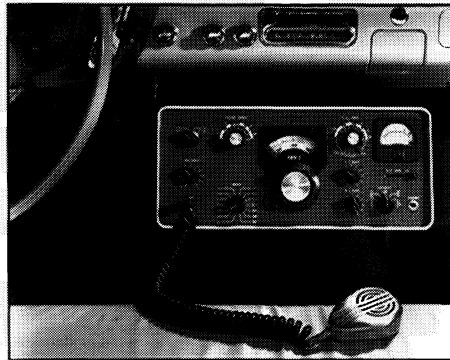


COLLINS S-LINE/KWM2 DIAL ASSEMBLIES - Part 2

by Ed Brooks, W5HTW ed.brooks@worldnet.att.net



The Ultimate Mobile Radio - The KWM-2

This is the second part of a multi-part article by Ed W5HTW. The article concludes in the next issue of the Signal (2nd QTR 2001 in April).

VI. DISASSEMBLY OF THE DIAL PLATES

There are two dial plates. The front one has no numbers, but has the panels which shadow out the unwanted numbers on the back plate. For most newer units, after the earliest of the 32S1/75S1 series, this front dial plate is mounted on the PTO shaft in such a way it can not slip on that shaft. This is accomplished with a tab and a slot.

The back plate, the one with the numbers on it, can be rotated. On the aluminum hub, as viewed from the PTO side, there are several screws. On the earliest models, there are three. On later models there are six. These screws go through the hub, and through the front disk, and to the drive ring.

In the earliest models, such as my 32S1, the three screws, if loosened slightly, enough they can be turned freely, will allow both dials to be rotated on the PTO shaft. This is an undesirable condition; the front disk should

not rotate. On later models, with the tab and locking slot, the front disk will remain locked to the PTO shaft until the screws are removed completely. If disassembling the dial plates, remove these screws.

Note: If you feel it is going to be necessary to remove the dial hub assembly from the PTO shaft, do it before taking the following steps. To remove it, rotate the PTO shaft fully CCW until the stop tab is against the stop screw. Loosen the two set screws in the dial hub, and pull the dial assembly outward. If it is excessively tight and won't come off, continue to rotate it CCW while pulling gently outward. Now, for dial disassembly.

1. Remove the three or six screws holding the front dial to the PTO hub.
2. Lift the drive ring out of the front dial plate. BE CAREFUL! There may be a locking tab, or in some units, locking pins, to hold that dial fixed on the PTO shaft. Don't lose them! On oldest units these do not exist, and, with the three screws removed, the assembly can be easily pulled apart.
3. Remove the front dial plate.
4. There is a thin, flat washer that fits between the two dial plates. Remove this washer, and handle it carefully. Though it is metal, any warping of this washer will result in improper operation.
5. Note now that the rear, numbered, dial plate can be slipped off the hub. It may be tight, but it can be removed. Rotate it on the hub while pulling it free and it will slip off.
6. Give all components a good cleaning. One cause of binding is contamination on the Nylatron drive ring. When I took this assembly apart the first time, I did not clean adequately the drive ring, and when I put it back together I still had binding in one part of the revolution. I took it all back apart a second time, and removed all contamination from the Nylatron drive ring.

Also clean the aluminum hub, where the back dial plate slides on it. I used cotton swabs, dipped in warm water (only lukewarm) no soap, and I scrubbed the nylatron drive ring and the hub until I could see no spots of dirty or grease leftover. I then used a second swab (quite a few of them, actually) to dry components. I was afraid simply letting them dry on their own would leave some of the

contamination in place. Don't forget to clean both sides of the large washer. Contamination on this washer can cause the dial alignment to slip during operation.

