HOLLOW STATE NEWSLETTER

"For lovers of vacuum tube radios"

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HSN is produced and published by and for the community of those who appreciate the fine accomplishments of the manufacturers of 'top of the line' vacuum tube communication radios and auxiliary equipment. Originally created by a group of R-390 users, **HSN** has expanded to include industrial, military, and consumer grade receivers by Collins, Hammarlund, National, Hallicrafters and others. **HSN** includes tips, modifications, alignment and restoration advice, product reviews, parts, tubes and service sources, and subscriber buy/sell information - all provided by subscribers and friends of **HSN**. See page 8 for submissions, disclaimers, reprinting, copyrights, subscriptions, reprints, and the Editor's and Publisher's Corner.

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SUBSCRIBER SURVEY ENCLOSED

We have included in this issue (see back of mailer sheet) a subscriber's survey that we would like you to complete and return. A most important item in the survey relates to contributor permission to allow others than HSN to reprint your submittals. We have received requests from others to reprint back issues of HSN, for permission to allow back issues to be duplicated and distributed on CD's, and to permit back issues to be posted on other's Web pages. As most of you may know, HSN's original and continuing policy is to only allow reprinting (the format doesn't matter) with the permission of the author. We don't see it as our job to try and contact each contributor over the last 16 years to ask them if reprinting is OK. In many cases, particularly in the older issues, we don't have a current address. Perhaps most of you don't care, but the survey (hopefully) will allow each of you (assuming you are still subscribing) to let us know your wishes. HSN is not in the business of making a profit and is not particularly interested in having others make a profit from HSN material. We would, however, consider allowing at least some of the materials to be put on a bona-fide hollow state enthusiast's Web page. Please let us know how you feel – complete and return the survey to the Editor (you can use e-mail by just keying your responses to the question number). And please feel free to write or e-mail us anytime about the operation and management of HSN.

R-390A CARRIER AND LINE LEVEL METER ALTERNATES

Jan Skirrow, VE7DJX
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As most everyone knows by now, the original R-390A meters contain a small amount of radioactive material. So long as the meter seal is sound, this poses little or no risk. However, radios released to the surplus market recently have had the meters removed for safety reasons. Thus, one of the first tasks confronting a restorer is to locate suitable substitutes.

Used, but often battered, original meters can be found, and new replicas are available at a price. The search for a more economical substitute led me to look at other possibilities. I've been able to locate suitable surplus meters that are cosmetically much like the originals. Unfortunately, they often have different electrical characteristics and sometimes different scale markings.

The original line level meter is a Vu meter that I've yet to find an exact substitute for. This meter, with its associated range switch and resistors, is connected across the line audio output. I found meters of the correct size and shape with Vu markings. These particular units have DC movements, and require an external diode to work as a Vu meter, and a shunt resistor to correct the reading.

To calibrate such a meter, connect a modulated signal to the receiver's input and terminate the line audio output with a 600 ohm resistor. Set the audio line level switch to 0. The meters I found all have a marking of some kind that corresponds to 1 mw. Adjust the line level control until the audio line level output (measured using an rms voltmeter) is 1 mw. Then select a shunt resistor for the meter to give the correct reading. For the meters I have, this is usually a few hundred ohms. You might find a substitute meter that is too insensitive to allow this to be done, but so far I haven't.

The carrier level meter is a more difficult issue. The meter is a 1 ma FS movement, and is part of a bridge circuit. The internal resistance of the meter critically affects its operation, and none of the substitutes I've found so far work properly. These meters grudgingly give a modest reading for a very strong signal! I first considered modifying the bridge circuit so that it would work correctly with the different meters I had. But I decided not to do this, as the modifications might have an undesirable effect on the AGC circuit, might not be easily reversed, and likely would be different for every meter I might find.

Instead I decided to use a small amplifier that could be adjusted to match a range of low current DC movements. I wanted it to be easily removable (if I find decent original meters at the right price I'd still rather have them) and not too obtrusive. A simple operational amplifier would do the trick, but the big problem was where to get the power. I decided that I could derive the voltages I needed from the 6.3 vac that supplies the panel lamps.

