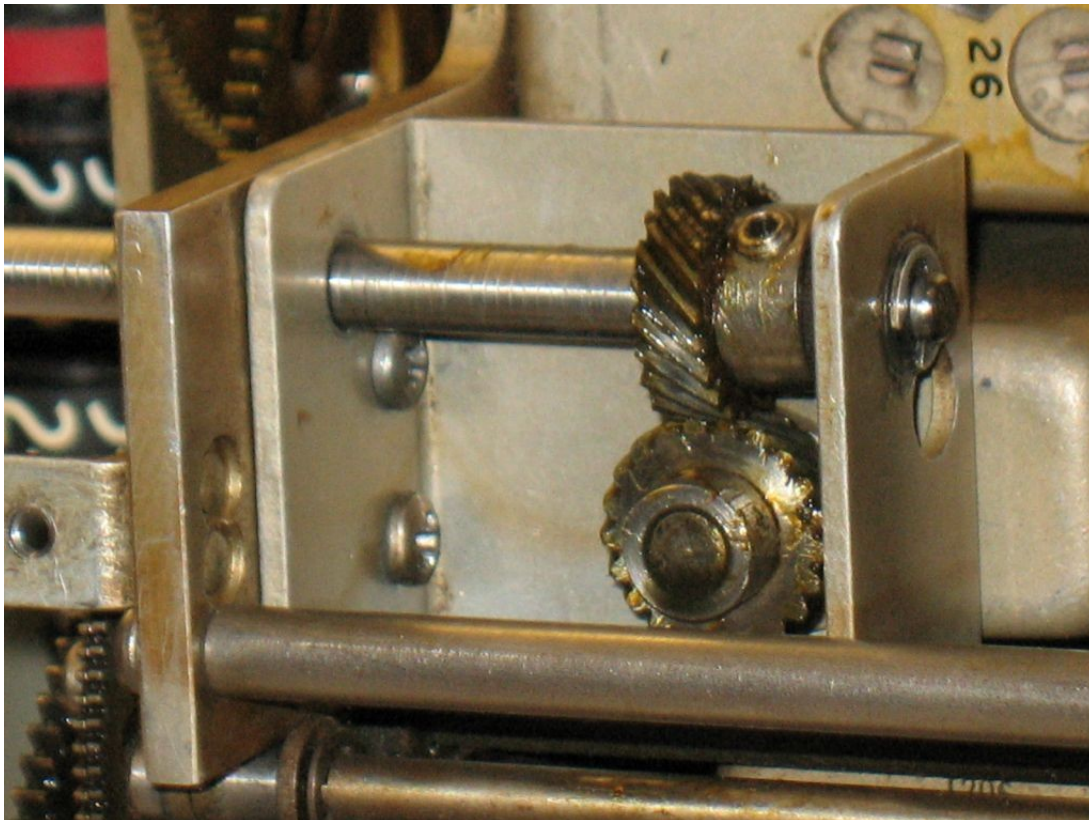


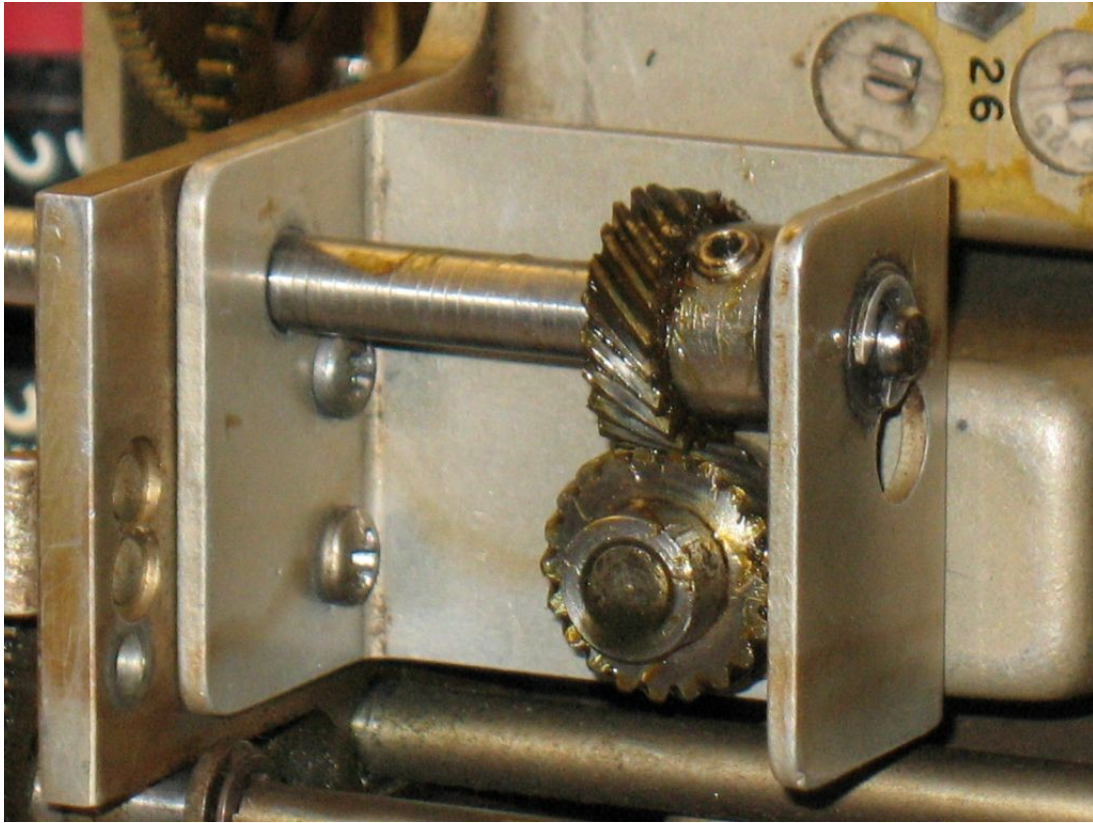
R-390A Antenna Trimmer Repair
Larry Haney, 7-09-2019 (version 2)
See end of document for version information.

