

By Jan Skirrow

# A New Approach to the R-390A RF Module

Working on the R-390A/URR is one of life's pleasures. It was designed and built to be repaired and for me that makes it a great Boatanchor. But I've been nervous of digging into the RF module—it's hard to get at and seems such a complex, almost mystical thing with all those moving gears and slug racks.

I recently bought a batch of the St. Julien's Creek radios, notorious for having been "stored" outside for a year prior to sale. They looked awful—front panels decorated with swipes of bright blue and black spraypaint and generally filthy. After removing the various modules, however, I decided that the radios had probably been in pretty good shape prior to their outdoor adventure, and should clean up and be restorable.

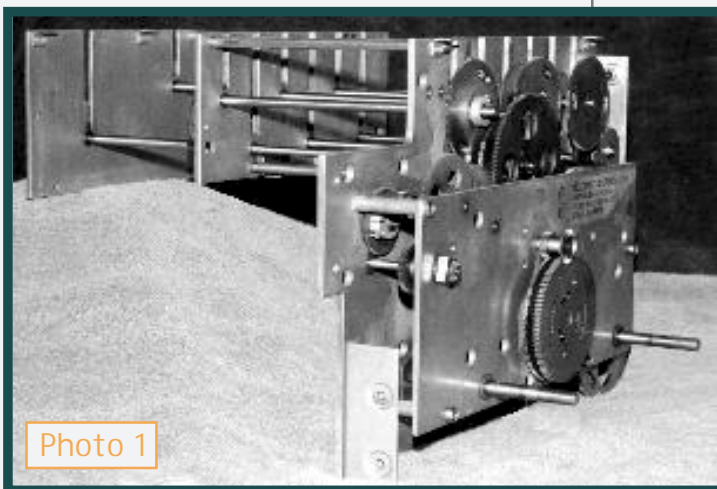
The worst mess was found in the RF modules. Old grease, now hardened and thoroughly mixed with sandy dirt, was everywhere in the

complex mechanical assembly. Oily dirt covered many of the RF transformers, slug racks and metalwork. Luckily, the way R-390A modules are mounted on a central plate kept the insides of most of them pretty clean.

Some Boatanchor lore swears by the dishwasher approach to cleaning old radios. But I wasn't desperate enough yet to risk further damage to a classic. So out came the cleaning materials and several boxes of Q-tips and many hours later one deck was clean. Well, not really clean, but cleaner. There had to be a better way!

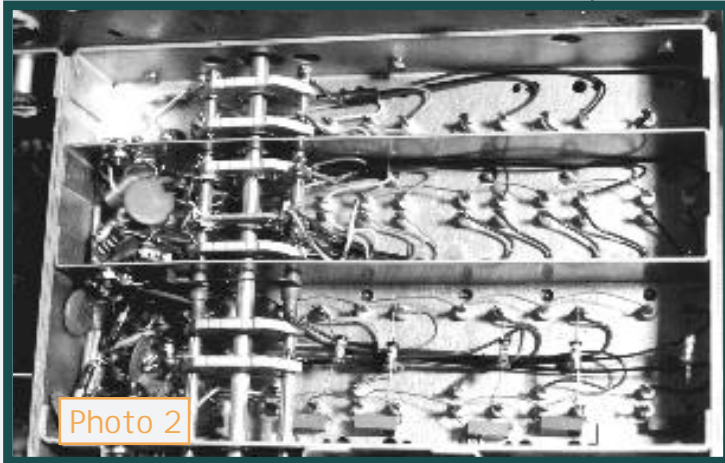
I'd noticed that the T207 cover (the first crystal oscillator transformer) could not be removed because of its location close under one of the cam shafts. Strange, given how accessible almost everything else is. I also noticed that the RF chassis had its own serial number, different from the one on the front of the mechanical assembly. One of my radios has a mechanical assembly and RF chassis from different manufacturers. Maybe these modules were intended to be separable. If the mechanical assembly could be removed as a single unit, cleaning and maintenance would be greatly simplified.