The op amp, and its associated components, are mounted on a small piece of perforated board fastened to the back of the meter using its terminals. Photo 1 shows the mounted board from the back. The dial lights receive power through R-124, the 1 watt carbon comp resistor at the left end of the front panel circuit board shown in Photo 1 (page 3). A single wire to the supply side of R-124 provides 6.3 vac. The wires that normally connect to the meter now go to pins on the upper right corner of the perf board. The circuit ground goes to the ground lug that mounts on one of the meter screws.

The circuit is very simple. I used junk box parts for my "prototype" and the schematic is shown in Figure 1 (page 3). The op amp is an LM-301A. The feedback resistor essentially sets the gain. I have used a value that works with the trimmer resistor and meters I happened to have on hand. You may have to play with these values, depending on your meter. The small compensating capacitor is needed by the LM-301A. I breadboarded this circuit with several other op amps, and it should work with almost anything you have. The power supply gives me the voltages the LM301-A needs. The electrolytics I used are 25 vdc, 47mfd, but these values aren't critical. The silicon diodes can be almost anything available.

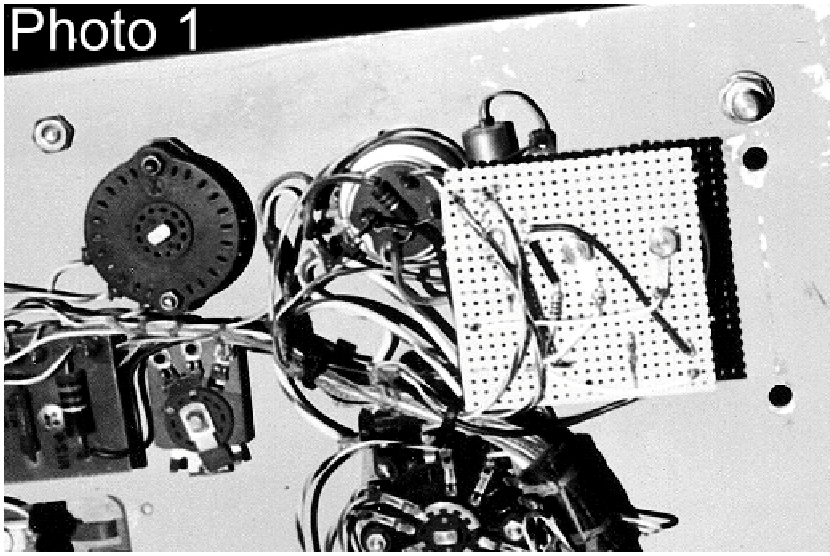


Photo 1

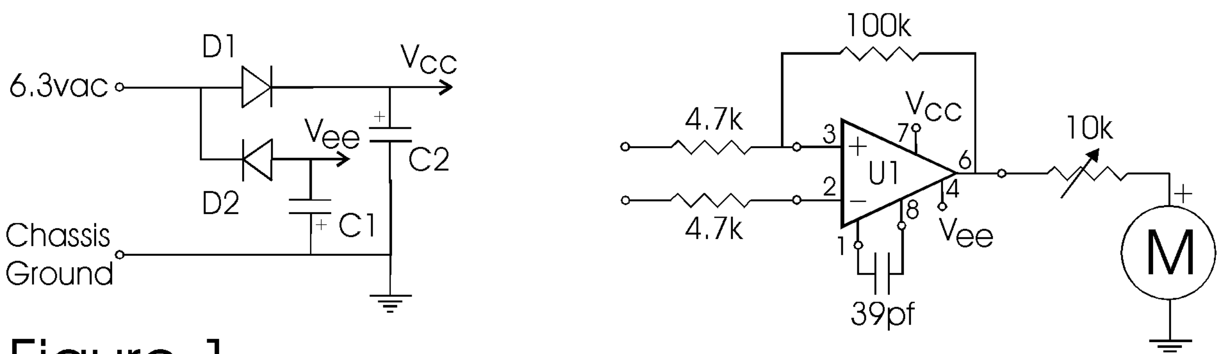
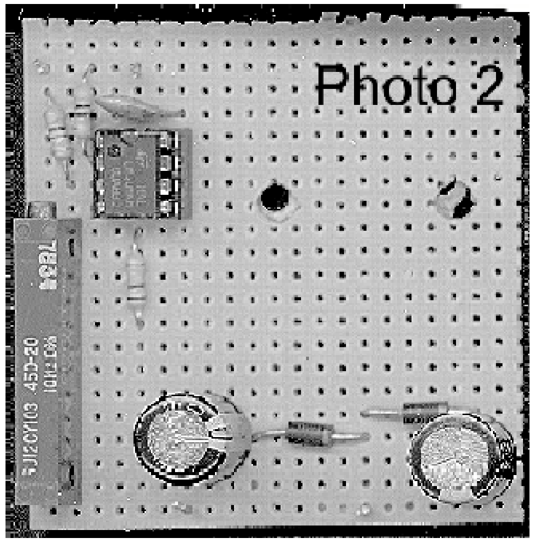


