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*. All articles and information shared through this newsletter may be reprinted only with permission of the author.

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EDITOR'S AND PUBLISHER'S CORNER

Please note that publisher Ralph Sanserino now has a post office box for all *HSN* subscription/reprint mail. Make **all** checks/money orders payable to him, **not** HSN!!!!

Apparently you all have found the new Vol 1-30 Index useful...at least I have not received any comments on it. A few errors have been discovered tho - on page 1, add 23-5 to the AN/FRR Receiver reference; on page 6 change the references for R-725 and R-1230 from 24-5 to 16-5. I expect that the index will be

periodically updated, probably after Vol 33. Please send me any suggestions, additions or corrections that will make it more useful to you.

A bit of good news from our publisher - Ralph has found a yet cheaper copying source and the price of reprints has been reduced to $1.00 each. Also note (see Short Subjects) that Dallas Lankford's rebuild notes for the URM-25D signal generator are now available as *HSN*'s first technical reprint ... very good stuff for the technically oriented.

Look for Volume 33 around late summer/early fall.

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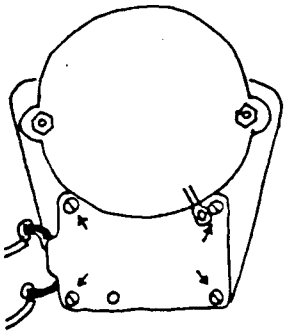
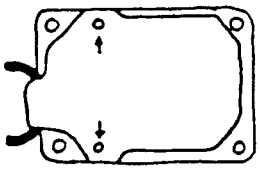
Editor emeritus Dallas Lankford provides a followup regarding <u>really</u> repairing the FUNCTION microswitch, or ....

R-390A WON'T TURN OFF (AGAIN) ?



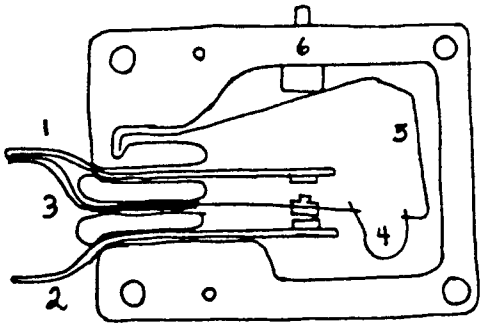
FUNCTION Switch



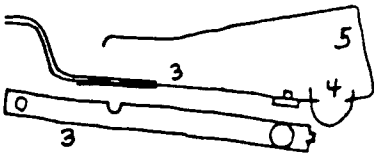
Microswitch

Yep. The first attempted fix, described in <u>HSN</u> 27, was not permanent for my otherwise trusty old 1956 model Motorola. As before, the symptom of the worn microswitch was the dial lights remaining on with the FUNCTION switch set to OFF. And as before, I removed the front panel (see <u>HSN</u> 29) to access the rear of the FUNCTION switch (see sketch at left). And as before, I used ChemWik Lite 0.100 desoldering braid to remove the solder from the two microswitch lugs. Be careful not to touch the hot iron tip to other wires (not shown). The two wires to the microswitch lugs are, maybe, #18 insulated, and not very flexible. Use the hot iron tip to straighten the bends in the wires, and keep the hot iron tip on the wires to aid in pulling the wires through the lug holes without breaking strands. Next remove the four slotted screws, indicated by arrows, and remove the microswitch. If you are lucky, the four flat washers behind the microswitch will be stuck to the FUNCTION switch frame with lock-tite (a varnish-like substance). If not, collect and remove the flat washers, and save them for when you reassemble the microswitch.

When you have removed the microswitch, you will observe two flat metal studs, indicated by arrows above, which attach a plastic cover plate to the side of the microswitch. If you slip the sharp edge of a small knife blade under the edge of the plate near the metal studs, the wedging action of the knife blade will lift the plate and studs slightly, enough to slip a very thin screwdriver blade under the edge to continue the wedging action. By using a succession of larger screwdriver blades (none of them very large), you can remove the plate and studs without damaging the plate, studs, or body of the microswitch. When the plate is removed, the interior of the microswitch should resemble the sketch below.