Well, I was hoping to never have to work on the antenna trim variable capacitor, but here it is, staring me down, daring me to open this can of worms. It has the 'rotor' grounded, which is not good for the AGC, and some static when rotating it to tune for best signal. I thought I'd look around the Pearls and the Y2KR3 tech manual for some help, but found only a little bit there. I will note in this document the help I found in the Pearls. Finding little help, I thought I'd document what I found during the repair so the next person knows what to expect. There's two main obstacles, one is the pinned gear on the shaft coming up vertically out of the can covering the capacitor. The other is getting the can that covers it off of the RF deck. My approach was to remove the capacitor, it's cover, mounting bracket and the gear attached to the shaft as one unit.

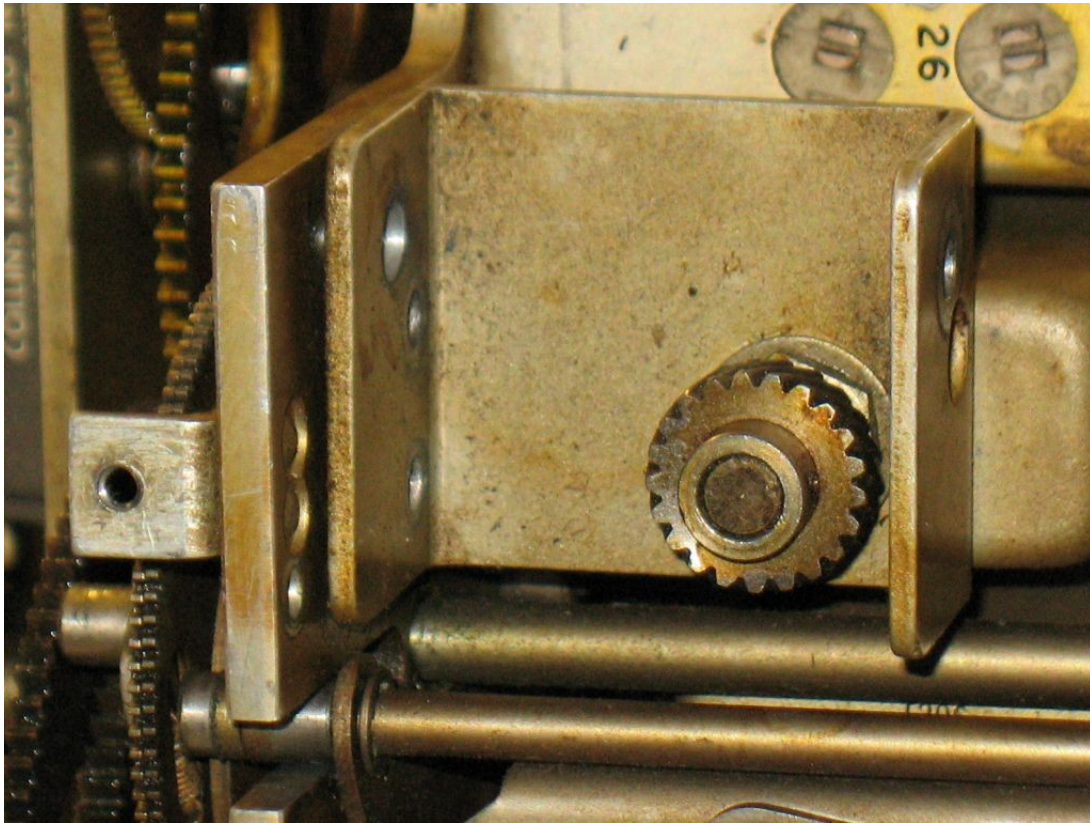
The first step is to remove the shaft that has the knob on it that you turn to trim the antenna tuning. Since the RF deck needs to be removed to remove the capacitor, lower down the front panel and remove the RF deck, first. All three of these procedures are in the tech manuals. Once the RF deck is removed and on the bench, it's easier to remove the 'Ant Trim' shaft. Be careful to not loose the 'C' clip holding it in place. It likes to go flying unless held in place. You can see the clip on the right end of the shaft in the following picture.



When I removed the RF deck, I took it out with the 2nd crystal oscillator attached, as it's much easier that way. Once the 'Ant Trim' shaft is removed, the next step would be to remove the 1/4" rod brace that is 5 5/8" long that is right on top of the capacitor drive gear (shown above). It's held in place with a screw on each end and are easy to remove. Next is a picture with the rod brace removed.



Now with both shafts removed, it's easier to remove the two short screws holding the 1 3/4" by 1 3/8" U shaped frame onto the rear gear frame. These are shown on the left side of the above picture between the two shafts that were removed. The next picture shows the two screws removed.



