THE HOLLOW STATE NEWSLETTER

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Publisher's Corner

We're back! Please excuse the long delay. This special double issue, Nos. 24 & 25, was to have been the final issue. Camera ready copy was sent to Chris in May 1990, and Chris was to have printed and mailed this special final double issue, and refunded outstanding subscriptions. But it never happened. After many delays, the details of which need not concern us here, our new publisher, Ralph Sanserino (address above) volunteered to assume Chris' duties and I let myself be talked into continuing as editor. We all owe Chris a BIG THANK YOU for his years of service as publisher of The Hollow State Newsletter.

You may observe the peculiar mix of typesetting and IBM typewriter fonts. This is because I am temporarily without a computer and laser printer. But never fear, the technical quality of the newsletter will remain first rate. Looking ahead, there are a number of articles that I know you will not want to miss. For example, you may recall in HSN #23 there was an improved version of Cornelius' AGC mod for R-390As. But you haven't seen anything yet! Wait for my write up of a true fast attack, slow release AGC mod for the R-390A which greatly improves SSB and CW performance without degrading the R-390A's already outstanding AM performance. It will appear shortly in HSN #26 or #27. Also ready to print are articles on a great fast attack, slow release AGC for the 51J-4, an outstanding product detector for the 51J-4, a mod which fixes the 51J-4 band 1 insensitivity without degrading dynamic range, and an HQ-180(A) mod which eliminates overshoot and slows down the release times for much improved reception quality of fading SW broadcasts and MW graveyard signals.

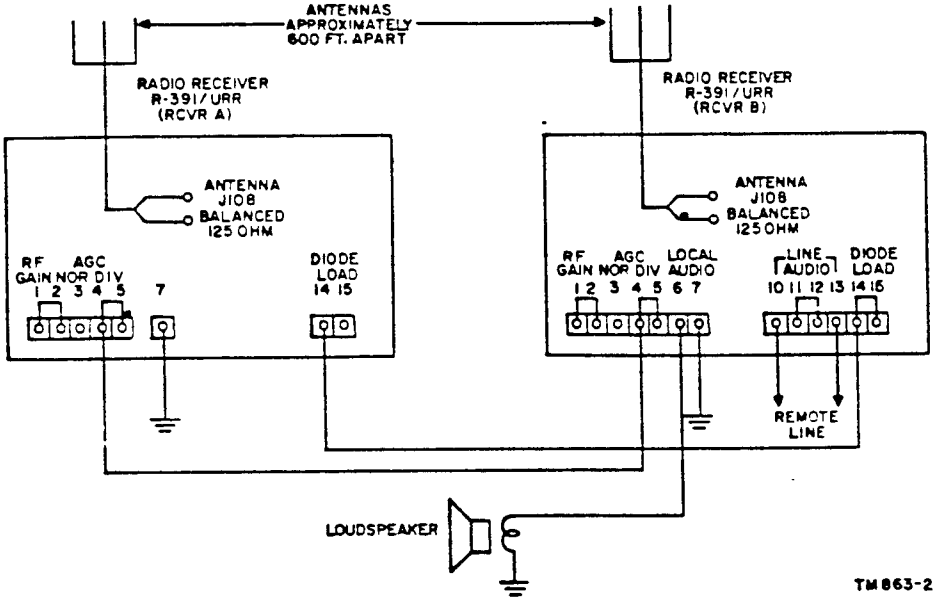
One problem that Ralph and I face is a serious shortage of cash. Most of the current HSN assets are tied up in back issues. Hopefully we will eventually convert these back issues into operating capital, but that does not solve our immediate problem. You can help by sending Ralph (address above) a one dollar bill. Please remember that neither Ralph nor I receive any pay or make any profit from HSN. Your help in this regard will be greatly appreciated.

In closing, let me mention The Collins Owners Club, C/O Bob Ralph, 4 Leam Crescent, Solihull, West Midlands, B92 8PD, England. They need someone to help in obtaining spare parts from the USA. Any volunteers?

SHORT CONTRIBUTIONS

Q-MULTIPLIER AND SB-620 FOR THE R-390A: Connecting a Q-multiplier and SB-620 (Heathkit Scanalyzer) to an R-390A is not entirely trivial. Previously I had connected a Q-multiplier to the plate of the 1st IF tube. This worked, but seemed to produce a degraded signal. Apparently there was a detuning action between the Q-multiplier and the IF strip. Since the R-390A IF transformers are stagger tuned, I decided not to mess with them. The best approach is to use a 7 pin miniature tube test socket to obtain a solder lug at pin 1 of the 455 KHz mixer V204. I used a full size test socket, so I removed the RF deck cover plate. [Many test sockets can be disassembled and modified to a shorter length so that the cover plate can be retained. Or you can remove the RF deck and add an appropriate connector beside V204. Ed.] After experimenting with different values of capacitance recommended in the Scanalyzer manual, I found that 7 pF gave the best overall results. I am currently using two Heathkit Q-multipliers, one as a notch, and one as a peak, together with the SB-620. I find the combination useful in some difficult listening situations. The SB-620 helps adjust the null and peak. (Wayne Heinen, 4131 South Andes Way, Aurora, CO 80013) [Wayne, I am sorry that I did not understand from your description how you connected this most interesting combination of accessories. I hope you don't mind my including your address so that interested individuals can contact you for more information. Readers, please include an SASE if you write Wayne. Ed.]

