

Repair of the 70E-8 PTO used in my Collins 32V3

by Bill Feldmann N6PY n6py@QNET.COM



The Collins 32V3 (on right)

With the high interest in AM operation on the ham radio bands, one of the best AM transmitters available today is the Collins 32V series transmitter. Most are very reliable even though many are over 50 years old because they were manufactured with the best components and design available in the 1950's. They don't seem to require the extensive modification of many other AM transmitters for good audio quality. However, the test of time has pointed out two weaknesses. The first is the failure of the 5 Volt HV rectifier filament windings in the LV power transformer requiring an expensive replacement. The second is PTO tracking problems. In my 32V3 the PTO tracking problem was that I could not correct a 3 kc dial error over the 80 meter band. Below I'll describe how I corrected the tracking error along with the method I used for removing the PTO from my 32V3 without affecting the transmitter's alignment.

If you suspect you have an error in your 32V PTO dial reading first follow the procedure on page 5-4 of your owners manual, which I won't describe here. However, I modified this

procedure to use my HF380 transceiver digital readout to accurately listen for a signal from my 32V3 at 3500 kc with my 32V3 the CAL mode. I then tuned my HF380 to 4000 kc and tuned my 32V3 dial to where I could hear the CAL signal in the HF380. With mine it took a 32V3 dial setting at 4006 kc to zero beat the receiver at 4000 kc. After following the adjustment procedure in the manual I could only get the error down to 3 kc, then I ran out of adjustment on the PTO trimmer capacitor.

After some looking at the 32V3 schematic and bugging my friend John Bess, WA5VVT, I decided to open the PTO and see if I could get more adjustment out of the trimmer capacitor. Changing some of the PTO's fixed capacitor values looked promising. Also I didn't want to pull the front panel of the 32V3 so I decided to try removing the PTO from behind and underneath which turned out to be much easier than pulling the 32V3 panel.

After disconnecting the AC power I removed the 32V3 from its cabinet and the RF shielding from the chassis. I then removed its rear panel and tipped the rear panel down on my workbench. This panel holds the transmitter's connector strips and fuses, it's secured to the rear chassis by six #6 screws. With the panel open I carefully removed the two #6 screws and lock washers securing the bracket holding two large capacitors, C101 and C102, to the rear chassis. Be careful not to drop the screws by using a captive head screwdriver because it's almost impossible to fish them out if you drop them. Having this bracket loose will allow you swing it clear when you remove the PTO. Next I removed the connector assembly, P101, located on top of the PTO just in front of the PTO desiccant container. It has the two cables running out of the cover to the exciter chassis. I loosened the two long #6 Phillips head screws to allow lifting the connector up and free of the PTO. Be careful to not lose the two hollow standoffs under the connector brackets. I left the screws in the connector brackets for ease of assembly later.

Then I tipped the rig on its side and turned the dial to the 4000 kc end of its range. I then turned the tuning knob to be able to reach and loosen one of the screws. "Don't remove the screws securing the PTO shaft to the U joint."

You can gain access to the screws by looking from the bottom of the rig and next to the bracket securing the PTO to the front panel assembly. Use a long screwdriver to loosen one of the screws. I then moved the tuning knob to expose and loosen the second screw securing the PTO shaft. After loosening these screws do not move the dial knob or PTO shaft. Confirm the U joint is completely loose on the shaft by pushing it with your screwdriver and observing it to move freely on the PTO shaft.

Next I removed the four #6 Phillips head screws securing the PTO bracket to the front panel assembly. Two are on the bottom near where I just loosened the U joint and two are on the top forward of the PTO connector pins. I then pulled the PTO very carefully toward the back of the rig while holding the now loose capacitors located behind the PTO up and out of the way. I confirmed that the PTO shaft came completely out of the U joint and then removed the PTO from the underside of the rig. I removed the PTO mounting bracket and shield by removing the three #6 screws from the inside of the mounting bracket. (Be sure to remember the orientation of these parts for re-assembly later.)