Since the 2nd crystal oscillator is still attached, it's not as easy as it could be to remove the top screw of the two, but a right angle phillips screw driver will help to loosen it up. Loosen the bottom one up the same way. I got this idea from part of this post in the Pearls RF Deck Mechanical:

Date: Tue, 14 Aug 2001 09:08:38 -0700

From: David Wise

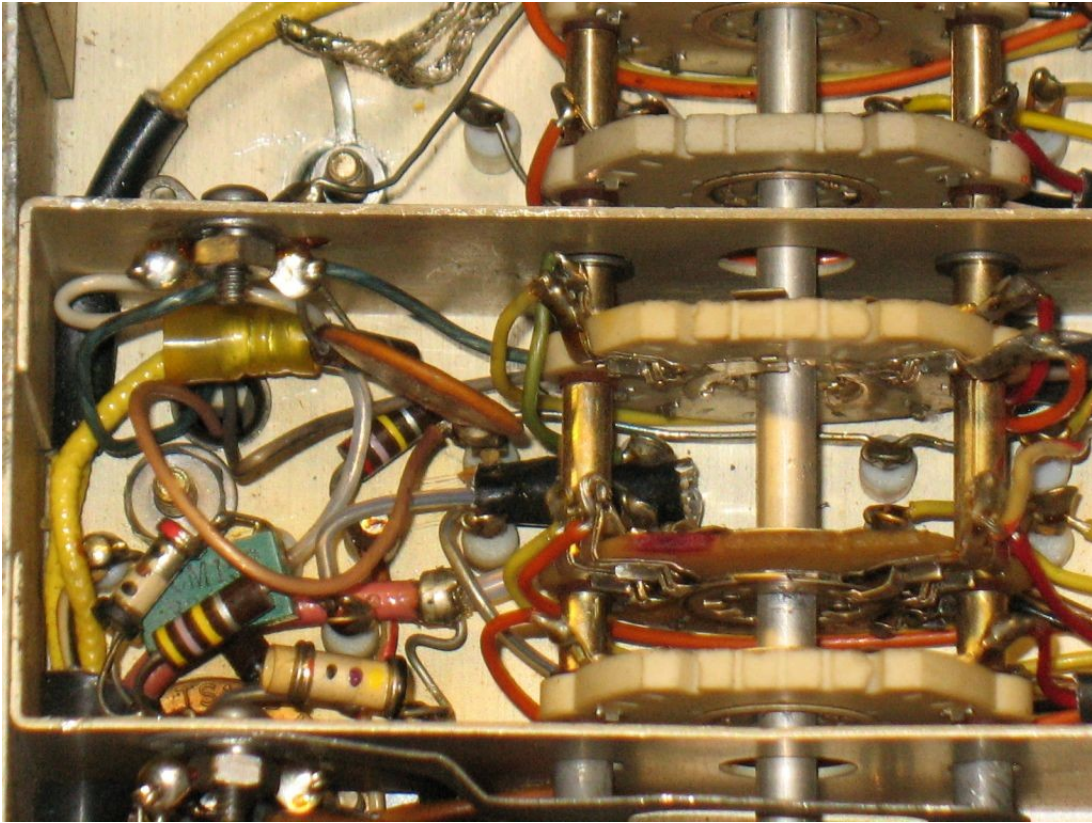
Subject: [R-390] [390A] Restoration Bulletin 5: Gear Train Button-Up [MOT 363-PH-54]

..... Next most difficult are the two phillips screws on top of the antenna trimmer. I tackled these with a right-angle screwdriver.

Thank you, David.

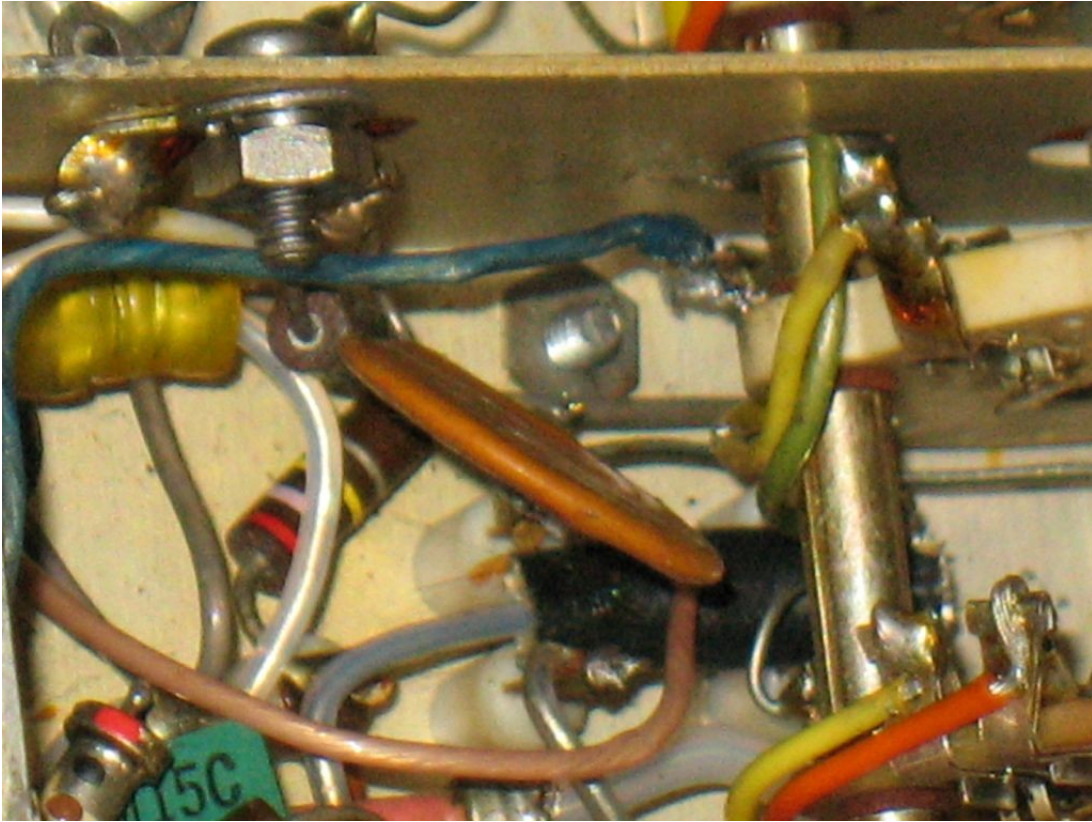
If you don't have one, you could make one with a screw driver bit and vise grips.