R-390A SPACE DIVERSITY RECEPTION: In *HSN* **3** there was a block diagram which showed two R-390As connected for space diversity reception, but no details where given. Recently I stumbled across the following from TM-863. (Dallas Lankford)



TUBE FILAMENT VOLTAGE: In *HSN* **19** Dallas commented about the undesirability of operating tubes at tube filament voltages much beyond the maximum rating. In *Glass Audio*, Feb. 1989, an article "Extending Tube Life," by Charles King, provides detailed information about this issue. Here are some of the important points reported in that article. There is considerable published misinformation on the topic of tube life and performance versus tube filament voltage. For example, a graph in Tremaine's *Audio Cyclopedia* (2nd Ed., p. 472, Fig. 11-71) shows that tubes will fail prematurely if the voltage is either too

high or too low. However, King remarked that he had found data published by GE (King gave no reference) which conflicts with Tremaine's position. The GE data reported by King included the following interesting items. "When filaments intended for operation at 6.3 V were driven at 7.56 V, 80% failed during the first 5,000 hours. When a similar number of tubes were operated at the rated voltage, 75% continued to work at the 5,000 hour point. When tubes were operated at only 5.04 V, virtually *all* lasted through the 5,000 hour point. Transconductance was also measured, and a significant reduction was noted when the voltage dropped from 6.3 V to 5.04 V, but the difference lasted for only about 1,200 hours. Throughout the test, the transconductance of the tubes operating at 5.04 V remained relatively constant, while the other tubes varied considerably." [Inspection of the graphs in King's article revealed that the transconductance of tubes operated at the rated filament voltage or higher declined quickly until the 1,200 hour point (where their transconductance became equal to the tubes operated at 5.04 V) and then declined slower thereafter (while the tubes operated at 5.04 V continued to maintain relatively constant transconductance). Ed.] King also ran extensive tests to determine the optimal value of tube filament voltage for audio equipment. He concluded that tubes should be operated at 5% less than their rated voltage. For tubes with 6.3 V filaments, this would be 5.985 VAC. (John Peterson)

L TYPE MULTIPLE SPLINE BRISTOL WRENCHES: As of November 1989, the Snap-On Tool company carried a complete set of L type spline wrenches. The following table summarizes their product line, and includes useful information for identifying spline wrench types. (Walter Hann)

Screw #	Flutes	Outside Dia.	Snap-On #	1989 Price
2	4	0.033 inches	MS2	$1.00
3	4	0.048 inches	MS3	$1.00
4	6	0.060 inches	MS4	$1.00
5	4	0.069 inches	MS5	$1.00
6	4	0.076 inches	MS6	$1.00
7	6	0.072 inches	MS7	$1.00
8	6	0.096 inches	MS8	$1.00
10	6	0.110 inches	MS10	$1.00
16	6	0.144 inches	MS16	$1.00
20	6	0.183 inches	MS20	$1.25
24	6	0.216 inches	MS24	$1.65
28	6	0.251 inches	MS28	$2.50
32	6	0.291 inches	MS32	$3.75
40	6	0.372 inches	MS40	$5.50
48	6	0.454 inches	MS48	$9.95

R-389, R-390, R-390A, R-391 RELAY PROBLEMS: Some time ago, Richard Parker and I corresponded about problems he was having with the relays in his R-389 and R-391. In cooperation with professors in the Electrical Engineering Department at Louisiana Tech University, I assisted Richard with a solution. We had planned to write a detailed description of the problem and the fix, but due to space limitation in this final issue of *HSN*, and because the problem and cure apply the the R-390 and R-390A as well, I have decided to write a generic description of the problem and the cure, and ask Richard to assist needy individuals with specific questions about the R-389 and R-391. His address is 21 Blue Grass Drive, Trenton, NJ 08638. Be sure to include an SASE if you write him. The relays in R-3XX receivers are operated from a DC voltage generated by a copper oxide or metalic rectifier. My EE friends tell me that metalic rectifiers are notorious for slowly failing, which means that we all can expect problems with the relays in R-3XX receivers

as time goes by. When the voltage of a failing rectifier drops, the relays may fail to operate in STAND BY and CAL, and the BREAK IN relays may fail to operate. The solution is to replace the rectifier (CR801 in an R-391, CR102 in an R-390A) with a full wave silicon bridge rectifier. At my suggestion, Richard used a 4 amp, 50 PIV bridge, Radio Shack # 276-1146. He also used a 25 ohm, 25 watt dropping resistor for his R-389 and R-391. The dropping resistor was used because a metalic rectifier puts out less voltage than a silicon bridge. I don't recall How Richard arrived at the 25 ohm value for the dropping resistor, and I don't know if the same value will work for an R-390A. The idea is to select the dropping resistor so that the DC voltage across the relay(s) is the same as before. Since this information does not appear to be in R-390A manuals, I suggest that you measure this value now and keep a record of it for future reference. Richard told me that the mod is easy to do in an R-389 and R-391 (Dallas Lankford and Richard Parker)

SOLDERING AND UNSOLDERING TIPS: Over the years I have worked on many fine tube type and more than a few solid state communications receivers and have had the opportunity to observe repairs and modifications done by military maintenance persons, dealers, hams, and other radio hobbyists. I have seldom seen any solder work yet, except my own and the original production line work, which was done right.

If you don't know how to make correct solder joints, go to a hamfest, buy some inexpensive electronics gear, something with tubes, lugs, and other components and a PC board full of components like you will encounter in good receivers, and unsolder enough components and wires until you understand how they are put together.