7. Let's hope you noticed carefully where the locking tab or pins go, where the washer goes, and how to put the two dial plates back together!! All of this disassembly can be done without loosening the two set screws on the dial hub, holding it to the PTO shaft. If you have not loosened those screws, you are a step ahead in putting it all back together, for you will not have to concern yourself about how far onto the PTO shaft the hub must go. If you have loosened those screws, you can probably see the markings left on the shaft where the hub has rested for so many years. You can probably also see the set screw marks. Don't worry about it, though, if you can not. We will take care of that.

If you need to remove the dial assembly from the PTO shaft, rotate the assembly fully CCW, until the PTO shaft stop screw has blocked rotation. Now loosen the two set screws holding the dial assembly and pull it forward off the shaft. If it is excessively tight, grip BOTH dial plates simultaneously, and continue to try rotating gently in a CCW direction, while pulling outward.

VII. REASSEMBLY

You are reversing the above process.

1. Install the back dial on the aluminum dial hub. Push it to the shoulder on the hub, then rotate it to be sure it can rotate fairly freely. It may not "spin" but can be rotated without excessive pressure. Be sure the numbers face outward!
2. Install the large washer. There is no way to fasten this down, so lay the hub on its end and lay the washer on it.
3. The outer dial plate goes on next. If you are working with anything but the oldest of units, you may find a locking tab and/or pins. Be sure these go into the right place. With the oldest units you may simply lay the dial on top of the washer. Note. The outer dial has a single black dot on its edge. This dot should face toward the front of the radio. If viewed from the back, the dot looks white. Be sure this dial plate is installed with the white-appearing dot toward the back dial plate and the large washer.

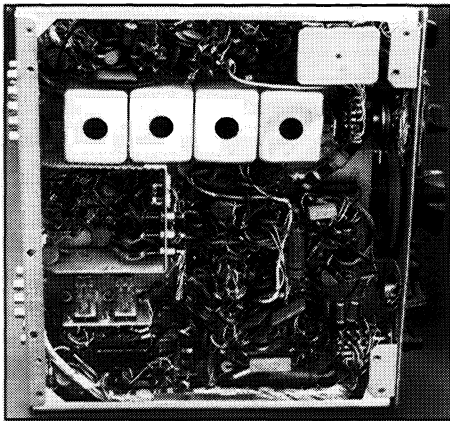
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Send us a picture of your shack, your call sign, and any shack information and we may use it in a future issue of the Signal. Just mail it to the CCA address.

COLLINS S-LINE/KWM2 DIAL ASSEMBLIES - Part 2 *(continued from page 1)*

by Ed Brooks, W5HTW



Bottom View - KWM-2

4. Install the Nylatron drive ring. Position it so the three/six screws may be screwed into it from the rear of the hub.
5. Turn the assembly on its side, and install the 3/6 screws. Do not completely tighten them yet.
6. Now be sure the washer, drive ring, and the two dials are properly aligned with each other.
7. If you removed the assembly from the PTO shaft, now is the time to reinstall it, unless you plan to work on the PTO itself. If you do, lay the dial assembly aside, without further tightening the 3 or 6 screws. Refer to directions regarding the PTO. Otherwise, proceed with step 8, below.
8. With the PTO shaft fully CCW, rotate the dial assembly so that the black dot on the front panel is straight up, at the center of the PTO chassis. Hold the chassis upright, and position the dial assembly so the PTO is at the top of rotation. Push the dial assembly onto the PTO shaft. Note: If it rotates, simply continue rotation CCW until the black dot is back at the top center of the PTO chassis.
9. Now, for initial alignment of dial assembly, rotate the dial assembly CCW until the black dot has moved to the left to about the 11 o'clock position, no further! Don't worry about the back dial plate, except check to be sure it can be rotated.
10. Tighten the 3 screws in the dial hub. Watch closely. These screws are to be "lightly" tightened. If you tighten beyond "lightly" the front dial plate will be forced away from the back dial plate by more than the width of the separation washer. The object in tightening these 3 or 6 screws is to prevent the front dial from rotating on the dial hub, but not to force the two dial plates apart. One half turn too much will force the dials out of alignment, and may cause problems later with the idler gear. Once the front dial plate can not be turned freely on the dial hub, use these screws to make certain of dial plate alignment, but do not tighten further.

