



# HOLLOW STATE NEWSLETTER

"For lovers of vacuum tube radios"

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## CONTENTS

### Feature Articles

Adventures with the R-392 ..... Geoffrey Fors pg 2

### Departments

Questions & Answers from Our Readers ..... pg 5  
*Modified HQ-180 as SSB converter; Q-Multiplier connection; SP-600 serial numbers; SP-600 sales outside North America; SP-600 panel restoration*

Short Subjects ..... pg 6  
*R390/390A relay rectifier replacement; URM 25D repair case history; SP-600 BT's; RA17 review rebuttal*

Publications of Interest .....  
*None this issue*

Buy / Sell / Trade items ..... pg 8

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## EDITOR'S AND PUBLISHER'S CORNER

Readers should note the masthead changes - my home phone is now shown and Ralph has provided us his e-mail address which may be of use to those of you who are on the 'net'. For at least the next 12 months I, too, will have an e-mail address which has been provided by my employer. By this time next year (April), however, I will be retiring after 30 years service to the government of the state of Washington; current plans are to purchase a new computer for home/business use and get back on the net then ... meanwhile, I can be reached via e-mail at [reid@crab.wa.gov](mailto:reid@crab.wa.gov). Work on expanding the 'selected reprints' of more of the earlier issues is proceeding, albeit slowly and as time permits. Thanks to those of you who have sent current manual source information - perhaps the next issue of *HSN* will carry the updated list.

## **ADVENTURES WITH THE R-392**

*Geoff Fors*

The R-392 receiver has been a regular find at ham swaps and surplus dealers since the late 1970's, at considerably cheaper prices than R-390 type receivers. Some of the major drawbacks are the 28-volt DC power requirements, a somewhat ungainly physical shape, olive drab paint job, a 200 mw audio output and special, hard-to-find connectors.

Finding a sad-looking Stewart Warner R-392 for the grand sum of \$35.00 at a recent hamfest, I began my education with that investment and have since overhauled a number of others. Even though one might look terrible on the outside, it is probably "mint" on the inside, due to the waterproof case and innards liberally gooped up with the famous yellow/brown "MFP" fungus-preventing varnish of WWII fame. Fortunately, semi-gloss olive drab spray paint in an exact match is readily available.

### **BACKGROUND**

The history of the R-392 has been well covered elsewhere. It was designed by Collins as a scaled-down R-390 for vehicular use, and saw service in the mid 1950's as a companion to the T-195 transmitter. Together, they were usually seen as the AN/GCR-19 HF radio system, mounted in the rear of an M-38 jeep. Manufacturers included Collins, Western Electric, Motorola, Stewart Warner, Stromberg Carlson, and probably others. Part of the scaling down process included elimination of the ballast tube, and the heaters for the crystal deck and the PTO.

The R-392 is alone among communication receivers in having the feature of running both plate and filament of all tubes directly from 28 volts DC, although eliminating the requirement of a high voltage power supply. Such an idea enjoyed brief popularity among design engineers, starting with the WWII BC-1206 longwave beacon receiver, and resurfaced during the twilight of the vacuum tube era when transistors were expensive and only capable of DC power and audio applications. Some of us can recall the Delco automobile radios of 1958 which used "12 volt plate supply" tubes and transistor audio output amplifiers, and the Gonset Super-12 converter which ran its tubes completely from 12 volts DC. This idea isn't without drawbacks, however. The R-392 uses a few tubes not designed for such an application, such as the 12AU7. Gain is lower, so more stages are needed, and tubes that don't have voltages of at least 150 volts on their screens are more susceptible to overload from very strong signals. I have noticed that a "hybrid" tube which tests "good" in a tube checker may fail to perform in the set, or may be "noisy" due to internal shorts apparently caused by close inter-element spacing. The good news is that component stress from the strains of working at high voltages is all but eliminated.

### **MAINTENANCE**

The R-392 is easier to work on than the R-390, in my opinion, and most faults will be found to be mechanical ones rather than electrical. Since these receivers were mounted in vehicles, an occasional fault may be due to broken leads inside one of the lower range RF coil cans where fine diameter wire is used. An alignment of the RF section is usually called for, and follows the general routine used on the R-390. Any of the RF transformers in the RF subassembly can be unplugged in the same manner as they are in the R-390, i.e., via the small phillips screw at the bottom of the tuning slug hole after the slug rack is removed.

The early versions of this set used standard shiny tube shields. A recognized improvement in tube longevity

can be realized by changing these to the IERC style black heat-sink shields. Late R-392's use a black tube shield with an internal finger-stock heat sink; these are equivalent to the IERC shield for this application and are OK to leave in place.