A soldering iron with a 45 watt, 900 degree element and copper tip seems optimal for working on most tube gear. A 27 watt element is about right for solid state gear. I use fine sandpaper, usually #400 and #600 wet-dry sandpaper available at most auto supply stores, and a small file to reform and clean the copper tip on a regular basis. I form my copper soldering iron tips to the shape of a blunt pencil with rounded end, or like a blunt wedge. To prepare a tip for use, I file the end to the shape I desire, sand the entire tip until smooth and shiny, plug in the iron, and touch some solder to the tip until solder flows onto the tip and tins it (covers the tip with a shiny coating). The iron is now ready to use. I use a holder for the hot iron when it is not in use. Radio Shack used to sell a cheap but perfectly acceptable soldering iron holder. I don't use steel coated soldering iron tips because the inner threads tend to corrode after some time, which makes them virtually impossible to remove from the heating element.

Some unsoldering and soldering jobs require more heat than a 45 watt iron provides. In that case I use a 100 watt soldering gun, but only as a last resort. Some people may be surprised at what a 45 watt iron can unsolder and solder. If you are the kind of person who will use a 100 watt soldering gun just because it saves you a few seconds, then you will never learn to solder well, and you will almost certainly damage some of the equipment you work on.

In my opinion a desoldering braid is essential for unsoldering wires and components in receivers and other tube gear and also works fine for PC boards. I use Chem-Wick Lite 0.1" desoldering braid. It is the only kind which works really well. I know. I have tried them all. The current Radio Shack desoldering braid is satisfactory for emergencies, but I would not use it on a regular basis.

There are two ways to desolder - destructive and non-destructive. If you are replacing a component, then it doesn't matter much how you remove it as long as you don't destroy the lugs to which it is soldered or separate the PC board traces from the board. You can cut leads close to the solder joint, remove the solder, and pry or cut the leads with a diagonal cutter blade to remove the remaining wire on the lug. But if you must reuse the component or wire, then you must try to unsolder the wire and remove it without damaging it. That requires a different approach.

My two most useful tools for non-destructive removal of wires and components from tube gear are a small curved tip hemostat and a dental probe which I filed and sanded to

a thin, sharp, angled blade on the end after breaking off part of the curve. My hemostat is not a $2.95 Pakistani special, but is the real thing ... a stainless steel, surgical grade hemostat which an operating room nurse gave me some 15 years ago. I also have a larger straight hemostat which she gave me, but I don't use it as often, and miniature needle nose pliers or the small hemostat can almost always be used instead. My dental probe is also the real thing, not one of the cheap (and useless) probes you can buy at hamfests or from industrial electronics stores and catalogs. If you are on friendly terms with your doctor and dentist you may be able to get them to order you some. Don't flinch when you are told the price. The last time I checked, I think hemostats were between $20 and $30. I wanted a spare, but after hearing the price, I decided to wait until mine broke. However, if my small hemostat broke, I wouldn't hesitate a moment to buy another, regardless of the price. The dental probe is used to pry wires away from lugs, and the hemostat is used to unbend and remove wires after they are pried away from the lugs. The hemostat is also used to crimp wires to lugs. For larger wires, like half watt resistor leads, the large hemostat is better. The hemostats and dental probes are stainless steel, so solder does not stick to them (well, almost never). This means that you can work on a solder joint with the soldering iron tip applied to the joint, which is often necessary when the desoldering braid does not remove all the solder residue.

Stranded wire is the most difficult to reuse because solder adheres to the strands. It is usually undesirable to cut off the end of a stranded wire and strip additional insulation to get clean strands because there is seldom much excess wire length. The best approach is to use a wood tongue depressor as a support, place the bare end of the stranded wire on the tongue depressor, place desoldering braid on top of the stranded wire, and apply the hot soldering iron tip to remove as much solder residue as possible. Then hold the stranded wire in one hand (some distance away from the end), and use the tip of the hot soldering iron to separate the strands. The strands can then be straightened without breaking them, twisted together, and recrimped at the lug the wire was removed from.

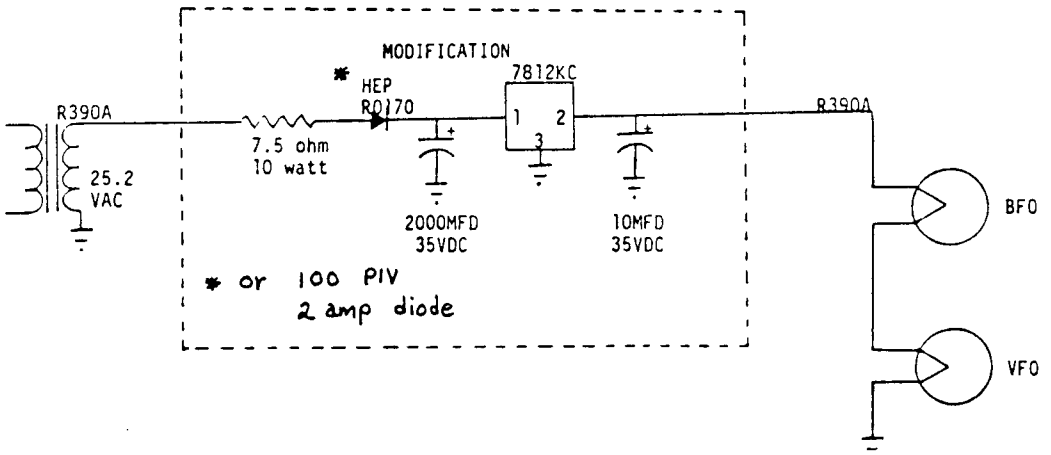
It is generally much easier to remove components from PC boards, but also much easier to damage a PC board trace. Use Chem-Wick Lite 0.1" desoldering braid to remove all solder from around the cut lead where it pokes through the PC board. Do not leave the hot iron tip applied to the braid (and hence the PC board) any longer than necessary. Excessive heat will cause a copper trace to separate from the board. With small needle nose pliers or a small screw driver straighten the lead. Do not pull down or push up or you may separate the trace from the board. Push and pull from side to side. Straightening the lead will usually break any small solder bridge with the PC board trace. If not, look closely to see where the remaining solder is, use more desoldering braid, and then straighten the lead again.

