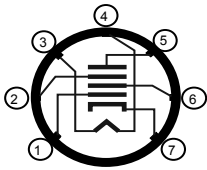


# HOLLOW STATE NEWSLETTER

"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

For those of you who may have checked out some of the Internet sites mentioned in HSN 39, it should be quite apparent that it will likely be the information exchange medium in the future. Can you just imagine what a Hollow State Newsletter 'home page', focused on the serious tube-type receivers and accessories, might look like ....and how much faster it would be. Are there any volunteers??? Be that as it may, I am now suffering from a severe shortage of quality (as well as original) material. If things don't (*continued pg 8*)

## **CAPT. LEE'S PRODUCT DETECTOR FOR THE R-390/ R-390A - REVISITED**

by Paolo Viappiani

The simplest way to add a true Product Detector to an R-390A (or to an R-390) is undoubtedly the one described by Capt. Paul H. Lee in his 1968 and 1973 CQ articles ("Modifying The R-390A For SSB", CQ #1/Jan. 1968, pages 55-58; "Using The Surplus R-390 Receiver For SSB", CQ #8/Aug. 1973, pages 43-44 & 82-83).

The proposed conversion is quite simple and can be performed in a week-end or so (you have only to make some rewiring and to replace the 5749/6BA6W BFO osc.- with a 6BE6 -osc./mixer-); in addition (unless you have already performed the Dallas Lankford AGC mod described on HSN #27) it might be useful to install the recommended 1.0 mF capacitor between the "Fast" terminal of the AGC switch and a ground lug. The mod works fine both in the R-390 and in the R-390A; but, as Dallas Lankford remarked in HSN #27, the Noise-Limiter is bypassed in the CW/SSB position and a regenerative effect had been reported by Eugene A. Hubbel and others (see: Eugene A. Hubbell, W7DI, "Improving the R-390A Product Detector" on Ham Radio #7/July 1974, pages 12-15). I do not agree with Mr. Hubbell's approach (it requires new holes in the IF subchassis and the addition of expensive components like the Potter & Brumfield relay) and after various trials I succeeded in fixing both the mentioned problems.

I installed the Capt. Lee's Product Detector in an R-390A of mine (an EAC unit built in 1967 - Order No. FR-36-039-N-6-00189(E), Serial No. 1717) and had the same mod successfully performed in an R-390 (a Motorola unit built on Contract No. 14214-PH-51-93, Serial No. 4385) by my friend Rick Mish of Miltronix in Toledo, Ohio.

In both the receivers all the regeneration problems have been fixed simply by grounding all the shielded leads of the three involved shielded cables (carrying the audio signal to the new BFO switch) not at the switch side but inside P112 (or P117 in the R-390) only, and the Limiter (and Squelch in the R-390) operation has been restored by applying a small negative bias voltage to the Product Detector Output.

As per Mr. Hubbell's idea, the negative bias voltage has been obtained by rectification and filtering of the 25.2 VAC present at the 3TF7 current regulator socket, but with a proper adjustment of that voltage no need was found for also applying a small positive bias to the normally grounded end of the Limiter pot for proper operation (differently from Mr. Hubbell's circuit). So the entire mod becomes simpler and allows using the Limiter both in AM and in SSB.

The following schematics show the proposed mods both for the R-390A (Fig. 1) and for the R-390 (Fig. 2) receivers. The "Rx" value was found to be 220 K in my R-390 and 100K in the R-390A; but I think it is better to install a 470K trimmer first and adjust it for the proper bias voltage. After the adjustment, the trimmer can be replaced by a fixed resistor. Please note the restoration of the original 56K/200pF R-C filter proposed by Capt. Lee (and removed by Mr. Hubbell) at the Product Detector output.

