R-390 Newbie Support Information
Revision 1, changes A - D, 7-25-2020, Larry Haney

Although I've been working on R-390As since 1963, I've only been monitoring the R-390 List Forum since November of 2013 and contributing since June of 2014. There is a huge amount of information stored out in the R-390 list archives that is important, but not well know. This is especially true for folks that joined recently and missed the helpful posts that so many folks made, before their time of joining (like me). Revision 1A start: There's also a lot of information on the 'R-390a.net' (R-390) disk and other places. So, this document is my attempt to fill that gap and let you know what's where. What I plan to include in this document is that information that is not diagnostic or repair in nature, but none the less, important. (Wei-i Li did a great job of capturing the technical posts and saving them in the 'Pearls'). I'm including stuff that is not currently on the R-390 disk (like in the Pearls, etc), just in the list forum archives or nowhere. Here's a link to the Pearls contents page: http://www.r-390a.net/Pearls/index.htm .
Revision 1A end.

For instance, Tisha Hayes did a nice piece of research and a very nice post about the mini bayonet (MB) connectors used on the mini-coax inside the R-390A. David Wise posted about the Noise Limiter filament dropping resistor. Spare tubes organization software: Hank (Dan) Arney. R-390A internal coax size: Scott, Barry (Clyde B). More information on those and other subjects later in this document. For GFI and GFCI issues, see post by Roy Morgan, Date: Wed, 19 Jan 2000 11:59:32 -0500 in the Pearls Power Supply section. There is also a lot of GFI info in the 'AC and Other Line Topics' section of the Pearls. Cleaning and Lubrication - see the Restoration section in the Pearls on the R-390 disk.

Revision 1B start:
Larry Haney, 7/25/2020 - I obtained most of that information from the R-390 Email Reflector Forum archives. I used 2 methods to do so:

1. The HHI Email Reflector Search Tool accessed with the internet link: http://www.w9wze.net/ReflectorSearch/SearchReflectorForm.php . Because it searches all of the archive, it takes a couple minutes to provide the list. To see the item of interest from the list, just click on the highlighted link.
2. The built-in method in the 'Mailman' tool that provides the function for our Email Reflector Forum. Here's how I access the R-390 list of the archived entries from an internet window: http://mailman.qth.net/pipermail/r-390/ . If you want to display information for a different product group, just replace the 'r-390' with it's name, such as: Collins, Hammarlund, National, Hallicrafters, Heathkit, Eico, QRP, etc. It displays a table entry for each month. You can display the months forum entries in a list sorted by: thread, subject, author or date (by clicking on those keywords). From that 2nd list you can display a desired post entry.

For both of the above, I created an 'Internet Shortcut' on my desktop with the link as the target location. This is easy to do by 'right clicking ' in an empty space on your Windows desk top and selecting 'create a new shortcut'.
Revision 1B end.

There is a lot of information available on our R-390 disk (R-390A.NET), a lot of which is in the Pearls, the Y2KR3 R390A and other Tech Refs, miscellaneous contributors documents, original Collins, Army, Navy, and Air Force documentation, and much more. One of them we are usually very interested in is the 'Tech Ref'. So, where are they? Do they have indices? Are the schematics included and do they print out OK? Are they searchable online? So here's some things you might want to know about the tech ref manuals: the Y2KR3 R390A Tech Ref is searchable, but does not contain an index. The schematics are in section 5 and are good for printing. There is no index, so you may not want to print the whole thing.

There are 2 tech refs listed in the 'References' section (http://www.r-390a.net/faq-refs.htm). One is in the U.S. Army section at the top, TM 11-856A from 1/1956. It contains 8.5 x 11 printable schematics and an index, but it is not searchable. All the pages should look ok when printed. The other is TM 11-5820-358-35 from 8 December 1961 (it's about in the middle of the U.S. Army section). It contains schematics (not printable on 8.5 x 11), an index and is searchable. It also has a lot of wide pages that will not look right when printed on 8.5 x 11. What's important to remember about this file is that it is searchable.

There's a lot of information on the Bama web site, including the R390, R391, R392 and R390A. You can find them by Googling 'R390 bama', 'R391 bama', 'R390a bama', etc. The tech ref for the R390 is TM 11-5820-357-35. It has schematics and an index, but it is not searchable online. All the pages are 8.5 x 11, so should be easily printed. This version is from 9 March 1962. The tech ref for the R390A is TM 11-5820-358-35 (21 MB). It has schematics and an index, but it is not searchable online. All the pages are 8.5 x 11, so should be easily printed. This version is from 8 Dec 1961. The tech ref for the R392 is TM11-5820-334-35 (17 MB). It has schematics and an index, but it is not searchable online. All the pages are 8.5 x 11, so should be easily printed. This version is from 21 August 1961. The tech ref for the R391 is TM 11-863 (32 MB). It has schematics and an index, but it is not searchable online. All the pages are 8.5 x 11, so should be easily printed. This version is from 23 October 1953. All of these files on Bama have indices, but are not searchable.