Microswitch, Interior View



Some Details Of Microswitch

The microswitch has six removable parts, numbered 1 through 6 on the sketches above. Parts 1 and 2 are thick metal plates with small discs attached to them. Part 3 is a thin copper alloy plate. These three parts function similar to the points of an automobile distributor, making and breaking contact for 120 VAC. Parts 4, 5, and 6 move the flexible part 3 to turn the R-390A on and off. Part 6 is a miniature lifter, which is controlled by a cam attached to the shaft of the FUNCTION switch. In the sketch above, the switch is shown in the ON position. When the FUNCTION switch is rotated to the OFF position, the cam raises the lifter, which causes internal parts 4 and 5 to move the end of part 3 to the OFF position (end of part 3 resting against end of part 1). Although both microswitches were manufactured by Robertshaw, the lengths of parts 3, 4, and 5 were different for two switches I examined. Also, the semicircle cutout on part 3, which determines how part 3 can be inserted into the case, was on opposite sides for the two switches. This means that for one switch, the small diameter point of part 3 faced the "hot" point on part 2, while for the other switch, the large diameter point faced the "hot" point on part 2. Although I did not try it, it would seem that part 3 can be made reversable by using a small file to file a semicircle into the other side of part 3. Parts 1 and 2 for the switches I observed were reversable; i.e., they has semicircles on both sides. The semicircles mate with small half-cylinders (not shown) at the bases of the mounting slots (apparently to assure proper alignment of the parts).

Part 4 can be removed by using miniature needle nose pliers to slip the end of part 4 off the end of part 3. Part 4 has slots on both ends; parts 3 and 5 have tabs which mate with the slots. After part 4 is removed, part 5 lifts (or falls) out, and then part 6 may be removed. Use a hot soldering iron tip to remove any residual solder from part 3 where it touches part 1, and use the iron tip to move the double end of part 3 away from the end of part 1. With a right angle dental probe slipped under the inside end, and your finger on the outside end, slowly and gently "wiggle" part 2 out of its mounting slot. Apply the hot iron tip to the outside end of part 3 for about 10 or 15 seconds, and then grasp part 3 with miniature needlenose pliers near the inside edge of the mounting slot, and try to "wiggle" part 3 gently but firmly. If part 3 does not move, apply the hot iron tip again, this time for maybe 15 or 20 seconds, and try wiggling part 3 again. In this way you should be able to extrace part 3 without damaging it. Do <u>not</u> pry on part 3 with a dental probe ot other miniature pry bar; part 3 is very delicate, and easily damaged.

With a small piece of #1200 wet-dry (automotive) sandpaper placed on a flat piece of wood or metal, sand the points of parts 2 and 3 until all

evidence of pitting is removed. Then polish the points using "used" areas of the # 1200 sandpaper. Making these small points flat again is difficult, and maybe not even desirable. I opted for slightly curved surfaces, so that the refinished points would touch at one point. My theory (untested) is that as arcing evaporates metal from the points surfaces, a small, more-or-less flat circular area would grow on the surfaces of the points (as opposed to small pitted "holes" which would grow if the surfaces were initially flat). If the point of part 2 was so deeply pitted that after sanding not much point surface was left, you can reverse parts 1 and 2 as I did for one switch. It may be possible to reverse part 2, if a small semicircle can be filed into the other side, and if the bent lug end can be bent into an opposite curve without breaking the lug end. I did not try that.

To reassemble, reverse the removal steps above. Use a small but perfectly flat screwdriver blade to seat part 3 completely. You may have to remove parts 2 and/or 3, and install them again to get the points to align properly. For one switch, part 4 touched (or nearly touched) part 2 when the switch was in the OFF position, which would cause the switch to be ON in the OFF position. By bending parts 4 and 5 as shown in the "Interior View" sketch, parts 2 and 4 had plenty of clearance in the OFF position. I also bent part 2 (down) slightly so that the points were parallel.

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Rummaging thru Dallas' material stockpile, we have another 'adventure of the tube testers' with a 1989 article by G.W. Murphy of Scottsville, NY....

HICKOK 539B TUBE TESTER

Here are some comments regarding the above model to supplement the information in *HSN 21* on tube testers:

Model #: Hickok 539B - circuit dates to 1955; full manual with operational data, a section on ballast tubes not found in the tube charts, and circuit diagrams; roll chart (his roll chart is dated 10-1-65).

Specs.