A 24-28 volt regulated DC power supply will be required, at about four amps. There are lots of these on the surplus market from old photocopiers and computers, at prices less than their more useful 12-volt brethren. However, a problem with such power supplies is "hash" from the silicon rectifier diodes, causing a constant buzz to appear on most frequencies throughout the HF spectrum. The cure is to put .011 mfd ceramic disc capacitors across each rectifier diode, and across the output terminals. I wish manufacturers routinely did this in the first place.

There are two common styles of 9-pin power connectors but only one of them will work. The olive drab colored type with the rounded body is the one to use. There is a second style which is dull aluminum in color and squared off near the cable entrance, which is held together with machine screws rather than being threaded together. That one works on the R-390 remote control connector, but won't screw down deep enough to work in the R-392.

Drastic variations in gain between selectivity settings is usually an indication that the row of 455 Khz IF transformers is out of alignment. This only happens when the previous owner has been into the set without benefit of the technical manual. Normally, the IF stages should never require alignment. A cardinal rule of troubleshooting often violated by beginners -- when something quits working, leave the alignment alone!

A peculiar problem which seems to be unique among the CTS brand pots used for the AF and RF gain controls in the 392 is failure by the end-to-end resistance going very high with wear. For example, the 500K AF gain pots wear out and measure 3 meg or higher. Also, the binders used to deposit the carbon track inside the pot on the fiber insulator pad are dissolved by some types of tuner cleaner, so be forewarned. WD-40 did do a perfect job on cleaning a "dirty" replacement pot without washing most of the carbon track away, and is all I would recommend using on the R-392 pots. So, if your receiver seems to have weak audio output, or weak sensitivity, check the resistance value of the RF and AF gain pots across the two end lugs. It isn't necessary to disconnect them first but you will have to remove the front panel. Unlike the R-390A, these pots are used as ground return for the associated stages and the value of total end-to-end resistance is important.

I didn't have any exact replacement pots in the junkbox, so I wound up making them by disassembling some unused CTS pots with different shafts and putting their carbon tracks into the R-392 pots. This requires great care because the panel bushings are staked onto the carbon track assembly in this brand of pot.

## PERFORMANCE

The 600-ohm audio output of the 392 is only 200 mw, but this is still enough to provide room-filling volume. The military LS-166 speaker is available from most surplus dealers, as is its special audio connector. This was a mobile set, so don't expect hi-fi audio! If you don't have the military speaker, you can also obtain audio at pins H and E of the power plug, and feed the speaker through an old filament transformer. A common 70-volt line transformer, as discussed recently in HSN #26, can also be used but don't expect a big difference between them.

Some R-392's may be found with a transistorized audio output module in the socket normally occupied by the 26A7GT audio output tube, made by Western Electric. They don't seem to provide any additional output, but do eliminate the need for stocking a spare 26A7, which is a rather unusual tube. I have seen homebrew

replacements for the 26A7 made from an LM-380 amplifier IC, but the tube is still available for around \$6.00 from suppliers such as Antique Electronics Supply.

The antenna input is designed to match a variety of antennas, although the receiver was most commonly used with a whip antenna of about 15 feet in length. In cruising the shortwave bands, I found the antenna trimmer has little effect on most bands above 2 MHz when used with my 40-foot longwire.

Some R-392's seem to have more BFO injection than others, allowing SSB to be copied with little reduction in RF gain needed. As in the R-390 and SP-600, a 455 KHz IF output jack is available for an external SSB or RTTY converter, although only a RTTY converter was used with the R-392.

The CW performance leaves a number of things to be desired, but this can be excused since the set was not intended as a serious CW receiver. The 2 KHz selectivity is too wide for most conditions, and the BFO control overadjusts the beat note. This is the result of a strange design which uses a small PTO for the BFO function, just as in the R-390, except that the PTO shaft is not connected to anything, and the BFO is adjusted by tuning a variable capacitor which parallels the BFO! Zeroing the BFO is probably the main alignment headache, requiring removal of the IF chassis to reach a screwdriver slot on the "fixed" PTO, without allowing the use of extender cables due to detuning effects.

All in all, the R-392 is an interesting and very rugged receiver, which seems to have a going price of around \$100 at hamfests, making it well worth acquiring. I wish it had an illuminated S-meter, but then you don't get that in the R-390 either. The same general servicing and alignment techniques used with the R-390 and R-390A apply to the 392 series as well; modular construction is used, allowing the entire set to be broken down into component modules in a short time. Replacement chassis modules are readily available from surplus dealers at reasonable prices, and Antique Electronic Supply carries all the tubes.