I'll conclude my tips on soldering and unsoldering with a few don't's and do's. Don't lay the end of a wire on an existing solder joint and dribble more solder onto the joint. Don't heat an existing solder joint and stick the end of a wire into the melted solder. Don't flow solder onto a joint by applying the solder directly to the hot soldering iron or gun tip. Don't apply solder to a joint with mechanically unstable wires; if anything moves except flowing solder, it is not a good solder joint. Don't cut leads at a lug and leave the cut ends crimped to the lug; if you must cut leads, then you must remove the cut ends. Don't burn nearby insulation or components with your hot soldering iron or gun tip. And there are several things you should do. Do crimp all wires firmly and securely to a lug before soldering them. Do apply a small amount of solder directly to the soldering iron or gun tip to help conduct heat to the joint if it is necessary, especially for joints with multiple wires. Do apply most or all of the solder to a joint without making direct contact with the soldering iron or gun tip. Do protect nearby insulation and components from your hot soldering iron or gun tip with pieces of wood or metal. (Dallas Lankford)

3TF7 REPLACEMENT: Here is another solution to the expensive and difficult to find R-390A ballast tube. It is taken from a MARS article by Don, AFF4MS in the March-April

1984 issue of Department Of The Air Force *Communicator*, Air Force Communications Command, HQ AFCC/TPMOG, Scott AFB, IL 62225. The schematic below tells most of the story. The article suggests removing the 3TF7 tube socket and making the circuit a permanent addition to your IF subchassis. I am opposed to that approach, and recommend that you get a 9 pin miniature tube test socket with solder lugs and make the circuit plug-in. Well, you can't quite make it plug-in because none of the 3TF7 pins are grounded. You will need a short length of insulated, stranded wire with a lug on one end to attach to a nearby screw. The 7812KC regulator package should run warm to the touch, but not hot. I don't recall who sent this article to me.

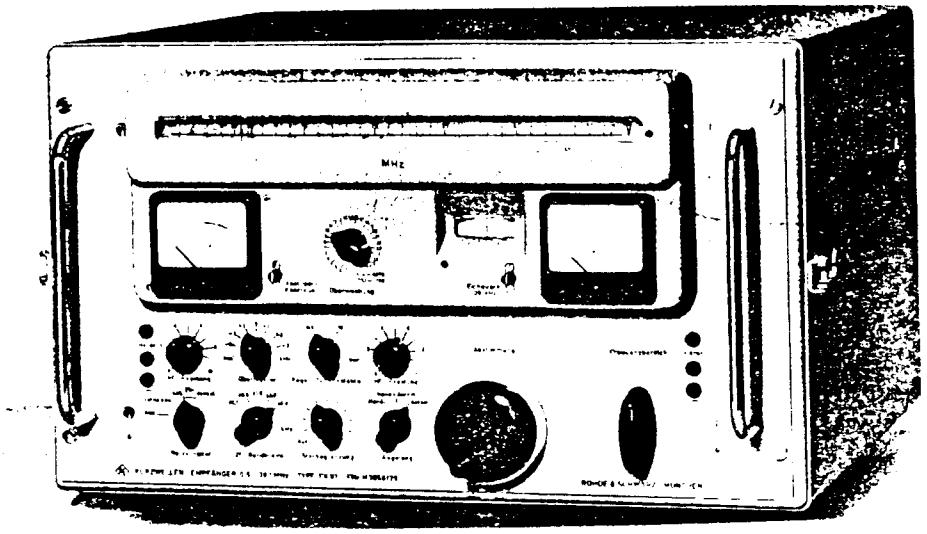
An identical circuit, apparently taken from the article above, was published in the Nov. 1985 issue of *AM Press Exchange* by B. Harp, N4GSB. I should mention that this ballast tube replacement is not as simple as Irving Megeff's dual 13 volt 5 watt zener diodes and 40 ohm resistor circuit which appeared in *HSN* **17** (Fall 1987). Also, as George Ross pointed out in *HSN* **23** (Fall 1989), after he did the dual zener mod, the 5 watt (40 ohm) resistor recommended by Megeff ran hot. It was replaced by three 15 ohm 10 watt resistors in series. This suggests that a higher wattage dropping resistor may be desirable in the mod below. If the zener diode mod is simpler, then why consider this mod? As far as I know, no one has compared these mods with each other or with a 3TF7 ballast tube to determine which one results in a more stable PTO frequency. Obviously, a performance freak would want to try all three and choose the best. (Ed.)