Dimensions: 17w x 7.75h x 18.5d Weight: 29 lbs.
Power: 117 volts, 60 cps. Test voltage adjustable by rheostat in the AC line and AC meter. Line voltage check also possible. Normal test voltage is 100 volts.
Tubes: Type 83 and 5Y3 rectifiers.
Lamps & Fuses: #81 line fuse lamp; #47 pilot; NE-51 in tube short test circuit.
Sockets: 7 and 9 pin miniature, 7 & 8 pin subminiature, loktal, octal, 4 to 7 pin standard type, and a pilot lamp test socket.
Meters: transconductance in ranges 0-600, 3000, 6000, 15000, 30000, 60000 with scales for rectifier, diode, voltage regulator checks, and ohms up to 50 megohm used in leakage tests. Polarity reverse switch for testing of some uncommon types.
Miscellaneous: Roll chart on the chassis. Sockets for tubes having grid or plate cap type contacts. Noise test using a radio receiver externally as noise detector. Plate and filament current can be measured using external meters via banana plug contacts on the panel. Self-bias resistors and bypass caps can be used in cathode circuits via similar connections on the panel.

Gas test for grid current down to about 0.1 μamp.

This instrument dates to 1955 and was obtained for $15.00. It has features that sound similar to the TV-10A/U described in *HSN 21*, but does not contain the solid-state rectifier mentioned in that article. It does not have individually adjustable settings for plate or screen voltage, only a high-low setting which provide 175/135 and 75/60 volts for these two elements.

When obtained, this unit has been dormant for years and was filthy. Both tubes worked, but the 83 developed some internal cloudiness on the envelope at first, which cleared after about 1 hour's use, and this tube still is OK. (The type 83 is a mercury vapor rectifier, but it looks physically like a high-vacuum rectifier. There is no mention in the tube charts or 539B manual of any precautions in use of this tube regarding filament preheating such as is usually required for higher powered mercury vapor rectifiers used in transmitter power supplies. Perhaps the initial cloudiness is normal for this type rectifier, but I have no basis for comparison.) The sockets and selector switches were pretty grimy and took a long time to clean up using TV tuner spray cleaner and gentle scrubbing. The numerical and alphabetical indicators on some of the switches had been twisted loose and required straightening and bonding into position with epoxy glue. A number of minor repairs such as replacing missing screws, paint touch-up, rewiring two disconnected tube sockets, cleaning rheostats, resoldering some loose joints, replacing dried out meter glass gaskets, were needed. I also replaced the AC line cord with a polarized unit, hot side of the line to the power switch. I checked the grid bias and AC line meters using a good VOM and they were very close. The ohmmeter section of the large transconductance meter was only fairly accurate, but a small point.

The manual with this unit is fair at best, and not too well written. It contains no information on trouble shooting, but there was a separate circuit diagram included. Some sections seemed to be afterthoughts, and a section on gas checks was modified and inserted as an addendum. There is a large (and to me useless) section on ballast tube checking. Our little favorite from the R-390A is not listed either. There is no information on calibration, despite the fact that there are calibration adjustments in the circuit.

The roll chart on this unit was cranky to operate and was chewing up the edges of the chart, so I scrapped it and made a separate folding chart out of the roll, which is about 17 feet long. It can be folded up so it's reduced to 12 fold-out sections of about 17 inches and fits well in a manila folder.

The rectifier tubes dissipate a fair amount of heat under the chassis, so I cut two side by side 3.5 in. square apertures through the wooden case, opening them into the accessory compartment near the top end of the panel and screened them with aluminum screen. They open into the case close to the rectifiers.

If anyone substitutes other rectifiers for the two standard tubes using other than straight subs, now sockets and/or rewiring may be needed. Also, check out how the tubes should be oriented per the manufacturer's suggestions, as I understand it, to give best mechanical support to the hot elements which were generally designed to operate vertically. The probably won't be necessary as the 5Y3 is common and I've had no trouble finding spare type *#'s. It would be easy to go solid state with this, too, but I suspect it would cause some problems with calibration so I don't plan to do this. (If another type rectifier is used for the type 83, perhaps it would be a good idea to check the transconductance of a few tubes to set a standard, since the voltage drop (power loss) of mercury vapor rectifiers is less than comparable high-vacuum types and could lead to some change in the DC output supplied during testing.)

I picked up the last several type 81 lamps at an auto accessory shop. They are 6.5 volts/1.02 amp rated (I blew out the original immediately by twiddling the line voltage adjustment. I now have it marked to the approximate correct position to avoid this.) I also made up a small cardboard cursor to help read the tube data charts. It is very easy to go astray on these charts and enter the wrong settings, as the charts are crowded and closely spaced. I also made up a short table of commonly tested tubes to avoid endless thumbing through the large charts.