Figure 1

Photo 2 (page 4) shows the component side of the board. The layout is anything but critical, and depends mostly on what components you decide to use. The parts are mounted on the side of the board facing the panel, as there is very little clearance between the meter and the RF module. As long as you remember to leave space for the meter body and mount the trimmer where you can get at it, little can go wrong!

Setting it up is simple. Set the trimmer for mid-range, and with the receiver's RF gain control set to minimum and the AGC on, adjust the carrier meter adjust control on the I.F. chassis for a zero meter reading. Tune in a fairly strong broadcast signal, turn the RF gain control to maximum, and adjust the trimmer for a suitable meter reading - say 75% of full scale. You could calibrate the meter properly with a signal generator, but I didn't. Turn the RF control back to minimum and check that the meter is still reading zero. If it isn't, touch up the internal carrier meter adjust, and that should do it. The meter should now be lively and useful for comparing signal strengths.

Future work will look at using the same approach to drive an external large-face meter. Also, I'd like to mount the components in a small plastic box which could be hidden underneath the meter so that it would be even less obtrusive, and yet still easily reversible.



RECONSTRUCTING POWER SUPPLY CAPACITORS IN THE R-390A

by
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Scottsville, NY 14546-0152

Reconstructing defective filter capacitors C603 and C606 in the R-390A power supply can be readily accomplished by motivated hobbyists with moderate skills in do-it-yourself electronics. (I was motivated by blown B+ fuses.) I spent about 3-1/2 hours doing both sets of my old ('57 and '67) capacitors which were deteriorating, with significant leaks of B+ current to ground. The plug in arrangement was preserved.

Materials and parts required are:

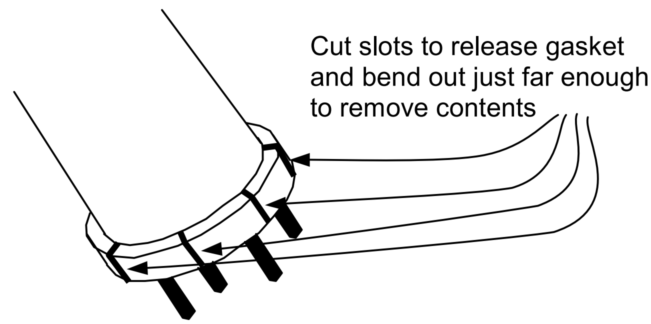
- 2 – 47 μfd 350 WVDC general purpose polarized aluminum electrolytic capacitors with radial leads (16 mm x 33 mm dimensions)
- 3 – 33 μfd capacitors (16 mm x 28 mm) and other specs as above
- Bare hookup wire 1 mm in diameter or insulated #18 solid wire
- Insulation sleeving or heat shrink tubing (small)
- Thin, strong, ribbed mailing tape and vinyl insulating tape
- Aluminum auto body repair tape or equivalent
- Small hand tools, etc.