#### NOTES:

- TM 11-858 Technical Manual, Radio Receiver R-392/URR
- TM 11-5820-334-35, later edition of above
- "The R-392 On The Air", 73 Magazine, August 1974, p.47
- "The R-392/URR", Electric Radio No. 20, December 1990, p.4
- "The R-392 -- A Miniature R-390", Electric Radio No. 38, June 1992, p.28

#### R-392 power plug connections:

- |                                |                   |
|--------------------------------|-------------------|
| A - + 24-28 VDC                | F - N/C           |
| B - Mute relay, GND during PTT | H - 600 Ohm audio |
| C - N/C                        | J - N/C           |
| D - Jumper to A                | K - N/C           |
| E - -24-28 VDC, Common Ground  |                   |

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## 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 the Q&A column in HSN #36, Robert Bukovsky asks about using the IF strip of a Hammarlund HQ-170 as an HC-10. I've been using an old HQ-180 in exactly that arrangement for about six months, and it works very well. I ran a piece of coax from the IF output of my R-390A to the junction of T-3 and C-16 in the 180. This effectively feeds the signal into the grid of V-4, the 455 kHz IF amp of the 180. I removed the five tubes that come ahead of V-4 (RF amp, HF oscillator, mixer, gate and first converter). As I had hoped, this gives me almost all the advantages of the HC-10: product detector, switchable upper and lower sidebands, 3 and 6 kHz bandwidths, vernier tuning, tunable notch filter, and better audio. I do have one problem, which may be unique to the rather beat-up 180 I'm using: with the AVC on, the frequency varies unacceptably, shifting up and down as the received signal varies in strength. This was cured by turning off the AVC. However, it means I had to sacrifice one of the benefits normally available on an HC-10, the improved selection of AVC constants. Has anyone out there isolated the source of such a problem in the 180? [Art Delibert, 17 Montgomery Ave, Takoma Park, MD 20912]

**???** Mr. Delibert also has a question: "Several years ago, I read that a Q-multiplier should not be connected ahead of the mechanical filters because the filters could be damaged when the QM goes into oscillation. Can anyone confirm (or refute) this? I've never seen it mentioned in HSN or Electric Radio. If it's true, does anyone know why? Is it simply because the filters are overdriven? Is there a way to connect a QM before the filters and avoid the problem? (Of some help, perhaps, is Wayne Heinen's HSN #24/25 suggestion for connection to the third mixer, V204, which is in front of the filters -I've done it and it works for me. Also, Shawn Merrigan suggests connection to the second IF amp, V502, which immediately follows the filters in HSN #27 - ed.)

**Ans.** In HSN #37 Alan Douglas asked about Hammarlund SP-600's with serial numbers lower than 1130 and between 1130 and 3488. After some discussion with Robert Fowle (a Hammarlund historian) I can offer the following: SP-600's (and all Hammarlund radios) were sequentially numbered starting from #100. Different model numbers within a series (that is, SP-600JX-14 or SP-600-JX-21) were simply included in this numbering scheme (does this also apply to SP-600VLF?). So, a new sequence of serial numbers was not started for a different model number (within a series). Also, when a government agency or organization bought SP-600's they were just taken from regular stock. Now, I have an SP-600JX serial #2469 which also bears an RCAF (Royal Canadian Air Force) sticker. This may explain where some of the serial numbers between 1130 and 3488 went; if the Canadian government bought a large number of them, all of those serial numbers would have wound up in Canada. This idea would apply to any government or organization which purchased a number of SP-600's and then destroyed or otherwise disposed of them (for whatever reason) so that they would not show up in the US surplus market. [Shawn Merrigan, 14203-72 St., Edmonton, AB, T5C 0R4 & Robert Fowle]

**???** As a followup to the above answer, Mr. Merrigan asks, "were SP-600's sold to other allied nations (besides Canada)? If so, which ones? And, did the former Soviet Union copy the SP-600 design for one of their own radios?"

