be a lot smaller if one wanted to make the effort. I built mine using some old National tube BFO and IF coils - the original schematic used crystals for each sideband frequency. Instead of switching crystals, I turn the BFO cap between two marks for USB/LSB selection. It works great and I use it all the time with my 390 which is pretty standard otherwise. You could adapt the R392 BFO PTO available from Fair for the BFO as well if you wanted it to be "Collins" unit !! I wasn't interested in making any mod's within the receiver itself. I believe there are numerous tube mod's in the archives that take you in that direction.

Date: Tue, 22 Jul 2008 08:34:19 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] R-390 SSB Product Detector mods?? Not A

There are lots of outboard ones that use the IF out. No mods required and no A or non-A issues. Mine uses 2 balanced modulators with the split BFO fed 90 degrees shifted. The effect is SSB stereo. Of course it does nothing to the SSB signal but it really changes the noise. Instead of a hiss it sounds like a waterfall in 3D. Less tiring and almost pleasant. The AGC is likely a source of grief but there are mods available, or use the terminals on the back to supply your own from the detector system.

Date: Tue, 22 Jul 2008 11:42:35 EDT
From: DJED1@aol.com
Subject: Re: [R-390] R-390 SSB Product Detector mods?? Not A

I'd certainly recommend the AI2Q unit if you're up to building it. Alex based it on my design using a capacitor-tuned BFO. I've been using mine for several years and have done a couple of modifications. I'm happiest with the last, which uses a R-392 BFO coil as the oscillator. I checked the stability and it's just as good as the original R-390A oscillator. I modified my circuit to use Alex's crystal BFO several years ago, but I like the tunable better. It depends on your preference- the crystal is easier to use-just flip the switch. However, my crystal frequencies are a bit off for the correct edge of the 2 Kc filter so I lose the lows on one sideband, and are obviously not at the edge of the 4 Kc filter. With the tunable BFO, you can set it exactly to the edge of the filter. I had two objectives when I designed the SSB adapter, to make it work without and mods to the radio, and to provide both a product detector and a fast attack AVC. It works great and will handle very strong signals. The AVC is not quite as flat as my R-4C, but the original AVC on the R-390A is not very flat either. Unfortunately, this is not available except as a build-it-yourself. However, I can provide help if you have problems. Ed W2EMN (formerly WB2LHI)

Date: Tue, 22 Jul 2008 16:41:44 -0700
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] R-390 SSB Product Detector mods?? Not A

Ed, my memory is poor. You reminded me how much help you gave me when I was trying to build the AI2Q unit and you provided a nice description and schematic in a Word document of the unit that was a precursor to his crystal controlled unit. Likewise, I've been very happy with the result. I bought a couple of the R392 BFO PTO's and used one in replacing the BFO in a Mackay 3010 and haven't gotten around to putting the other in a SSB detector but it's in the back of my mind. We moved about a year ago and only two days ago did I get around to hooking up the 390 with the outboard SSB detector - it and the radio worked just fine after the rest. best regards, Dan.

Date: Thu, 18 Dec 2008 14:53:07 -0500
From: Bill Kulze <wak9@cornell.edu>
Subject: Re: [R-390] R-390A / SoftRock SDR setup

Interesting, I did the same thing a couple of years ago with my WinRadio, I posted something here regarding it. But since I was using the IF out going into the antenna input, I turned the IF gain down to compensate. I had a couple 20db pads inline, but needed more. I've since acquired an old step attenuator, but haven't tried it again. It did prove to be a quick and dirty way (and seemed quite effective) to get multiple modes of demodulation out of the radio while making use of its great reception. I'll have to revisit that.

Date: Tue, 20 Jan 2009 09:51:23 -0500
From: frankshughes@aim.com
Subject: [R-390] SE-3 Synchronous Detector question

I want to add a Sherwood Engineering SE-3 Synchronous Detector to my 390A. Rob @ Sherwood sent me some schematics about mods needed to improve performance w/ the Synchronous Detector. Anyone here had experience using the Sherwood SE-3 w/ a 390A? Are the AGC and current regulator mods really necessary or not for the Sherwood to work properly? (It's not completely clear to me if the current regulator mod he sent pertains to the 390 or the "A" or both, the schematic references R390 current reg RT510)

Date: Tue, 20 Jan 2009 09:12:12 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] SE-3 Synchronous Detector question
To: <r-390@mailman.qth.net>, <frankshughes@aim.com>
Message-ID: <7A98467F39B2457D94F8FE5EA94D04F7@zion>
Content-Type: text/plain; charset="iso-8859-1"

I've owned a couple of the SE-3's older and newer (not the newest) versions. No, the modifications aren't "absolutely" necessary, but the AGC mods greatly improve listening on AM fading stations, it also allows listening to SSB without riding the RF gain. If you look closely, it is quite similar to the Lankford AGC Mod. Regarding the RT510/3TF7 Ballast Tube, there are more threads than you can possibly imagine on replacement modifications. I think there is no need for a fragile troublesome tube in the R-390A/URR, and replaced mine with great results.

Date: Fri, 10 Apr 2009 13:40:38 +0000
From: Gene Dathe <dathegene@hotmail.com>
Subject: [R-390] AGC Mod from Electric Radio #208

I need a new project. Has anyone done the AGC mod from Electric Radio #208? What did you think of the performance vs. unmodified?

Date: Fri, 10 Apr 2009 09:52:37 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] AGC Mod from Electric Radio #208

It appears that is not the fairly simple mod proposed by Dallas Lankford in Hsn #23. That mod is touted to be the single most effective simple improvement that can be made to the R-390A. Two diodes are simply added to the circuitry. The AGC mod you refer to may be the much more complicated one. I have not done it to any radio... yet.

Date: Fri, 10 Apr 2009 20:35:52 -0400
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] AGC Mod from Electric Radio #208

Are there schematics easily accessible? I've not seen this mod, but I've done a lot of work on AGC systems and would be happy to analyze the mod and comment on what you would likely experience if you did it.

Date: Mon, 21 Dec 2009 19:20:01 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: [R-390] Best approach for SSB mod on R-390A

What is the suggested approach for SSB modification for the R-390A.

Is the 2 diode modification worth attempting? I know it has been covered here more than once just wanted to solicit the current thinking on the matter ..

Date: Mon, 21 Dec 2009 22:46:40 EST
From: djed1@aol.com
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Compared to buying a tube SSB adapter these days, the two diode approach will make the radio work pretty well on SSB. I used to just run mine on medium AGC, and that was OK. The two diodes made it better, but I eventually removed them because they affected the meter readings, and I got a R4C for my SSB work. Since then I've built a solid-state SSB adapter that works well (product detector and fast-attack AVC), so I occasionally use the R-390A to monitor the ham bands. AI2Q published a version of the adapter if you want to give it a try.

Date: Mon, 21 Dec 2009 22:26:38 -0800
From: "Dan Merz" <mdmerz@verizon.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Tom, I concur with Ed's comments. I used the two diode mod for a while, worked pretty well except for agc and very strong signals which made manual tweaking of the rf gain necessary. I later made the outboard ssb adapter that Ed mentioned and that's been good enough for me. I've used it with both the 390a and 390. The 2-diode mod is very easy to do/remove. The outboard adapter is more of a project and needs a small power supply, which I built right on the adapter chassis. Dan.

Date: Tue, 22 Dec 2009 09:01:17 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Top of the heap....Sherwood SE-3. Treat yourself... www.sherweng.com

Next in line....PD-2 <http://electronicspecialtyproducts.com/>

Also there was a VE making a kit...Jan Skirrow, think he was a member here for quite some time. External Syncro/product detector. Worked real well as I understand.
<http://skirrow.org/Boatanchors/TechTalk10.pdf>

Then there are the various mods you've read about that utilize the BFO to do SSB that are slight improvements on just using the radio as is. You will no doubt get many emails telling you it works fine just like it is...and in a fashion it does...it you desensitize the radio by backing down on the RF gain and what not... It works but really...the radio was never designed to do SSB. There are also a few product detector mods which are probably worth looking into further. Problem is they are radio specific. You mod that radio and that radio alone works...but if you have several radio's the external approach is a better choice. (SE-3 or PD-2) Just my opinion though...