I obtained these capacitors from Tech America; P.O.Box 1981, Fort Worth, Texas 76101-1981; phone orders: 1-800-877-0072. Service was prompt and accurate. Also, they have a large and interesting catalog. Catalog Part #s: 33 μfd 900-1759; 47 μfd 900-1760.

Procedure:

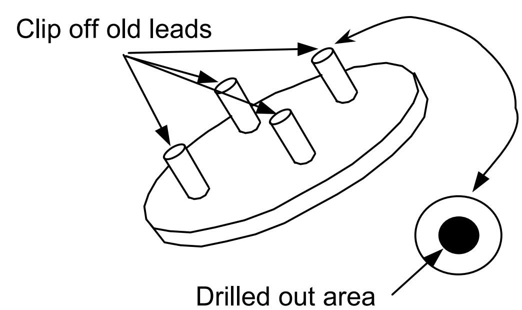
1. <u>Open the aluminum cans and remove old capacitor unit and base.</u> I used a fine saw to cut through the flange in 6-8 spots and bent open several flaps just enough to remove the rubber gasket and slide

out the element. One unit required a bit of careful physical effort to remove – it was dried out and stuck firmly to the can. Clip off the leads flush with the top of the aluminum pins in the Bakelite base.



2. Clean glop and insulation out of the cans. It's messy. Heating in hot water helps, and the black goo is gasoline soluble (an outdoor overnight soak helped to finish the job.) Although probably not really needed, I re-insulated the inside of the cans with cardboard, top and sides. (I used empty toilet paper spools cut to size!).

3. Prepare pins in base for the leads. This is the only 'iffy' and tedious part. After placing the pins sequentially in a vise (gentle), I filed the tops flat, carefully punch marked the wire centers, and in 5 of the 7 successfully drilled out the lead to a depth of approximately 4.5 mm with a 1.5 mm hand drill. The metal is very soft, drills easily and also can be damaged easily. In 2 of the pins, I could not do this without some damage – see below.



4. Prepare the capacitor units. For C606, the two 47 µfd capacitors were taped together tightly with one turn of thin, strong mailing tape so that the negative leads are close together where they can be joined and soldered to make the single common negative lead needed: Figure 1 gives details.

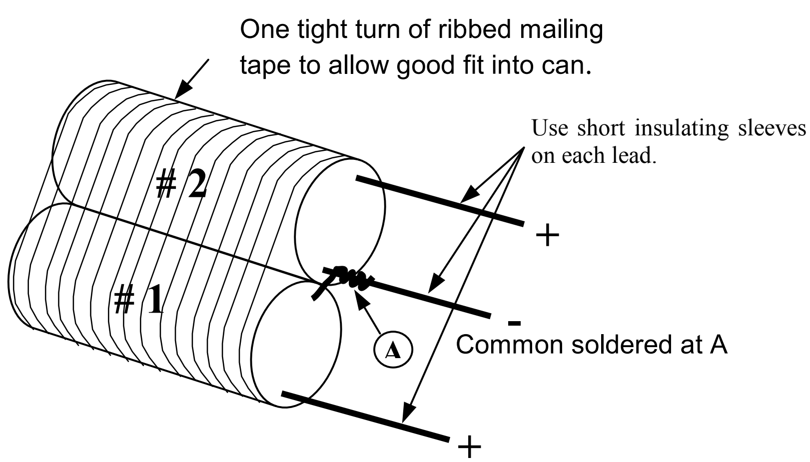


Figure 1: C606: Two 47 µfd 350 WVDC Electrolytic Capacitors

For C603, the procedure is varied to allow housing of the three capacitors. I arranged these in a 3-piece pyramidal fashion, taping the bottom (#1 and 2) together as above. I then covered the top ends of capacitors #1 and 2 with vinyl tape. Lead extensions (either sleeved hook-up or insulated #18 solid copper wire) were soldered to leads of the upper (#3) capacitor and brought down to the base outside the mailing tape – these new leads were kept long enough to reach the base pins. The negative lead from #3 capacitor was joined and soldered to the negative leads from #1 and 2 to form the single common negative lead required. Be sure that all positive leads are insulated to rule out any possible shorts.