I have seen and used a Hickok Model 580A tube tester that sounds similar to the TV-2 described in *HSN 21*. It is all solid state and has multiple settings for the element potentials and somewhat easier to use metering and test procedures.

Overall, one could survive without a tester. I have made up a chart of the measured characteristics of the tubes actually in use in my receivers, so at least I have a comparison base to go on if problems develop. Unless defects are obvious, substitution is still probably the best procedure.

QUESTIONS AND ANSWERS FROM OUR READERS

This section will present questions from subscribers for which responses are solicited. 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.

Ans. In my response to Paul Tice's ??? on substituting the 5749/6BA6W for the 6DC6 (*HSN #31*), some further insight has been received from Dallas Lankford. He has done some research on this - actual measurements show this substitution does worsen the third order intercepts (ICP3) and will degrade the receiver's sensitivity and reduce the dynamic range. The 6BZ6 substitution does appear to be the only one that doesn't have any measurable undesirable side effects. Use the 6DC6 or the 6BZ6; the 6BA6 is suitable for an emergency substitute only while you're looking for another 6DC6 (or 6BZ6). [the Editor]

??? No new questions this issue...

SHORT SUBJECTS

MORE $ DATA ON THE 3TF7 - It's probably too late, but the **Fair Radio Sales** ad in the January 1994 issue of **Electric Radio** shows the 3TF7 ballast tube (unused) for $17.50 + shipping. If you have been following the prices on this hard-to-get item, this is a real bargain and will not last long! Call them at (419) 227-6573. To provide some perspective, long time subscriber and contributor Joe Bunyard in a recent discussion with an Amperite rep has discovered the price of new 3TF7's are now $150 ... and this is not a typo! If you have been putting off getting a spare, this might be the time to get serious. The general availability of tubes at reasonable prices is not getting better. [courtesy Dallas Lankford]

TUBE SOURCE UPDATE - From time to time in *HSN* there have been references to **Daily Electronics Corp.** in Compton, CA as an excellent source for tubes of all types. If you haven't already heard, they have moved to Vancouver, WA. During a recent business trip in that fair city I found the time to make

a visit to their new facility located in a small commercial park and to personally visit with owner Jim Grimes. The business is doing well and he adds that Southern California just wasn't the place he wants to raise his family. His stock is all new stuff with the 3TF7 available for $25 plus shipping (+ 7.25% sales tax WA residents only). Checks and money orders only, no credit card sales. You can call for prices, etc. at 1-800-346-6667 (or 206-896-8856 and fax 206-896-5476). The mailing address is 10914 NE 39th St #B-6, Vancouver, WA 98682.

POT PROBLEMS - The RF GAIN, LOCAL GAIN and LINE GAIN linear potentiometers (RV4N's) on the R-390A invariably are badly worn by the time the receiver gets into your hands and you should be considering making some replacements. The original supplier in the '50s and '60s, Allen-Bradley (bought out recently by Clarostat) made the best ones. Apparently only Clarostat makes 'em now ... and that's the problem. One of Dallas's associates, Russell Scott, who builds phasing units using the same 2500 ohm, 2 watt units which are purported to be the milspec equivalent is finding the new Clarostat's aren't up to the expected standard. The end-point areas are not smoothly linear - as the control is rotated from the 'stop' nothing happens, then suddenly 'kicks in'. Furthermore, they are wearing out far before the 100,000 rotations spec. Clarostat has suggested that Russell buy the higher quality unit in their Model 380 C1 series; he has some on order to try out, and as we get more information it will be passed on. (Clarostat also has an even higher quality Model 485 series, rated at 1,000,000 rotations.) In the meantime, you might consider haunting the local hamfairs - perhaps some of the Allen-Bradley ones may still be around. Dallas also indicates that he has worked out a method of evaluating these pots in-circuit and has promised to send it to me for a later publishing. [the Editor]

INTERMITTENT OUTPUT VARIATIONS - I recently was plagued with an intermittent output variation on my EAC R-390A. For no apparent reason, the output would suddenly drop off drastically and mysteriouly return. I pulled all the tubes and they tested good. Next was the 'pencil test' (using a pencil or equivalent), gently tapping components and connectors. The problem was in the coax cabling and connectors between the IF and RF decks. As it was explained to me, these miniature BNC-type connectors (I have never yet been able to determine an Amphenol or other manufacturer's equivalent) have the center conductor soldered in but the braid or shield is a friction fit via the screw-on bushing. In my case, the braid on one of the connectors was loose - a simple tightening of the bushing sufficed. This 'easy' fix only applies to the EAC units as they use a white nylon bushing instead of the full metal units and the braid connection can be easily examined. The metal ones are much more difficult to disassemble. Of course if the problem was a break in the center connector in which case the entire connector must be taken apart and rebuilt. [the Editor with help from Dallas Lankford]