Date: Tue, 22 Dec 2009 14:28:08 -0800
From: "Dan Merz" <mdmerz@verizon.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Hi, I would ask myself which of these detectors has any gain control built into it so you're not fussing with the RF control manually on strong signals. As far as I was concerned, this was the main reason for going beyond the 2-diode approach. I'm pretty sure the Skirrow kit doesn't, and looking at the SE-3 and PD-2 I see no specification that addresses this issue so I assume they don't either. Maybe someone with experience with these latter two detectors could clarify that point. But if fussing with the RF gain manually doesn't bother you, then take your pick for all the other features offered, or just stick with the 2-diode fix. The outboard detector that Ed mentioned and the one that I built provide a line back to the AGC for gain control based on level at the detector and use a product detector. Dan.

Date: Tue, 22 Dec 2009 17:29:53 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

The SE-3 is a complete IF/Sync Detector/Product Detector/Audio system, with an incorporated AGC system I'm quite sure. Should be no need to fiddle with the RF Gain. I've heard one of these things work and it's simply amazing. Brings any of the old Boatanchor radios up to date as far as detection of Sync AM and SSB. Good part is he offers a switching system that allows a whole rack of radio's to be routed through it with adjustments for the varying IF output levels found between radios such as the

SP-600 and R-390 series. The PD2 is a new product and Jan would have to speak to the effectiveness of the need to fiddle with the RF gain.

My understanding of the issue with the RF gain on the stock boatanchor is more to do with the level of BFO injection. It's way too low for SSB work and the RF signal level has to be kept below the injection level of the BFO to keep things working properly. If you are not using the BFO for SSB detection the RF gain level should become a non-issue.

I would love to hear from anyone that might own some of these outboard devices...I know there were several of the earlier PD-1's out there and a few SE-3's as well....

Date: Tue, 22 Dec 2009 20:06:28 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

>I would love to hear from anyone

I have an SE-3 and frankly, in my view, it's not worth the time it would take to toss it into the trash. Anyone who has used a properly designed synchronous detector would just laugh at it. IMO, the esteem in which it seems to be held in some quarters shows how few hams and SWLs have used a properly designed synchronous detector. The SE-3 oscillator is not temperature compensated, and it drifts beyond the ability of the frequency trim capacitor to center it as the temperature changes. I had to drill a hole in the top cover above the tuning coil and leave a tuning tool poking out the top to tweak it. The capture and lock-in ranges and behaviors were also not well chosen, necessitating that the user manually "guide" the PLL into lock. All in all, a very poor effort, IMO. PLL design is just not that difficult.

NOTE: the above comments pertain primarily to using an SE-3 as an AM synchronous detector. It's OK as a BFO/product detector, but far from state of the art even for that use. The SE-3 does not have IF filtering or AGC -- it depends on the host radio for those functions. For anyone interested in constructing a properly working synchronous detector, here are three of the many references you will find through a web search:

<http://www.premium-rx.org/ref/amsynchronous.pdf>

http://webpages.charter.net/wa1sov/technical/sync_det.html

<http://www.arrl.org/tis/info/pdf/9307028.pdf>

Date: Tue, 22 Dec 2009 21:30:56 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Personally, I would either (i) just modify the AGC to work properly and increase the BFO injection, or (ii) build an outboard IF/detector box that has some IF filtering and AGC, will do both SSB and selective-sideband synchronous AM detection, and has 2 or 3 notch filters. The former is quite easy, the latter a fair amount of work (I've been noodling at a design for 20 years, but it has never come to the top of my "to do" list).

Here are the AGC and BFO mods I've been doing for 35 years:

(1) Parallel R546 and R547 with solid-state signal diodes (1N914 or equivalent), with their cathodes toward V509A. This will produce asymmetrical attack and release times. (Attack will be very quick, release will not change.) To slow down the attack, if desired, put a resistor in series with the diode across R546 -- I often use 1 to 5 kohms.

(2) Install a new 20 uF film capacitor with one end to the junction of C548 and C551 (i.e., the grid of V506A). Disconnect the plate of V506A from J512 pin 15, and connect the free end of the new 20 uF capacitor to J512 pin 15 instead. Switch the wires from S107, terminals 9 (ground) and 7 (C551) -- ground to terminal 7, C551 to terminal 9. Install two, 2.2 Mohm resistors at S107 -- one each from terminal 9 (C551) to terminal 7 (ground) and from terminal 8 (new capacitor) to terminal 7 (ground). The AGC switch will then add C551 in parallel with C548 for Medium AGC and the new 20 uF film capacitor in parallel with C548 for Slow. The new 2.2 Mohm resistors bleed any residual charge from C551 and the new capacitor to reduce any pops when switching between AGC time constants. You can adjust the AGC release times by changing the values of C547 and 548 (Fast), C551 (Medium), and the new capacitor (Slow). I often use as much as 50 uF for the Slow AGC capacitor.

Mod (2) fixes the "audio disappearing" problem when switching to and from Slow AGC. (Note that this is a design "feature" [i.e., problem] -- If your 390A does NOT have this problem, it's because C551 is not a capacitor anymore.) If you can live with the "audio disappearing" problem when switching to and from Slow AGC, you can omit mod (2).

(3) To increase the BFO injection, replace C535 (12 pF) with 47-75 pF.

These changes will make the 390A perfectly serviceable for CW and SSB reception, as well as improving AM performance substantially.

Date: Tue, 22 Dec 2009 22:05:16 EST
From: djed1@aol.com
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I know the Skirrow detector does not have an AVC function, and so he says in the manual that you may need to ride the RF gain. But the real issue with the AVC is that you need a fast attack/slow decay in order to accommodate the rapid variations of SSB. With my adapter I just run the AVC voltage into the AVC circuit- the adapter provides the fast attack and the radio AVC is set on slow to provide the slow decay. I don't know about the SE-3-for the price, I hope it provides every function required.

Date: Tue, 22 Dec 2009 19:49:41 -0800 (PST)
From: "Drew P." <drewraille807@yahoo.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I performed the 2 diode mod and I would characterize the results as a night-and-day difference over stock. It is extremely simple to perform and gets you probably about 90% of the desired result with less than 5% of the effort. Give it a try, it is just as easy to undo if you are not satisfied.

Date: Tue, 22 Dec 2009 23:29:09 -0500 (EST)
From: JAMES BRANNIGAN <jbrannig@optonline.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I use a CV-591 for SSB. The "2 diode" mod increased the AGC attack time and was a vast improvement. The R-390A is an OK SSB/CW receiver. An a clear frequency the wider passband makes for nice listening.

Date: Tue, 22 Dec 2009 21:32:41 -0700
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I use the diode mod as well and I think it works very well too. The article I read also said to parallel a few more PF with the injection capacitor which I also did. Without this, you may still find yourself backing down the RF gain to get rid of the distortion on the really strong signals. I also suggest that you avoid 1N4148 or 1N914 for the diodes. You need something with a higher PIV rating. I blew one of the diodes within a few days before I was advised of this issue by someone on this list. I switched to some different diodes and it hasn't hiccupped since.

Date: Tue, 22 Dec 2009 21:35:23 -0700
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

One other thing I forgot to mention is that the mod makes the carrier meter respond in a more useful way (IMHO) to SSB signals.

Date: Tue, 22 Dec 2009 21:14:53 -0800 (PST)
From: "Drew P." <drewraille807@yahoo.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

On the 2 diode AGC modification for SSB on the R-390A, Don (2002tii) wrote:

<snipped>

"Here are the AGC and BFO mods I've been doing for 35 years:

(1) Parallel R546 and R547 with solid-state signal diodes (1N914 or equivalent), with their cathodes toward V509A. This will produce asymmetrical attack and release times. (Attack will be very quick, release will not change.) To slow down the attack, if desired, put a resistor in series with the diode across R546 -- I often use 1 to 5 kohms."

I've seen a similar scheme which put the resistor in series with the time constant cap. I think that would allow the full AGC voltage to reach the gain controlled stages (relatively) immediately upon reception of a large signal transient, instead of being dragged down while the cap is charging. The effect might be to reduce the "pop" often heard on the leading syllable of a strong SSB transmission.