As a final insulating precaution, I put a loop of vinyl tape around the vertical axis of the unit, cutting slots in the tape to fit around the positive lead from #3 capacitor and the common negative lead as needed. Figure 2 details some of this.

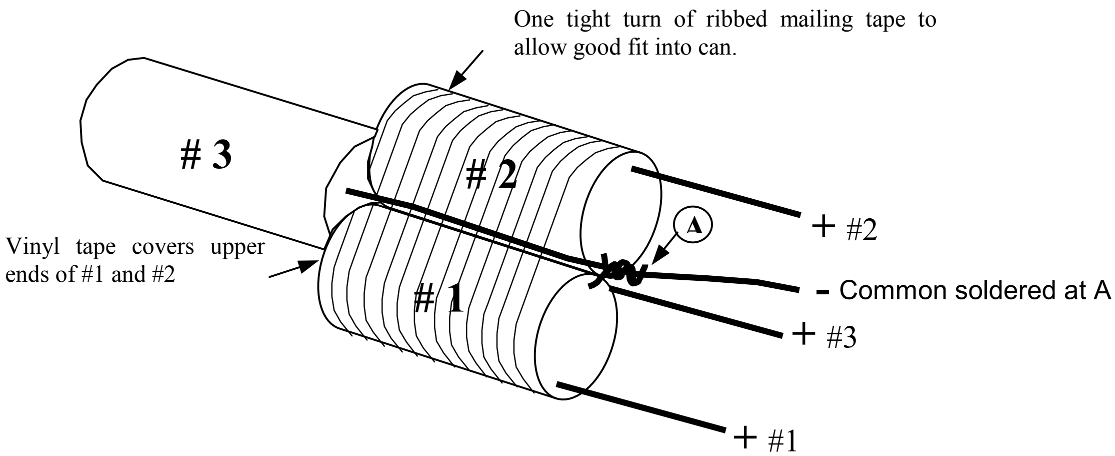


Figure 2: C603: Three 33 μfd 350 WVDC Electrolytic Capacitors

5. <u>Crimping or wrapping the leads</u>. In my units, soldering was not an option because of the aluminum used for the leads and pins. Crimping or wrapping the leads onto the 3 or 4 pins of the base requires a bit of fitting and bending, especially with C603 – just be sure there are no shorts. The pins are soft and crimp very easily with needle nose pliers – I inserted approximately 4 – 5 mm of lead into each. As mentioned, two of the pins that were a bit mauled by the drilling were fastened to the capacitor leads using a tight wrap of #24 bare copper wire. At the upper end, the wrap was soldered to the capacitor lead (1 or 2 turns) and tightly wrapped for 5 or 6 turns around the pins, securing the end of the capacitor lead firmly to the pins over a length of about 6 mm. I began the wrap and also ended it at the base of the pins so that the two wire ends could then be twisted tightly together. Additionally, I infiltrated the wrap lightly with solder to solidify it. This gives excellent mechanical and electrical characteristics. The lead connections to the base pins are:

    C603 – Negative to pin 1, positives to pins 3, 5 and 7
    C606 – Negative to pin 1, positives to pins 3 and 5

Check before making the final crimp or wrap. The pins on the bases and sockets are numbered in conventional vacuum tube format. My Bakelite bases have visible numbering both top and bottom.

6. <u>Replace cans</u>. (I tested each unit before this step in the receiver with a check of the B+ current at F102). Before inserting the capacitors into the cans, I packed some paper (soft paper towel material) loosely inside the can to reduce any movement after insertion – probably overkill. Bend back the aluminum flaps tightly at the base. Omitting the rubber seal make for a tighter crimping process. I taped over the edge of the cans circumferentially with a 2 cm strip of heavy aluminum car body repair tape. A bit of the edge of the tape was left free at the lower end of the cans so it

could be folded inwards against the base. The units are very solid and easily strong enough to plug in and out of their sockets.

When I started this project, my receiver had blown two 250 ma B+ fuses (F102). Prior to that, for several years, the total B+ current measured at F102 was 155 ma. When the real trouble began, one of the 30 µfd capacitors measure only a few 10's of ohms to ground. The other capacitors measured 15-20K ohms to ground. When disassembled, they all looked flakey, dry, and decrepit. Five such leaky capacitors exposed to B+ of 230V (in my R-390A) could dissipate between 55 and 75 ma.