Now the hard part begins. These PTO's were sealed using a yellow Gliptol to exclude dust and humidity, which makes it very hard to disassemble the PTO. I found the heat from a large soldering iron handy to break screws loose from the Gliptol. I removed the four #2 screws securing the cover over the PTO tube, V001. I had to heat the heads of the screws to loosen the Gliptol and not damage the screw heads. I then removed the cover and tube. I carefully removed the desiccant container using a large pair of channel lock pliers. I then removed the trimmer cap cover by removing the three #2 screws securing it. Next I removed the connector from the top of the PTO by removing the two #2 screws holding the connector retainers. I again had to use heat to break the #2 screws loose. I was very careful not to break the connector insulator when prying it loose from the PTO using my pocketknife. It could lift up and unplug it from the PTO after the Gliptol seal was broken loose. The last and hardest job was to remove

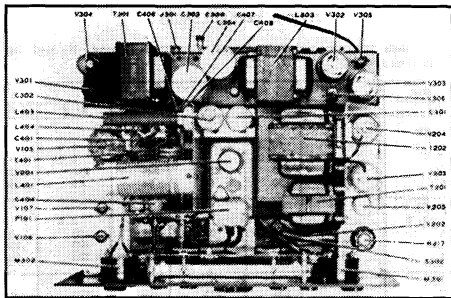
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Repair of the 70E-8 PTO used in my Collins 32V3 *(continued from page 1)*

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Inside the Collins 32V3 transmitter

the two #6 flat head screws from the shaft side of the PTO in line with the heads of the barrel nuts that can be seen on each side of the PTO. Only remove these flat head screws to disassemble the PTO from its case. On mine Gliptol had run into the barrel nut threads and under the screw heads. For me the best way to remove these screws was to heat the head of each barrel nut and then the screw heads to melt the Gliptol.

I then slid the PTO chassis carefully out of its aluminum enclosure. I then removed a #2 flat head screw securing a shield to the PTO and then removed the shield by heating each of the four finger stock shield corners soldered to the PTO chassis. I found the best method was using a pocketknife blade to hold the finger stock off the chassis as the solder melted and then re-hardened. Then I slid the shield off the chassis to gain access to the PTO circuit.

In my PTO I found the desiccant to be good, the PTO chassis very clean and the lubricant was in good shape so I decided not to mess with cleaning or re-lubrication. I thought that any attempt to re-lubricate might mess it up more than help. I also found that C005, as shown as 20 pf on my schematic, was really two 10pf caps of different negative temperature coefficients in parallel. Thus making them very critical to the PTO's temperature stability. I decided not to change them. There is a stack of disks across the bottom of the PTO with two arms from the PTO slug riding on them. They are set by the factory during assembly to correct tracking errors of the PTO over small parts of the PTO range. Never mess with them unless you really know what you are doing. In most cases they don't need adjustment.


Looking at my PTO I found the trimmer capacitor C003 was in its completely opened position. Therefore I needed less capacitance to correct my tracking error. Evidently the components in the PTO age with time and humidity resulting in an increase of the LC ratio in the original PTO components. On my PTO I found a small 10pf NPO capacitor, C002, in parallel with the large 710pf capacitor and the 0 to 25pf trimmer capacitor. This is labeled (select in test) on my schematic and was

probably selected during calibration to gain a midway setting of the trimmer capacitor when the PTO is calibrated. However it may be of a different value on your PTO. I decided to try removing it from the circuit but physically leave it in the PTO for possible future use by cutting only its lead to the top of the tank circuit. I then reassembled the PTO, First installing the shield and then re-melting the solder at the shield corners. On both barrel nuts the Gliptol re-hardened in the threads so I had to chase them using a 6-32 tap. Also I resealed the PTO, to exclude dirt and moisture, by using GE RTV sealant. It will provide an excellent seal and be easy to remove if any future work is done inside the PTO. However, RTV is conductive so don't get any on the PTO connector around the connector pins or any electronic components. I also put some under the flat head screw and barrel nut heads.