"(2) Install a new 20 uF film capacitor with one end to the junction of C548 and C551 (i.e., the grid of V506A). Disconnect the plate of V506A from J512 pin 15, and connect the free end of the new 20 uF capacitor to J512 pin 15 instead. Switch the wires from S107, terminals 9 (ground) and 7 (C551) -- ground to terminal 7, C551 to terminal 9. Install two, 2.2 Mohm resistors at S107 -- one each from terminal 9 (C551) to terminal 7 (ground) and from terminal 8 (new capacitor) to terminal 7 (ground). The AGC switch will then add C551 in parallel with C548 for Medium AGC and the new 20 uF film capacitor in parallel with C548 for Slow. The new 2.2 Mohm resistors bleed any residual charge from C551 and the new capacitor to reduce any pops when switching between AGC time constants. You can adjust the AGC release times by changing the values of C547 and 548 (Fast), C551 (Medium), and the new capacitor (Slow). I often use as much as 50 uF for the Slow AGC capacitor."

I just use the AGC "SLOW" position without these mods - still works pretty well. If doing so, it would be well to ensure that the 2 uF oil-filled AGC cap isn't leaky - mine was, and I replaced it with an under-chassis mounted polyester dielectric radial lead cap.

Don, do you see a disadvantage to using the original AGC integrator (tube) circuit with a good cap as opposed to disabling it and using larger caps as you did? Is disabling the AGC integrator tube mainly to facilitate gaining flexibility in selecting time constants?

"Mod (2) fixes the "audio disappearing" problem when switching to and from Slow AGC. (Note that this is a design "feature" [i.e., problem] -- If your 390A does NOT have this problem, it's because C551 is not a capacitor anymore.) If you can live with the "audio disappearing" problem when switching to and from Slow AGC, you can omit mod (2)."

Ahhhh - sounds like Dave Wise's "Ending the Moment of Silence" mod. However, with all the mealy-mouthed preachers on the shortwaves nowadays, an occasional "moment of silence" can be a good thing!

"(3) To increase the BFO injection, replace C535 (12 pF) with 47-75 pF."

I didn't perform that part of the mod. If adding capacitance to increase BFO injection, it has been recommended to readjust the neutralization of the last IF amplifier stage to keep the added BFO injection from finding its way back through that stage and into the AGC IF amp/detector, where it would drive up the AGC voltage and desense the receiver.

ISTR where someone recommended replacing the 6BA6 BFO tube with a 6AU6 (12AU6 to all who use the paperclip ballast substitution) to obtain increased BFO injection. I don't know how the increase (if any) thus gained would compare with that obtained by upping C535.

Date: Wed, 23 Dec 2009 03:15:05 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

>I.....The effect might be to reduce the "pop" often heard

The two achieve different objectives. The resistor in series with the diode slows down the AGC attack. The resistor in series with the cap does as you suggest -- speeds up the attack for an instant, then lets it recover quickly. This can have the disconcerting effect of blunting the leading edge of a vocal plosive, with a louder following vowel sound. This inversion of normal speech dynamics can sound quite odd.

>do you see a disadvantage to using the original AGC integrator
>(tube) circuit with a good cap as opposed to disabling it and using
>larger caps as you did? Is disabling the AGC integrator tube mainly
>to facilitate gaining flexibility in selecting time constants?

The "nether" end of C551 gets switched between ground and the plate of V506A, which sits at about 30 volts. Every time you switch from Slow to Medium AGC, you put a -30 volt step onto the AGC line, which turns all the gain-controlled stages hard off. You don't get your audio back until C551 discharges through the AGC release resistance. When you switch from Medium to Slow, you get a blast of distortion (but it doesn't last as long as the silence, because the cap discharges relatively quickly through the grid of V506A). As I said, "If you can live with the 'audio disappearing' problem when switching to and from Slow AGC, you can omit mod (2)."

>If adding capacitance to increase BFO injection, it has been
>recommended to readjust the neutralization of the last IF amplifier
>stage to keep the added BFO injection from finding its way back
>through that stage and into the AGC IF amp/detector, where it would
>drive up the AGC voltage and desense the receiver.

It's good practice to adjust C525 after any work on the BFO, but IME even if you don't adjust it you are very unlikely to notice whatever small desensitization may be introduced.

Best regards, Don

Date: Wed, 23 Dec 2009 19:20:45 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Thank you for all of the idea's!! I have a 1958 Motorola R-390A scattered all over my shop in the process of being restored. I started putting the RF deck back together today. I'll report back which direction I have embarked on.

Date: Wed, 23 Dec 2009 21:43:17 -0800 (PST)
From: Steve Toth <stoth47@yahoo.com>
Subject: [R-390] Fw: Re: Best approach for SSB mod on R-390A

FWIW: What I've been doing here is this: I picked up an Icom R70 receiver for under \$200 - 100khz to 30Mhz coverage. Tune it to 455khz and connect it to the R390A IF output jack. I then use the R70 with USB/LSB modes, noise blanker, passband tuning, notch filter, RIT, AGC and the R70 audio section with the R70 speaker, or an external speaker, to listen to SSB. Seems pretty simple and it works. No changes necessary to the R390A. By just tuning the R70 to 500Khz I can also use it on the IF output of my R388 forSSB. Maybe ignorance is bliss?

Date: Thu, 24 Dec 2009 17:23:34 -0600
From: <ka9egw@britewerkz.com>
Subject: Re: [R-390] Fw: Re: Best approach for SSB mod on R-390A &

Ah, a Q-5er for SSB! Liking it...

Date: Fri, 25 Dec 2009 10:00:02 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

My SE-3's oscillator is very steady. I wonder if there are good ones and bad ones. Also, without manual controls, the detector has to guess the operator's intentions, based on, say, tuning rate. I don't like machines trying to read my mind, because they usually get it wrong. For me it's better to have direct hands-on control. My only complaints have been the lack of a noise limiter and lack of a 5kHz notch filter in addition to the 10kHz filter. I've bookmarked your recommendations. Sometime I'll build one or more and report my experience using them vs the SE-3. Or if anyone local has built one, let's get together and try it out next to my SE-3.

Date: Fri, 25 Dec 2009 13:57:41 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

>Also, without manual controls, the detector has to guess the
>operator's intentions, based on, say, tuning rate.

For this reason, it's better to have the SAM detector in the box with the tuning -- you can then either turn the oscillator off and revert to an envelope detector for tuning around, or (my preference) just center the oscillator during tuning so one hears the carrier heterodynes. I prefer to hear the carrier heterodynes while tuning, and have found with my SAM designs that it's not difficult to adjust the PLL characteristics so that the action is invisible while tuning, even if the SAM demodulator is external and doesn't know when you're tuning. IMO, the need for manual guidance into lock is a design of necessity (because the loop characteristics were ill-chosen and the PLL therefore did not exhibit benign behavior while tuning), not an original ergonomic specification.

>Sometime I'll build one or more and report my experience.....

One I didn't mention in that post because I don't know of an on-line copy of the manual: the Drake R8B has a truly excellent SSSAM detector. If you're going to build, a study of that schematic and the accompanying discussion of the theory of operation will undoubtedly be very rewarding. Drake chose to turn the oscillator off and revert to an envelope detector for tuning around, so the PLL loop dynamics would probably need to be tweaked to use it in "tuning with the oscillator on" mode. (I keep meaning to convert mine, but haven't gotten around to it.) Of the links I posted, my expectation from a not very thorough design review is that the Surrey Electronics unit may be quite good, but I have never used one.

Date: Fri, 25 Dec 2009 21:42:51 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Somehow I didn't get Don's post... Don I would say yours is broken...that is not at all the experience I have seen nor heard from a local that used one for a very long time. Sherwood is also very particular about his designs and would probably invite it to be sent to him for evaluation.

Date: Fri, 25 Dec 2009 22:57:04 -0500 (EST)
From: JAMES BRANNIGAN <jbrannig@optonline.net>
Subject: Re: [R-390] frequency counter project is working!!

You are going to have the same issues with the 32S-3. It is also a heterodyne unit. I don't know if "spot" or "sync" on the 32S-3 will put out enough RF to hear on the R-390A, so put a dummy load in the circuit, put the 32S-3 in tune and tune the R-390A for zero beat.

Date: Fri, 25 Dec 2009 23:51:11 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

>that is not at all the experience I have seen nor heard from a local
>that used one for a very long time.