It worked great to loosen them up. Don't pry against the gear, as that can damage it or bend the shaft it's on. Use a small flat blade screw driver to remove them the rest of the way. Once the two screws are out, the next step is to turn the chassis upside down with the wiring side up. This will expose the two nuts to remove and the two wires to unsolder and disconnect. There are three wires connected to the capacitor, blue, gray, and brown. I found it easiest to only disconnect the blue and brown on the bottom of the chassis. You can see the three wires coming through the chassis directly next to the larger nut (on the far left) to be removed, in the following picture. The gray wire will be disconnected from the capacitor later (it should be long enough). The 2nd nut is smaller and holds a ground lug onto the chassis. The braid for two mini coax are connected to it.

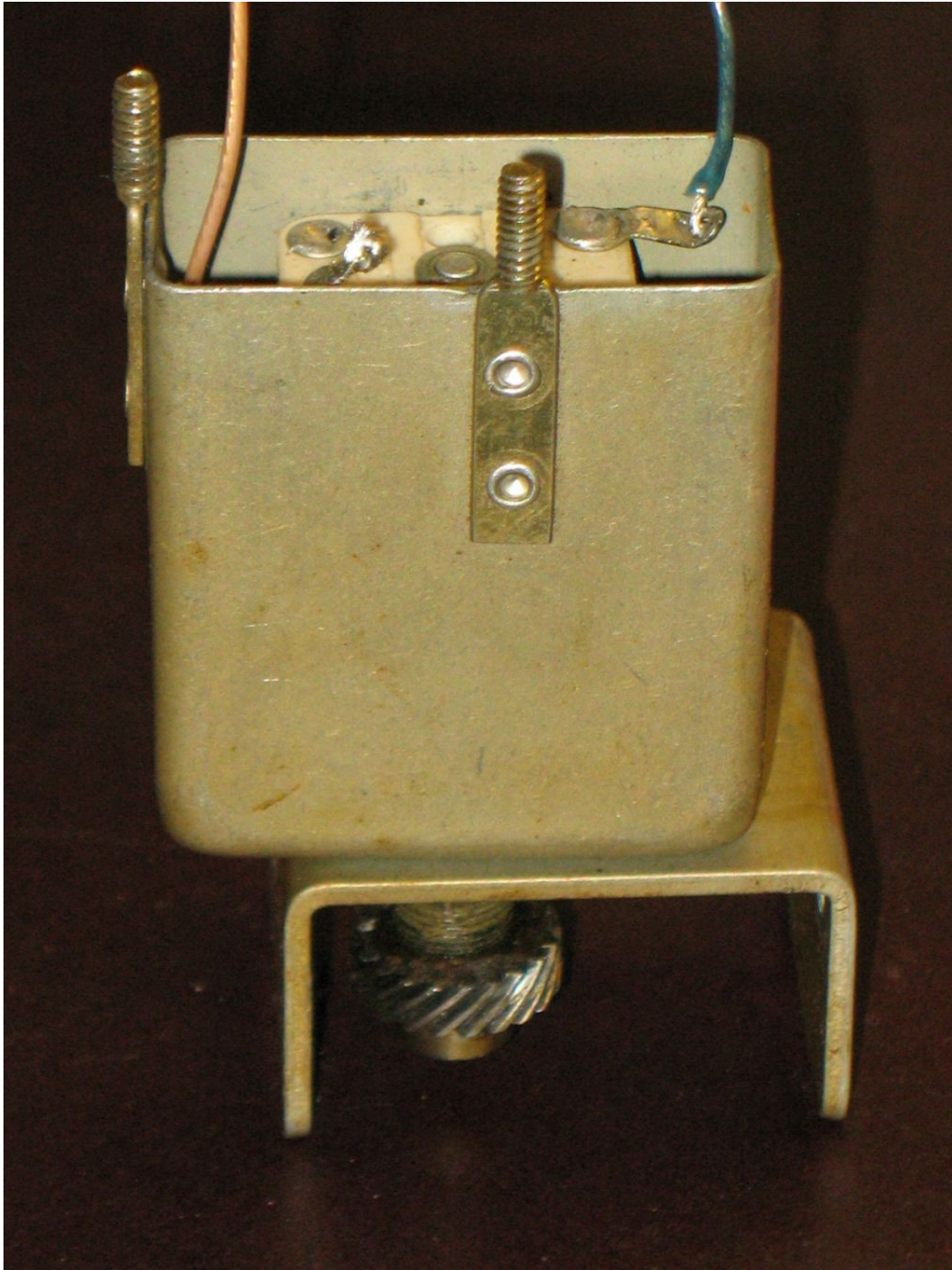


The following two pictures show where these two wires are connected, so you can put them back in the right place. The other end of the brown wire is connected to the rotor on the capacitor while this end is connected to the AGC line. The blue wire is connected to the switch contact.