Installation of the PTO is in the reverse order of the method I used to remove it. Be careful not to drop screws and washers into the transmitter. That's why the captive head screwdrivers are a real help. Be very careful when sliding the PTO shaft into the dial drive U joint not to damage it, and leave the two screws loose on the PTO shaft U joint. If you didn't move the PTO shaft or 32V3 tuning knob while the PTO was removed, your transmitter will still be in alignment with the exception for a small dial error. Also be sure to install the two hollow standoffs under the connector bracket. My PTO also had a tendency to drift about 75 cycles when the 32V3 was keyed to transmit. It was noticeable working SSB stations. I replaced my PTO's 6SJ7 tube, which completely solved this problem.

After the PTO was installed, I turned on the transmitter, held my breath, and placed it in the "CAL" mode. I had lots of grid drive and then relaxed. I then used my HF380 to find the signal from my transmitter. Set the dial of the 32V3 to the zero beat frequency on the receiver and then tightened the screws securing the U joint to the PTO shaft with the PTO signal zero beat with my HF380. I then repeated the calibration of the PTO using the method of page 5-4 of the manual but with my HF380 as described above. I was able to get my dial to track within 100 cycles over 500 kc of the 80Meter band after this procedure.

This repair worked well for my 32V3 but may not work as well for you if your C002 test select capacitor is too small to correct the error. If the scale factor had been too large (with the trimmer running out of adjustment with the trimmer completely closed) it's easy to find good quality NPO caps to add in parallel with the air variable to achieve more adjustment of the variable. Unfortunately, most 70E-8 PTO's

seem to age such that capacitance or inductance has to be removed from the circuit. Also I was fortunate that the sealing of my PTO was so good that both the desiccant and lubrication were in excellent condition. However, if anyone has had experience with re-lubrication or more extensive work on this PTO, I would like to hear from you. Also it would be interesting to hear if anyone has removed windings from the inductor or changed other capacitors in the PTO to solve larger tracking errors. 

Dayton Hamvention Cometh

For many of us, there's nothing like the Dayton flea market and indoor displays to revive the amateur radio spirit for yet another year. If you've come before then come again. If you've never been to Dayton now's your chance.

Dayton is a special place for the Collins gang. There's no better place to seek out and probably find that special Collins Radio you've been looking for. The CCA will once again be holding it's annual Dayton Banquet on Friday, May 17th at our new location, the Dayton Fairborn Holiday Inn. Hospitality hour starts at 7PM, with the Dinner at 8PM sharp. Bob Heil, K9EID will once again be at the Hammond organ and after Dinner the annual Awards will be presented followed by Door Prizes and our featured speakers. Speakers and presentations include an FCC Update from Riley Hollingsworth, K4ZDH and a special presentation from Ted Craven on the Collins Radio Company Dallas operations in the 1960's. The Raffle drawing will wrap things up and this year Tony, W9JXN, has rounded up a truly amazing treasure trove of Collins and other goodies to be handed out to the lucky winners. Prizes this year include a Collins Aviation Atomic Clock, a 'Fly Collins' jacket, a new Vintage mic from Heil Sound, two MM-1 mics, an Ultimeter 800 WX station from Peet Brothers, a 51 6F-2 Solid State Conversion kit from Peter Dahl and much, much more! Banquet Tickets are still available but going fast. Hospitality Suites will be up and running at the Fairborn Holiday Inn on Thursday night through Saturday night. This is where you get to meet and greet your fellow CCA members, renew old friendships and put a face to some of the voices you've heard on-air.