All the ones I've seen perform similarly. Some folks may have tighter temperature control in their shacks than I do, so the lack of temperature compensation may not be a practical problem for some users. However, the need for manual guidance (intolerable in a PLL demodulator, IMO) is no secret -- it is described on the manufacturer's web site. I've designed and built more than a few different PLL detectors over the last 30 years, and the worst of the bunch performed a lot better. There are also commercial designs that perform well. I think the folks who sing the SE-3s praises do so simply because they haven't used a PLL detector that works as one could (and should). Horse-drawn buggies must seem really fast to someone who hasn't ever seen a car. If an SE-3 fills someone's needs, fine -- but it is far from the best that can be done, and the price is outlandish (IMO) in light of this shortfall.

Date: Sat, 26 Dec 2009 06:54:58 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I have owned three over thje years in two different configurations. Never a drift problem. Unless you have it in a glass greenhouse or an unheated garage in International Falls, Minnesota in winter there should be any drift problem. I sed one with a Drake R-7A which is in itself drifty. A R-390a which drifted maybe 200 hz on a bad day. The last was a SP-600 which drifted 1-2 khz depending which band it was on. The SE-3 that Don has has to have a faulty component.

Date: Sat, 26 Dec 2009 10:04:16 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I guess many of us are just not as demanding...and I approached this from the perspective that it is the best of what is commercially available at the moment. There's no question that a better box is within the realm of design but nobody has stepped forward with one that they are willing to build or kit for the receiver enthusiast. Even most AM Sync detectors included in commercially available receivers are lacking in performance. The Drake R8B being one of the best...but it's not in production. The Icom R-75 is a good radio but the AM Sync detector is flawed right out of the gate...and with mods barely approaches the Drake. That said using most of these radio's for IF/Detector/ Audio sections for the R-390 series comes with the limitations contained in the radio selected. They all cost as much or more, new or used than the SE-3. But that said they are all better performers at AM Sync detection and SSB then the R-390 alone...or even with the simple mods like the two diode deal and or AGC mods. At least that's my oppinion...

Date: Sat, 26 Dec 2009 10:24:02 -0600
From: <wb5uom@hughes.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I know that when my CV-591 went on the blink, I put the Drake R8B in its place on the R-390A and it worked like a champ, almost to the point of forgetting about the CV. Actually, I have pressed into operation on of my Racal 6217A's for the same purpose on a second R-390A , and it is doing well too.

Date: Sat, 26 Dec 2009 11:38:46 -0600
From: "Clarence Lozano" <jeeper@netins.net>
Subject: [R-390] SSB DETECTOR KIT

Hello to all ,I have been using JAN SKIRROW`S SSB Detector kit -V3.1 with my R390A for a year now ,works great

Date: Sat, 26 Dec 2009 17:41:00 -0600
From: Richard <theprof@texoma.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

For SSB on my R-390A I use a HP312A Selective Level Voltmeter. Works like a champ, weighs in at canoe-anchor level, and has a nixie tube display. For more esoteric purposes, such as DRM, I use an outboard down-converter to take the 455KC IF to audio frequencies and run it into the PC sound-card.

Date: Sat, 26 Dec 2009 17:56:58 -0600
From: Grant Youngman <nq5t@tx.rr.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I would certainly have to agree.<snip> I use an SE-3 (version III upgraded to a IV) with an R-390, 390A, SP-600, and recently an HQ-140X. It works just fine. Not sure what the bug in Don's ar*e is here, but either his unit was defective, or ... (comments deleted in the interest of list harmony). If that makes me just another stupid and ignorant luddite, so be it :-)

Date: Sun, 27 Dec 2009 19:47:58 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] R390A SSB

While this thread is good, more in depth answers are available from 3 web sources. The R390A FAQ Y2KR3 chapter 11, the HSN archives, and the current Dallas Lankford site in Norway. All these cover the subject matter in great depth.

Date: Mon, 28 Dec 2009 00:05:22 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] R390A SSB

Here are the links to those places.

- > The R390A FAQ: www.r-390a.net/
- > Y2KR3 chapter 11, <http://www.r-390a.net/Y2K-R3/index.htm>
- > the HSN archives,

This is Hollow State News, for those who have not read it. It's now not published.
www.hollowstatenews.com/

> and the current Dallas Lankford site in Norway.

Note: Dallas Lankford was a experienced boatanchor fellow and was editor of Hollow State news for quite some time. He wrote a set of overhaul notes for he URM-25D that were offered in but not published in HSN. No URM-25 owner should be without them. The "Norway site" is the website of a radio club that makes an annual trek to a remote Island off the coast of Norway for the best possible receiving conditions. Their website is: www.kongsfjord.no/ and the page has a link to "The Dallas Files".

Date: Sat, 2 Jan 2010 12:11:37 -0500
From: Steve Byan <stevebyan@verizon.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

If you were designing a PLL synchronous detector that attempted to maintain phase coherence during a selective fade lasting several seconds, what loop bandwidth would you choose? Given such a loop bandwidth, how would you arrange to achieve lock after tuning the receiver without waiting an inordinate period of time? Not that I'd ever spring for a Sherwood SE-3.

Date: Sat, 2 Jan 2010 21:29:42 -0500
From: "James A. \ (Andy\) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

This is a complex subject, but I will try to give 2 short answers:

(1) In a fully-analog design, what you do is design a PLL with multiple FET-selectable loop bandwidths. Generally 2 (narrow and wide) is enough, but I have seen as many as 5. The trick is deciding when to switch from "hold" (very narrow) to "capture" (very wide). There is generally some kind of signal-to-noise detector that compares the amount of signal in a wide band to the amount of signal in a narrow band, but the circuitry gets pretty baroque very quickly. It is hard to make this design work reliably over a wide range of operating conditions. The PLL tends to get sucked into nearby hot stations, or gets stuck holding in noise after the transmitter drifts off one way or the other.

(2) The classy way to do it is put a computer and DSP in the loop where the oscillator is tuned with a D/A converter from the computer. The computer and DSP do digital spectral analysis and look at the signals all around, then decide what number (frequency) to stuff into the D/A, and consequently what the oscillator frequency should be. This can be made arbitrarily smart, although more often than not it is still pretty dumb. On some of the \$\$\$ receivers, this "digital detector" is pretty good, like the high-end R&S offerings these days. Not for the casual listener, of course. If you have enough DSP horsepower, you do it all digitally with no hardware PLL at all. Being a DSP-head, this is my preferred implementation, but it takes a lot of careful DSP programming to make it work well.

Date: Sat, 02 Jan 2010 21:55:34 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

>.....designing a PLL synchronous detector.....

Those are the right questions to start with. The first thing one has to do is hard limit the signal to make sure one has every scrap of carrier available. Then, one needs to use a number of techniques to ameliorate the various kinds of disturbances encountered in radio reception.

As you recognize, the primary loop time constant should be large to handle slow fades, but this limits the speed and can limit the range of acquisition when the loop is unlocked. Using higher-order loop filters can help to reconcile these divergent requirements, and a reasonable synchronous detector can be made this way if one is very careful with the loop design. But IMO, a good synch detector for a communications radio requires a loop envelope larger than what can be achieved by this means alone. I have used three additional techniques to make detectors that have good acquisition range (± 1 kHz is about right, IME), reach lock quickly, and hold lock during long fades: dynamically variable loop gain; dynamically variable loop bandwidth and order; and oscillator clamping. How one deploys these techniques depends on the ergonomics one wants to achieve.

One ergonomic approach is to design a slow, first-order loop with a limited capture range. If not well designed, such a system may require manual guidance to achieve lock. In any case, such systems are difficult to tune accurately. As I have said before, I believe each of these characteristics is intolerable in a synchronous detector. Another ergonomic approach, exemplified by the Drake R8B, is to disable the synchronous detector and speed up the PLL loop filter during tuning -- this avoids hearing carrier heterodynes while tuning, and allows a larger capture range and faster acquisition while not sacrificing tenacity of lock. Personally, I prefer hearing carrier heterodynes while tuning -- thus, for my own use, I prefer to clamp the BFO to its nominal (center) frequency during tuning, and leave the product detector operating. When tuning stops and the clamp is released, the fastest loop parameters are engaged. As lock is approached, slower loop coefficients are selected. As with the R8B scheme, this is easier if the detector is in the same box with the main VFO and a "tuning in progress" flag is available, but there are any number of parameters one can detect and use to manage the switching of loop bandwidth/order, gain, and clamping without having such a signal. Clamping (not to center, but to the last locked frequency) is also very helpful in dealing with long fades when the carrier goes to zero and stays there.