NRD-525 BEATS R-390A?: I can't resist a parting shot on this topic. In the March 1987 issue of *Lowdown* we read the following on page 9 of an article by Sheldon Remington. "But the newer equipment, such as the R70/R71 series, the R7A, the NRD-515 and 525, and the receiver sections of Kenwood amateur transceivers, will substantially outperform the classic hollow state units like the R-390A in this respect [dynamic range, Ed.]." I guess Sheldon doesn't know about Sherwood Engineering's narrow (2 KHz test signal separation) dynamic range comparisons where an R-390A (79 dB) beat an NRD-515 (77 dB), R7 (75 dB), and R70/R71A (62 dB) or about Magne's narrow (5 KHz test signal separation) dynamic range measurement for the NRD-525 (69 dB). Add to that the limited number of bandwidths (except for the NRD-515 and -525 which have four bandwidth choices, as opposed to six for an R-390A), poor audio, and assorted other problems of solid state receivers, and one has to wonder why people buy them. For example, both the NRD-515 and -525 suffer from limited ultimate skirt rejection (65 dB) due to signal leakage around the filters (Sherwood Engineering has a $39 mod which improves ultimate skirt rejection to 85 dB, compared to the 90+ dB ultimate rejection of an R-390A), a -525 has terrible audio on strong signals in AM mode because of audio on the AGC line (send me an SASE and $2 and I'll explain how to fix this), a -525 has bad audio generally because of hiss due

to broadband IF amplifier noise (this is harder to fix, you'll have to spend several hundred dollars for ESKAB's PLAM board and do the mod yourself), and a -525 emits RFI in the BCB, rather strongly in the 500-1000 KHz range, so that a loop antenna cannot be used effectively, much to the disappointment of MW DXers. Add to that power supply hum (which can be eliminated with additional power supply filtering) and internally generated hum (which cannot be eliminated), and you'll understand why I say that an R-390A is still the best receiver ever, solid or hollow state. (Dallas Lankford)

ROHDE & SCHWARZ EK-07-D/2: This receiver, built between 1958 and 1966, was intended for commercial reception and monitoring purposes. Uncompromizing quality and complicated circuitry make the receiver particularly useful for long term use and reception under difficult conditions. Even today, the technical specifications of this 15 year old [in 1981, Ed.] receiver are at the limits of what is possible to provide. The purpose of this report is to describe the characteristics of the receiver and how it performs in use.



Mounting Problems

With a weight of 66.3 kg (146 lb) and dimensions of 54 x 33 x 55 cm (21.5 x 13 x 21.6 in), the EK-07 is not suitable for desktop operation. It is better to mount it in an iron frame some 15 cm (6 in [? Ed.]) from the floor. In this way, operation from above is more comfortable. The antenna and loudspeaker connections at the back will in any case be rarely changed, but if so, you will have to get on your stomache. [This sounds like the receiver is mounted on its back, with front panel facing up. Ed.] The receiver is designed for normal mains use; 130 watts will be required.

High Quality German Work

The enormous front plate with the large hand drawn linear scale and the symmetrically oriented meters always impress. Buttons, knobs and switches have been designed for decades of use. Some of the adjustments do not have the satin smooth feel of some modern receivers, but they are easy to grasp and give a solid feeling. The main tuning is satin smooth. A large flywheer mass and ball bearing races make the tuning of stations a real pleasure. The ratio of coarse to fine tuning is 30:1. [Except for the lowest three bands where 3 fine tuining knob turns are required to cover 100 KHz, the fine tuning is 1 knob turn per 100 KHz, just like an R-390A. Ed]

The EK-07 has practically all the attributes we could wish for in a good DX receiver: RF gain is manually controlled, automatic or manual AGC with an adjustable treshold. The AGC time constants are adjustable between 0.1, 1 and 10 seconds. [These are release times. Ed.] BFO, noise limiting and a calibration oscillator are built in. There are 6

bandwidths from 0.15 to 6 KHz.

The visible resolution of the selected frequency is better than 0.5 KHz; the scales can be recalibrated. An AF amplifier with more than sufficient output is built in. On the front panel are two connections for headphones; the connection "narrow" is fed through a complicated LC filter and is particularly suitable for CW reception.

The mains switch has a position which has completely disappeared from modern receivers: Preheat (Standby). In this mode of operation only the valve heaters are connected. The HT voltage is then switched on with the "bright" (Hell) position, and off with the "dark" (Dunkel) position. Bright and dark refer to the frequency scale lighting, which only has any significance when the radio is actually in use.

The right hand meter shows the AF level at the loudspeaker or line output. It is also used as a meter when checks are carried out on the whole receiver with the knob "Performance Check" (Überwachung). The knobs for "Tuning Check" and "Crystal Calibration" permit an exact adjustment of the separate range scales with a received frequency. The large linear frequency scale covers a range of 3 MHz with 9 separate bands above 3.1 MHz. Below 3.1 MHz the division is different: 0.5–1.1 Mhz, 1.1–2.1 MHz and 2.1–3.1 MHz. All of the ranges are selected with the large flat switch (bottom right) which operates a series of tunes on a turret tuner. [Like the SP–600?! Ed.]

At the back of the receiver access is provided to the main oscillator, other oscillators, various IF frequencies, as well as the AF crystal calibration frequencies for various test purposes. The AGC voltage is also accessible and the EK–07 can be used in diversity mode when other similar receivers are available. Then the receiver only takes the best available signal.

Antennas are connected to a coax or a simple 4 mm socket. When the receiver is used in connection with a transmitter, a mute switch can be operated by a relay from the transmitter.