Of special note is Hap's 'Dance Card'. Each year Hap, WA4UPV, compiles a list of all flea market spaces held by CCA members and prints them up on a handy pocket-size card. Pick yours up at the CCA Hospitality Suite on Thursday night. We look forward to seeing as many of you who can make it to Dayton this year. It promises to be another great CCA gathering. '73 Peter, VE3KWM



At the Mic with KOFLY

Gayle Lawson
President, CCA

As many of you have heard Sandy KW6KW has chosen to retire from the CCA Board of Directors next year. In order to provide a smooth transition of leadership, Sandy has stepped down as president for the remainder of his term. The CCA Board has elected me as president as part of the transition process. Sandy will remain on the CCA Board and will continue to support the CCA web site, CCA Collins Reflector, and production of the *Signal* newsletter. I feel that the CCA has progressed immensely since Sandy took the reins in 1998, the organization is on the correct course and the current board does not plan on instituting any changes. We will continue to maintain and expand our informational services and Nets. The CCA is in the process of applying for IRS 501C-3 tax free status, this when approved will allow us to receive donations in exchange for tax credits as well as reduce the mailing costs of the *Signal*. Over the last several months the BOD has been making preparations for Dayton Hamvention and the CCA annual awards banquet. The meeting and banquet location has been moved to the Holiday Inn Fairborn, which has facilities that rival the Marriott, it also has a lower per day room rate for the weekend. The banquet program is quite long this year, consequently we plan on eating on time and stepping out lively with the festivities, it should be a lot of fun.

Our 75 and 20 meter AM and SSB nets remain as popular as ever, Pete K5PZ has started a Sunday 10 Meter AM net. Pete and Bill N6PY have been performing the NCS duties on 10 Meters, operating on this band has brought some propagation problems where certain areas do not hear either Pete or Bill very well. We can use some more Net Control Stations to fill some of the voids.

The CCA is a volunteer organization; we need volunteers to fill positions as we find new projects to do and services to perform. I would like to start a technical committee whose charter will be to supply the *Signal* with technical articles. Please contact me if you would like to volunteer to help with our various CCA projects. I hope to see you all at Dayton.

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.

Editor's Operating Desk

by H Michael Crestohl, W1RC/VE2XZ
Editor, The CCA Signal

Spring is finally here in the Northeast and the weather is getting nice and warm. We just changed our clocks ahead one hour and now the daylight lasts until after 7:00PM. To me Spring always signifies a rebirth, including many hobbies. Hamfests are coming up with all the fine junk, er, I mean great stuff and of course, seeing the gang and swapping tales. This also means that Dayton is coming up soon and so if you're planning it please be sure to note the information elsewhere in this issue that gives details on the banquet and accommodations. Thanks to the efforts of John Bess and others the CCA is moving to a new headquarters hotel - The Holiday Inn in Fairborn Ohio which represents a decent savings in the room costs over the downtown venue. I have it on good authority that the banquet this year is really going to be something very special and memorable. However I am sworn to secrecy and cannot divulge any more details. Regretfully I cannot attend Hamvention again this year and unfortunately will miss the all the fun.

Big news in the CCA is that Sandy Meltzer, KW6KW has stepped down as President due to professional demands and to make sure we have a smooth transition for our new president. The Board of Directors has chosen Gayle Lawson, KOFly as the new chief executive. I know that he will continue to guide the CCA wisely. We all owe Sandy a sincere thanks for his hard work and the countless thankless hours he has devoted to CCA affairs the last several years. He is the person responsible for the *SIGNAL* looking as good as it does although I am usually the one that gets the compliments. Sandy is well respected in the Collins community and his work will leave a lasting positive imprint on our organization.

Some sad news from John WA5VVT. Roger Reader, KA5YAY became a silent key in March at the young age of 55. Roger was an expert at repairing and restoring Collins equipment and worked with John for many years. I was always very happy to see Roger at John's booth at Dayton. He always had a big smile had a new funny story or joke for me every time. He truly was a "good ole boy" and I will miss him.

The CCA needs articles, stories, technical stuff and restoration notes for future *SIGNAL* issues so please help us out and send in something. You don't have to be a top-notch writer; our editorial staff will take care of that and you will get all the credit! Pictures and illustrations will be great but not absolutely necessary.