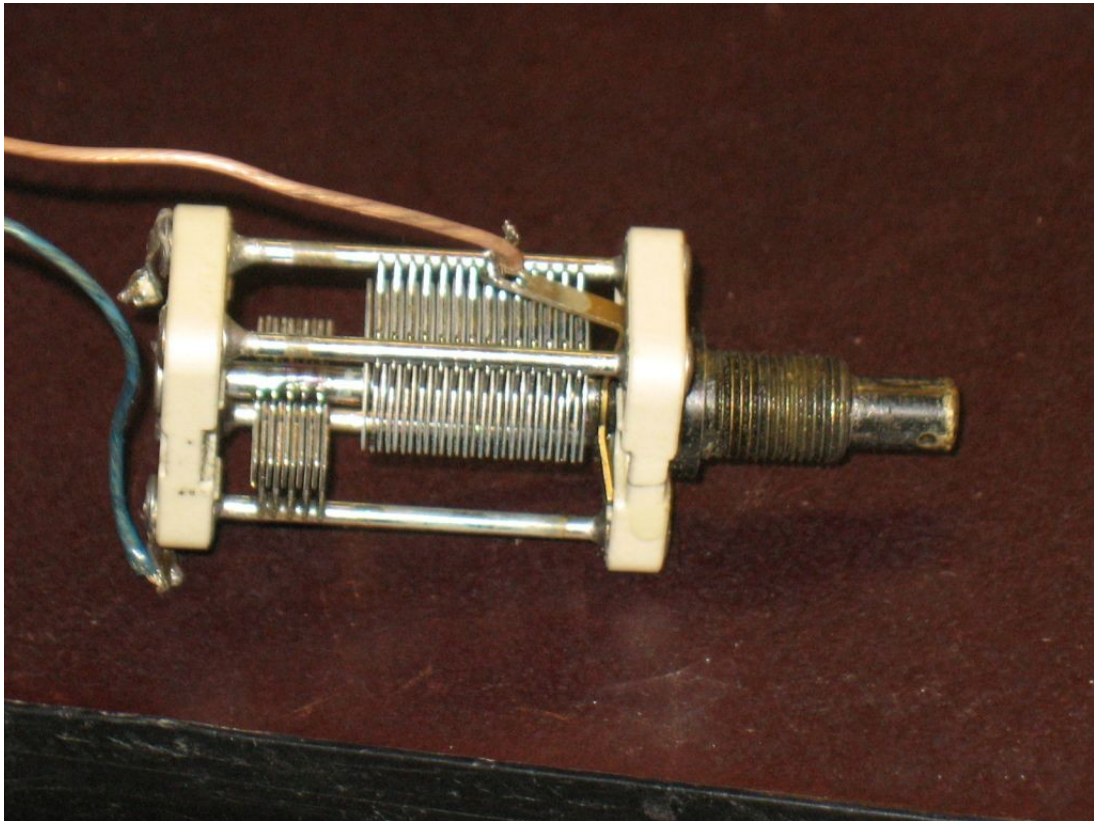
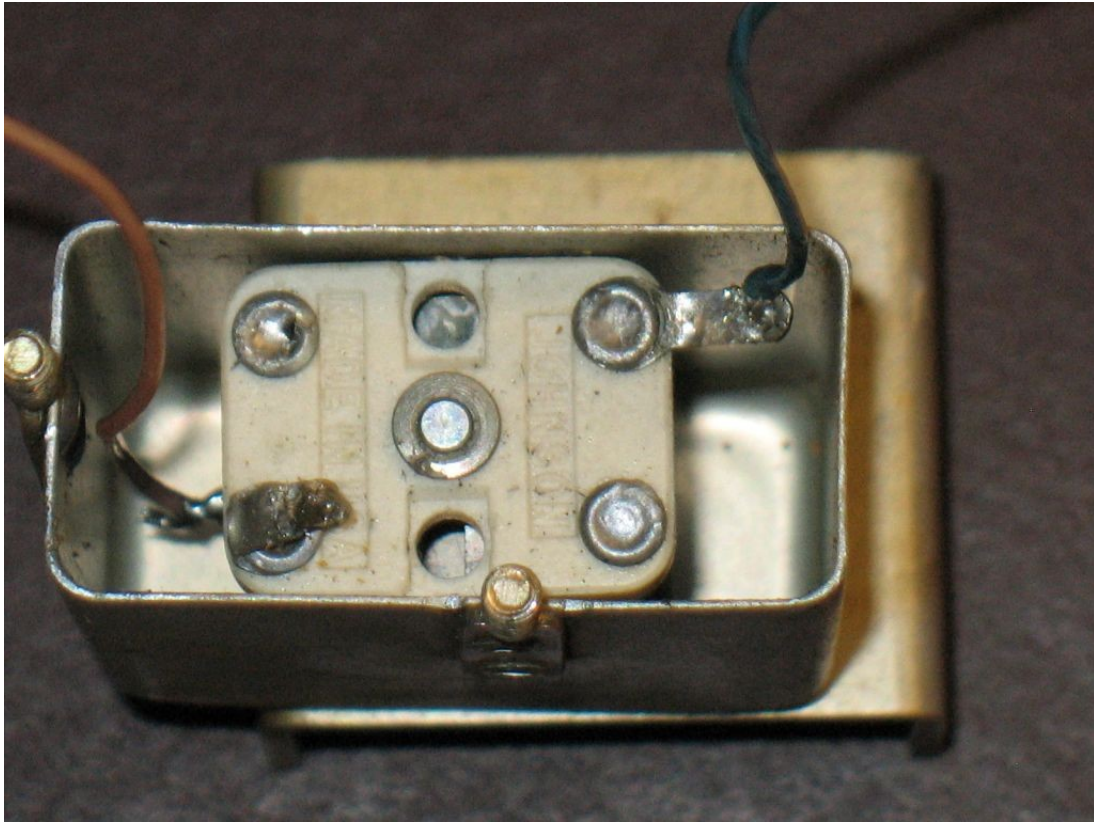




Once the two wires and two nuts are removed, the capacitor and cover assembly can be removed a few inches so that you can disconnect the gray wire from the capacitor. If it's too short, also disconnect it from the switch. At this point, you should be able to remove the assembly shown here.



The gray wire was connected to the empty lug on the end of the cap shown in the next two pictures.



Now that the assembly is out, let's remove the variable capacitor from its cover. In order to do that, the gear will need to be removed first. I found this very beneficial post by Roger in the 'Pearls'

'Antennas' section:

Date: Tue, 30 Jan 2001 07:50:20 -0800
From: "Roger L Ruskowski"
Subject: Re: [R-390] Accessing Antenna Trimmer Cap.