The manuals I have don't hint at this possibility, but despite my nervousness, it turned out to be quite simple. Photo 1 shows the separated mechanical assembly, all cleaned and ready for lubrication and reassembly. This operation isn't for the faint of heart, but it's not so difficult. What follows will be easier to



understand if you have an RF module in front of you!

First remove the 2<sup>nd</sup> crystal oscillator chassis from the RF module as per the manual. Then



remove the mechanical counter and all the slug racks. I use a dental pick to slip the springs on and off the racks. The plug-in transformers may not have to be removed, but do it anyway. The tabs that protrude slightly through the sides of the transformer cans stick out far enough that they can hang up on one of the cam shafts when the RF chassis is lifted away.

Remove the antenna trimmer shaft and the two 1/4-inch hex head bolts that fasten the antenna trimmer bracket to the mechanical assembly. On some units these may be Phillips screws. In Photo 1, the threaded holes for these bolts are in the upper left front, just below and to the right of the large antenna trimmer shaft hole.

There are two brackets that fasten the front one of the middle pair of vertical plates to the RF chassis. Remove the two Phillips screws that fasten these brackets to the chassis. In Photo 2, the nuts can be seen along the bottom of the large compartment, one just under the bandswitch and the other further right.

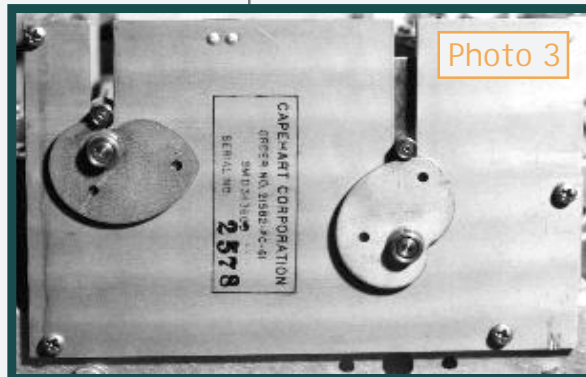
With the assembly turned upside down,

loosen the collar on the bandswitch shaft gear and carefully slide the shaft towards the rear of the chassis until it clears the front panel. It may need a bit of persuasion, but be careful not to damage the bandswitch. Without the shaft in place, the gear and its collar just hang there, so remove them as well to prevent damage during later mechanical adjustment.

Remove the three 1/4-inch hex head bolts on the inside of the front lip of the RF chassis. These are easily seen in Photo 2 on the chassis lip at the top of the bandswitch. Then remove the three Phillips screws that fasten the rear plate to the rear of the RF chassis. In Photo 3, these are the single right and bottom two screws.

Be careful at this point, because there is nothing holding the assemblies together except friction. On the units I've disassembled, the fit is snug. It helps to loosen off the Phillips screw on the rear spacer rod (left upper screw on Photo 3).

One last thing may make separation difficult. The Megacycle Change has a detent spring that fastens with two Phillips screws. There is a clearance hole in the front lip of the RF chassis that allows one of these screws to stick through a bit.



In Photo 2 this is the hole on the right side of the front chassis lip. If the screw does extend through, it may hang up. Loosen this screw off through the access hole that is provided on the front plate of the

mechanical assembly.

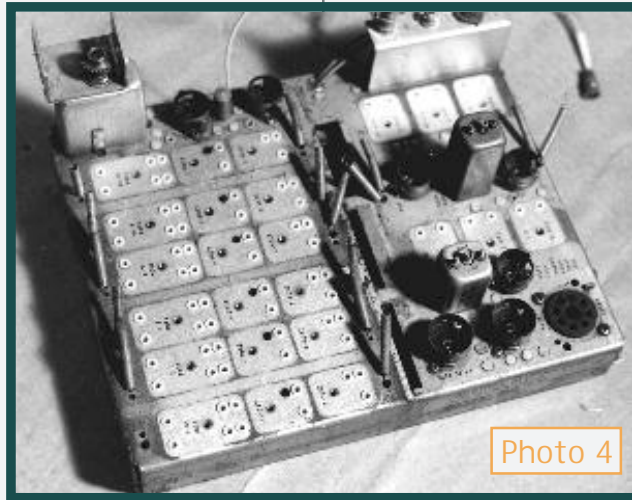
The main bandswitch gear has a shaft sleeve that protrudes very slightly into the clearance hole left for it in the RF chassis lip. Make sure it doesn't slide backwards with the shaft, but keep it snug against the plate. If everything else is