Have a great time at Hamvention and buy lots of goodies!

73's Michael W1RC/VE2XZ

Join Us on the Air!



- Sunday 14.263 mHz at 2000Z
- Tuesday 3805 kHz at 8pm CST
- Thursday 3875 kHz at 8pm CST
- Friday (West Coast) 3895 kHz at 10pm CST
- Sunday 10m AM 29.050 mHz at Noon CST
- 1st Wednesday AM 3885 kHz at 8pm CST

Sunday for Technical, Buy, Sell & Swap
Tues., Thurs., Fri., & Sunday for Ragchew

THE COLLINS VIDEO LIBRARY!

- 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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 - '91, '92 & '97 Dayton Videos
- also the PDC-1 kit that converts ANY average reading wattmeter to true PEAK READING even the Bird 43!

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Call M-F 4pm-6pm Central
Leave message - will return call

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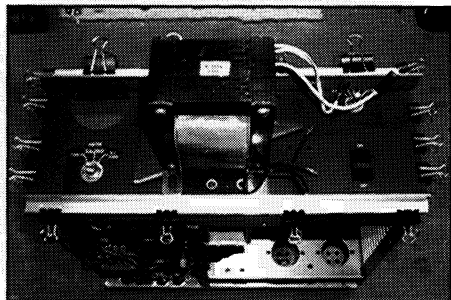
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Replacing an Overlay on a 30L-1 (or any S-line)

By Bob Sullivan, W0YVA



Replacement overlay for 30L-1 amplifier

I recently acquired a 30L-1 whose front panel was so bad it needed replacing. Thanks to the help via the reflector I found a replacement overlay and based on lots of advice received here is the process by which I replaced the panel. **Note:** Although I simply pried up and destroyed the existing overlay, it could have been removed without damage that would allow it to be re-screened, if necessary, and be reused. Do this by carefully heating with a heat gun and very slowly and carefully "lifting" the overlay from the subpanel by using a thin tool such as a stainless steel ruler or knife blade. Do not pry and be very careful not to nick or otherwise bend the overlay. The overlay will eventually "pop off" the subpanel and will be reusable! (Thanks to John Bess, WA5VVT for this technique!)

(1) Remove the existing overlay. This requires that you remove the meter, knobs, Tune/Load bezel, "30L-1" badge and the RE (or WE) emblem. Note: Do NOT remove the large flathead Phillips screws around the TUNE and LOAD shafts. These hold the variable capacitors in place and upon removal you will "lose" the spacers that are very hard to reinstall.

(2) Carefully scrape off excess old adhesive from the replacement overlay. It does not have to be completely clean. Lay the overlay on a soft towel to avoid any damage to its face. I did this cleaning by using a large very sharp knife carefully drawn across the overlay. I then roughed up the surface a bit with steel wool.

(3) Clean the 30L-1 aluminum subpanel. Again, it does not have to be completely clean, just get off the thick stuff. The cleaning process was the same as above.

(4) Using a rag dampened with lacquer thinner (or equivalent) wipe down the subpanel and replacement overlay. Be VERY careful not to touch the front face of the overlay with this solvent.

(5) Now the controversial part (adhesive selection). I received many suggestions but finally selected a small tube of Elmers "Stix-All" available at any hardware store, most drugstores, Home Depot, etc. This stuff is basically the same as RTV Silicone but which

is not available in handy little tubes. I coated the subpanel with a thin coating ensuring there was a nice layer at the edges and around all holes. Adhesive note: Other recommendations for adhesives included 3M Sprays, Plyo-Bond (what Collins originally used), and other contact glues. I chose not to use contact-type adhesives because you don't get a second chance to position the panel.

(6) Place the replacement overlay onto the subpanel no need to hurry, you have time to move it around and get it perfectly positioned. I used a drill bit placed in one of the meter mounting holes as a guide. Carefully squeeze the overlay onto the panel use your fingers.