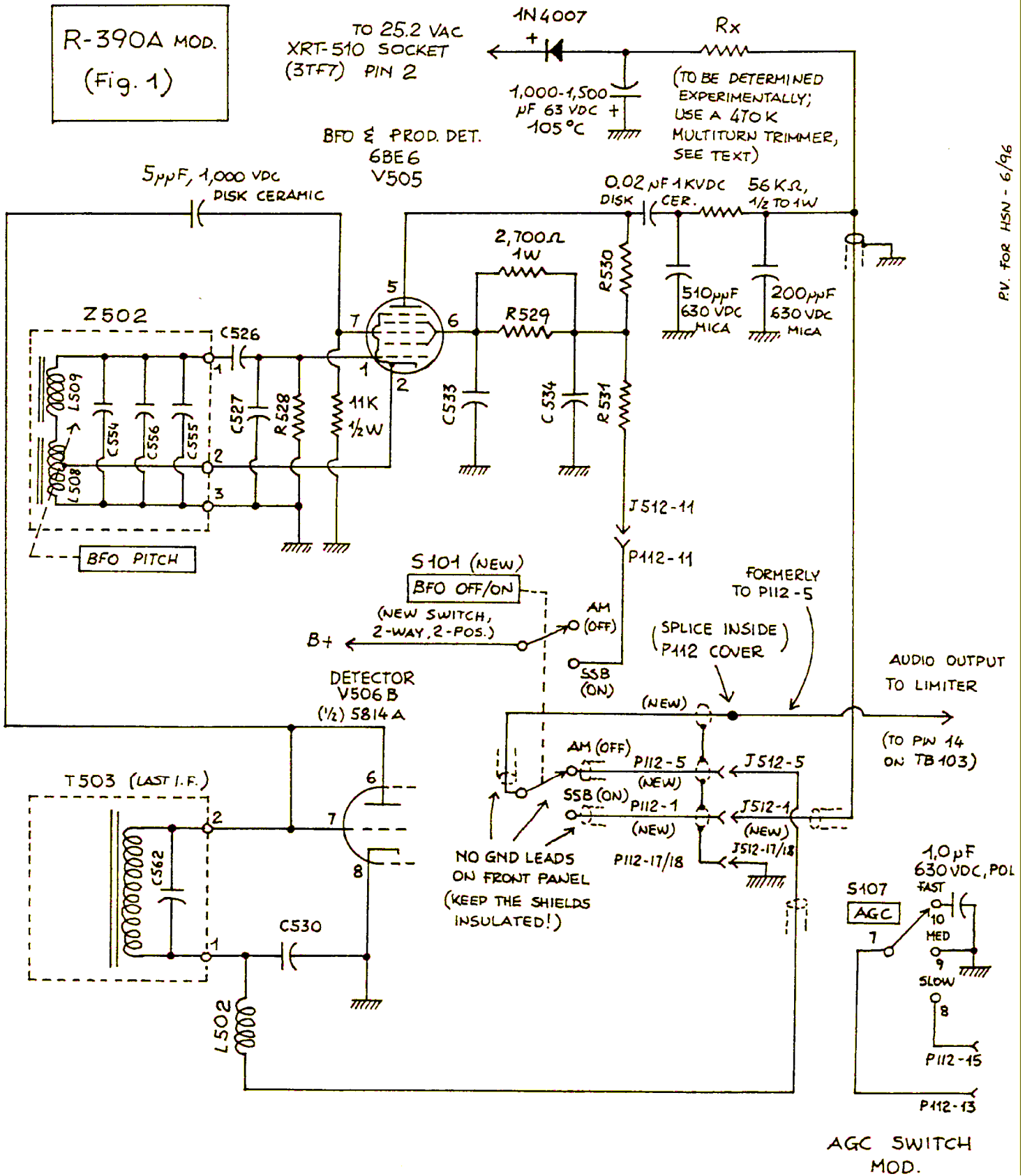
In any case I recommend performing the simple modification the Limiter circuit proposed by Bill Kleronomos, KD0HG on ER #70/Feb. 1995 ("Updating That R-390A - An Improved Current Regulator And Noise-Limiter", page 36): in my experience, the addition of a 33K resistor in series to R527 (in the R-390A) or to R539 (in the R-390) really leads to a Limiter that works effectively and does not noticeably degrade the sound of AM or SSB signals.

I think the proposed mods are well worth the effort and hope there will be some feedback from HSN readers on the matter. Anyway, we are still waiting for the Product Detector by Wally & Dallas (see HSN #27 page 3), but in the meantime this one might represent a valid solution.