Here is a pretty decent introduction to PLL design (best free tutorial I know of), which discusses some of these techniques:

<http://www.national.com/appinfo/wireless/files/deansbook4.pdf>

Date: Sun, 03 Jan 2010 20:11:00 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

>.....(regarding synchronous detection): (2) The classy way to do it is put a computer and DSP in the loop where the oscillator

It's an intriguing notion, and I'd love to see a good DSP implementation. I have no doubt that Andy knows lots more about DSP than I do. Even with substantial DSP horsepower, I've never gotten decent results trying to implement synchronous detection in DSP, nor have I seen a decent commercial DSP implementation (though I have not seen an R&S DSP receiver).

Date: Sun, 3 Jan 2010 19:45:49 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I think Ten-Tec uses a DSP implementation in the RX-340 and 350. Les can report on both as he has owned each and still has one. Last I heard it was good but still not up to the Drake R8B level..unless I misunderstood...which happens more frequently these days.

Date: Sun, 3 Jan 2010 20:03:10 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Actually, the RX-350 sync detector is superior to the RX-340. Having had both side by side for a couple of months, I sold the RX-340. The 350 has good audio, better sync, better noise reduction, better notch filter. Too bad they decided not to keep selling them. The R8B sounded more mellow, but I prefer the 350 1 hz readout and the remote keypad tuning knob set-up.

Most people that own or owned the RX-350 don't understand the filter scheme or how to properly implement the synchronous detector. It also sounds better than my NRD-545 and the DSP noise reduction is waaaaay better than the 545 which is not very good in that regard.

Date: Sun, 03 Jan 2010 22:36:33 -0500
From: 2002tii <bmw2002tii@nerdshack.com>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I have an RX340, and the synchronous detector is -- IMO -- all but useless. The WJ-8711 implementation is a tiny bit better, but also -- IMO -- useless.

I have heard from other sources what Les reported -- that SAM in the RX350 is better than the 340 -- but have not had the chance to play with one. (I see that not everyone thinks the 350 SAM is great -- some of the eHam.net reviewers give it low marks, for example.)

With the 340, besides losing lock all the time, accompanied by distracting clicks, a number of the other features don't work with SAM on -- no notch filter or PBT, and the BW choices are limited to ≥ 4000 Hz. So, even if it held lock properly, it would still be pretty useless because the very signals where you really need SAM are the most likely to require the other tools, too. I assume the DSP just lacks the horsepower to run all the routines simultaneously, but I don't know for sure.

The blurb at the Ten-Tec website indicates that the RX350 lets you use PBT, notch filter, and narrow BWs, and allows you to select sidebands, with SAM on. I don't know if you can also use SAM to hear both sidebands (DSB), as you can on the 340 and R8B. (This feature can be useful to reduce atmospheric noise if neither sideband has interference.)

Date: Mon, 4 Jan 2010 07:39:46 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Yes, you can use DSB on the RX-350. Some users on eHam and the RX-350 Yahoo group gave it low marks, then changed their tune after figuring out the not so good filter implementation. In AM modes, the displayed filter values were doubled, which widened the passband and made the sync detector lose lock.

An example, instead of say a 5.4 khz filter (which is actually 10.8) one can use say the 2.7 khz filter (actually 5.4 khz) and use the am upper or am lower sync detector, dial in about + or - 1350 hz (that is how the PBT is displayed) and the sync detector is wonderful. If a station is totally in the clear, use DSB and the 8.0 khz (actually 16.0 khz) for really sparkling audio.

As with any receiver, there will be those who like it and those who don't. I guess that's probably the reason for owning more than one. Although these days, my collection is the thinnest in recent memory.

I'm retired and with the sunspot cycle, I haven't listened much of late. The weather is supposed to be in the low 20's tonight, maybe I'll fire up the SP-600 and HQ-180A to keep the shack a bit warmer.

Date: Tue, 5 Jan 2010 09:08:09 -0500
From: Steve Byan <stevebyan@verizon.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

I've been wanting to try a DSP Costas loop synchronous detector when I get a around to it. The analog one in the Sony 2010 works very well.

Date: Tue, 5 Jan 2010 10:28:02 -0500
From: "James A. \ (Andy\) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Best approach for SSB mod on R-390A

Indeed - doing it well will be quite difficult. I'm not surprised that there are very few commercial implementations, and those that exist are probably reserved for military or clandestine uses.

That's where the high-end R&S and DRS receivers play, of course. I haven't tried to implement this specific case (synchronous detection for radio), but I have done similar things about synchronous extraction of signals from noise, and I can confirm that it is not simple and very hard to make it work well. There are doctoral dissertations written on these things

Date: Sun, 31 Jan 2010 10:16:35 -0500
From: "Jerry Stern" <jsternmd@att.net>
Subject: [R-390] New (to me) R-390A Can't Tune SSB

Just got a very nice R-390A and the receiver appears very sensitive but I cannot tune in SSB signals. Weak or strong stations are just garbled as if the radio is on the wrong sideband. I have checked for any loosely seated tubes and the usual tapping around to see if I can find any microphonics or signs but to no avail. The BFO does seem to be functional, at least to my ear, but I guess the problems would still be likely in this stage? I will start changing tubes but would appreciate any other diagnostic advice. I wouldn't bother the list for this question but I cannot find any way to search through the R390 archives.

Date: Sun, 31 Jan 2010 11:21:37 -0500
From: Jim <jbrannig@optonline.net>
Subject: Re: [R-390] New (to me) R-390A Can't Tune SSB

Can you tune in CW signals or use the BFO to beat against the CAL signal?
If yes: Set BANDWIDTH to 8 (for starters)
Reduce the RF GAIN until the CARRIER LEVEL stops bouncing
Set the BFO for + or - 1 or so....
Tune carefully and adjust the above as necessary.

Date: Mon, 1 Feb 2010 16:39:24 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] New (to me) R-390A Can't Tune SSB

Try reducing the RF gain.

Date: Sat, 17 Apr 2010 18:21:35 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: [R-390] tube based product detector.

Do we have a nice tube based product detector mod for the 390A documented somewhere. Anyone have experience with one...as in having built one into their rebuild. I am considering this approach on one of mine when I go through it. Thought maybe something on the audio deck. Can't imagine one not working well with these rigs...

Date: Sat, 17 Apr 2010 21:31:37 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Product Detector

I ran across this tube based product detector that is for the SP-600. It may be adaptable to the R-390A. There were other associated changes that need to happen around it as well...

<http://www.hammarlund.info/SP600mods.htm>

Date: Sun, 18 Apr 2010 08:22:06 -0400
From: "Judi Doran" <cooner@embarqmail.com>
Subject: Re: [R-390] Product Detector

You can also check on the plug in product detector manufactured by Universal Service for the 75A2. it is a two tube unit, I have one and schematic. It sure looks like it could be easily converted to sync det by feeding the osc some carrier. schematic is online. Bernie W8RPW

Date: Sun, 18 Apr 2010 08:56:01 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: [R-390] R-390A Product Detector Schematic available

I have a schematic available in pdf format of the R-390A product detector using a 6U8A and two crystals that is commonly referred to as the EAC product detector modification. This mounts on the audio chassis. Send me an e-mail off list and I'll be glad to send it to you.

Les Locklear Gulfport, Ms. Dx'ing since '57

Date: Sun, 18 Apr 2010 12:23:25 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] R-390A Product Detector Schematic available

Was that the detector design based upon the W1KLLK "Updating the SP-600" article from August 1970 QST? I have another schematic that would have required about seven different interconnects to the SP-600 to add a product detector and SSB to the SP-600. That was something I was working on when I compared the differences between the SP-600 variants and was looking at making a plug in module to add functionality. It has a 12AU7 as a product detector and a 12AT7 as a carrier oscillator.

Date: Sun, 18 Apr 2010 15:58:10 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] The R-390A EAC Product Detector Schematic

Send it to me. I'll stick it up on my site and tell folks how to get it. I've got about 250MB of space there, minus a tad for email and a couple of other files.

Date: Sun, 18 Apr 2010 16:35:45 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] EAC R-390a/URR Product Detector File

The subject file is located at:
<http://home.comcast.net/~rbethman/EACProd_Det.pdf>
It shows as a 10.4MB file.