The 27 valves [tubes Ed.] of the EK–07 require a ventilator fan which is also at the back. The quiet humming of the ventilator is annoying during long periods of use. After removing four screws, the whole receiver can be slid out of its steel case. Operation out of its case is only possible with the aid of a special connector (20 way) which could be a disadvantage for alignment or repair. [Why can't adapters be fabricated? Ed.] The test receiver only required the replacement of a fuse and the replacement of a low noise valve for the RF amplifier. I ordered a second fuse and this should last for the next 15 years: that is a measure of the standard of workmanship. [Apparently a special fuse is required. Ed.]

Some Details

A detailed circuit description is not possible within the limits of this article. A short description of circuitry gives a good idea of the extent of the effort which has been put into this receiver.

The antenna voltage reaches the first mixer after passing through a three stage preselector. Signals between 0.5– 3.1 MHz and 3.1MHz–6.1 MHz are converted to a first IF of 300 KHz; the receiver is a single superhet. [Images? Ed.] From 6.1–30.1 MHz a 1st IF of 3.3 MHz is used, and then a 2nd IF of 300 KHz again.; here the receiver is a double superhet. At the end of each 1st mixer stage is a complicate 4 pole filter, and after the 2nd mixer (i.e., ahead of the 300 KHz IF transformer) is the four way selectable IF bandwidth. In the narrow setting, a real double crystal filter is used. There are three other IF stages with complicated three and four pole filters. After this, the signal is envelope demodulated, or the BFO is switched in. A switchable and adjustable noise limiter is before the AF amplifier.

The AGC circuitry is unusually complicated: there are three different types of controls which operate on seven valves. The completely modern form of generation of the oscillator frequencies is the particular feature of this receiver: a special form of PLL [phase locked loop Ed.] is used. There are several forms of compensation for temperature, aging,

valve changes, etc., which give this valve receiver an unusually good short and long term frequency stability. An extremely accurate crystal calibration receiver [crystal oscillator? Ed.] permits the calibration of the frequency scale every 300 KHz. Between these points the accuracy of the calibration is better than 0.5 KHz. The mains supply is protected from mains borne interference and the HT is stabilized.

A very complicated test system is built in for quick checking of correct functioning or fault finding, which from a switch on the front panel can locate faults to a particular stage in a few seconds. The internal construction is modular; whole groups can be removed and replaced.

How complicated this receiver is can be seen from the master oscillator. The unit is contained in a thick cast metal box. A silica gel package compensates for humidity changes. In case this oscillator has to be aligned, there is not only the normal L/C adjustment, but in order to be able to have the most accurate possible readings from the frequency scale, 32 separate trimmers (on the tuning capacitor!!! translator) can be adjusted.

All components have been tropicalized. All metal components are either rust free or have been specially treated. The visible degree of effort expended on fine tolerance engineering with tiny chain drives, worm gears, etc., can hardly be described in words. This receiver cost DM 25,000 [over $6,000 Ed.] when made. Nowadays (1981) such a receiver could not be made for twice as much considering the complicated mechanics. The modern successors, e.g., EK–070, replace mechanics with complicated microprocessor technology and in this way the receivers have become much smaller, lighter and cheaper. The specifications of such newer receivers only improve on their predecessors with respect to the accuracy of the frequency display. [Well, not quite. All aspects of such modern receivers are microprocessor controlled. Ed.]

Selectivity, sensitivity, large signal handling and AGC performance of the old EK–07 are now, as then, simply first class.

Practical Operation

The usual mode of operation is unfortunately only for A1 to A4. For SSB reception, a special adapter (NZ–10) is requires, which is unfortunately no longer manufactured. The biggest problem is, as I mentioned, mounting the radio. When you have solved that problem, the gray monster gives you a reception experience that only the NRD–505 in the amateur category can match. [Come on! An R–390A is surely the equal of an EK–07 by any measure you want to use. I think an R–390A is superior for obvious reasons. Ed.] Whether long wire or active antenna, frame aerial or directional ferrite antenna, in all these areas the EK–07 leaves nothing to be desired. The frequency readout accuracy of 0.5 KHz is adequate. The signal strength indicator is a great help when different antenna are connected as it shows a true input signal level. The manual adjustment is excellent in the thickly populated tropical bands. The selectivity of 1.5 KHz is adequate for every sort of interference. The wider filters permit an unusually clean AF when the reception conditions permit it.

This Rolls-Royce is not entirely free of criticism: a notch filter was badly missed [and difficult to add because of the 300 KHz IF, Ed.] as well as an internal speaker (Why? Who uses a 146 lb receiver as a walkman? translator). The built-in noise limiter takes away some of the AF and produces unacceptable distortion at the end of its frequency range. A notch filter would be better here. Both of the meters had no illumination which required that the whole receiver be taken out of its case just to change a fuse. The running noise of the fan is annoying during quiet evenings when one is listening with a loudspeaker. As is usual for all valve radios, one has to wait after switching on until the valves can have the HT applied (Barkhausen one minute's silence). [Do you suppose we should switch an R–390A to STANDBY for 1 minute before applying power? Ed.] As with all radios of this type, full stability is only reached after about 60 minutes' warm up, which is usual and is not a fault.

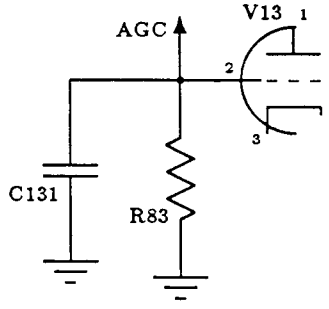
The remarkable frequency stability is shown, for example, in combination with a RTTY

decoder (Theta 350). After the required warm up period, the radio can be used for hours without any adjustment, The versatile connections at the back can be used in the laboratory in connection with reception tests, whereas special receivers with these facilities are prohibitively expensive. For this reason, the EK–07 is used in the WWH Technical Lab (Lichte's own lab, I believe, translator) after the specifications of the radio have been confirmed in a series of extensive tests.