11. Push the dial plate to its approximate previous position on the PTO shaft. MODERATELY tighten both of the two set screws. You don't want the hub to rotate on the shaft, but you need to be aware you will be loosening these two set screws again later in the process, so you don't want to permanently set them into place!

12. Now, rotate the back dial plate so that the "0" on it (zero) is directly under the black dot on the front plate. There are two sets of numbers on that dial plate. Either zero is correct.

VIII. PTO MAINTENANCE

With the PTO subchassis out of the radio, you may perform other maintenance on it if necessary. If there is no good reason for it, do NOT loosen the two set screws holding the stop tab to the PTO shaft. If you do, and then the shaft rotates, you may have to realign the PTO electrically as well as mechanically. While this is not a major project, if it isn't necessary, why bother?

For effective maintenance of the PTO, it should be removed from the radio completely. That means unsoldering the wires from the PTO to the various terminal strips. See section V.11 (a) for how to remove these wires. Reverse the process to reinstall them.

1. Remove the two nuts on the back of the PTO chassis.
2. Snake the back cover off the PTO by sliding it along the wrapped cable. Remove it completely.
3. You can now see into the back of the PTO. The actual tuning slug is the steel-looking cylinder. Note that it has two slots in it, with tabs that slide as the PTO shaft is rotated. The shaft is threaded for precise movement of these tabs, and of the tuning slug.
4. Check this shaft for contamination. It should be cleaned of any buildup. I chose not to dismantle this, but it is relatively easy to do so. I used a clean swab, one of the electronics, lint-free types, and held it against the shaft as I rotated it. Rotation will be two full turns before you hit the next stop. Be SURE you have not loosened the set screws on the tab stop, and have not moved any stop screws, or the spring tensioner, on the front of the PTO chassis.
5. If you wish to go further, you can remove the two screws holding the slug back plate, but be aware there is a spring pushing against that plate, and it could be somewhat difficult to get it back into place.
6. You may also unsolder the two connections to the slug tuning mechanism, and entirely remove the tuning slug, but I did not do that, and will not relate the process in any detail here. If you do this, you will need a way of resetting the PTO electrically, against a known frequency measuring device. Basically this

consists of removing the two set screws on the lock tab, removing the two screws holding the tensioner spring, removing the spring, and unsoldering the two internal connections from the tuning slug assembly. Reinstallation is the reverse, and relatively simple, but you may not want to tighten the set screws in the stop tab until you have determined correct electrical alignment. (Frequency.) For this part you are on your own!

7. If you do choose to remove the tuning slug assembly, you may as well remove the entire threaded shaft, clean it thoroughly, and then lubricate with a thin machine lubricant, such as standard white lithium grease. Do not apply too much. It should feel lubricated to your fingers, but if you see grease on the shaft, you probably have too much.

IX. CHASSIS ALIGNMENT

Having cleaned all dial components, but specifically the nylatron drive ring, the aluminum hub where the numbered (back) dial plate rides, and the large, thin plate separation washer, you may put it back together.

We have already covered the reassembly of the two dial plates and their mounting on the PTO shaft. From here we have to cover the final mechanical and electrical alignment. The Angelfire web site has excellent information on mechanical alignment of the PTO on the main chassis. If you can go there and download that information, it can prove valuable to you.