??? Looking for someone to repaint the panel and refill the engravings on an SP-600 [Dave Sundheimer, 13020 Lakeview Dr, Burnsville MN 55337-3831]

## SHORT SUBJECTS

**R390/390A TR RELAY RECTIFIER REPLACEMENT WITH SOLID STATE BRIDGE** [Dave Sundheimer] In HSN #36, pg 6, Dave Metz mentions replacing the copper-oxide rectifier with a solid state bridge. Mr. Sundheimer comments: "Having this week obtained a Collins R-390 and checking it out, I found the copper-oxide rectifier CR 801 (CR 102 on the R-390A) bad as the TR relay would not operate. Having had the experience of replacing a copper oxide rectifier with a solid state bridge in the GRR-5 power supply, I added a resistor of 25 $\Omega$ , 5w in series with output pin 7, as the voltage drop across a solid state bridge is considerably less than the original copper oxide bridge. Measurements after modification gave 5.7 v across the 6 v relay and a drop of 5 v across the 25 $\Omega$  resistor, which would have put 10.7 v across the relay without the resistor. Although not mentioned in the article, I assume Mr. Metz did add a series resistor to drop the excessive voltage. It might be well to once again mention this problem to R390/390A users." *[This is not the first time this issue has come up - at least for the R-390A. See Paul Tice's comments in HSN #31, pg 5 as well as Neil Clyne's in HSN #34, pg 7. Perhaps it is not all that critical? - ed]*

**MORE ON REPAIRING THE URM 25D - A CASE HISTORY** [John Gillespie] I purchased this generator in Toronto in clean condition, being less apprehensive after reading some of the back issues of HSN. In fact the modulator was dead on both frequencies, many adapters were missing, and it needed new dial lamps. Inside, the meter had been disconnected but seemed to be functional. The meter failed as soon as all other repairs were made - isn't that the way?

Fair Radio supplied all the missing adapters, a partial reproduction manual, and replacement meters in like-new condition. The replacement meters were manufactured by Federal Mfg. and Eng. Corp and seems to be a far better sealed meter than the original from Kings Electronics.

A voltage check at the twin triode 5814A indicated that voltages on the first stage amplifier, pins 6, 7 and 8 were normal, while voltages on the second stage pins 1, 2 and 3 were way off. Voltage on pin 1 (the plate) was 40 instead of 108 volts. Pin 3 (the cathode) was 4.1 instead of 2.4 volts. The grid pin 2 was normal at 0. Since the plate load resistor tested normal, the other possibility was that something was affecting the bias on the grid, even though the voltage was normal. Testing the coupling capacitor C164 between the grid pin 2 (stage 2) and the plate pin 6 (stage 1) revealed excessive leakage. Replacing the Micamold cap restored the modulator on both frequencies and the voltages returned to normal. I am assuming this leakage condition made the grid appear more positive, and caused heavy conduction in the tube, dropping the plate voltage and raising the cathode voltage.

Thanks to the report from Dallas Lankford and Joe Bunyard regarding problems with the URM/25D signal generator in HSN #21. They suggest these Micamold caps may be leaky, even though their outward appearances look great. All the Micamold caps in this generator were, in fact, extremely leaky and therefore replaced.

In HSN #21 it is mentioned than the special base #323 bulbs are difficult to locate. They can be purchased through Electro Sonic in Toronto at \$22.06 for 10 lamps. I contacted Electro Sonic source, Spectro, also in Toronto, and asked if they had distributors in the USA. Their USA distributor is Atlas Electric in Florida. Spectro suggests the best method to obtain the bulbs is to order them through Electro Sonic which is only a couple of miles from Spectro. This may help expedite immediate response. Spectro currently has 1100 bulbs

in stock, but they only stock them infrequently. So if you need them get them while they're in stock. They are shown on page 709 in their 1995 catalog as #323. Contact ELECTRO SONIC Inc., 1100 Gordon Baker Rd., Willowdale, Ontario M2H 3B3, phone (416) 494-1555, fax (416) 496-3030 or telex 065-25295. *[John, I suggest you order Dallas Lankford's URM-25D Rebuild Notes from HSN Publisher, Ralph Sanserino for \$1.00 - it's essential for the 25D owner - ed]*

**SP-600 BT's** We hate to "beat a dead horse" but here's one more set of comments from Mr. David Sundheimer (13020 Lakeview Dr., Burnsville MN 55337-3831) regarding the infamous "BT's" (black tubular capacitors) in the SP-600: "I recently got an SP-600JX-17 and manual (TO 31R2-4-18-2, Sept. 1955). In the manual there is a note that states if it is necessary to replace any of the .01 or .022 tubular capacitors, use .01 disc type. The pictures in the repair section show two modules with either the BT's or disc and a warning on the schematic to replace certain asterisked capacitors with .01 discs. While opening the unit to add an isolation resistor and coax for a panadaptor, I found the modifications had been added, and, joy of joys, the capacitors were .01 disc ceramics. I thought SP600's of -17 and higher might all have .01 disc, but reviewing past HSN issues, #16 contained an item by Kulow replacing BT's in his -21. Electric Radio #73 gives SP600 dash number identification and shows the -17 produced in 1952 and the -21 in 1953. Apparently Hammarlund knew of the problem with BT's in 1952 but continued to use them. I can supply copies of the TM for coping costs if anyone needs one." *[The BT issue has been discussed in HSN #16, 17, 19 and 22 - ed]*

