The Right "Stuff"

By Scott Kerr, KE1RR

It is a fact of life that some of our 50 to 80 year old radios that we collect and enjoy are going to need some maintenance sooner or later. Sadly, the number of qualified repair offerings continue to decline.

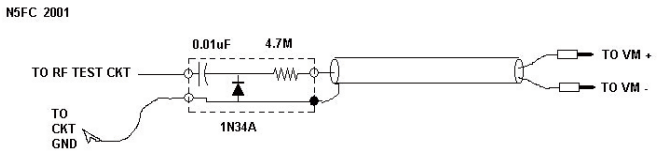
If you watch the Collins reflector it seems that almost every week a new Collins fan has decided to restore or repair his or her prize possession. While the reflector is great for specific problems, we thought that a review of the equipment necessary for a basic and intermediate test bench would be appropriate and an aid to those wishing to get their foot in the door or expand what they already have.

Like many collectors, I got back into the hobby after the career was on its way and the kids were grown. Seems that I realized all those radios that I dreamed about early in life were now within my grasp and I gradually fell down that slippery slope to becoming a Collins collector. My first acquisition was a KWM-2. It arrived at my office and I could not wait to get home, listen and then get it on the air! That night it was unboxed, plugged in and fired up. Twenty meters was hopping and I sat amazed at the wonderful sound coming out of the speakers. That lasted about 3 minutes until I smelled an acrid smell and then saw my KWM-2 releasing its smoke into my ham shack! It would be some time until I heard the M2 again.

Luckily I had restored a few brand X boat anchors and had a modest test bench area set up. I could also draw on my experience as a kid working on tube ham radio equipment, and then many years of pro audio work. So the M2 went down to the garage test bench where I had what I consider the basics of the things needed to work on Collins radios. **These basics include:**

Digital Multimeter – (Which of course will supplement that period correct Simpson) While not 'period' correct and not absolutely essential, they have gotten so cheap that it would be unwise not to have one. While Fluke is the name brand, the cheap imports can be had for under 50 bucks and almost any of them are more than accurate enough for resistance and AC/DC voltage measurements. I cannot imagine not having one in the shop. Search Amazon for multimeter and you will find choices from $9 to $150 for the Fluke. While you are shopping, get some extra test cables with alligator clips on the end. This will add an extra hand or two when doing measurements! I have the older Fluke Model 8050A test bench unit bought used for $25 and it is my favorite on the test bench. I see them for $20-$50 at almost every big hamfest. Highly recommended.

VTVM – OK why go old school when I can purchase an accurate multimeter? Isn't that why you see all of those old VTVM's at every Ham Fest? The reason you want an "original" VTVM is that few things can beat one for its ability to not load down a circuit while doing a measurement. It also can do RF voltage checks when equipped with the proper probe. I had purchased the same VTVM that I had as a kid for ten bucks at a hamfest, the RCA Junior VoltOhmyst. I then made a simple RF Probe (see the Figure xx) for a couple of dollars and it served me well for a few years until I made an upgrade.



CLASSIC RF PROBE

Reads RMS Equivalent Voltage in test circuit, if Voltmeter is 10-11 Meg Input Impedance; Reads 4X RMS Equiv Voltage if VM is 1Meg Input Impedance (Set VM to measure DCV)

RF Signal Generator - If you are going to be serious about aligning and trouble-shooting ham equipment then this is an indispensable piece of equipment. Good units are going to be expensive but the fact of the matter is that perfectly serviceable units were manufactured by Eico, Heath, Elenko and other companies that will work just fine. These seem to go for $25 to $100 at the hamfests and a quick search of our favorite auction site found nice units in that price range. The problem is that we are used to digital displays that read the unit's frequency. How can you be sure that you are actually using 14.263 MHz if all you have is a dial with a marker? Well there is a way to do it (hams did it for years!) … a problem easily and cheaply solved!

Frequency Counter – The calibration of your low cost signal generator is easily solved with a frequency counter. At the same time, you then have a means to check crystal oscillator output frequencies and monitor other sources in your rig, like the PTO. Search eBay for Heath Frequency Counter and you can usually find them for 10-30 bucks. I have actually picked up some really nice HP units from the 5300 line for $25 - $50 at hamfests. This is something that can make that signal generator very accurate and will find many many uses around your shack!

O-Scope – This is the thing that seems to scare away many new troubleshooters as it can seem complex and expensive. The truth is that the scope is my favorite piece of test equipment. Along with my VTVM I often use a scope when doing alignments. But what about accurate RF voltage measurements you ask? Learning how to measure RF voltages on a properly calibrated scope is easy, and I find that 'seeing' the signal can give me many clues about performance that a VTVM just does not show. I recently had a 75S-3 that had strange audio problems. 5 minutes with a scope and I found the problem, a bias supply with WAY too much ripple. I replaced the bias filter cap and then I was done. A 50 or 100 MHz analog HP scope can be had for $100 or less at most hamfests. I would not work without one. You just do not need a digital scope with more bandwidth than 50MHz to work on Collins A or S line equipment.

Dummy load – you should have a dummy load at the bench (and one in your shack – You don't tune up on the air during the 20 meter net do you???). Make sure you find one that is sized to the equipment you will be working on.