1. Reinstall the PTO subchassis back cover, which is also the mounting plate. Do NOT tighten the two nuts at this time, except just enough to hold the cover in place. You must run the cable through the hole in that mount.
2. Place the PTO assembly, with the dial plates now mounted, onto the chassis of the radio.
3. Run the wrapped wire down through the hole in the chassis. Don't worry about resoldering anything at this time, as you may have to do some of this over. I did!
4. Position the PTO so that it looks horizontal to the front panel. It may not be exact, but it should be relatively close.
5. Insert the PTO mounting screws into the mounting bracket tabs. There are two screws. Do not tighten except enough to hold the screws there and keep them from falling out.
6. Check for free rotation of the dial. It should feel pretty free, with no binding at any point in its rotation. Any resistance should be even throughout the rotation of the PTO shaft. To rotate it, you can access it from beneath.
7. Rotate the dial so that the access hole in it is positioned over the drive clutch. The radio should be on its end so you can see this while reaching the top of the radio.
8. Engage the clutch disks on the drive rim. If

you have not loosened the escutcheon you may have to do so now, but if the bushing is sufficiently loose, you should not need to do this.

9. Using your needlenose pliers, hold the shaft bushing in place and tighten the locking nut enough to keep it from slipping. You need not tighten firmly at this time.

10. From the top of the chassis, tighten the PTO mounting screws more, but do not tighten fully.

11. Rotate the dial mechanism by hand, by turning the dial itself, not by rotating the tuning knob. Rotate it through its entire range and check for binding. Do not change relative positions of the dial plates to attempt to center the numbers.

12. Now turn the radio back on its end, and position the dial so that the access hole allows you to see the drive clutch disks. Again, rotate the dial by moving the dial itself, not the tuning knob.

13. Now tighten the lock nut on the tuning shaft bushing. Temporarily install the tuning knob and attempt to rotate the dial. If there is slippage, you will have to adjust the bushing to improve grip on the Nylatron drive ring. If there is no slippage go to step xxx. If there is slippage, perform the following adjustments.

a. Remove the tuning knob.

b. Slightly loosen the lock nut on the bushing.

c. Using your needlenose pliers, rotate the bushing in either direction, about one-quarter turn, or 90 degrees. While rotating, and looking through the access hole in the back of the dial, observe the motion of the drive clutch. To improve grip, you want the clutch to move downward, toward the bottom of the radio. Since this is an eccentric bushing, it works as a cam, to move that tuning shaft up or down. Of course, it also moves it to one side or the other!

d. Find the point of best contact, by rotating that bushing. Anything more than 180 degrees is taking you back toward your starting point. Note: If your system is fairly new, do not rotate this bushing so that it applies more than needed pressure, as, over a long period of time, this will weaken the drive clutch disks. With older systems, you may need to set the bushing so the disks are at their lowest point, which is tightest grip.

e. Tighten the locking nut and reinstall the tuning knob.


f. Place the radio flat on the table, facing you. Now, using the tuning knob, rotate the dial through its entire range. Do this a couple of times. Look for binding or "hard spots." After perhaps three or four complete end-to-end rotations, there should be no further binding or resistance. During this time, the rotation of the tuning knob is causing the PTO chassis to "center" itself. You may see the chassis move.

g. When you are satisfied with the smoothness

of the operation, try holding the PTO chassis in place with one hand while rotating the knob through its complete revolution with the other. If you find no binding or unevenness, it is probably positioned correctly.

h. Tighten the two metal screws holding the PTO to the main chassis.

i. Tighten the two nuts on the back of the PTO. Try not to move the PTO during this step or the preceding one.

14. The PTO is now mounted correctly. Once again, check rotation. This time you may do it with the tuning knob. Be sure there is no binding. If you run into problems, repeat the mechanical alignment process (a) through (i) above.  (concludes in next issue)

Please Note: Some of the techniques and technical information discussed in the Signal are controversial and we invite you to share your knowledge and experience with us. Please send your letters and comments to the Editor.