The conversion has to be performed as follows: *[please note that the detailed instructions and diagram for the R-390 conversion will be printed in HSN #41 - rcw]*

1. Disconnect the two control shafts from the I.F. subchassis, unplug all plugs from it and remove the subchassis from the receiver.
2. Carefully remove the cable clamp and cover from the multi-conductor plug P112 slipping it back along the cable. Remove the wire from pin P112-5 and leave it hanging.
3. Remove the BFO B+ wires from the BFO OFF/ON switch S101. Remove and discard S101, but save the knob.
4. Cut three 20" lengths of single-conductor shielded audio cable (or RG-174 cable); from one end of each piece strip back 1" of outer plastic jacket AND SHIELD BRAID and use insulating sleeves for protection.
5. Take the new switch, a 2 pole/2 position unit for S101, and connect the inner conductor of the three shielded leads to it, in order to form the audio changeover circuit as shown in Fig. 1.
6. Mount the new switch in the vacant hole on the front panel and 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 "CW/SSB" position of the new S101).
7. Twist the 3 shielded wires from S101 into a cable and wrap with plastic tape at 3" intervals; cut to the required length to reach plug P112 leaving sufficient slack for clearance over the I.F. subchassis and tubes and run the 3 wires through the cable clamp and plug cover.
8. From the free end of each of these 3 wires remove the outer plastic jacket and carefully unravel about 1" of the shield braid, forming a 1" pigtail lead. Twist the 3 pigtails together and solder them, being careful not to melt the plastic insulation on the inner conductors. Slip an insulating sleeve over the common shield lead and over the joint.
9. Connect the inner conductor of the shielded wire from the CW/SSB (BFO ON) audio terminal of S101 to pin P112-1 (a "spare" free pin in P112); use an insulating sleeve for protection (as is done for the other wires on the plug).
10. Connect the inner conductor of the shielded wire from the AM (BFO OFF) audio terminal of S101 to pin P112-5. Use an insulating sleeve as in step 9 above.
11. Slip an insulating sleeve over the free end of the remaining wire, which should be the one connected to the rotary arm of the audio section of the new S101; this is the "audio input" lead. Solder it to the free end of the wire left hanging in step 2 and slip the insulating sleeve down over the bare connection.
12. Carefully solder the "pigtails" lead to pin P112-17 or to P112-18 (both ground terminals in P-112); this one must be the only connection to ground of all the three added audio cables. Pay close attention in order to avoid undesired contacts in P112 (eventually use tape or insulating sleeves as required); carefully replace the cover and cable clamp on P112. Tape the three new wires to the existing cable just outside the clamp.
13. Turning the I.F. subchassis over, carefully remove the bellows coupling on the BFO PITCH control shaft; remove the shaft by loosening the panel bearing (in order to clear some working space around the XV505 socket). Remove V505, 6BA6 (BFO tube) and add it to your parts box.
14. Remove the ground (and all wires) from pin 2 of XV505. This may involve shifting several ground leads to other ground tie-points on the subchassis.
15. Move the existing lead from XV505 pin 7 to pin 2 (this is the cathode tap on the BFO coil Z502) and in the following steps be sure to leave enough room for replacing the bellows shaft coupling.
16. Connect the 11K 1/2W resistor from XV505 pin 7 to ground.
17. Remove and discard C535.
18. Connect the 2.7K 1W resistor in parallel with the existing screen dropping resistor R529.
19. Connect a 5uF SILVER MICA or DISK CERAMIC capacitor between XV505 pin 7 and XV506 pin 6 (and/or 7). This is the I.F. coupling into the injection grid of the 6BE6 Product Detector.