There is also a lot of info on Andy Moorer's Jamin' Power disk for both the R390 and the R390A. Take a look here: http://www.jamminpower.com/main/r390.html

Those Tech Refs without indices are probably not the best for printing. If you print it you will want an index.

There is also a lot of info in 'Dave Medley's R-390 Compendium of Knowledge' on Lester Veenstra's disk for the R-390. Take a look here: http://www.r-390.com/. The 'Link to Chuck's Page' does not work, but you can however, see it here in the archives: https://web.archive.org/web/20090204020515/http://www.r390a.com/

Revision 1C start:
Larry Haney, 7/25/2020 - There is also a lot of information about Navy radios on Nick England's http://navy-radio.com/ web site. There's a lot of manuals, pointers to them, history and pictures. Take a look in the http://navy-radio.com/rcvr-div.htm diversity receiving section for uses of the R-390x's in the AN/FRR-38, AN/URR-41 and AN/URR-49 and half way down in the Receivers section http://navy-radio.com/rcvrs.htm .

There is also a lot of information about antique radios (including many boat anchors) at Henry Rogers Western Historic Radio Museum here: http://www.radioblvd.com . One of the sections of interest to us is the 'COMMERCIAL & MILITARY

COMMUNICATIONS EQUIPMENT (Airport, Shipboard, General Purpose & Military Gear) 1932 - 1942 & 1946 – 1950' at: http://www.radioblvd.com/MilitaryCommunicationsGear.htm (notice this section covers 1932 to 1950, so no R-390 info there). But, there is a lot of information about R-390 and many of it's variants in a different section. One of the items covered is the 'real' story of the R-725 (thanks to Les Lochlear for the pointer) at the link: http://www.radioblvd.com/R390A_Rebuild_Part3.htm and then search for R-725. The link to the R-390 related information is a little past the middle of the main page (search on 390). Here's the link: http://www.radioblvd.com/R-390A%20Rebuild.htm .
Revision 1C end.

The following are excerpts from the R-390 Archives that I thought would be of interest and fit in the category I described at the beginning:

Cheap isolation transformers:

Drew Papanek, drewmaster813 at hotmail.com, Tue, 05 Aug 2003 13:10:15 -0400
On the subject of isolation transformers Gary E Kaufman wrote:
"You can grab most any 2 large filament transformer with the appropriate wattage ratings and put them back-to-back. I used a pair of 56v/3A transformers for many years set up as 115:56<--->56:115 with good success while repairing AC/DC tube radios. There was about a 5% voltage drop over line voltage. Admittedly this may be tough if you really need a 750-1000 watt unit."
Transformers from junk microwave ovens can also be used in this manner by connecting the HV windings together. One end has a terminal, the other is usually internally connected to the transformer's frame. Connect frame to frame, HV terminal to HV terminal. HV runs a couple or few KV; make sure that connection is well insulated and done with appropriate wire (salvage that from the junk microwave also). These transformers will handle quite a bit of power and you can use 2 differing units to get a slight increase or reduction in net voltage.
Drew

Larry Haney, 7-5-2020: Old microwaves end up at the 'recycling centers' by the hundreds. I suspect that transformers could be found there in abundance at a good price. I haven't had a chance to check into it, yet.

Marvel Mystery Oil gums up:

Todd Roberts, ToddRoberts2001 at aol.com, Sun, 27 Apr 2003 14:53:10 EDT
I think some people in the past have recommended using Marvel Mystery Oil or mixing it with another lubricant as a good way to lubricate an R-390A RF deck? I thought I would relate an experience I had with Marvel Mystery Oil. I had a can of the stuff sitting in a cupboard for about 15 years. Some of the oil leaked around the top of the can and after being exposed to the air for 15 years it did indeed turn into some kind of sticky red gummy substance. It would seem this is not a good indicator of the oil for use as a lubricant exposed to air over a long time = 15 years or more? It looks like Synthetic oil or grease would be the best bet for a long-term lubricant exposed to air?
73 Todd Roberts WD4NGG.