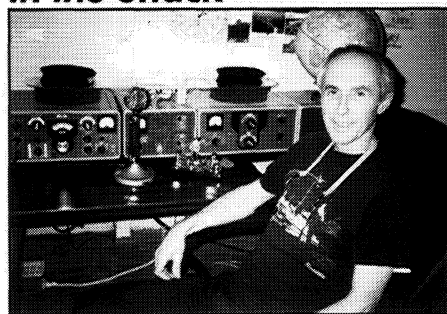


At the Mic with KW6KW

Sandy Meltzer
President, CCA

It's time to prepare for the Dayton Hamvention. Please check the CCA web site for the latest information about the various CCA-sponsored activities at Dayton this year including our annual CCA Awards Banquet on Friday Night, May 18th at 7pm at the Downtown Marriott hotel in Dayton. We expect to have another excellent program this year along with our traditional "Social hour", door prizes, and annual CCA raffle. The CCA reserves a block of rooms for CCA members and you must make your hotel reservations before March 30th. 73, Sandy

In the Shack



Jerry Webster, K7ENP

I have been a ham since 1958. I am 62 and am retired and I always sign 73's your friendly ham Jerry K7ENP.

Send us a picture of your shack, your collsign, and any shack information and we may use it in a future issue of the Signal. Just mail it to the CCA address.

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at 2000Z

•Tuesday 3805 kHz
at 8pm CST

•Thursday 3875 kHz
at 8pm CST

•Friday (West Coast) 3895 kHz
at 10pm CST

Sunday for Technical, Buy, Sell and Swap.
Tuesday, Thursday and Friday for Ragchew.

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- The R-390A Addendum Video
 - The R-390A Video
 - The Collins Amateur Radio Equipment Video Spotter's Guide
 - The Collins 75A-4 Video
 - The Collins KWS-1 Video
 - The Collins KWM-2 Video
 - The Collins 75S-3 / 32S-3 Video
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Basic Trouble Shooting

Post War 70-xx PTO Drift Problem

by John Bess, WA5VVT

Beginning in June, 1949 Collins Radio Company began developing two receivers, the R-389 and the R-390. This was a three-year effort and took approximately 30,000 engineering man-hours implemented with laboratory technicians and drafting help.

The delivery schedule for the working prototype units was as follows:

R-390 No 1. January, 1951

R-389 No 1. March, 1951

R-390 No 2. September, 1951

R-389 No 2. February, 1952

R-390 No 3. February, 1952

R-389 No 3. May, 1952.

The final engineering report was due in August of 1953. The report was issued on September 15, 1953. Contained within this report that was not "Declassified" by the military until May 8, 1985 is some insight to the PTO drift problems we are experiencing in the Collins gear that we have all come to love. Page 64, Section 4.2.7 R-389 Variable Frequency Oscillator contains the first clue.

Section 4.2.7.1 Design Problems and Solutions, second paragraph "FerriteDevelopment" states: "The high permeability of ferrite was the outstanding reason for its usage. At the time of the choice the Temperature Coefficient of the available ferrite was quite bad. As work proceeded a method was worked out to partially compensate the poor T.C. This method involved use of differential expansion properties of materials. This device was no more than developed when a new shipment of ferrite was received that was of opposite T.C. polarity. Since this indicated it was possible to cross over a zero T.C. reference, serious work then began to secure a product with nearly zero T.C. It was also recognized that the device that had been invented would not perform satisfactorily if the T.C. changed polarity."

Page 69 of this report, Section 4.2.8 "R390 Variable Frequency Oscillator" Powdered Iron Cores. States: "The powdered iron core aging problem was attacked in two different ways. First, the intrusion of moisture and vapor into the core was reduced by impregnation with a resin. Tests were made which show the permeability aging to be about 8 to 10 times slower and less than that measured upon an untreated core. Continuous research is being carried along presently to find materials and techniques that will still further improve the quality."

