

# Basic Trouble Shooting

by John Bess, WA5VVT

The first place to start in the process is to make a list of the problems, get out your copy of the manual and read the Theory of Operation. You need to take notes on the following items: 1. What is the frequency of each of the various oscillators? 2. What two frequencies are mixed in each of the mixer stages? 3. What is the resultant output frequency? and, 4. Is any one of the crystal frequencies doubled in the oscillator itself? (Make notes on which bands this occurs).

Next, get out the block diagram and then familiarize yourself with the signal path from each oscillator through the mixer stages. Once you understand what is supposed to happen inside the rig when it is working properly, you can then determine what is not working. (Or we can get closer to the problem.)

Now, what do I need to do this? It would be nice if you had a digital signal generator, frequency counter, digital multi-meter and an oscilloscope. But you don't need all that stuff. You will need a good V.O.M (Volt Ohmmeter, D.V.M (Digital Voltmeter) or a V.T.V.M (Vacuum Tube Voltmeter) and another rig capable of receiving from 455 KHz to 30 MHz. This could be an old boat anchor or one of the newer digital rigs. You also MUST have a new set of spare tubes. Now lets fix that rig.

One at a time change the tubes and see if changing a tube changed the items on your problem list. Remember, do this one at a time NOT all at once. If the problem went away and the rig works, then you are finished and congratulations on fixing the unit.

If problems still are present, you need to get deeper into the block diagram.

Check the oscillators next. Are they working? How do you know? If you have a frequency counter go to the other side of the coupling capacitor and read the frequency. (Oops, you will have to look at the schematic). If you are using a receiving device then hook up a convenient length of RG-58 to the antenna jack of your receiving device. Strip about 1/4 inch of the insulation and shield off leaving an insulated wire extending past the shielded part. This is your frequency sniffer. It is also a good idea to tape or put some heat shrink tubing over the raw end of the "sniffer" and any exposed braid. You do not want to short anything out and make the problems worse and/or mess up your new FT-1000 receiving device.

Tune the receiving device to the oscillator frequency and put the "sniffer" down into the oscillator circuit or close to it and see if you can hear the oscillator signal. Remember that every oscillator is a low-level transmitter. Use the S-meter as a field strength meter. If that oscillator is working move on to the next one

and do the same thing. If you find that one of them is not working then you have probably found your problem.

Now, you must determine what is wrong with the circuit. Is it a bad crystal, no crystal (should have checked to see if it was there first) a burned component, two wires shorted together, a cold soldered joint or no connection? Is it possible that some "skilled technician" installed the wrong value (A 47K resistor rather than a 47 Ohm)? Don't laugh, I did this myself just a few weeks ago and it took a while to find the "NEW" problem.

In addition to those components and obvious problems you should also check out any RF chokes in the circuit. Use your D.V.M., V.O.M., or V.T.V.M. to do this. The choke should show some resistance. If it doesn't, then it is open and needs to be replaced. The question is however, why did it open? The answer is that something went to ground (or close to ground) after the choke. This could have been a shorted tube, capacitor or anything on the circuit that could have gone to ground. Maybe someone prior to you shorted it to ground by accident. Look closely at all leads etc. Check the tube side of the choke for resistance to ground. This should be high. Check the resistance chart in the manual (with the choke open the resistance should be higher than that shown in the manual). If the choke shows resistance, how much should it be? Check the parts list. Sometimes the resistance is given as part of the component description. If not, then look around there are probably more of the same kind (same value) in the rig. Check them to get an idea of what its resistance should be. If it is considerably lower (10 Ohms rather than 56) then it needs to be replaced. Here again, why did it go low? Use the same procedures as before. After doing all of the above and it is still not working, what to do next? My suggestion is "If confused or in doubt run in circles, scream and shout". Well, you might want to take a break. Go get yourself a cool drink or cup of coffee, read the manual again, look at the schematic and review the

## CCA Hot Line

507-282-2141

Sorry, no call-backs available!

The CCA web site can be viewed at:  
[www.collinsradio.org](http://www.collinsradio.org)

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

block diagram. Darn, I forgot to check to see if there is voltage going to the circuit! That's a good idea. Why didn't I check that first and save all this time? Well, that's a matter that can be discussed by many and there will always be two opinions. I prefer the visual inspection first and I like to get in there and poke around before I get to more serious stuff. I have fixed many problems this way and I am set in my ways. If the voltage is not there then there is an open circuit somewhere between the circuit and the power supply. Start at the power supply and work toward the non-working circuit. It could be that the relay contacts are not making a good connection or a switch. Spray them with a good cleaner that leaves NO residue. Then check them out with your meter to see if there is continuity (this is a big word that means are they making contact now?). Make sure you don't use something like WD-40 anywhere in the radio. Oops, I will catch some flak on that one. But I will leave the reasons for another time. Speaking of time, Michael just gave me the sign. We will pick up in the next issue.  
73 John, WA5VVT



## At the Mike with KW6KW

Sandy Meltzer - President, Collins Collectors Association

Space is limited, but I want to take this opportunity to thank our CCA Nominating Committee Peter Lower VE3URO (Chair), Gayle Lawson K0FLY and Dr. Dirk Scholten W8IQX for the fine job they did soliciting for and collating nominees for the two Board of Directors positions now up for election. Great job guys. Please take a few seconds to complete, fold, and mail the CCA election ballot included with this Signal. Election ballots must be returned to the address indicated on the ballot on or before October 20th in order for it to be included in the final count. The winners will be announced on the Tempe/CCA Collins reflector before the end of October and on all of our weekly CCA radio nets.

73 Sandy, KW6KW