Use a small 3" C clamp for force. Cut a small pin for the punch. Use a nut or bushing on the anvil side so the pin can slide into it as it comes out of the shaft and gear. We had a small clamp that had the anvil ground down and a hole drilled through it in line with the clamp screw. The clamp screw had been turned down to a smaller dia. than the pin. I think the clamp screw was a replacement section of thread stock and it had a nice knob on it. I think, I took one apart once. The problem was not in the can. Now after 50 years, there could be things in there that need service.

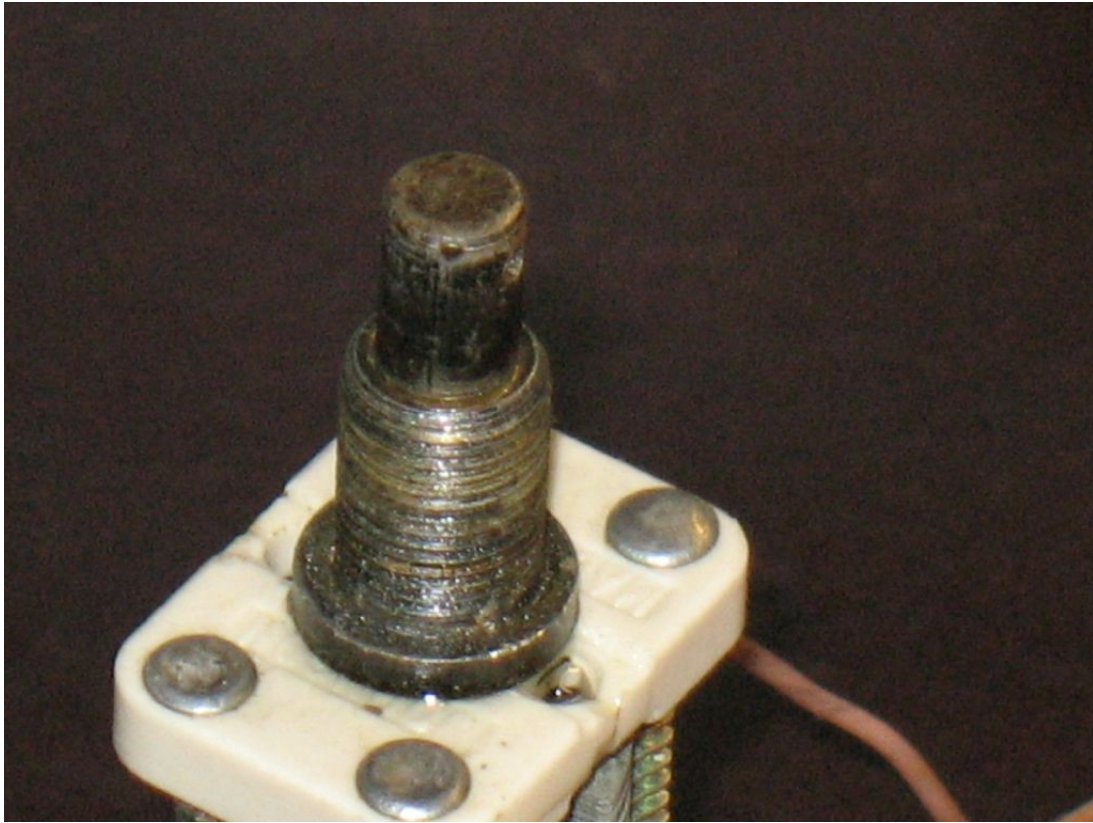
Thank you Roger.

What I like about the C clamp method is it eliminates pounding on the gear, which can bend the shaft it's on or damage the two insulating washers. Since the pin is a 'roll' pin (also found this valuable bit of information in the Pearls RF Deck Electrical on June 19, 2018 by Barry Scott) and is not tapered, it can be removed in either direction. Of course, it could have been flattened on one end from previous attempts to remove it. It's my understanding that gun buffs or other folks might have a roll pin removal tool and might loan it to you.

If you opt to drive the pin out with a punch and hammer, it's very important that a heavy metal support be used to place the gear collar on. Make sure there is a space for the pin to come out. Keep the rest of the assembly off of the work table to minimize the risk of bending the shaft. Make sure the punch is slightly smaller than the hole in the collar. If the pin does not move with a couple taps of the hammer, you should apply some penetrating oil and let it sit over night.

With the pin out, the gear comes off easily. Now the nut can be removed and the capacitor removed from the cover. I believe that the reason the gear is 'pinned' to the shaft is that the 'red dot' on the gear needs to stay in alignment with the rotor. Set screws will not accomplish this.

So now that the capacitor is out, let's fix it. I'm looking at it to see why the static is being created when the rotor is turned and notice that the rotor plates are not centered on the stator plates. Well, that would do it. Not quite sure what happened to it as I don't see anything else wrong with the cap, so I shimmed the rotor shaft to center the plates. No more plates touching and no more static. The very thin C shim is sitting right on top of the threaded mounting. If you look closely at the next picture, you might be able to see it.



The second problem was the grounding of the AGC line. I found this relevant post in the Pearls RF Deck Electrical section and will just show the important part of it here:

Date: Tue, 18 Aug 1998 18:09:34 -0400

From: "Bruce J. Howes"

Subject: [R-390] antenna trimmer fix

..... I noticed that the bakelite insulator was damaged, the ridge had cracked off. If you carefully examine the bakelite insulator pair used on the antenna trimmer capacitor you will note that a 'collar' serves to prevent the antenna trimmer cap from touching ground. My collar had broken, and the trimmer cap was touching ground. Since the bakelite collar is a two piece affair I wanted to inspect both the upper and lower collar. I found no lower bakelite insulator at all, the cap was actually touching ground! Over to my spare R-390A to rob the needed part, and after installation the radio plays fine! The long suffering AGC problem has been cured.