The second step taken was to approach manufacturers of the cores with the problem of aging. Considerable work was done with Radio Cores Company who have been trying various insulator materials and have been sending cores to us for aging test. The

magnitude of this problem has been so great that an answer has not been found, although trends have been established for further research." Page 79, Section 6.0 "Recommendations" States: "The following recommendations are made as a result of the Contractors experience in developing this equipment: 6.1 In a development project of this kind where a group of engineers design and build a piece of equipment, there is one problem always to be faced. That is, to decide at which point in design, work can be stopped and it can be definitely said that this is it. Of course the design objectives and specifications should be the answer to the problem, but no good engineer who is striving for the optimum in his design likes to stop work when he can see further improvement possible even though minimum design objectives have been met. However, in this equipment where production schedules demand completion of the design, it is felt that further investigation and design would be worth while especially in...The VFO has certain drift problems which might be reduced by new and better iron cores."

Well, there you have it, right out of the book. Part of the reasons that the PTO drift may not be that the capacitors have changed but rather that the permeability has changed over time more than the capacitor characteristics have changed. This throws all of the parameters out of kilter. The temperature compensating capacitors are trying to compensate for a value of permeability and drift characteristics that no longer exists. Yes, capacitors do change but not at the same rate as the ferrite cores. Moisture, temperature and vapor affect the cores more than the capacitors over the long run.

The Collins factory used 10 different temperature coefficients at the same value of capacitance (20 pf) for C301 and 2 different coefficients for C305 (100 pf) in the 70K-2 that was used in the S-Line series. This would indicate that they had not yet found the one and only perfect temperature and ageless stable core for the PTO. These cores have been aging from the day of their creation and they were not all the same then. Therefore, there is no ONE SINGLE ANSWER to your drift problem. You must consider all of the factors and take them one at a time. To quote a famous individual "Now you know the rest of the story".

The Annual CCA Awards Banquet will be held at the Dayton Hamvention on Friday night, May 19th at 8pm at the Downtown Marriott hotel. Please register early. Complete registration information is available on the CCA web site.

Editor's Operating Desk

by H Michael Crestohl, W1RC/VE2XZ

Editor, The CCA Signal

Now that the Holidays are behind us it's time to play radio again. Here in the Northeast it's still hard winter but the days are slowly getting longer and soon it will start to get warmer and that means Hamfests! Some of you folks who live in warmer climes are more fortunate when it comes to outdoor events but this winter has seen some strange weather patterns indeed.

The manual scanning project is proceeding very well. I see that a large number of service bulletins, information letters, dealer memos, Collins Radio Company SIGNAL magazines from the 1930s and, coming soon, operating manuals as well as Rod Blocksom's interesting Collins surveys. There's lots of good stuff free for the downloading and more to come. New BoD member Larry Saletsky WA9VRH (wa9vrh@ocslink.com) is the coordinator of this effort and so if you have any Collins Radio documentation and would like to loan it to Larry for scanning please feel free to contact him.

Recently I was able to borrow a couple of very scarce U S Army manuals from Peter Grave to scan. These are training manuals that he found at a flea market in Jersey that cover setting up and operating the FRC-93 HF radio station (KWM-2A/30L-1/PM-2/312B-4/5). It's quite interesting to see how the military used to instruct soldiers in handling this sophisticated equipment with no prior knowledge or electronics experience and, in many cases, absolutely no interest whatsoever. I'd like to thank Pete for making these rare manuals available and shortly they will be available to any interested party free of charge in .pdf format on the CCA Web Site. In addition to being a very dedicated vintage radio enthusiast and active CCA member, Pete is also an antique car buff as well, particularly knowledgeable on Packards, Edsels and police cruisers and, most important, a good friend. Pete and his wife are regulars in the flea market where he parks his huge white truck loaded with vintage radios, especially Collins and other high-end equipment.

Also coming up soon is the Dayton Hamvention May 18th - 20th 2001. This year marks their 50th anniversary and so hopefully there will be some special events to commemorate the event. I see that there is a full slate of seminars including a Collins Forum on Saturday morning at 8:30 followed by Drake and Heathkit. Wonder why they scheduled them early in the morning which is prime flea market cruising time? You can get full information at: www.hamvention.org. Hope to see you all there!