HOLLOW STATE NEWSLETTER

"For lovers of vacuum tube radios"

Issue # 48
Summer-Fall 1999

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

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SUBSCRIBER SURVEY RESULTS

Reid Wheeler, Editor

First let me express my appreciation for the good response I received to the survey in HSN #47. A total of 66 (52 by snail mail, 14 by e-mail) were returned. Although there are 250+ subscribers, this is considered a pretty good response. I also appreciate the many supportive comments on the work Ralph and I do to keep HSN going. Some statistics from the responses:

- Average years of subscription = 6.7;
- Percent that consider HSN a primary source of information = 46%;
- Percent with home internet service = 68%;
- Percent of those who do have internet service but do not subscribe to either 'boatanchors' or 'r-390' mail list = 38%;
- Percent who have an R-390A and/or R-390 = 77%
- Percent who do their own service/modifications = 89%; average skill level (1 to 10 scale) = 6.6

The comments from the questions concerning changes and improvements and specific issues to be covered in future issues of HSN included:

- More on other receivers such as National, Hammarlund, 51J's, etc.
- More on test equipment and scopes and how to use them in radio servicing.
- More on R-390 non-A receivers.
- Compile and update list of current parts sources.
- Compile and update list of technical experts and businesses that can repair/service BA's.
- More on SSB adapters such as the HC-10 and CV series.
- Improve the Q and A section to a regular column answered by a knowledgeable, technical person.
- Restrict modifications only to those that can be 'un-done'.

- Keep articles and information at a technical level that 'average' or less skilled owners can use.
- Articles relating personal experiences of those who used/serviced military radios.
- More 'history' articles.
- More 'general knowledge' articles.
- Periodic list of 'key discoveries' that appear on the internet mailing lists.
- More frequent issues.
- More detailed articles on restoration.
- Put back issues on CD.

All these are good comments but they primarily give me an idea of what **WE** need to do to keep HSN as we know it alive and well. "WE" is capitalized and bold because **YOU**, the readers of HSN, are the primary source of new articles. I have been reasonably successful in persuading the contributors to the internet mailing lists to expand their ideas into full articles when I see topics that appear to be of general interest to HSN subscribers. . . . but I really need YOU to write up your experiences, etc. and send them in. Many of the preceding 'comments' from the survey should give you some good ideas.

If those who responded to the survey do represent a cross-section of HSN readers, it appears that the internet, although providing an excellent, contemporary service and resource, has not yet replaced paper publications like HSN. And for those of you who are on the internet and have not yet subscribed to the 'r-390' or 'boatanchors' mail lists, I urge you to do so. The 'r-390' list is free – send the text 'subscribe r-390' in the body of an e-mail to majordomo@qth.net. The 'boatanchors' list costs $20 annually – send the text 'subscribe boatanchors' in the subject line of an e-mail to listown@jackatak.theporch.com.

Now on to the meat of this issue –

TAMING POWER-ON CURRENT SURGE

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The Problem

When I bought my first R-390A, the radio lit up as soon as I plugged it in, even though the Function Switch was in the Off position.

I knew essentially nothing at that point about the R-390A, but with the help of the folks on the Boatanchors reflector I soon discovered that the microswitch used as the main power switch was notorious for welding in the On position. I was able to repair the switch, but was curious as to what might cause this problem, and what could be done to prevent it.

There seemed to be two views among R-390A enthusiasts. One was that the momentary arcing that occurs whenever a switch interrupts the current flow was the culprit. The other view was that the heavy current flow at the instant the switch closed was the problem. Having pondered this, I think both play a part!

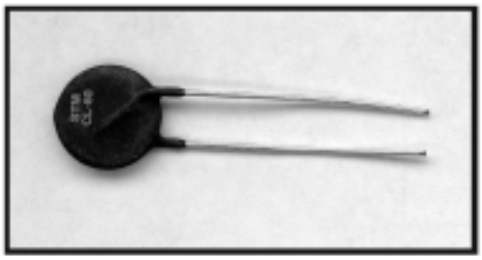
When the switch opens, a momentary arc occurs. How significant the arc is depends upon several factors, including the point in the AC voltage cycle when the circuit is interrupted. Over time, the surface of the switch contacts will inevitably develop a certain amount of pitting from this arcing.

But I think the switch failure occurs on switch closure. At the moment of contact, the radio's transformer looks like a resistance of less than one ohm. Although this rapidly becomes a much higher reactance, depending upon the point in the AC cycle when contact is made the initial current flow can easily exceed the rating of the microswitch contacts. Also, with some previous arc damage, initial contact between the two switch parts is likely to be between the damaged areas (little peaks and little craters). The local heating could be enough to sooner or later weld the contacts together such that the switch will not open.