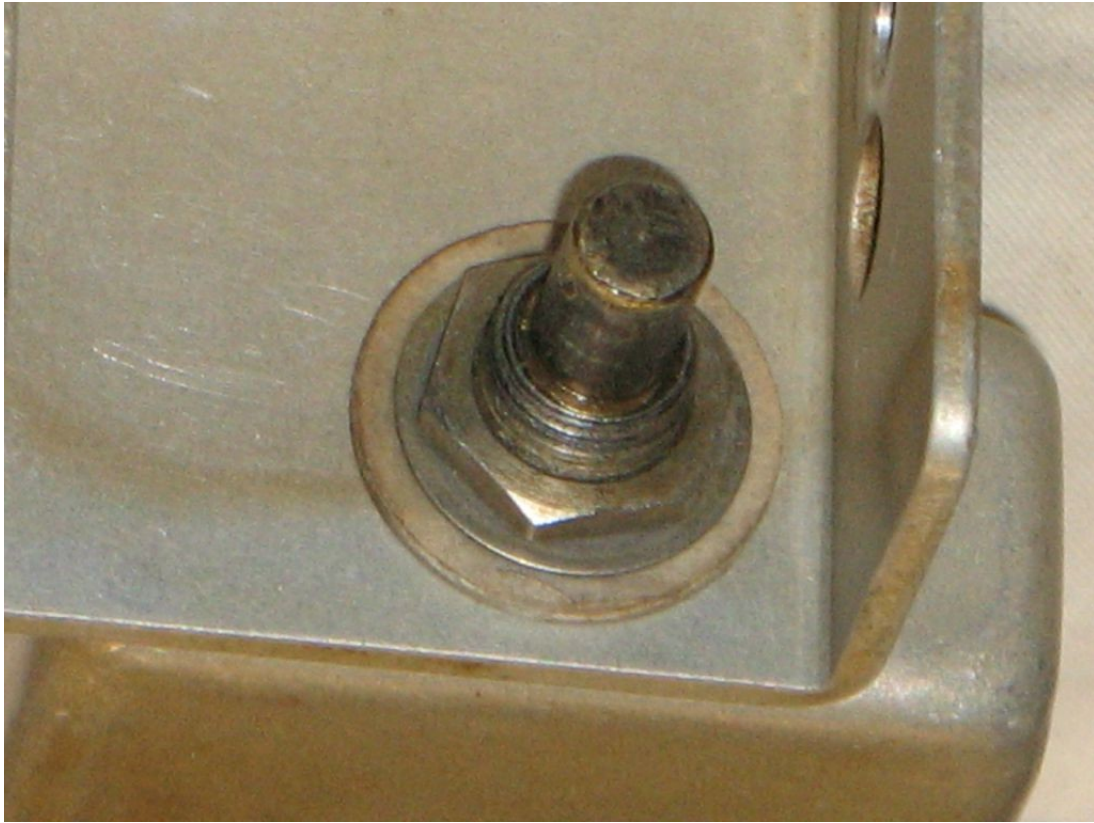
Thank you Bruce.

This was one of my problems exactly, except my top collar had not broken, so I only needed to find one other good one. The next picture shows a similar spacer that would work, but is not an actual replacement. The spacing collar in the center sticks up higher than the original ones. Any good insulating material would be fine. This one is white plastic. It does need to be strong enough to stand up under the pressure of the tightening nut.