Robert Meyer, meyer_rm at yahoo.com, Sun, 27 Apr 2003 21:31:16 -0700 (PDT)
I had something similar happen. I have model aircraft that have glow-fuel engines on them. Someone recommended that I use Marvel Mystery oil to lube the engines prior to storage. I had one engine that sat for about three years. When I went to turn it, it was so gummed up that it took significant force to get it to move. Poured some solvent into it and it freed up. I only use synth oil, now.
Robert

Drew Papanek, drewmaster813 at hotmail.com, Mon, 28 Apr 2003 13:46:59 -0400
Marvel Mystery Oil is described as a solvent/penetrant and all penetrating oils with which I have had experience have gummed up, some after only 1 week. Penetrants are good for freeing up stuck mechanisms but ultimately should be cleaned out and replaced with a non-gumming lubricant such as Mobil 1 or other synthetics.
I have not used the Nolan Lee-recommended mixture of 50:50 MMO and Mobil 1 for R-390 series RF geartrains but have wondered if the Mobil 1 inhibits gumming tendencies of the MMO.
My approach has been to completely tear down gummed up geartrains and soak in lacquer thinner (any brand except that in the red white and blue can from A** Hardware). On assembly I apply Mobil 1 and re-apply semi yearly or yearly as needed.
I have heard that Mobil 1 was recently reformulated and may possibly not be as good as previously. Maybe time to switch to Amsoil?
Kerosene or fuel oil will gum up after a year or two.
Drew

<u>Dittmore-Freimuth mechanical filters are superior:</u>

Les Locklear, Llgpt at aol.com, Tue, 7 May 2002 17:08:10 EDT
Fabio, The Dittmore-Freimuth mechanical filters a superior to the Collins mechanical filters. They were installed in the 1968 run of R-390A's. Manufacturing techniques were much improved over the Collins type filters and they exhibit much less loss.
Les Locklear

<u>R-390A internal coax size:</u>

Scott, Barry (Clyde B), cbscott at ingr.com, Wed, 6 Mar 2002 15:00:54 -0600
Is RG-178 the proper coax? I remember a thread about this a couple of years ago and according to the emails I saved, it was RG-179. I also have a quote from SkyCraft for RG-179. Which cable is correct?
Thanks, Barry(III) - N4BUQ

Larry Haney, 7/4/2020 - RG-179 is the specified coax used, but RG-187 is very close. It really does not matter except that it fit the MB connectors correctly. Impedance is not a factor to consider. However, the coax for the high impedance antenna connection (C connector) is larger and lower in capacitance.

R-390A mini BNC connector real type, MB (Mini Bayonette):

Tisha Hayes, tisha.hayes at gmail.com, Mon Dec 8 12:53:31 EST 2008
I finally found out what the mini BNC connectors on the R-390A are designated as. This has been a question asked by many on the R-390A reflectors and on the Hollow State News, no answer was readily apparent. Since I have a large amount of coaxial inter-series adapters as part of my professional work, I decided to pursue an answer to this question through the Amphenol tech-rep. Here is what I found out;

The series connector is designated as MB. It is not rated for a specific impedance like 50 or 75 ohms. The specification has a wide variety of impedance's that the connector will work with, ranging from 50 to 150 ohms. I also found that the connector, chassis plug, Tee's and terminators are still available through a variety of sources. Since this is a little-known specification without any widespread knowledge of it's applications the parts are available cheaply from some surplus sites. At the higher end, there are still suppliers who can make custom cables with the MB connector.

One surplus site that has the connectors is Surplus Sales of Nebraska. Of course, their prices are on the high end of what is considered surplus but they have a decent array of connectors. This can be found at http://www.surplussales.com/Connectors/MB.html

These are a direct fit and I have purchased connectors and tested them on my R-390A. This may be a great tip on rebuilding the R-390A when the coax cables are seriously deteriorated or when connectors are badly corroded.
Tisha

Larry Haney, 7-6-2020 - Surplus Sales of Nebraska still does carry an Amphenol straight MB connector for RG-179 coax. Their part number is 44950 and their price is $23.

Chris Farley, Thu Jul 24 12:25:11 EDT 2014
Before somebody buys the wrong thing, I just want to clarify a detail- These are NOT "mini-BNC" connectors, which do exist and are readily available. The connectors used are simply called "miniature bayonette", or "MB" connectors. They are NOT the same, nor compatible with each other.

I spent quite a bit of time digging for these things a while back, and basically you're not going to find new ones from any dealer unless you want to spend A) more than the whole receiver is worth, or B) buy NOS from a surplus dealer. Even then the prices were insane for the most part. I found ONE surplus dealer who was willing to work with me on their tarnished NOS stock, but didn't feel the rather large investment required was worthwhile.