**R-390A (Fig. 1)**



P.V. FOR HSN - 6/96

20. With a pair of small metal shears cut a 1/4" 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.
21. Mount the 200 uuF and the 510 uuF SILVER MICA capacitors on the grounded center post of the XV506 socket, letting them be supported in space by their own ground leads (about 1/4" long).
22. Connect a 56,000 Ohm, 1/2 to 1 W resistor between the free ends of the 200 and 500 uuF capacitors.
23. Connect a 0.02 uF/1,000 V DISK CERAMIC capacitor from XV505 pin 5 to the 510 uuF end of the 56,000 Ohm resistor.
24. Locate XRT510 (the 3TF7 current regulator socket in the corner of the subchassis below the BFO tuning shaft) and solder the cathode end of a 1N4007 diode to XRT510 pin 2; let the diode be supported in space by its cathode lead or install an insulated standoff on the side of the I.F. subchassis for a more adequate support (this requires drilling a hole in the subchassis).
25. Connect a 1,000-1,500 uF, 50 to 63 VDC/105° quality electrolytic capacitor from chassis ground (positive terminal) to the anode lead of the 1N4007 diode. A ground lug under the spade bolt holding the 12 mH RF choke (L502) works fine for the positive (grounded) terminal of the capacitor. Be sure the negative lead of the capacitor is properly insulated from the chassis ground.
26. Add a small insulated standoff to the XV506 screw towards the BFO can (if there are not enough screw threads to mount the insulated standoff securely, you will have to replace the screw with a longer one) and connect its lug to the junction between the 1N4007 diode (anode lead) and the electrolytic capacitor (negative lead). You can use a small piece of insulated wire for the purpose.
27. Place a small 470K, 25-turn trimmer on the outer side of the I.F. subchassis (you can use a drop of glue for fixing it temporarily in place) and route two insulated wires connecting the trimmer center lead to the 200 uuF end of the 56,000 ohm resistor (see step 22) and one of the outer trimmer leads to the junction between the 1N4007 diode (anode lead) and the electrolytic capacitor (negative lead).
28. Use 12" of RG-174 cable for the CW/SSB audio lead. Remove 1" of the plastic jacket from one end, and make a 1" braid pigtail on this end. Slip a 7/8" insulating sleeve over the pigtail and ground the pigtail to the center ground post of the XV506 socket. Connect the center conductor to the 200 uuF end of the 56,000 Ohm resistor.
29. Lay the RG-174 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 (the formerly unused pin that mates with pin P112-1 of the cable plug). Strip back 1/2" of the plastic jacket and braid from this end of the shielded wire; connect the center conductor to pin J512-1, using an insulating sleeve for protection.
30. Carefully replace the BFO shaft and bellows coupling removed in step 13; make sure the coupling doesn't accidentally ground any component or wiring.
31. Replace the IF subchassis in the receiver (allowing a bit of space in the bottom for the crossing of the two trimmer leads); insert all the plugs previously removed and temporarily reconnect the 2 control shafts and their front panel knobs (make sure they are properly positioned).
32. Plug in a 6BE6 tube in the XV505 socket; turn on the receiver and switch the new S101 to the CW/SSB position (BFO "ON"). With the antenna disconnected and the BANDWIDTH switch in the 1 Kc position, set the BFO PITCH control for the lowest pitch of the hiss. Then, without rotating the shaft, loosen the knob set screw and set the knob pointer to "0".
33. Connect the antenna and enjoy both AM and CW/SSB reception. Switch the Limiter on and with various settings of the LIMITER control carefully adjust the 470 K trimmer for the most satisfactory operation (caution: this adjustment requires several trials and a long time listening).
34. After having adjusted the trimmer properly, disconnect its leads (this requires the I.F. subchassis removal) and measure the resistance with an Ohmmeter. Remove the two wires crossing the bottom of

the subchassis and connect directly the standoff near XV506 and the 200 uF end of the 56,000 Ohm resistor with a fixed resistor of the nearest value to the measured one (1/2 to 1 W rating).

35. Replace the I.F. subchassis and enjoy your R-390A!

### AGC and Limiter mods

While you are in there, if you have not yet performed the Chambers/Lankford AGC mod in your R-390 or R-390A (see HSN #27 page 3) you should consider doing it; in my opinion that AGC mod is the best one ever proposed. Otherwise, you can perform the simpler one proposed by Capt. P. H. Lee.

To do this, you have to simply connect to the unused terminal (#10 in the R-390A, #2 in the R-390) of the AGC switch (FAST position) a 1.0 uF/630 V mylar or poly capacitor with the other lead connected to ground (i.e. to a ground lug placed in the vicinity).

It is not the best possible solution, but it really works and can help in several circumstances.

In order to reduce the severe audio distortion created by the Limiter circuit you can also perform the mod proposed by Bill Kleronomos, KD0HG, on ER #70: it is a very simple mod, as you have only to add a 33K 1/2W resistor in series of a 27K 1/2W one (R527 in the R-390A, R539 in the R-390), and I think it is well worth the effort.

### 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.*

??? During a recent complete alignment of my R-390A as per TM 11-5820-358-35, I did not perform Step 82, "Crystal Filter Neutralizing". Can anyone explain just what this step accomplishes? What are the audio or meter indications that would point out the need to perform this neutralization? Has anyone devised a simplified method with a conventional signal generator as I don't possess the AN/URM-25 as referred to in step 82 [Ron Reeland, 1921 12th St., Peru IL 61354-1708].