Upon completion of this repair, total B+ current measured at F102 had dropped to approximately 85 ma. I don't know what a perfect R-390A B+ current should be. Perhaps we should be aware of such norms so that with periodic checks, a measureable rise in B+ current could herald capacitor failures. In the meantime, thank heaven for those B+ fuses and the robust durability of these radios. Incidently, since I am a physician and used to keeping lots of records, I maintain detailed chronological records for my R-390A and R-392. I regard them as eminent senior citizens of the radio world, and they both get routine health maintenance checks. They seem to have everlasting life and it is amazing how, over the years, one forgets prior problems, interventions, and ideas. I recommend such detailed records to all HSN readers.

QUESTIONS AND ANSWERS FROM OUR READERS

This section will present questions from subscribers for which <u>*responses are solicited*</u>*. If you can help in providing answers, suggestions or just plain good advice - please send them to the editor for inclusion in the next issue of HSN.*

? – Have recently acquired a vacuum tube adapter labeled "137 Adaptol". The adapter is octal male to octal female and appears to substitute a 12A6 tube for a 50L6. A check of my tube manuals indicate both tubes are beam power audio output tubes, similar in characteristics except for the heater voltage. Both tubes require 0.15 amps heater current. One needs 12.6 volts for the heater, the other 50 volts – obviously a drop of about 38 volts is required. An ohmmeter check showed a resistor in the Adaptol of 148 ohms to provide the drop. However Ohm's Law: R=E/I, R=38/0.15, R = 253 ohms! Therein lies my puzzlement. What am I doing wrong or where does my misunderstanding lie! Why the approximately 100 ohm difference? [Ron Reeland, 1921 12th St, Peru IL 61354-1708]

SHORT SUBJECTS

ANATOMY OF AN R-390A PROBLEM AND FIX *[Ben Wallace, 9475 Aldabra Court, San Diego, CA 92129 bwallace@sd.cts.com]*

I recently had a problem with my R390A. I would like to share with the group [r-390 mailing list] how I diagnosed and found the problem.

The receiver had been working fine when suddenly it started to overload on stronger signals -- just as if you had switched to MGC with a very strong signal. Turning down the RF gain control eliminated the distortion. I decided to check the AGC circuitry.

A quick check of the rear AGC terminal strip revealed approximately -7 vdc with very strong local AM station. This value should have been around -9 to –10 vdc. Looking at the manual, the AGC should measure approximately -2vdc with 10µv signal, approximately -9.5 vdc with 100,000µv signal.

My next step was to check the IF subchassis connector J512. Every connection checked within reasonable tolerance except pin 4. It measured approximately 63K vs. 500K. To the TM -- A quick look at the schematic revealed pin 4 as the main AGC line coming from the AGC time constant tube, V506A. Several resistors and 2 capacitors were in the path from V506A to pin J512, pin 4. C551 and C548 were my first likely candidates that might be causing the problem. I decided that I would focus on C548 as the likely problem....C551 was a large capacitor mounted on the top deck of the IF subassembly so I was hoping it wasn't the problem. I removed the IF subassembly and did a quick check of C548 and it measured 10K resistance vs. approximately 600K. C551 checked out fine. Replaced C548 which restored the receiver to normal operation.

Careful characterization of the problem and some analysis of the schematic and a few measurements can usually significantly narrow down the problem.

PUBLICATIONS OF INTEREST

Nothing this issue

WANTED TO BUY / SELL / TRADE / WHATEVER

Nothing this issue

EDITOR'S AND PUBLISHER'S CORNER

It's been a busy 1999 so far and I'm running a little behind in getting this issue of HSN done and off to Ralph for printing and mailing. I also hope all of you regular subscribers like the new HSN Index through issue 45 and find it of some use. Our small 'treasury' which we have accumulated over the last few years from subscription and reprint fees was used to print and mail the new Index.

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