**THE RACAL RA17 - ANOTHER VIEW** A long-time subscriber and veteran contributor to HSN, Neil Clyne, comments on the Terry Robinson article in HSN #37 as follows: Sensitivity (in practice) - Don't believe the official spec. - check it for yourself. My RA17 bought cheaply as possible from a local source, produces specified 2nd detector output from measured RF inputs of 0.25 to 0.45  $\mu$ V throughout the range 1 to 30 MHz. My 390A (a good one) needs roughly twice the input (0.5 to 1  $\mu$ V) for an equivalent 2nd detector output throughout its range. Selectivity (in practice) - Appalling! No doubt about it, this is where the 390A wins hands down. Unless you're a CW man, you will almost certainly use one of the L-C filter bandwidths (1.2KHz and up), and all sorts of unwanted trash gets in the way, as a result of the broad, bell-shaped response curves. The half-lattice crystal filters (750Hz and down) are moderately effective in practice, but far from perfect in theory. Short of trying to locate a source of good mechanical for 100Khz (I've never seen any), there's no real answer to this problem other than to fit some kind of external audio filter. AGC - This actually works on an RA17 without modification, though the attack and release times are not optimal for SSB operation. Audio - Yes, this is diabolical as reproduced in the internal speaker, far better to use an external 3 or 4 ohm speaker or phones. SSB performance - Abysmal? Garbage! Sure, it isn't great, but it's no worse than an unmodified 390A. There are several SSB/ISB adapters available, i.e., RA63, RA98, RA121, RA218 and some of these must have found their way across the pond by now, all of which are much smaller and lighter than a CV157 (wouldn't be difficult!). Serviceability - Service-friendliness is not a strong point on the RA17 - the R390A wins hands down on this, too. Whoever decided the location of the test points on the RA17 chassis was playing hunt the slipper at the time, I guess. However, in my experience most faults appear in the harmonic generator and 37.5MHz IF amp and filter which are readily accessible and all too often, can be attributed to failures of poor quality components or dry joints, neither of which is a serious problem on the 390A. Rectifiers - All British-made RA17s for the UK market contain tube rectifiers, normally GX34/CV1377 (=5AR4). The North American version RA17C and C-2 were fitted with 5V4G/CV729, whilst RA17C-3 and up contain silicon rectifiers. Be warned, the original specified types (SJ401B and 40AS) are officially rated at just 400PIV! Literature - For heaven's sake, anyone out there who wants info on the RA17/117, please get in touch with me and forget Muritron! Racal's own manuals for these sets are not particularly brilliant, but the Royal Navy handbook in particular on the RA17 is very comprehensive. Finally, in reference to Terry's final comment - no sir, that just is not true and I'm not saying that because I'm a Limey!! *[Those wishing to contact Mr. Clyne, write him at 78 Halford Road, Ickenham, Uxbridge, Middlesex UB10 8QA or call 01895 230006]*

## PUBLICATIONS OF INTEREST

Nothing new.....

### 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 does not evaluate the accuracy of any statements or claims herein. No 'business' ads, please. Items printed will be on the basis of available space. **Please send all 'ads' to the editor - Ralph just passes them on to me!***

Wanted - Loan or rental of the separate schematic package associated with the R-390 technical manual (TM 11-856 or T.O. 31R1-2URR-154) for photocopying. My manual does not have this package of fold-out schematics. Dave Sundheimer, 13020 Lakeview Dr, Burnsville, MN 55337-3831

Wanted - Reader Fritz Bruns, DC8XA, is looking to contact fellow R-392 users who have built plug-in transistorized modules to replace some tubes. He is also looking for the extension cable set, the multiconductor extension cable for the subchassis, and the BFO pitch capacitor, C101. Please write to him at Stupf Str. 2, D-80634, Munich, Germany.

Wanted - Manual for Aircastle 23-02 plus a mic that will work on this model; also a receiver that works on both VHF and UHF bands. Jeremiah Puhek, PO Box 265, Newman Lake, WA 99025

Wanted - Hallicrafters SX-117. Shipping to San Diego required. Lloyd Anderson, 19A Tui Glen Rd, Birkenhead, Auckland 10, New Zealand. Ph. (64) 9 480-5652 collect.

Wanted - Original or copy of manual for AN/URM-32A Frequency meter. Ralph Sanserino, PO Box 1831, Perris CA 92572-1831

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