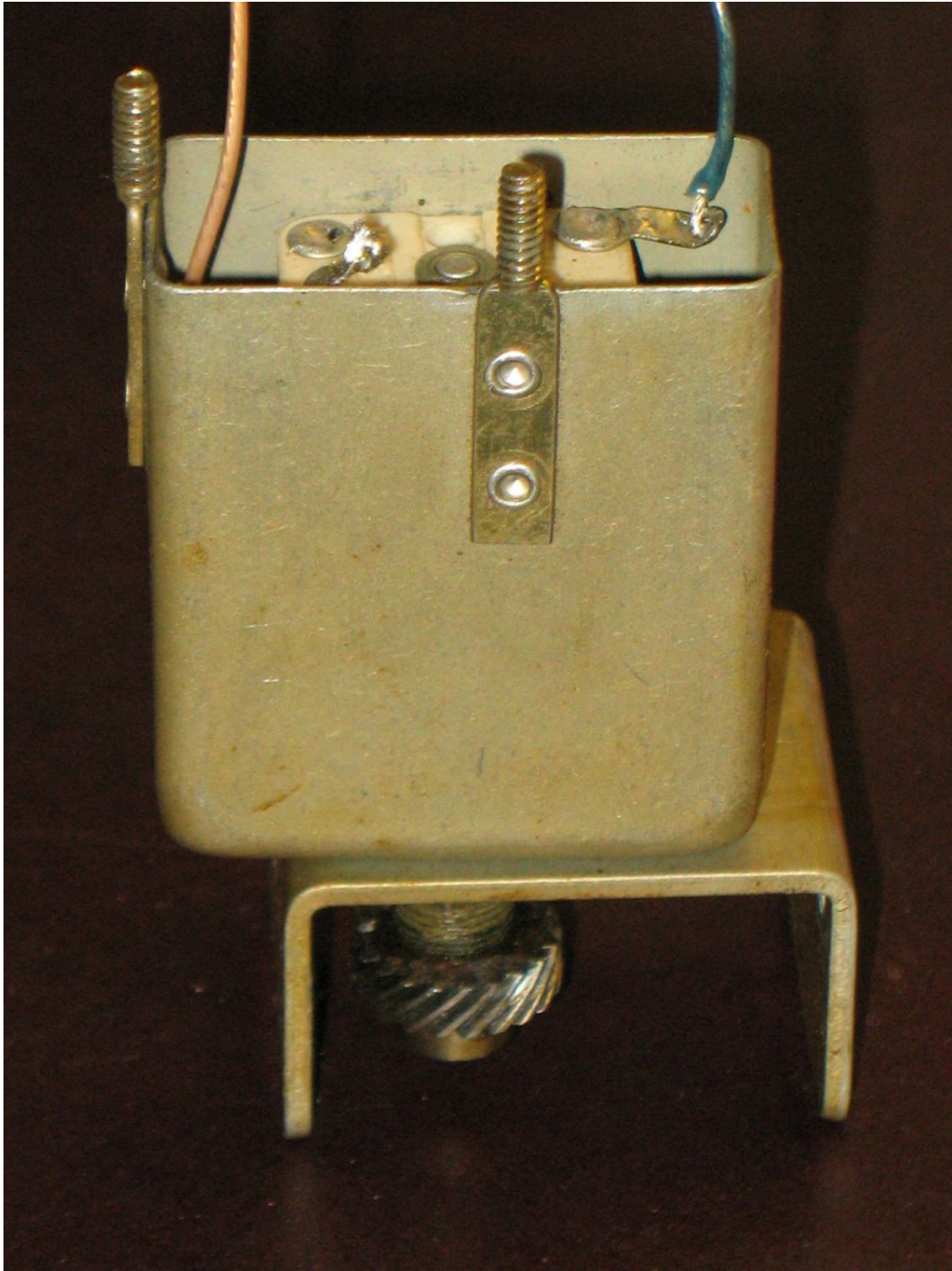


Although the spacing collar in the center on this one sticks up higher, this could still be used as it would space both the capacitor cover and the mounting bracket, and then just a flat insulating washer could be used on the top.

With two good ones in hand, I proceeded to put it back together (except for the gear). But first, once it's repaired, check the resistance between the rotor and stators to make sure they read infinity as you rotate the rotor in a full circle. Then place the special insulating and centering washer onto the capacitors threaded shaft with the small ridge facing the end of the shaft that the gear goes onto. Place the cover back over the capacitor making sure that the insulator is centered in the hole. Then place the mounting bracket onto the threaded shaft followed by the other insulated centering washer. This will keep the mounting plate from grounding the shaft. Follow this with the metal flat washer and nut. This next picture shows it put together that far:



The nut needs to be firmly tight, but not so tight that it will damage the insulators. The capacitor cover must be oriented correctly to the bracket so that the screws go into the holes in the chassis like in this next picture:



Before I put the gear on, I wanted to make one last check that the static problem (plate touching) and rotor grounding were fixed. Sure enough they are, so I proceeded to put the gear on.

Replacing the gear is pretty easy. It must go on the shaft with the gear end first (facing the threaded mounting the nut goes on). As you put it onto the shaft, try to line up the hole in the shaft with those in the gear collar. Once close to the right position, use a scribe or tapered punch to line them up very close. Then, insert the roll pin that was removed and set aside. Finish installing the pin with an appropriate pair of pliers to press it in, being careful to not bend the pin.

The red dot on the gear goes at a 90 degree angle to the pin in the shaft. Orientation of the shaft is not important as the capacitor is the same at 180 degrees. So when the capacitor is 50% meshed (engaged), the pin in the gear will be perpendicular to the front panel. This is the 'zero' point on the Ant Trim dial. With the plates fully meshed, the knob should be pointing to +4 and the red dot pointing towards the rear panel. The pin in the shaft will be parallel to the front panel. Or the plate meshing could be the opposite. I don't think that it is important whether the plates are meshed fully or not at all with the knob at +4, as long as the capacitor plates are meshed half way with the knob at '0'. I have never read whether the + side means more capacitance or higher frequency, which would be the opposite. Functionally, it really does not make any difference. The main thing is that the plates are meshed half way at '0'.

Now you can hold the assembly close to the gray wire so that you can solder it back on. Make sure that the lug on the capacitor is not sticking up too high so that it might contact the chassis when firmly seated. After that you can put the blue and brown wires back through the hole in the chassis. I twisted them together to make it easier to put through the hole. Pull them all the way through from the other side before screwing the assembly into place. Don't bend the capacitor lug the blue wire is attached to. Use one screw or nut to hold it in place while you solder the blue and brown wires back on. Now make one last test to be sure that all is well. Ground the capacitor assembly frame to the chassis. The rotor/brown wire should read about 1.5 M ohms to ground. Make sure that the blue and gray wires are not grounded. Finish bolting it back into place and reinstall the rod brace that is 5 5/8" long that goes right on top of the capacitor gear. And finally, reinstall the antenna trimmer shaft that the front panel knob attaches to. For more information, see the tech manual. Make sure that the gear is positioned back and not touching the metal on the shaft. Measure the resistance from the gear to ground for about 1.5 M ohms. If it's less, the gear is not insulated well enough. Check the fiber washer and fiber tube insulators for poor insulation factor. They might have gotten soaked with oil or some other contaminant.

I spent about 19 hours looking through the Pearls to find the above noted helpful information and wanted to thank those that contributed it:

Credits: Roger L Ruszkowski, David Wise, Bruce J. Howes, Barry Scott

I found this information in the Pearls sections: RF Deck Electrical, RF Deck Mechanical and Antennas. Thank you Wei Li for maintaining the Pearls.

Version 2, 7/9/19: Added a picture on each of pages 10 and 11. Improved verbiage on pages 3, 9, 10 and 13.

Regards, Larry