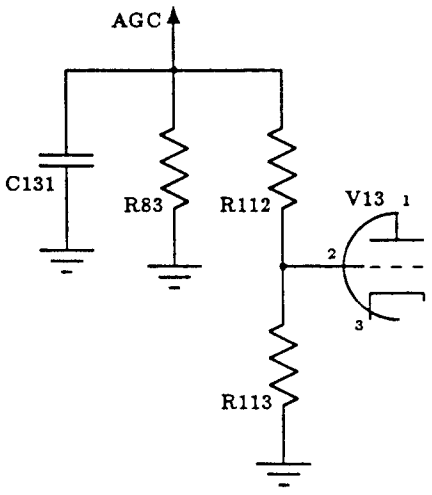
Size, price, operating comfort – there is no modern digital display – mean that this receiver is not to everybody's taste. However, this vintage radio can still deal today with any DX reception. (Rainer Lichte, translated from the German by Denzil Wraight, from an unknown 1981 publication)

[There was another page of specifications from Denzil Wraight's translation of Rainer Lichte's article which I have not included because most of the information has already been stated in the article. The article and spec sheet left me confused about the selectivity bandwidths for the EK–07. Three bandwidths (6/60 dB) were mentioned specifically in the spec sheet: 8/26, 6/14, and 4/9 KHz; two bandwidths (presumably 6 dB) were mentioned in the article: 0.15 and 1.5 KHz. However, the article stated that the bandwidths were 0.15–6 KHz, which is not consistent with the spec sheet. The spec sheet gave the following additional information: sensitivity – better than 15 microvolts, 0.5–3.1 MHz, better than 2.6 microvolts, 3.1–30.1 MHz; audio power – 2.4 watts at less than 10% THD; audio frequency range – 33 to 6,400 Hz with 3 dB variation; power required – 110 or 220 volts, 135 watts; IF rejection – about 75 dB; AGC control range – about 92 dB. No image rejection figures were given. Denzil told me that the /D from EK–07/D signifies the German version, and the /D1 and /D2 signify different connectors on the rear panel. The front panel view at the beginning of Denzil's translation is taken from the article "Die deutsche Antwort auf Collins? Rohde & Schwarz EK 07," (The German Answer To Collins? Rohde & Schwarz EK 07), pages 99–103, *Oldie KW-Empfanger*, by Nils Schiffhauer, Baden-Baden, 1987, ISBN 3-88180-302-5. Ed.]

HQ–180 S-METER AMP CORRECTIONS: In my article on HQ–180 S-meter amp variations which appeared in *HSN* **17** (Fall 1987) there were errors: the third schematic from the left, called "Early HQ–180A," does not correspond to any HQ–180A, the second schematic from the left and the last (fourth) schematic from the left should be labeled as below. In addition, below I have shown C131 as part of the RC networks at pin 2 of V13 where it is wired, although it is shown at a distant position on the HQ–180 manual schematic. The values for C131, R83, R112, and R113 are 0.01 mF, 4.7M, 2.2M, and 4.7M respectively.



HQ–180 and HQ–180A, series 1 and 2



HQ–180A, series 3 and 4

51J-4 PRODUCT DETECTOR AND AGC MOD: After warning everyone about untested mods on page 6 of *HSN* **22** (Spring 1989), I should have followed my own advice. But curiousity and a spare 51J-4 which had already been "chewed on" a little prompted me to try a product detector and fast attack, slow release AGC mod. I used a variant of Commander Paul H. Lee's product detector with component values determined to some extent by the already existing component values in the 51J-4. Fortunately, I had all the articles about 51J product detector and AGC mods on hand, including Frisco Roberts' remarks (from "Comments" on page 6 of the Oct. 1978 issue of *Ham Radio*) about adding a 10 mF electrolytic at the junction of the screen and plate resistors to cure a motorboating problem. Naturally, my product detector mod motorboated. Happily, Roberts' fix took care of the problem. Unhappily, as I mentioned in *HSN* **22**, the AGC mods suggested by Scherer, W2AEF and Orr, W6SAI were uniformly disappointing for various reasons. However, I persisted, and eventually developed an AGC mod which is fast attack and slow release, and gives satisfactory results on SSB/CW and AM. That is the good news. The bad news is that it requires replacing the BFO switch with a switch which is not an off the shelf item, and it requires a difficult to find cable clamp as part of rewiring the cable bundles attached to the back of the front panel. Also, the mod takes many hours. But if you just have to try this mod, send me a large SASE plus two $1 bills, and I'll send you about 25 pages of my notes and drawings which should be sufficient for you to duplicate my mod. (Dallas Lankford)

SECRETS, TRICKS, CHEMICALS, ETC.: Joe Bunyard and I have discussed doing a "Hints and Kinks" or "Tips" contribution for some time. With each of these techniques, you should practice it first on a similar piece of material before using it on your favorite receiver or other piece of equipment. If you don't have a similar thing on hand, attend a hamfest or order some junk from Fair Radio. In the credits, (JB) will denote Joe and (DL) will denote me. (Ed.)