IMHO just rebuild your original ones, it will save you time and be less aggravating in the long run. If you have a missing or broken one, I do have just a few 90° spares.
Regards, Chris kc9ieq

Larry Haney, 7/6/2020 - There are a couple MB connectors manufactured and available in small quantiities today, BUT they are not for the small coax used in the R390A. They are for 7/32 inch (5mm) (RG-58) coax and will not accept the small 1/10 inch coax used in the R390A. As mentioned above, Surplus Sales does sell the correct straight one, but not the 90 degree one.

Limiter Heater Filament Dropping Resistor R536:

David Wise, David_Wise at Phoenix.com, Wed Apr 29 13:19:46 EDT 2009
The limiter is running dim to reduce noise and hum.
Those cathodes are at the input of the audio chain, and they're floating around at high impedance; the slightest H-K leakage would cause hum. In some positions in old tube-type Tektronix oscilloscopes, a tube might be selected for low leakage. The other day I noticed hum in my R-390A when the limiter was on. I replaced the limiter tube and the hum stopped. The original tube did not register any leakage on my Hickok 600A.
Tube audio preamps run dim to reduce noise. If the cathode emits enough electrons to satisfy the maximum requirement of the circuit, then it's bright enough. The requirement here is very small.
Dave Wise

Larry Haney, 7-6-2020. I have been investigating this subject for a couple months now, and put together a small document about it (which I have not published, yet). Here's a little bit of it:

John (W3JN) found the information on reducing hum documented in the Hallicrafters R-274 manual TM 11-897 on page 49 under power supply. A Hallicrafters R-274 is similar to a Hallicrafters sx-73. Here's the relavant information that it says: "Tubes V12 and V16 are important from the standpoint of hum in the audio amplifier. Hum can be reduced by reducing the heater voltage of a tube. Therefore, the voltage on heaters of V12 and V16 is reduced by resistor R105 to approximately 5.5 volts." V12 is a 6AL5 and is the audio detector and noise limiter, V16 is a 6AT6 and is the 1st audio amp.

I thought I'd check and see how many receivers use triodes today or what else they use. I knew that the R-390A uses 5814/12au7s dual triodes connected in a diode configuration (the grid tied directly to the plate). Well, to my surprise, I find that the 51J-3 (R388) and 51J-4 use a 12AX7 (dual triode) for the audio and avc detectors and 1/2 of a 12AX7 for the noise limiter. These are of course connected in the diode configuration as just described. And, guess what, only the half of the 12AX7 used for the noise limiter has the filament dropping resistor. The Hallicrafters SX-111A uses a 6BJ7 (triple diode) for audio and avc detectors and the ANL, and uses a filament dropping resistor in it's line. The 75A4 uses four 6AL5s for a few functions and one is for the noise limiter (V12), and it is the only tube that has a filament dropping resistor. The other three 6AL5s (V10, V16, and V19) do NOT.

What I have found is that there are many, many receivers that use the dropping resistor in the filament line of noise limiters (both diodes and triodes) in order to reduce hum in the audio.

Spare tubes organization software:

Hank (Dan) Arney, hankarn at pacbell.net, Sun, 30 Dec 2001 03:52:49 -0800

Ken, Someone on the list had an EXCEL spreadsheet for tube inventory that was good and you could change it to suit your needs. I lost it due to having to reformat to kill a worm. Would sure love to find it again.
Hank

Larry Haney, 7/4/2020 - There is a free spread sheet program available for Windows. It is part of the 'Open Office' org software at OpenOffice.org. I have not set up my tube inventory in a spread sheet, yet.

Revision 1D start:
Temperature compensating capacitors:

millerke6f at aol.com, *Thu Dec 10 23:40:31 EST 2015*

[R-390] Negative temperature coefficient capacitors

Check Surplus sales of Nebraska. They list a pretty wide selection of N type and NPO types
see: https://www.surplussales.com/Capacitors/RF-TempDogbone.html
Cheers
Bob, KE6F

Larry Haney, 7/25/2020 - NTC (Negative Temperature Compensating) capacitors are not very easy to find, but Surplus Sales of Nebraska does carry a fairly large supply of them, the **last two entries** in their 'capacitor' listing are NTCs: 'Uncased Silver Micas' And 'Temperature Compensating: Dogbone Ceramic'. The first being the type usually found in Collins VFOs and BFOs (BEWARE – these are very fragile). Here's the link to their cap page: https://www.surplussales.com//homenew.html#Capacitors
Revision 1D end.