Have a ball!

Date: Sun, 18 Apr 2010 15:36:30 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] tube based product detector.

Thanks to all who sent the product detector stuff...good stuff.
I'll report any progress once a direction is chosen.
Thanks again..

Date: Sun, 18 Apr 2010 16:42:42 -0400
From: Al Parker <anchor@ec.rr.com>
Subject: Re: [R-390] EAC R-390a/URR Product Detector File

Les sent me that file this AM, I printed it out, didn't realize it's 10mb+. I wondered if Bob got more than the one page, but see he didn't. There's no good reason it has to be so big, it should be able to be "distilled" by Acrobat, after it's properly cropped. I tried to crop it this AM, but am fussing with a new computer that doesn't have the useful amenities reloaded yet. I'll give it a try later tonite.

Date: Sun, 18 Apr 2010 15:47:42 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Dropbox for data storage relating to the R-390A

I have created a dropbox that is shared out that contains all of the files I have on the R-390A. Whenever someone posts something up for the group if you want to send it to me I will add it to the dropbox. I invited some folks who have been posting today. If you want an invite into the dropbox files please send me a personal email and I will make sure you have access.

Date: Sun, 18 Apr 2010 20:41:14 +0000
From: Dropbox <no-reply@dropbox.com>
Subject: [R-390] Tisha Hayes wants to share "Radio Shared" with you

Tisha wants to share some files with you using a new technology called Dropbox.

Message from Tisha:

"Here is a storage site for all of the R-390A documentation I have. The R-390A directory also contains the document from Les Locklear. If you have things that can be incorporated into this directory structure let me know. I will keep this dropbox active as a data repository if it is of value... Tisha Hayes, AA4HA"

View the "Radio Shared" folder that Tisha shared at
<https://www.dropbox.com/link/17.tgp8G7NfGP?k=4798be6a7f825183baee1aaedc26299f> Enjoy! - The Dropbox Team

Date: Sun, 18 Apr 2010 16:51:21 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] The R-390A EAC Product Detector Schematic

I've got a lot more than 250 MB available: and will be happy to carry the load so Bob doesn't have to shoulder it all. See <<http://mikea.ath.cx/indexa.html>>

Date: Sun, 18 Apr 2010 16:55:33 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] The R-390A EAC Product Detector Schematic

Thanks to all of you who have graciously put the EAC R-390A/URR Product Detector on their websites for all to see. That's why this is still the best group out there!

Date: Sun, 18 Apr 2010 17:15:48 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] R-390A Product Detector, SSB, new diagram

There is a cleaned up version of the product detector file called: *SSB converter EAC.bmp* in the R-390A dropbox. Thanks to Dennis, WA6ACC for providing it.

Date: Sun, 18 Apr 2010 18:19:28 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: [R-390] Another website with the EAC R-390A/URR Product

Thanks to Al Tirevold, he has posted the pdf on his website.
<http://www.r-390a.net/EAC-product-detector.pdf>

Date: Sun, 18 Apr 2010 20:18:03 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] tube based product detector.

I'm hesitant to say anything due to my lack of expertise with this... Believe there have been several things in Electric Radio and Hollow State News, but will have to look them up. Some people take the position of keeping the R-390A "pure" and build an outboard product detector or sync detector that hooks to the IF output and either has its own audio output or feeds back into the receiver's audio stages. Besides the product detector you need to tackle the AGC problem. There are a number of mods that involve using diodes in the AGC circuits to get fast-attack, slow-release action. It's harder to put a product detector into an R-390A than it is with some less-modular receivers, because you have the limited number of connector pins on the IF module. Typically the product detector mod requires putting in a relay to switch the audio between product and diode detectors, operating the relay from the BFO power. You can learn a lot by googling for Dallas Lankford, and in particular www.kongsfjord.no and click on "The Dallas Files" Once you get the AGC modified you can do pretty well without a product detector by increasing the BFO injection. The reason a diode detector doesn't work well with SSB signals is that the BFO level is insufficient.

Date: Mon, 19 Apr 2010 11:37:05 +1000
From: "Pete Williiams" <jupete@internode.on.net>
Subject: [R-390] SSB ADAPTOR

G'day all... thanks for the schematic Les. Now I don't suppose anyone's going to be brave, or foolish enough to volunteer to get a rush of bulk orders organized for the 2 xtals . Don't ask me ... our lot don't do any thing below 1 MHz in OZ. !

Date: Mon, 19 Apr 2010 18:55:41 -0500
From: Richard <theprof@texoma.net>
Subject: Re: [R-390] SSB ADAPTOR

International Crystal sells stock 455.00KHz, 453.65KHz, and 456.35KHz crystals for ham experimentors. I requested a price but haven't heard back yet but I have bought from these guys previously and they were reasonable at the time.
<http://www.icmfg.com/hamradio-stockcarrier.html>

Date: Tue, 20 Apr 2010 10:38:52 +1000
From: "Pete Williiams" <jupete@internode.on.net>
Subject: Re: [R-390] SSB ADAPTOR XTAL PRICES

G'day all---- got through to Irad ... 2 xtals on way at \$17.50 each plus shipping. The maidens prayer been answered..

Date: Mon, 26 Apr 2010 18:47:24 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: [R-390] Using additional RX for if R-390x ssb conversion

I picked up a broken FRG-7700 the other day on ebay. The florescent display tube was indeed cracked and I doubt I can find a replacement sans another bad FRG-7700. The only other problem was a defective CMOS to TTL converter chip. Without beating a dead horse, my thoughts are to tune the receiver to 455KHz and use the radio as a ssb converter appliance Any comments? ... tom, N3LLL

Date: Wed, 28 Apr 2010 08:05:06 -0400
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] Using additional RX for if R-390x ssb conversion

Tom, I've done this with my 746pro and also with a WinRadio Rx. You get all modes plus whatever audio the 2nd Rx has. With the WinRadio you even get to use the panadapter to help tune the RF and IF.

Date: Thu, 20 May 2010 12:43:44 -0400
From: wa4aos@aol.com
Subject: [R-390] 390A AGC

I am working with different AGC mods, 5 so far, that I have found on the web and in ER. The Lankford mod looked most promising initially but I had problems with it

bowing diodes but fairly decent AGC when working. Recently I found, with the help of Ray at ER, the W0BY mod listed in issue 208 of ER and it looked very promising as well, however, it still pops on loud signals going quiet. A good example are the morons who tune across the bands with full power, especially annoying if you are coping CW with headphones. I have noticed it on strong SSB signals as well. The article in ER seems to indicate this should not be a problem but yet it is and on 3 different modules wired correctly; perhaps there is something external to the mod that is affecting this AGC mod. I am working with late run EAC modules presently and was wondering if others had had success with an AGC mod that REALLY worked well. I will say that the W0BY mod does work much better than stock 390A AGC.

The Lankford mod as listed on the web is kind of tricky to follow as listed from his hand drawings but I have made many notes and easy to follow schematics. If I get the diode problem resolved, I will release my notes to the group if anyone wants them. I tried to contact Dr Lankford but he is not available and I can only ASSUME he would not mind if I offer help to clarify his notes as well as my own experiences and documentation.

I found the article in ER to be very well written and easy to follow but again that author was not available for questions or comments. Maybe they found something more worthwhile to do with their time instead of playing with 90 pound radios; bass fishing comes to mind. Hi.

I may try increasing the PIV of the diodes that were in the Lankford mod but to date I have had 4) IF modules blow diodes from that mod after some use. Perhaps implementing SSB compatible AGC with the 390A is not necessary but the receiver has so much going for it that I want to go a step further. I know I am preaching to the choir. Hi Any thoughts would be appreciated. Regards, Glenn WA4AOS

Date: Fri, 21 May 2010 20:07:41 EDT
From: SHELLY199@aol.com
Subject: Re: [R-390] R-390 Digest, Vol 73, Issue 24

I, too, have used the Lankford mod with the two diodes in many IF modules and find that the 914 diodes break down. I've been using 1N5060 diodes and find a remarkable AGC in a properly operating IF module. Try it you'll like it! Rich
WD2Q

Date: Sat, 11 Sep 2010 16:02:39 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Free Shipping

That is a Delta Research SSB Converter, LSB, USB and ISB. NSA, etc. used them years ago. Chuck Rippel had one a few years back said it wasn't any better or worse than the MSR-4's (CV-591A's) Delta Research also sold multicouplers to the same people back in the days of damn it all defense spending....