Ans. New subscriber Allan Mui of Seminole, OK responds to the first two questions in HSN #39 - For receiver sensitivity measurements, one might consider an article in the May 1994 issue of QST on how to construct a calibrated noise generator with output from 0.5 to 500 Mhz. One would probably need an input RF signal generator, either built in to the receiver or external, in order to use the noise generator effectively in testing. I would think that by raising the noise level to the point which caused an increase in audio output one could get a comparable measure of sensitivity (for that frequency band of the radio).

### SHORT SUBJECTS

**R-390A CARRIER METER ADJUSTMENT FIX** [James Toney, Jr. KD4UEX, Williamsburg VA; tcltd@widomaker.com] A quick, inexpensive, and relatively easy way to deal with the very sensitive potentiometer (R523) used to zero the carrier meter is to replace it. Radio Shack carries a 25 ohm 3 watt wire-wound potentiometer that works well (#271-265-B). The R523 adjustment is located on the IF strip; all one has to do is get access to the top of the radio- the IF does not have to be removed. Before changing it out, examine the original pot closely. From a top view of the pot, there should be a jumper between the left-most terminal and the center terminal. In addition, there should be a 22 ohm resistor between the outer two terminals (apparently some IF's may not have the resistor - which may have been a field/depot modification).

Three wires connect to the pot; one to the right-most terminal (viewed from the top) and two to the center terminal. Before installing the new pot, configure it in the same manner with a jumper and resistor, except use a 10 ohm 1 watt resistor instead of the 22 ohm original. The original pots are 100 ohms and with the 22 ohm resistor, the range on two I replaced went from about 0.8 ohms to 20.0 ohms. The 25 ohm pot with the 10 ohm resistor had an adjustment range from about 0.8 to 10 ohms. The new pot fit perfectly in a late EAC IF, the small tab did not fit the bracket on an older Collins IF. Adjustment was far easier with this modification. A bonus is that it is hard to distinguish from the original. [Readers should also see Dallas Lankford's discussion on this issue on the top of page 7 in HSN #29 - rcw]

## PUBLICATIONS OF INTEREST

### **TUBE LORE - A REFERENCE FOR USERS AND COLLECTORS** by Ludwell Sibley

*On a recent 'cruise' through the internet I came across an announcement for a new book on tubes plus a review of same at the New Jersey Antique Radio Club web site (<http://www.globalent.net/oldradio>). The author, Ludwell Sibley, a newsletter editor himself, graciously provided me a copy of **Tube Lore - A Reference For Users and Collectors** . . . and it's a great reference for hollow state fans. With the permission of the reviewer, Marv Beeferman, editor *The New Jersey Broadcaster*, here is an abbreviated reprint of his review:*

Up to this point, standard tube references have been dedicated to the historical development of vacuum tubes in general (Tynes's *Saga of the Vacuum Tube*, Stoke's *70 Years of Radio Tubes and Valves*) or those of a specific manufacturer (Mager's *75 Years of WE Tube Manufacturing*). In most cases, stress is placed on the progression of tube technology and refinements, with little emphasis on application. In this sense, Ludwell Sibley's **Tube Lore** comes as a welcome addition, uniting both the practical with the historical, with an appeal to the restorer, collector and historian alike. In the author's own words: *This book is intended to aid the present-day user and collector of electron tubes by providing historical insight and specific technical data. It supplies information, from a variety of sources, on the characteristics and design relationships of tubes. With this insight, the user (equipment restorer, audiophile, etc.) may be aided in finding suitable replacement tubes as the supply grows smaller, and the collector may be able to determine the nature and uses of a fresh acquisition.*

The data chapters are divided into three major sections, each with an individual theme: types preceding centralized registration by the Radio Manufacturer's Association (today's EIA), receiving tubes registered by the RMA/EIA, as special-purpose tubes as produced by multiple makers and those unique to particular manufacturers such as DeForest, Eimac, GE, Raytheon, RCA, Sylvania, Western Electric and Westinghouse.