Switch designers know about these kind of effects, and design-in measures to reduce the potential for failure. But whether through poor design, or overly long operating life, the problem is one that will occur sooner or later in most R-390As. Unfortunately, satisfactory replacements for the R-390A microswitch are hard to find.

Current In-Rush Limiters

One way to reduce the initial current flow is to install a small device called a current in-rush limiter in the hot AC line. The one shown in the photos is made by Keystone Thermometrics and is available at most large electronic suppliers. The limiter is essentially a positive temperature coefficient thermistor designed to handle current. At room temp it exhibits some resistance. As current passes through and it warms up, this resistance drops by a factor of a hundred or so. Keystone limiters are rated by current handling capability (1.1 to 16 amps) and cold resistance (0.7 to 120 ohms). Not all possible combinations of resistance and current are available, but my Mouser catalog lists about twenty to choose from. They cost a couple of bucks each, which is cheap insurance!



Many different kinds of electronic gear could benefit from such a limiter. However, it is very important to understand that these devices are essentially fancy resistors, and generate significant heat. There must be adequate air flow around them to protect other components.

The specs for in-rush limiters specify the cold (room temperature) resistance, and the maximum steady-state current rating. To pick the right unit, first determine the steady-state AC line current of your radio. That is, the current draw after it is warmed up and with all accessories turned on. Pick a unit that has a steady state current rating of 120 - 130% greater than this current, and that has the highest cold resistance. This allows a margin of safety should you live in an area subject to high line voltage and provides the greatest power-on protection.

As an example, suppose your radio draws 2.5 amps. The Keystone type CL80 is rated for 3.0 amps with a cold resistance of 47 ohms - a nice fit. The CL110 will handle 3.2 amps, but the cold resistance is only 10 ohms. While this would work, it would not provide the same level of protection.

You can probably determine the steady state current from either a tag somewhere on your radio, or from the manual. However, because line voltages do vary across the country, it might be useful to actually measure the current draw. This can be done by inserting a small resistor (say 1 ohm) in the line and measuring the AC drop across it.

Applying to the R-390A

The R-390A is nominally rated at 225 watts for 115 line volts with the Ovens switch on, and 140 watts with it off. The in-rush limiter is chosen on the basis of the maximum possible load, even though most people operate their R-390A with the Ovens switch off. The steady-state line current will thus be about 2 amps, and with the elevated line voltages found in some areas could go to 2.1 amps.

There are several possible choices: CL80 (47 ohms and 3 amps), CL160 (4 ohms and 2.8 amps) and CL170 (16 ohms and 2.7 amps). The best choice is again the CL80. It has an adequate current margin, and the highest cold resistance. Exactly the same analysis can be used to select the best limiter for any other radio.

Installing an in-rush limiter in the R-390A is very simple. There is a short wire that connects the centre lug on fuseholder F101 to the top lug (closest to the C103 bathtub capacitor) on the FL101 AC line filter mounted on the rear apron. At least this seems to be the usual configuration, but I do have one EAC chassis that connects this wire to the other FL101 lug. It doesn't matter, just be sure that your line cord is wired so that the in-rush limiter is in the hot lead between F101 and FL101.

Remove this wire and replace with the CL-80 current in-rush limiter. There is quite a lot of space here, so the device can be mounted well clear of surrounding components. Don't just tack the leads to the lugs, but make a solid physical connection so that the limiter will stay exactly where you install it!

The main change you will notice when turning the radio on is that the antenna relay now does a slow "ka-chunk" – which means you've been successful!

I'm indebted to the great folks on the Boatanchor reflector who helped me to understand the operation and use of in-rush limiters.

B+ DELAY FOR THE R-390A WITH SOLID STATE POWER SUPPLY MOD

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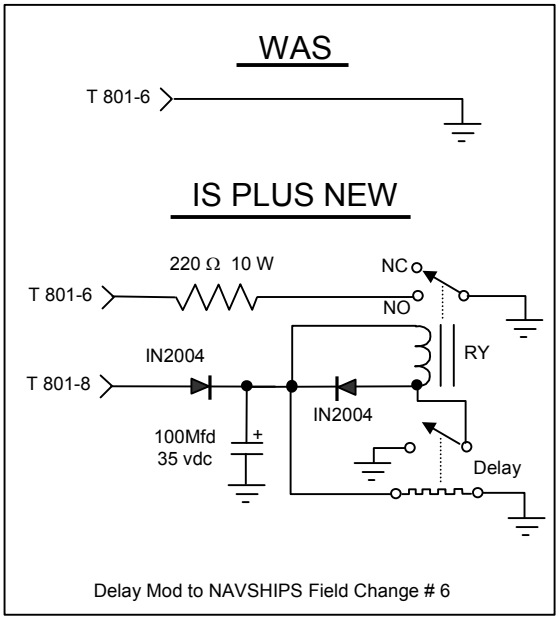
The power supply module is available from several sources in case you want to keep one intact for the 'original' configuration. There are several ways to approach this, I chose one that was dictated by the parts that were in my junk collection, yet I wanted it to look good and to achieve the expected end result. My unit already had the Navy HV rectifier modification which can be found elsewhere. *[The original wiring and the HV rectifier mod are shown near the end of this article – Ed.]*