Tools – One thing you learn is to buy quality. I am partial to Xcelite since it is a brand I have used for over 30 years and find the quality to be top notch. Yes, you pay more, but you then have a tool that lasts a lifetime if it is taken care of. You will need both slot and Philips screwdrivers, needle nose pliers, wire cutters (both small and large),

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wire strippers, allen wrenches, Bristol wrenches and a soldering iron. Add a good pair of tweezers to boot. While a pencil iron that plugs into the wall will do an OK job, the soldering stations with the ability to vary the iron temp is much preferred. Weller is the name brand but Hakko and others make good units. You will also need a solder sucking bulb and some solder braid to 'unsolder' components. A couple of cheap dental picks and clicking hemostats make life much easier also. You will also need the proper alignment tools. You can purchase the Philmore 63-8420 and 63-8454 ($5.45 and $5.52 respectively online) alignment tool sets and you will have the proper sized tools. DON'T USE THE WRONG ALIGNMENT TOOL OR YOU WILL RUIN A COIL ASSEMBLY.

Upgrading and moving up as you grow.....Someday you will.

I have had to admit to myself that I have never seen a piece of good quality vintage or modern test gear I did not want to have. Kind of goes with the Collins 'addiction' I guess. As you grow in your experience you will want to add to, or upgrade, your test gear and tools.

RF VTVM – the class act and the gear that Collins recommends for troubleshooting is the HP410 B or C. While the C looks sexy, I really like my B rather than the C. Be very careful when purchasing one as you need to be sure and get the RF probe that has the miniature vacuum tube in it. There are a number of poorly working units that get traded and you find that repairs are difficult. If I had it to do over again I would purchase a refurb'd unit from http://www.kiss-electronics.com/ and make sure I started with a fully rebuilt and calibrated unit. This is the 'Gold Standard' of vintage VTVM's and well worth the money. Kiss is run by a retired highly qualified HP engineer and she rebuilds the units quite cost-effectively.

Better O-Scope – I have several units – among them, a modern 500 MHz 4 channel digital unit, a USB computer interfaced 50 MHz and others. However, I find that I use my used HP 2253 2 channel 100 MHz analog scope purchased at a hamfest for under $100 95% of the time. Accurate, easy to use and reliable. Upgrading does not need to be expensive. If I were to purchase a new unit I would look hard at the Rigol units. Price point is good and they make great products.

Multimeter – Fluke – enough said!

RF Signal Generator – Lots to choose from, but the older HP units are fabulous. Not cheap but pick up a 8640B or 8660 B OR C and you will have something that will last longer than most of us. I was able to pick up a more modern 8647B recently and love it. Shop carefully and make sure that you are getting a good calibrated unit. Be careful when neutralizing a big transmitter to unhook the generator from the antenna line before firing it up! Ask me how I know this……

Frequency Counter – HP used or Rigol new. The used HP units have really come down in price and should outlast you.

Spectrum Analyzer – Not very many cheap units here but a piece of test gear that will tell you more in a few minutes than anything else. The used HP 8553B and variants work great but make sure that you get a unit that works well. Also make sure you get the tracking generator that matches your unit ALONG WITH THE CABLE BETWEEN THE TWO. The tracking generator makes that Spectrum Analyzer much more functional. Rigol makes a GREAT unit that has a built in tracking generator for about a $1495. See more about spectrum analyzers in this issue.

Grid Dip meter – I have a James Millen vintage unit with all the plug-ins. It was a nice surprise present from a fellow ham and indispensable when working with any tuned circuit. I found that the add-in for the MFJ 259 antenna analyzer to be less than a desirable way of satisfying this need.. To be honest, I would almost put the Grid Dip Meter on the "Basic" list above.

Capacitance Checker - The Sprague Tel-Ohmike is a wonderful unit that will check for leakage in caps. Not easy to find, but a nice one comes in handy when deciding if a cap is the problem. I am not in the "replace all the caps because they are old" camp.

Tube Tester – There are the TV-7, the Hickok testers and then everything else. Here is something that is getting pricier each year if you want quality. Be careful of HamFest finds for a lot of money – make sure that you are getting something that works as the switches in these things are getting old, sockets get tired and functionality intermittent. This is something that I have not upgraded to. I have a lesser quality tester that is workable and have a lot of tubes. JUST BECAUSE A TUBE TESTS OK ON A GOOD QUALITY TESTER DOES NOT MEAN THAT IT ISN'T PART - OR ALL - OF THE PROBLEM!! This is especially true of transmitter PA finals. There is nothing that beats substituting a known good tube in a problematic stage of the unit under test. That said – I would love to have one of those old stand up testers from a 1960's drug store! Would look great in the shop and a wonderful storage place for all the tubes!

There are lots of other gadgets and test equipment that make the diagnosing and repair easier. This is a summary of the basics and first steps to upgrade and I think you will find that equipping your bench with quality vintage test gear is almost as much fun as collecting Collins. There is a saying in the woodworking world – 'All new projects should require the purchase of a new woodworking machine.' This might apply here also.

If you get the urge to get some test gear and have questions, give one of the board members a call and they, or I, will be glad to help.

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