PTO Removal - A little care in removing the PTO will save you a lot of work later. First, set the KILOCYCLE tuning to XX.000, it doesn't matter where the MEGACYCLE tuning is set but the KILOCYCLE setting must be at .000 (not +000, see note below.) Next, disconnect the PTO output cable from the RF module and unplug the power cable at the PTO. Loosen the captive screws in the front of the PTO. Now, pull back on the PTO body until the oldham coupler center piece comes off of the gear box-side coupler face. Now lift out the PTO. Be careful to not move the tuning shaft of the PTO now. It is set for .000 and you should pay attention to the orientation of the oldham coupler or you can mark the shaft so you know the proper setting. If no work is going to be done to the PTO, when reassembling the R-390A you merely have to assure that the PTO is still set to .000 and that the gear box and Veeder-Root counter are set for XX.000 when the oldham coupler is assembled. In this manner, the mechanical settings have been maintained and calibration should be very close. NOTE - XX+000 is the highest frequency tuned on a specific band and XX.000 is the lowest frequency tuned on a specific band. All of the settings here are at the lowest tuned KILOCYCLE frequency on any of the MEGACYCLE settings.

Synchronizing the PTO to the RF Module (if you didn't do the "pre-set" part first) - If you've pulled the RF module without setting the Veeder-Root counter to XX.000, or if you had to do some work on the PTO, or if the PTO shaft has been moved and you don't know where it needs to be, or if you just want to be sure that the PTO is correctly aligned with the RF module then you'll have to synchronize the PTO. This requires a digital frequency counter (DFC.) The PTO should output a specific frequency range, 3.455 mc to 2.455 mc, in ten turns. All that is necessary is to monitor the frequency output of the PTO and set it to 3.455 mc. This frequency will be equivalent to XX.000 on the Veeder-Root counter. Here's the procedure,...
If the Veeder-Root counter wasn't set to XX.000 before removing the RF module, then the PTO was not pre-set to 3.445mc. This is a minor inconvenience that requires the PTO be set by powering up the R-390A and measuring the frequency out of the PTO with a digital frequency counter. It is assumed now that the PTO was out of the receiver so the oldham coupler is not together. Connect the PTO to the power plug in the PTO bay. Then route the PTO output coaxial cable to the back panel IF output connector. Disconnect the IF output cable and install the PTO output cable in its place. This provides you with a BNC connection for the PTO output that is then connected to the digital frequency counter. It isn't necessary to have the PTO mounted at this point but it will have to be in the PTO bay because of the cable lengths. With the R-390A powered up, the PTO will show the output frequency on the counter in about 30 seconds or so. Now rotate the PTO coupler and adjust the frequency to 3.455mc as measured on the DFC. Be sure the R-390A Veeder-Root counter is set to XX.000. Now the two faces of the oldham coupler should be correctly aligned (one projection oriented 90 degrees difference from the other face's projection.) Next, insert the coupler center piece. This may require moving the PTO body around a bit to get the two faces and the center piece to fit together. Once they fit, then go ahead and tighten the three captive screws to remount the PTO. Fit the backlash spring to the pins on the two coupler faces. Now, test that the PTO output frequency is 3.445mc at XX.000 and is 2.455mc at XX+000. Power off the R-390A and reconnect the PTO output cable to the RF module and the IF module's IF output cable to the IF output connector.

End-Point Error Adjustment - Collins PTO - It's rare to find an R-390A PTO that has excessive end-point error that is beyond adjustment. Most of the End-Point Error (EPE) horror stories come from the 70E-15 PTO that was used in the R-388 receiver. The R-390A PTO used high quality material for the ferrite core and consequently stability is

maintained of a period of decades. This applies to both Collins-built PTOs and to the Cosmos-built PTOs. Most of the time just a slight "touch-up" is all that is necessary and luckily that can be accomplished without a test jig or with having to operate the PTO outside of the receiver (as you do with the R-388 receivers.) The TM manuals direct you to remove the PTO and remove the access plug for access to the adjustable compensation inductor, then reinstall the PTO and dismount the front panel (lower it down) for access through the holes in the KC tuning lock plate and the front and rear gearbox plates back to the PTO compensation inductor adjustment. You'll need a long, thin small blade screw driver for this procedure. The first step is to check your EPE and see what it is. Usually, it will be pretty close. The greatest excursion I've found on a Collins-type was around 4.0kc Most EPE encountered are around 1 or 2 kc. The TM manual will give examples of which way to turn the EPE compensation inductor based on whether the ten-turn coverage is greater than or less than 1.000MC. Make a small adjustment to the EPE compensation L and then return the R-390A to XX.000 on the Veeder-Root counter. With the CAL on, loosen the oldham coupler on the gearbox side and readjust the PTO shaft for zero beat. Retighten the gearbox side oldham coupler and recheck your EPE. If you've adjusted the compensation L in the correct direction your EPE should be less. Repeat the procedure until you've gotten the EPE to less than 500 cycles. You can adjust it even closer if you want to since the "tic-marks" on the Veeder-Root counter are for 200 cycles. When you're satisfied with the EPE, remove the PTO from the receiver and install the threaded plug that covers the access to the compensation inductor adjustment. Remount the front panel. Pretty easy when compared to the hassle of doing a 70E-15 PTO from an R-388.

EPE Adjustment - Cosmos PTO - With the Cosmo PTO the location of the EPE access hole was moved slightly to the right and almost behind Z-702. This makes it difficult to access in the normal "thru the dial locking plate" method. The screwdriver used has to be minimum 6" long with a shaft diameter of around .060" (8" length is better.) Even then, it's mostly achieved "by feel" rather than sight. If you don't have the long very thin screwdriver the only option is to remove the PTO for EPE adjustment (with a shorter but still thin very small blade screwdriver) and then reinstall to test. This will take around five or six operations to get the EPE close to spec. It depends on how far off the EPE is. The greatest EPE I've encountered on a Cosmos PTO was 8kc. My long thin screwdriver that works on Collins PTOs would not adjust L-701 due to the very small access hole in the Cosmos PTO. I had to do the remove, adjust, reinstall and test operation about six times to get the EPE down to 0.5kc. With the PTO out of the receiver I could use a very small screwdriver to make the adjustments. The upshot is, expect more difficulty in doing EPE adjustment with a Cosmos PTO.