Date: Sat, 11 Sep 2010 16:14:28 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Free Shipping

More on the Delta Electronics ssb converter, it is an ISB-1.....
Look here somewhere on Rippel's website there is a better pic of it.
http://www.r390a.com/html/r390a_factory_ssb.html
Kinda tough to get those sensitivity figures at 140 dbm. YMMV

Date: Sat, 11 Sep 2010 16:10:35 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: [R-390] SSB adapter Manufacturer

Item number 300465986317
I meant to say it was manufactured by Delta Electronics rather than Delkta Research

Date: Thu, 23 Dec 2010 20:36:14 -0800 (PST)
From: Gary Weddle <w1ghw@yahoo.com>
Subject: [R-390] Mod discrepancy

I am working on an Amelco R390A receiver that has had the Capt. Lee Product Detector Mod installed. When I got it, it worked for a while and then just quit. I checked the as-built against the circuit published in the 2009 Y2K 21 Century Reference Manual (so many names) and found the circuit to be identical in all but one area: The capacitive network outboard of the Z502 BFO Pitch unit is different. The original circuit diagram calls for a series 100 pf cap, C526, between pin 1 of the Z502 and pin 1 of the 6BA6W shunted to ground with a 5 pF cap, C527. (Pin 1 of the tube also has a 150k resistor to ground.) The Y2K mod schematic calls for the same configuration but the cap size(s) are 0.033 uF. (Only one cap is labeled so the intention is not clear.) Does anyone know about this change? Has anyone had difficulty with this circuit? I have no voltage chart for the 6BE6W replacement tube (after socket re-wiring) and the 455 kHz peak voltage is around 20 mV when the BFO is engaged. Is this correct?

Date: Thu, 17 Mar 2011 07:21:31 -0700 (PDT)
From: Bill Wilson <we509w@yahoo.com>
Subject: [R-390] SSB mod

Currently I'm restoring a Collins R-390A that a friend of mine salvaged from the landfill. The AGC circuit has the SSB mod that works great for SSB with no distortion or complaints. The issue I am having is that on regular AM listening the volume is very low and sometimes the audio on some stations is only heard by turning up the local gain fully clockwise. This particular mod was done by removing R545 (100K) and removing R546 (180K). Instead of R546 a diode was installed going to pins 1 & 2 of V509A (AGC rectifier). R547 (220K) was reduced to 10K. Spot checking some resistances indicated a 1 meg+ resistance on pin 2 of V504 which should be about 280K with the AGC in the "on" position.

Any hints on getting the AM audio (AGC on) back up a few notches short of scrapping the entire SSB mod would be welcome. Thanks in advance,

Date: Thu, 17 Mar 2011 13:53:53 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] SSB mod

Have you set the IF gain as per spec on AM?

Date: Fri, 12 Aug 2011 18:53:20 -0400 (EDT)
From: frankshughes@aim.com
Subject: [R-390] Suggestions for SSB adapter for R-392?

I have recently added an R-392 to keep the R-390 and R-390A company. Looking for suggestions for a small, DC powered SSB adapter that I can use with the 455 IF out?

Date: Sat, 13 Aug 2011 11:58:49 -0400
From: "KR4HV" <kr4hv@numail.org>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

I have often wondered why somebody hasn't designed a very good solid state/transistor SSB/CW board(s) for the 455kc and 500kc ifs. Could sell the board with or without components. It would have buffer amps & crystal carrier oscillators for SSB & CW and maybe 2-3 positions for the Collins torsion type filters (Rockwell Collins sells them for around \$100 each in qty 1 and they have bws of 2.5 and 5kc plus bws available. I have these 2 for one of my RA6790s) and a audio amp, maybe one of the 5w chip amps. Board could have jumpers if the filters were not used. Maybe a MC1496 or equivalent product detector. Designer could sell the boards. lots of radios could use them. Guess I will dream some more.....

Date: Sat, 13 Aug 2011 12:56:15 -0400 (EDT)
From: frankshughes@aim.com
Subject: [R-390] ssb adapter kit

I also had hopes for some kind of kit. Jan Skirrow once did provide just that. <http://skirrow.org/Boatanchors/TechTalk10.pdf>

Some years ago I was able to obtain the parts and instructions from Jan, but there were no more circuit boards available, and not enough demand for him to have another run produced. Jan gave me a photo copy of the trace layout, but I have no idea how to get that turned into a double side-plated through hole PCB.

Date: Sat, 13 Aug 2011 14:02:36 -0400
From: "KR4HV" <kr4hv@numail.org>
Subject: Re: [R-390] ssb adapter kit

Thanks Frank. Too bad it's not available any more.

Date: Sat, 13 Aug 2011 13:11:58 -0500
From: "Don Cunningham" <donc@martineer.net>
Subject: Re: [R-390] ssb adapter kit

Along these lines, does anyone have any experience with the PD-2 adapter sold by Electronic Specialty Products?? Price looks decent, and the unit looks like the one by Jan (don't have schematics to compare, so not sure). I have no connection with this group, but sure like the price line of this offering.

Date: Sun, 14 Aug 2011 08:07:04 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] SSB adapter kit

Frank wrote:no idea how to get that turned into a double side-plated through hole PCB.....

OK, check out EAGLE sold by Cadsoft. It is a graphical layout editor that can be used to help convert a schematic into a PC board layout, so that any low volume board maker can employ to make you a custom board. It has a steep learning curve for us casual users, but not impossible. My son designs controller boards for solar, and has used it extensively (shameless plug); and I am impressed with the results.

Of course, with my limited background, I just haywire stuff onto ready-made \$3 DIP boards from Fry's...

Date: Sun, 14 Aug 2011 11:08:12 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

I guess if I was in the market for a new adapter I would consider the Sherwood Engineering SE-3 MK IV. A great many of the neat features are built into the box. <http://www.sherweng.com/indepth.html#features>
Right now I have a TMC CV-591A that probably generates more heat than an R-390. I keep it because it can work on either R-390A or the SP-600. For the other receivers, most have USB/LSB/ISB capabilities but they "are not" classical boat anchors, just premium receivers.

If you were to go out and buy a restored CV-591A you could spend as much as the price of a new SE-3. If you are trying to keep your setup as "period authentic" then the CV-591A is probably one of the better ways to go.

I do not have too much faith on the inboard SSB mods to the R-39x series. Most are real compromise circuits. A few years ago I built an add-on box for the SP-600 that put the circuitry from a JX-21A into a JX-17. It was more effort than it was really worth. I traded that radio for a Cubic R-3030 and stuck with the unmodified, stock JX-17.

Date: Sun, 14 Aug 2011 11:14:30 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] SSB Adapter Kit, Making your own boards

If you did not have to worry about plated through holes you could use a standard photo resist etch on a double sided board. It just means that after you drill component leads you will need to apply solder to both sides of the board to make the component lead into a "via". You may have to add "via's" if there are spots on the board where they are called for (through holes, component leads, double sided soldering and clip flush).

I have gone the commercial PCB app before and had to satisfy the minimum purchase quantities. At least when I did it, I ended up making six circuit boards when I only needed one and the total cost came to around \$200 (3 full boards, cut in half to make six discrete boards).

Photo resist will be much easier, cheaper and faster. You will just need to contend with the vias

Date: Sun, 14 Aug 2011 11:31:06 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: Re: [R-390] R-390 Digest, Vol 88, Issue 12

If there is a University or vo-tech near-by, Get to know someone that works in one of the electronics labs. They can make small quantities for you quite reasonably. I have a friend that works at the UW-Madison. I supply the art and photosensitive PC board, and he does the rest.

Date: Sun, 14 Aug 2011 09:44:09 -0700 (PDT)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

Since my first "real" receiver as a novice (back in 1962 - uh,oh, I'm dating myself here)?was an HQ129x, I learned to tune in USB/LSB with the manual RF gain control and the BFO.? The R390A?works the same - no problem.? However an outboard adapter does make it easier (I?use an Icom R70 connected to the IF out jack that's tuned to the IF freq.?).??