(7) Now, using pre-cut lengths of small aluminum angle, clamp the top and bottom edges into place using small "binder" clips (any office supply store). Use additional binder clips at each end then place a heavy weight in the center of the overlay (I used a big transformer). Let it sit for a day.

(8) Remove the weight, clips, etc., and trim the edges where the adhesive squeezed out. Replace all panel components. That's it, you're done.

(9) Step back and admire your work.

My 75S-3B doesn't sound like Collins!

I noticed that when using my 75S-3B receiver that SSB signals simply did not "sound good." The receiver seemed to be fine but tuning a SSB signal was very difficult and playing with the BFO control was required for good sound. Also when operating CW and switching between filters excessive retuning was required to maintain the signal within the passband. After some basic troubleshooting I decided to measure the frequencies of the USB and LSB crystals using my trusty Radio Shack "RF Frequency Counter" (the one we all bought when they became available at a very low cost). I did this by sampling via a small capacitor connected to the plate of the Crystal BFO oscillator (V8, pin 6). The LSB crystal was dead on but the USB crystal was off by around 30hz - doesn't sound like much but ... I purchased a new USB crystal from Surplus Sales of Nebraska (\$45) and replaced it (very easy - the crystals are quite accessible under the chassis). Wow, what an amazing difference - my Collins quality sound was back! (The frequency of the new crystal was off by only 1hz.) If I had thought to listen on LSB and compare I might have immediately suspected the USB crystal since it is used on both USB and CW.

Lesson: Crystals can change frequency over time! Don't forget about them when troubleshooting! 73, Bob W0YVA

Make reservations now!

John Bess, WA5VVT
CCA Dayton 2002 Chairman
E-mail: wa5vvt@troi.csw.net

The Dayton Hamvention 2002 is May 17, 18, & 19. The CCA has moved all of its Hamvention 2002 events to a new hotel...the *Holiday Inn Fairborn*. The hotel will provide us excellent room and event accommodations at an excellent price...as well as easier access to the Hamvention's HARA Arena.

To make a reservation, please call the Holiday Inn Fairborn "reservation department" at 937-426-7800. Please request the group rate for the Collins Collectors Association. This will ensure that you receive the special CCA group rate of \$99/night double occupancy.

Holiday Inn Fairborn
2800 Presidential Drive
Fairborn, OH 45324

937-426-7800
937-426-1284 (fax)

If you missed the April 17th reservations deadline, check with me to see if I can help find you a room...i.e. due to a cancellation. Check-in time is 4PM, check-out time is 12:00 noon. The Holiday Inn Fairborn is located just off of I-675 at exit #17, with convenient access to I-70, I-75, and US 35. No worry about maneuvering downtown one-way streets, parking garages or congested traffic.

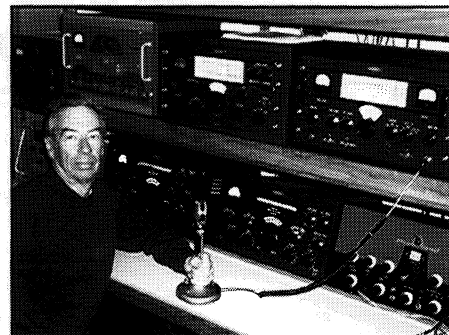
CCA 2002 Dayton Hamvention Events:

Thursday, May 16, 2002
CCA Hospitality - 7PM

Friday, May 17, 2002
CCA Awards Banquet - 7PM
(See CCA web site for more information)

Saturday, May 18, 2002
CCA Hospitality - 7PM
CCA Membership Meeting - 8PM

In the Shack



Bill Feldmann, N6PY

Bill is one of our CCA net control stations for the Sunday CCA 20m net, new 10m AM Net, and the Friday Night CCA West Coast Collins Net. Now you know the secret to Bill's great signal!