R-725/URR - Subscriber Dave Metz has recently acquired a direction-finding version of the R-390A which was used by NSA (National Security Administration??). According to a section of the TM he sent (TM 11-5825-231-24) the R-725 is a basic R-390A with a six-stage IF subchassis. It was used in the ARMY TRD-15 direction finder set with 4 to 8 receivers and a trailer load of other equipment and an array of antennas spread out in a 150-foot circle. By measuring doppler phase shift they could get line of bearings. The reason for the receiver not being a straight 390A was that the mechanical filters in the 390A create a phase shift that will introduce errors in the doppler shift. Therefore, they resurrected the older 390 IF strip with the 6 IF stages. [Wally Chambers also provided a short blurb on this unit in *HSN 16*]

CABINET OPTIONS FOR THE R-390A - We all know the difficulties in finding a cabinet for the R-390A. New subscriber Doug DeWeese (Tacoma, WA) has discovered that the Heath TX-1 Apache

transmitter and companion RX-1 receiver cabinet will, with only slight modification, fit the R-390A. If you can lay your hands on one of these venerable 'Green Machines' for a good price, you might consider cannibalizing it for the cabinet (hopefully it would be a 'parts only' unit).

URM-25D SIGNAL GENERATOR REBUILD NOTES AVAILABLE - As a follow-on to the signal generator material in *HSN 21*, Dallas Lankford has provided a 10-page set of rebuild notes for the URM-25D. These notes include info on the AC power input filter; removal and overhaul of the modulation (audio) subchassis, buffer amplifier subchassis, and calibration oscillator subchassis; rebuilding the step attenuator; and calibration and alignment data. Rather than devote an entire issue and then some to this, Dallas' originals have been forwarded to our publisher, Ralph Sanserino, who will provide them as requested for $1.00.

BETTER AUDIO FROM THE R-390A - Subscriber James Tabola (Waco, TX) provides his experience with audio improvements... "The 70.7 volt line transformer mentioned in *HSN #26* is the way to go. It's readily obtainable and it's cheap. Mine was $5.95 at Radio Shack. In *HSN #26* the primary taps are already calculated, but you should check the transformer yourself with an ohmmeter. I was suprised at the values I got. The 10 watt tap was 500 ohms, 5 watt was 625 ohms, 1.25 watt was 1200 and 0.62 watt tap was 4000 ohms ... of course the 5 watt tap worked great. This particular transformer was made in China. Is the quality this far off? While I was at Radio Shack I noticed they had a speaker & enclosure on sale for $16.95. It has a 5 inch, full response speaker, valnut simulated case. It measures 8 x 10, 4 inches deep, catalog #40-914. The back is removable which sometimes is not the case on stereo speakers. I put the transformer and a toggle switch in line so I can turn the speaker off when using headphones. Needless to say, without a doubt this is the best sounding speaker setup I have ever heard on shortwave. Music on medium wave and short wave is fantastic. All this for $24."

TUBE LIFE EXTENSION - Charles Harrison of Lincoln, RI suggests that to conserve old components, refrain from shocking them with line voltage. His R-390A and other hollow state receivers are run through a variable transformer (Variac) enabling line voltage to be increased slowly. Radios are warmed as gently as you please depending on their age and length of time they have been operative.

WANTED TO BUY / SELL / TRADE / WHATEVER

This section is reserved for HSN subscribers in good standing (i.e., you're paid up according to Ralph) looking to connect with HSN readers for mutual benefit. All deals are between individuals; HSN doe not evaluate the accuracy of any statements or claims herein. No 'business' ads, please. Items printed will be on the basis of available space.

CORRESPONDENCE FROM CHILE - *HSN* has received correspondence from a Thomas McManus in Conception, Chile. A self-professed "lover of Collins tube receivers" (he has a 51S-1), he also is looking for an R-390A to purchase for DXing the USA BCB. He states he has a copy of the R-390A Army Technical Manual but wants copies of all the technical corrections. If you can help, write to him at Ainavillo 678, Conception, Chile.

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