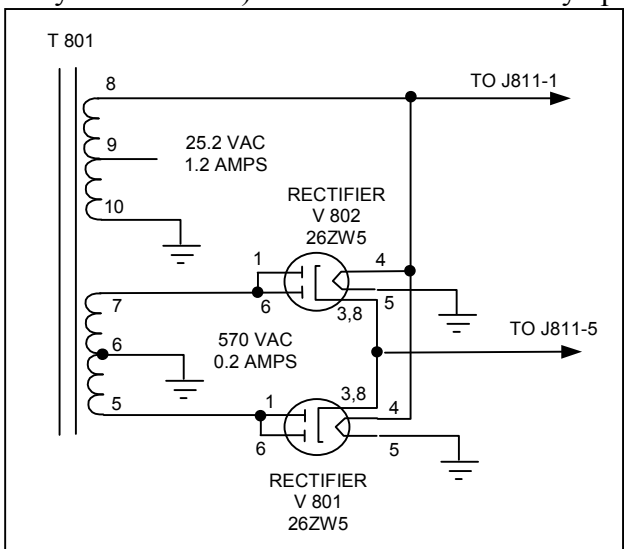


Delay Mod to NAVSHIPS Field Change # 6

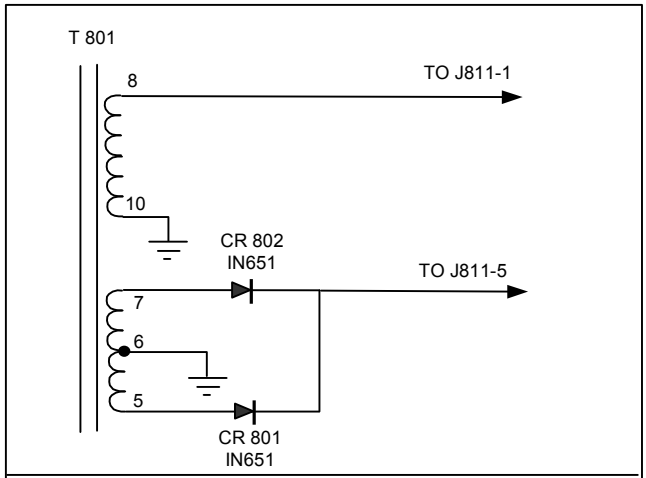
The most suitable time delay in my assortment was an Elgin Advance RT 1141 which is 35 seconds powered by 25 VDC. Anything from 30 to 60 seconds would be good enough, less than 20 would be doubtful of the desired effect and more than 60 would be OK if you are not impatient.

The 25 VDC power was easy to obtain by wiring in a half wave rectifier with a filter capacitor off the 25 VAC filament supply, I used a 1N4002 diode with a 100 Mfd/35 Volt capacitor, not critical just observe voltage ratings.

The next item was a Allied Control MHX-4043 sealed power relay, again the choice was dictated by what I had on hand that would fit and could be powered by the 25 VDC that I was using for the time delay relay. A diode across the relay coil to de-spike was added. The center tap of the 570 volt winding was disconnected and the path was replaced with a 220 ohm power resistor (to approximate the internal resistance of the rectifier tubes, something that should have been done with the Navy modification) and a set of the normally open contacts on the Allied relay. A bracket was required to hold and heat sink the 220 ohm resistor.



ORIGINAL WIRING (NAVSHIPS 0977-063-2010 Fig 5-13)



Field Change #6 (NAVSHIPS 0977-063-2010 Fig 5-13)

NOTE: The first requirement for a modification should be that there is a obvious improvement either in performance or operation when completed, it should be reversible and it should look good enough to show someone else your workmanship.

[This is also available on John's web site at http:/members.xoom.com/JCStott/stoll/radio/R-390A.html. John also suggests that this modification is generic and you are limited only by your imagination and technical expertise. Parts are not critical as long as the working voltages and currents are treated accordingly. The description is simple and, above all, you can delete it and forget you ever saw it if you desire.]

CURE FOR ONE TYPE OF PTO INSTABILITY IN THE R-390A

by Chuck Rippel - WA4HHG
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Ever tune your R390A through a carrier with the BFO on and get a "warble?" Does the PTO seem unstable while tuning? If the answer is yes, this fix may apply if you have a PTO with an external cam stack /follower assembly.

Test for the problem by turning the radio on and allowing it to warm up about 30 minutes. Tune in a calibrator point and turn on the BFO. Tune the radio through the calibrator signal. The BFO note should change smoothly and without any warble or instability. If it does not, the problem may be as below.