Removing Varnish Sealed Screws

In commercial (51J series receivers) and military (R–3XX receivers) equipment, screws and set screws are sometimes sealed ("frozen") with varnish, often green varnish. For example, the #2 Phillips screws on the R–390A antenna relay, the spline set screws on the BFO PTO bellows coupler, and many set screws in the 51J series receivers come immediately to mind. I you see any green varnish around such a screw or set screw, don't even try to remove it. Get out your soldering iron (I use a 45 watt iron with a pencil point tip), heat the iron, and apply the tip directly to the screw, set screw, or set screw hole for about 20 seconds. Then try to remove the screw. If it does not turn with reasonable pressure, repeat the heating procedure for about 30 seconds and try again. I have never stripped a screw with this procedure. (DL)

Polishing Plastic

Toothpaste is an excellent plastic polish. I first read about using toothpaste to refinish dull or scratched plastic meter face covers in an old *73 Magazine*. If scratched, sand the meter cover dull smooth in one direction only using 0000 steel wool. Then polish it using toothpaste and your finger. It works. (JB)

Novus #1 and #2 plastic polish, available from Antique Electronic Supply of Tempe, AZ, works great. Directions are on the bottles. We have used it to clean and polish 51J knobs and meter face covers. (JB & DL)

Joe Bunyard is the expert on polishing plexiglass. Somewhere I have a detailed description of how Joe polishes plexiglass edges after they have been cut with a saw, but I can't find it (and it may be too long for this farewell issue). It involves sanding the surface smooth, using several grades of jeweler's rouge with a (motorized) buffing wheel, and finally using Novus #2 and #1 (by hand?) to remove the yellow haze left by heat of the rouge if I remember correctly. His results are amazing. If you need to polish plexiglass, write me (include a SASE) and I'll try to find Joe's description, or maybe talk Joe into corresponding with you. (DL)

Rumor has it that Brasso works fine on plastic. The Vietnamese are supposed to sand dull watch crystals to remove scratches, and polish the dull finish with Brasso. (JB)

Joe sent me a copy of some pages from "Secrets Of Corvette Detailing" which describes various techniques of plastic refinishing and polishing. It begins, "Scratched or cloudy plastic can be brought back. The trick is to remove the damage with a fine abrasive, then proceed through a series of finer abrasives until the surface is clear again." Among the abrasives mentioned are 600 grit sandpaper (available at auto parts stores, ask for #600 wet-dry sandpaper) dulled by rubbing two pieces together, jeweler's rouge (any good hardware store has it), regular car wax, rubbing compound and polishing compound (at any discount store), Meguiar's Sealer and Reseal Glaze, Blue Magic Metal Polish Cream and Ultra Finish (made by Liquid Glass of NJ). (DL)

White Filled Engravings On Black Plastic Knobs

Lacquer Stik, available from Antique Electronic Supply of Tempe, AZ, is just the thing for refinishing HQ-180 knobs and probably 51J knobs after you have cleaned and polished them. Cleaning and polishing often removes the white lines. Lacquer Stik is a solid white lacquer, very thick. You rub it into the engravings and wipe off the excess. (DL)

Liquitex Acrylic Artist Color, available at all artists stores and Wal Mart, can be used to refinish engraved knobs and dials, and is available in titanium white for late date military gear and parchment white for the antique look. (JB)

Cleaning Front Panels And Other Surfaces

Go Jo or Goop or any lanolin, jelly-type hand cleaner is a favorite of mine for cleaning front panels. You can let it sit on them. I use a toothbrush with Goop in the R-390A front panel engravings. It works wonders. (JB)

Spray N Wash is supposed to remove calibration sticker residue from front panels. I have never used this, but I know that Goop works well for this task. (JB)

Mineral Spirits is a good, safe, general purpose cleaner, and is easy to buy as charcoal lighter fluid. (JB)

Lacquer thinner is a much stronger solvent than mineral spirits, and should be used with caution on delicate or painted surfaces. However, for tough jobs it is much better than mineral spirits. (DL)

** Choke cleaning solvent, such as Berryman B-12, is a super powerful solvent useful for cleaning grease encrusted R-390A RF deck gears and racks. Remove the RF deck from the R-390A and remove the Veedor Root counter from the RF deck before using these solvents. (JB & DL)

A brass bristle brush is useful for cleaning grooves in metal surfaces, and won't damage the metal surface. (JB)

Polishing Metal

Nevr-Dull is the best metal polish you will ever use. I don't use anything else for my radio hobby work. If you can't find it in a nearby store, call The George Basch Co., Inc., Freeport, NY 11520 for your nearest distributor. Nevr-Dull is excellent for brass, nickel, and silver plate. Tarnished plated screw heads can be polished by wrapping the threads in thin rubber (a piece of bicycle tire inner tube), inserting the wrapped threads in your drill, and applying a piece of Nevr-Dull while spinning the screw head. Be careful what you use Nevr-Dull on. Some metal surfaces are chemically treated to retard rust and corrosion (some gold colored surfaces in 51J and R-3XX receivers). Nevr-Dull will remove the colored chemical surface. (DL)

Brillo Nylon Scrubber Pads, or SOS Pads, or Scotch Brite Pads (all the same kind of pads) can be used just like fine sandpaper, seem to come in different coarseness, and leave little gritty residue as you get with sandpaper. These will clean, smooth, and shine metal surfaces without scratching or removing metal. They are great. (JB) I agree. I used some recently to clean a PC board before and after etching. These pads are much better than steel wool. (DL)

** After the above was written, I learned that most solvents contain an acid which is used to dissolve the fibers which are normally contained in grease. You should not use such solvents, such as B-12, on R-390A racks and gears. NAPA Brake And Electric Motor Cleaner is the only solvent I know of which does not contain acid.