Date: Sun, 14 Aug 2011 13:29:40 -0400 (EDT)
From: frankshughes@aim.com
Subject: [R-390] SSB adapter, continued

Hi from Florida. We used to be in the South..not sure what happened..... Anyway, I have also had good luck using the BFO and gain control for SSB on the 390A and 390. But I put a Sherwood on the 390 and a TMC CV-591A on the 390A just because I need more knobs, switches, buttons, gauges, dials, indicators,

And I did try the BFO /gain control method on the R-392, but can't get a legible copy. (the R-392 needs alignment, I have not taken it apart yet to see whatever else is lurking within.) http://i180.photobucket.com/albums/x257/fish1_07/collins_r392.jpg

I'll probably end up w/ another Sherwood for use w/ the R-392 if the DIY PCB option does not work out.

Date: Sun, 14 Aug 2011 12:33:38 -0500
From: "Ron.K3PID" <ron.k3pid@sbcglobal.net>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

I agree Bob, I use my 390 for all modes without a problem. I think there might be something more convenient about an adaptor...

Date: Mon, 15 Aug 2011 19:45:34 -0400 (EDT)
From: bonddaleena@aol.com
Subject: [R-390] SSB adapter

Hi. I have a CV-591A on my '67 R-390A. It sounds great but still needs an audio amp.

I just wanted to say that before I purchased the 591As, I had an SSB adapter by the chap here in Florida, ESP Electronics. It works excellent and is very well made and small. I have the PD-1. He is now selling the PD-2.

I was fortunate, because I was able to purchase the 2 different sets of IF crystals. I moved the PD-1 to my 51J-3. It has a 500 KHz IF, where the 390A is 455 KHz. I was also fortunate that I was able to purchase the front artwork that states "51J Receiver". It also works excellent on the 51J-3.

The 'only' small issue is that I have the IF gain in the 51J set a wee bit too high and the audio is slightly distorted at max RF Gain. The 51J has never failed to amaze me with it's excellent performance. Super sensitive receiver. These 'problems' are easily addressed in both the receiver and the PD-1, I just have too many higher priority issues.

(especially since my 220 VAC drop took a direct hit one week ago today. Ah Florida, the 'Sunshine State', and also 100 miles from the "lightning capitol of the USA".....)

Date: Mon, 15 Aug 2011 19:15:16 -0500
From: Richard <theprof@texoma.net>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

I use an HP 312A selective level voltmeter as a SSB adapter. At around 60 pounds it is a boatanchor in its own right plus it has a Nixie tube display. I also have a down-converter to drop the 455KC IF to audio and feed it into my PC sound card to use software decoding. It handles SSB, AM, and DRM.

Date: Mon, 15 Aug 2011 21:19:08 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] SSB adapter

I work in engineering for a TV station.
We use a number of Wohler audio amplifiers for monitoring.
These are typically 1 RU in height and require 24 V either AC or DC to operate.
The inputs can be XLR/RCA/Phoenix.
These amplifiers are high fidelity and magnetically shielded.
There are a number of these on EBay now in the \$100.00 range.
There is at least one group of 2 for \$100.00.
The amplifiers that we use are AMP-1A and their variants.
I personally own a 12 channel AMP-1A that I bought on EBay.
These amplifiers can be loud.
The only controls are volume, balance and channel if multi channel.
These, for me, make a good amplifier for our line level boat anchors
as the input is line level.
If you do buy one, make sure that the one that you get is for analog audio.
Wohler makes analog, AES and SDI audio amplifiers.

Date: Tue, 16 Aug 2011 10:44:31 +0200
From: federico@dottorbaldi.it
Subject: Re: [R-390] SSB adapter

In my personal opinion and experience the CV-1982 is a good SSB adapter born to work with R-390A/URR, furthermore a quite good solution is also a diode bridge across DIODE LOAD in the rear of R-390/R-390A as stated by Paolo Viappiani in its book about these fine receivers.

Date: Tue, 16 Aug 2011 07:23:11 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] SSB adapter

I think that audio quality on almost every piece of repurposed military gear is going to be deficient when it comes to leisurely listening. Either it ends up being the limitations of the components stuck in the audio amplifier chain or a bandwidth/ linearity issue in the IF.

We have a little of both.

In each of my receivers someone had been at them with a magic screwdriver before me and took the stagger tuned IF and dialed them all down to 455.0 KHz. It made for real good IF selectivity (a bit too good) as the audio recovery chopped off the high frequency response. Then there is the typical "old cap" issue and while you are in there, making a few value changes to open up the low and high frequency response.

Many folks are mystified by the 600 ohm audio output as well.

I have not screwed around with the Cv-591A audio circuit. Then again, SSB is not something I want blasting through the house either.

I have ceased to use the R-390A as my amateur radio receiver and it is used more for weak signal utility monitoring and SWL listening. Much of the utility monitoring is USB (maritime, aviation, military, etc..).

For fun, BCB I still use the SP-600, I guess the only way to beat that audio quality would be to get another Telefunken console radio.

Since this thread has started I have been mentally reviewing my use of the Li family CV-591A and wondering if there may be a better way to go. (A.K.A. Sherwood SE-3) as it would add synchronous detection for BCB/ AM. I like PLL circuits ever since I built a SCA decoder back in high school.

Date: Tue, 16 Aug 2011 13:15:10 -0400
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

I've heard nothing but good about the Sherwood units but have never had the experience of one. One thing I have done, that I've seen mentioned here, is use an SDR to tune the IF out of the 390A. In my case it's a Winradio 303i, but I imagine it will work with any SDR capable of tuning to a radio's IF, as long as you can get the IF out of the receiver. Then I can use the demodulation of the SDR for whatever mode I want. I can even disable the winradio demodulator using a command line switch, leaving me with just tuning control of the winradio. I can then start up power SDR from flex or any other program that will work with I/Q inputs. Winrad is another one. These have a few more features than the winradio software, like noise reduction and such.

Kinda kills the whole vintage thing, but it does a good job with just about any signal, and gives me a panadapter to boot.

Date: Tue, 16 Aug 2011 15:02:08 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

I don't know if this has been mentioned in this thread but you can take the IF output into a sideband RX that will tune down to the IF frequency. It works well.

Date: Tue, 16 Aug 2011 16:42:14 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] The SE-3

Sherwood makes a front panel for it that is 19" rack mountable.

Date: Sat, 20 Aug 2011 13:27:57 -0500
From: Grant Youngman <nq5t@tx.rr.com>
Subject: Re: [R-390] Suggestions for SSB adapter for R-392?

The cv-591 is, in my opinion, about the worst of the lot. I got rid of it. Sure, it looks the part, but just doesn't make the grade.

CE slicers are great performers. The Sherwood is exceptional, but absurdly priced as an SSB adapter only (even though I wouldn't part with mine for other reasons).

The HC-10 is ok, and if you can find one that doesn't require a second mortgage (good freaking luck!!), the SPC-10, which is a rackmount MIL version. The HC-10 local oscillator tends to "pull" a bit on strong signals because of how AGC is applied to the mixer/osc stage. SPC-10 may have the same problem, but I wouldn't know for sure since I haven't owned one.

For a 455 IF, it's worth looking at the PD-2 from espelectronics.com. The original PD-1 got good marks. Don't own one, but the price is right. It's crystal controlled, so you can't shift it to the edge of the passband.

Date: Wed, 7 Sep 2011 10:05:12 -0700 (PDT)
From: Steve Quinn <squinn12345@yahoo.com>
Subject: [R-390] R390A SSB adaptor PD2

I tried this product the PD2 SINGLE SIDEBAND SSB ADAPTER R390 & R388/51J RECEIVERS and it works just fine..... at \$80 not a bad price....it is on ebay all the time... I like it so FYI to all on this mailing list

Sure I can still bring in SSB by riding the BFO after I hear the "Donald Duck" voice but this makes SSB just fine for me oh yes remember to turn off the BFO when the PD2 is on straight connection out the back of my R390A, simple and easy

Date: Wed, 7 Sep 2011 12:11:52 -0500
From: "Don Cunningham" <donc@martineer.net>
Subject: Re: [R-390] R390A SSB adaptor PD2

Thanks for that report. I am considering one of those and wanted to know if anyone had tried it. They also have a website if you dislike "the bay" at www.espelectronics.com. Other interesting devices there too. No connection, just found it in ER magazine and looked them up.

Date: Wed, 7 Sep 2011 15:18:38 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R390A SSB adaptor PD2

I used to have a PD-1. It worked fine as well.