clear, it should now be possible to separate the two assemblies by gently easing the RF chassis upwards past the end of the shaft sleeve. It will be snug, but they should come apart with only gentle persuasion.

Now the mechanical assembly can be thoroughly cleaned using a strong degreaser. Don't be rough with it, as it is vulnerable to damage when separated. Once dry, any remaining grease can be removed easily with Q-tips or a cloth. The assembly should then be lubricated and checked for damage. The ones I've cleaned have all had mechanical problems such as missing screws, lockwashers, springs, spacers, broken shaft clamps etc. Anti-backlash gear loading may not exist in some split gears, and mechanical synchronization may be way off.

The slug racks should also be thoroughly cleaned and lubricated before reassembly. If the racks are really filthy, I remove the slugs from the racks to make it less likely that they will be damaged. Check each slug plate to be sure it is not missing the spring clip on the underside that applies friction to the tuning screw. Otherwise, get used to aligning the radio every time you bump it!

The RF chassis can also be cleaned easily. Photo 4 shows one, already a fairly clean unit, ready for final cleaning. I've had RF deck problems due to corrosion on some of the plug-in transformer pins. I apply Deoxit to the pins and their sockets and disassemble each transformer to remove any residual dirt that's gotten inside. I also apply a tiny bit of Deoxit to the silver-plated ring that provides the rotor contact for the trimmer capacitors. It is often corroded, and I've had alignment problems due to intermittent contact.



If you wish to check components in the RF chassis, this is the time to do it. The capacitors are rarely a problem, except for the brown tubular versions (some units will have had these replaced already). The resistors are often high in value, and some may need to be replaced.

Reassembly is essentially the reverse of the above procedure. Take care not to damage the rack springs. Nothing should need to be forced. Start all the screws and bolts, but don't tighten them until the RF chassis is positioned so that the main bandswitch shaft lines up with its sleeve and nothing seems strained. Then tighten them, starting with the front RF chassis bolts, then the rear screws, the middle screws and finally the antenna trimmer bracket bolts. The three bolts on the RF chassis lip can be difficult to start but all must be in place.

I have not suggested trying to preserve me-

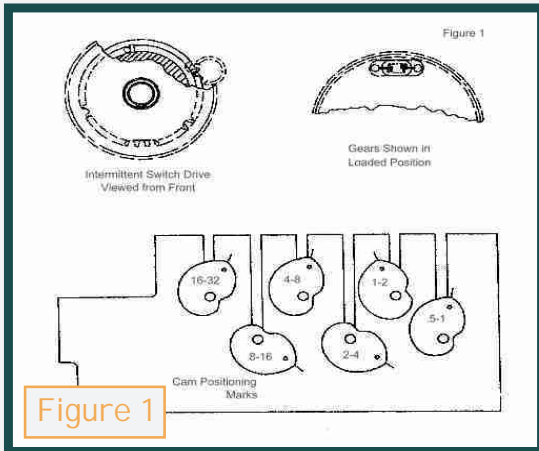
chanical synchronization through this process. I'm not sure it's possible, and most of the decks I've worked on have been badly out of adjustment when I started. It didn't make sense to me to try to be careful about maintaining synchronization during disassembly.

Resynchronizing the main

bandswitch, the second crystal oscillator switch shaft and the various camshafts is actually quite simple if you study the manual, use your common sense and don't panic! Almost everything can be set up independently.