The Information in the data sections goes beyond supplementing conventional tube manuals and guides and adds usage and application historical notes. In the author's words: *"Because it is not tied to the products of a particular manufacturer, (Tube Lore) contains information unobtainable elsewhere. (Tubemakers did not publish handbooks covering types available only from their competitors!)." Sibley also refers to his data as a "vector sum . . . because errors and ambiguities are often present in old-time tube material, and may send the unwary reader in the wrong direction."*

Additional chapters include trends in tube design which traces the physical development from acorn tube through the novar; a section on interpreting tube data with extensive interpretations of abbreviations, codes and tube numbering; a tube user's guide with practical guidance on replacement, testing, substitution, building a repair stock, repair and reactivation, identifying and dating; a section on TV sweep tubes in RF and audio use and a listing of recent tube auction prices. You'll find typical information on how to repair a loose base but also less typical guidance such as fixing broken keys on octals or restoring "open filaments."

For the novice, locating a particular tube in the data tables may take a little effort. For example, one would have to know that a 6550 is included in the RMA-EIA 5500 Series section or that a 1B23 is under the RMA 1942-1944 system. But with such an extensive listing as one finds in ***Tube Lore***, it would be difficult to index individual types in a more structured manner.

***Tube Lore*** is not a coffee table edition; extensive illustrative “filler” material takes a back seat to useful technical information. Don’t expect it to take a place next to Tyne on your bookshelf either; it would feel more comfortable on your repair bench suffering the same solder flux onslaught as Rider’s Volume 1.

*Tube Lore contains 186 pages and is 8-1/2” x 11” softbound. Price, postpaid: \$19.95 in North America; \$24.95 elsewhere. Order directly from the author - send your name, address and a check made out to Ludwell Sibley, 44 E. Main Street, Flemington NJ 08822.*

**R-390 & R-390A HANDBOOK** by Paolo Viappiani is a new book concerning the R-390 receiver family, recently published by Editrice il Rostro of Milan, Italy. Written in Italian, it consists of 144 pages and is divided into 20 chapters concerning the story, description, and much advice on modifying and aligning those beloved receivers and includes a complete biography of them. The author is a well-known writer in the field of electroacoustics - he has written several books on the matter and is the editor of CONSTRUIRE HiFi, an Italian magazine devoted to audio and hi-fi. He is also a radio enthusiast and a connoisseur of the R-390 family. In this book, Paolo has collected the results of his own investigations, experiences and studies concerning the R-390 and R-390A and a broad array of suggestions and modifications from a wide variety of US, British and Italian publications and correspondence. The book is professionally put together and is complete with photos and diagrams. The current price 35,000 Italian Lire (about \$25 US or L 15 in Great Britain, plus postage). You can contact the publisher directly at: Editrice Il Rostro - Via B. Buozzi, 5 - 20090 Segrate, Milan, Italy; phone 0039-2-2135366, Fax 0039-2-2132869.

**INTERNET ADDRESSES - UPDATE** Correction: the website for “Boatanchors” listed in HSN #39 has moved from the zynet location. Please go to <http://www.mindspring.com/~johnmb/>. You may wish to add **Fair Radio** at <http://alpha.wcoil.com/~fairradio/index.html>, **A.G. Tannenbaum** (manuals, research, vintage radios, test equipment, etc.) at <http://www.agtannenbaum.com> and **KD6CC’s homepage** with lots of interesting radio stuff at <http://www.geocities.com/~kd6cc>.

### **WANTED TO BUY / SELL / TRADE / WHATEVER**

Wanted Hammarlund I.F. Noise Immunizer for HQ-180A receiver. Please send details to: George Brown, 6 Glassel Park Rd, Longniddry, East Lothian, Scotland.

Wanted S meter for a 51J-4 [Tom Scherer, 5913 Main St., Williamsville NY 14221; (716) 634-2545, evenings (716) 741-9574]

Wanted Power cord for R-392, part #CX1957/U [Rick Sitz, 5210 14th St W #11, Bradenton, FL 34207. Call collect: 941-755-0627]

Come and Get It Parting out one R-392. You pay postage and you get the part. No PTO mounting bracket or the mounting plate for the calibrator, audio and IF decks, no cover for the gear train, no PTO. [Ralph Sanserino, PO Box 1831, Perris CA 92572-1831.

### **EDITOR’S AND PUBLISHER’S CORNER** *(Continued from pg 1)*

pick up, I may be changing the publishing schedule to once or twice a year . . . or worse! So please consider sending your articles of interest.