There is an angled piece of metal fastened to the front of the PTO. It makes a 90-degree bend then engages the tuning shaft just in front of the forward PTO shaft bearing. This piece of metal serves as the ground return for the PTO. The points where it engages the PTO tuning shaft and its connection point on the housing can become contaminated causing unstable PTO tuning. I have even seen well meaning but uninformed owners incorrectly apply grease or oil to the point where the return strap engages the PTO shaft.

Here is the fix:

--- Unplug the radio ---

Remove the PTO by first removing the shielded cable (center plug next to J-208 on the left rear of the RF deck). Turn the receiver upside down and unplug P109 on the back of the PTO. Loosen the two screws holding the rear PTO bracket. Do not completely remove them. Loosen the 3 captive, green-headed screws that hold the PTO to the chassis. Carefully remove the spring on the Oldham coupler and set it in a safe place. Carefully maneuver the PTO from the main chassis being careful to guide the shielded cable that was attached to the RF deck past the antenna cables and through the hole in the main chassis. Place the now completely free PTO assembly in a clean, well-lighted place so it can be worked on.

It's a good time to clean out the PTO cavity in the main chassis with some WD-40 on a rag and apply a few drops of oil to the tuning shaft at the bearing in the main chassis located in front of the PTO. I use synthetic Mobil-1 90W rear end lube.

Remove V-701, the 5749 tube, from the PTO.

Using plenty of light, you should now be able to see the ground return strap. There are 2 small screws holding it on the PTO housing. The opposite end of the strap engages the PTO tuning shaft after making a 90-degree bend. On some PTO's, this end of the strap rides in a small groove machined into the PTO tuning shaft.

Remove the 2 screws holding the strap to the PTO housing. It is not as easy as it looks due to the bracket being located directly above the screws which holds the PTO body to the mounting assembly. Be sure not to lose the small screws and their lock washers. Using DeOxit or Flux-Wash, thoroughly clean the curved end of the strap where it touches the PTO shaft. Work your way slightly up the sides of the strap to accommodate the sides of the groove. Next, use a toothbrush with DeOxit and clean the spot on the PTO housing where the strap attaches. Finally, clean first the side of the strap where it mates to the PTO housing then clean the other where the two mounting screws seat.

Turning your attention to the PTO tuning shaft, clean the area or groove where the strap rides. Do NOT TURN THE PTO SHAFT or you will be realigning the radio due to the cam positions versus the PTO frequency being changed. Be very careful not to get any DeOxit or Flux-Wash into the front bearing. To best do this, put some of the cleaner on a "Q" tip or small toothbrush first then clean the contact/groove area thoroughly. DO NOT GREASE OR OIL THE CONTACT POINT.

Reinstall the ground return strap on the PTO. If there is a groove machined into the tuning shaft, be careful to insure that the turning shaft end is riding in the groove.

Reinstall the PTO in the radio chassis, grease and install the Oldham coupler and reconnect the 2 plugs that were unplugged to remove the PTO. Make sure the PTO is mechanically aligned to the tuning shaft then tighten the 3 green captive mounting screws then finally the 2 loose screws on the PTO rear chassis bracket. Install the anti-backlash spring on the Oldham coupler. Reinstall V-701 after first tightening the screws in the tube socket and giving the tube pins a shot of DeOxit.

Turn the radio on. As it is warming up, put a single drop of (do NOT spray) DeOxit onto the PTO shaft where the ground return strap engages. Work the "Kilocycle Change" control back and forth about 50KC's to seat the strap against the shaft.

Repeat the turning test above. The radio should now tune without instability.

Should it not, you may have a Collins, Motorola or other PTO which has an internal cam stack/follower assembly which is sticking. Repair of this is beyond any explanation here and should be only attempted by someone comfortable with doing "surgery" on that PTO.

Future maintenance should simply require annually re-applying the single drop of DeOxit to the shaft/ground-strap contact point and rock the frequency back and forth as above.

[Chuck Rippel has been a frequent contributor to HSN. Please visit his web site for much more

information on the R-390A at http:/www.avslvb.com/R390A/index.html – Ed.]

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.

Nothing this issue

PUBLICATIONS OF INTEREST

Nothing this issue

WANTED TO BUY / SELL / TRADE / WHATEVER

WANTED – Fisher Tube Stereo system. *Bob Prahovic, PO Box 465, Branford CT 06405 or call 203-483-1572.*

EDITOR'S AND PUBLISHER'S CORNER

This is a short one – the Survey Summary just about says it all. I would, however, like to take this opportunity to thank those of you who have provided articles and short subjects for HSN over the years . . . and encourage you to continue your contributions. For those authors who responded to the survey and have given your permission for others to reprint your material, again thanks.

Reid C. Wheeler, Editor

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