This is how I've approached the problem. There may well be better ways, but this works for me. The challenge is to set the cam shafts to the positions shown in Figure 1 (none of the gears are shown in this drawing). The positioning marks on the 8-16 and 2-4 cams can be hard to see, but they are there! Photo 5 shows the RF

module from the front with the counter removed. The three mid-size gears lined up along the top are the 16-32, 4-8 and 1-2 mHz cam shafts respectively. The line of three gears under these (starting with the largest gear directly below the second slug rack slot, are the 8-16, 2-4 and 0.5-1 mHz cam shafts.



The only cam shaft that is not independently adjustable is the 8 to 16 mHz one, so start here. Loosen the shaft collar on the 16-32 mHz shaft and slide the gear back to disengage it from the 8-16 mHz shaft. Loosen the collar on the 4-8 shaft and slide it forward to disengage. Making sure that the Megacycle Change is firmly on a detent, set the 8-16 mHz shaft so that its cam is positioned as shown in Figure 1.

Now the frustrating part starts! Re-engage the 4-8 and 16-32 mHz gears, being sure to provide a two tooth gear loading on the split gears. Once done, and checking that the 8-16 shaft has not changed position, set the 4-8 and 16-32 cams according to Figure 1 and tighten their collars. The remaining three cam shafts can be set by loosening each collar and setting the cam according to Figure 1. As long as the 8-16 mHz shaft doesn't shift, all of the other cam shafts can be adjusted to make up for any small errors in the process. Make sure the gear loading is

maintained for the relevant split gears, and that nothing shifts until the next step is complete.

The intermittent switch drive assembly needs to be set according to Figure 1. The 8-16 mHz gear meshes with another gear assembly to its left. By loosening the collar on this shaft, the intermittent switch drive assembly can be set correctly. Now check that the camshafts and bandswitch gears all match the Figure 1 settings. Assuming you have removed the counter, set it to exactly 7+000 and reinstall.

All that remains to be done is to set the ten turn stops on the Kilocycle and Megacycle Change shafts. Turn the Megacycle Change shaft until the mHz counter shows 0. Then loosen the Megacycle Change shaft collar and turn the shaft only until it is against the lower limit of the ten turn stop. Rotate the shaft back a quarter turn or so and tighten the collar.

In Photo 5 the large gear and dial lock plate on the Kilocycle Change shaft has been removed. Turn the clutch assembly that meshes with it by hand until the kilocycle counter shows about -980. Turn the Kilocycle Change shaft until it is against the lower limit of the ten turn stop. Reinstall the gear and locking plate assembly on the Kilocycle Change shaft and tighten the collar.

At this point, the cam shafts should be in the Figure 1 positions at 7+000, and both Change knobs should be able to cover their full range. If the bandswitch gear and its collar were removed earlier, replace them now. With the



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counter set at 7+000, the bandswitch shaft should be slid forward into its collar. The manual instructions can now be followed to set the bandswitch and 2<sup>nd</sup> crystal oscillator shafts correctly before tightening their respective collars. It's useful to Deoxit both switches at this stage.

When you're done, and you've recovered your sense of equanimity, you should have a sparkling clean RF deck that you can tune with your pinkie!

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## Afterthoughts

**A**fter completing this article and sending it off, a few new issues emerged concerning the synchronization process. First, on some modules the 16-32 and 4-8 gears cannot be moved far enough on their shafts to disengage from the 8-16 gear in the way I described. However, this is not a big problem.

In this case, the 4-8 gear can be removed by removing the three screws holding it to its backing plate (visible in Photo 5). Then the 8-16 shaft (with the 16-32 gear still engaged) can be set correctly. Then loosen the collar on the 16-32 shaft and set it. Reassemble the 4-8 gear, and set it. The rest goes as described.

I'm sure there are other ways to do this, but what I first described seemed the easiest to accomplish, with my alternate approach only slightly less straightforward.










This procedure is very difficult to perform if the rack springs are connected. If they are, loosening a collar usually results in that rack going to its lowest position instantly!

Good Luck!

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