THE CARE AND FEEDING OF YOUR HICKOK TUBE TESTER

Hickok tube testers are respected worldwide for their build quality, ease of use, and accuracy. Most Hickok models are wonderful to look at and use. Their operating panels go far beyond merely functional, and are almost like pieces of art. So if you are reading this page you probably want to preserve your tester. The following mini-guide will help you keep your Hickok going for years to come. I am assuming people doing this work have some electrical background, and will use the care needed when working on any electronic equipment—especially stuff that is 30 or more years old. Electricity can kill, so do all you can to work in a safe shop. Install GFI outlets, use an isolation transformer, keep your shop clean and dry. Work on a rubber mat, and use a wooden bench. I am trying to help here—but you need to do your part to be safe.

Cleaning and Inspection

You can clean the outside of the case and operating panel with glass cleaner. This will not remove any of the markings on the panel, and will remove the dirt from the case. Do the final cleaning of the operating panel with WD-40, which will displace any moisture and apply a protective coating to the metal surface, as well as remove some oily dirt that the glass cleaner missed. The case can be treated with a product like Armor All. This usually improves the appearance considerably.

Plastic meter faces can be polished with Novus #2, followed by Novus #1. The plastic meters on Hickok testers tend to take a terrific static charge—so this can make them stick and do all sorts of strange things. Antistatic lens cleaner will help correct this problem—and so will time. Another suggestion is Endust for electronics. Once you clean the meter, try to avoid touching it again. Even dragging a finger across a plastic meter face will often cause it to act up.

Look inside the tester. Check the tubes--which should be an 83 and a 5Y3. The 83 has mercury inside, and may appear different than other tubes you have looked at. Carefully remove the tubes and test them on another tube tester. Both of these tubes are rectifier tubes and have two sections to test. Tubes with great differences between the two sections should not be used. You would not want to use a 5Y3 where one section of the tube tested very strong, and the other section tested marginal. Apply a light coating of a good contact cleaner—I recommend Caig DeoxIt -- on the pins before plugging the tubes back in. The interior plated parts are often covered with lots of oxidation. Dip a swab in WD-40 and carefully clean the oxidized parts. The reason for doing this is that you don't want this dusty oxidation falling on the many switches and contacts in the tester. You might want to wear a dust mask; some plating is toxic.

DO NOT—REPEAT, DO NOT spray the many wafer switches in the tester with contact cleaner, even a good one. You could ruin the tester. The wafers may become slightly conductive and not be able to be fixed. You can apply a tiny bit of DeoxIt with a toothpick or cotton swab (make sure no fibers get left behind). The pushbutton slide

switches can be cleaned with a Dill's pipe cleaner with DeoxIt on it. The line adjust pot can use a shot of DeoxIt at the center near the shaft. Clean the tube sockets with a pipe cleaner and DeoxIt. Again, make sure that no fibers are left behind from the cotton swabs or pipe cleaners. Don't use regular Q tips for this work, only swabs designed for electronic work. These swabs are available from Radio Shack, and other electronic supply houses.

Check to make sure the tester has a #81 fuse bulb installed. This bulb acts as a fuse and must be present for the tester to work properly. It is in series with the primary of the power transformer. The bulb will not light up during normal tester operation—but might go to a dull glow when testing a high current tube. **If the bulb lights up, stop what you are doing immediately.** Many Hickok testers have a second fuse bulb in series with the wiper of the bias pot. This is the bias fuse and it should be a #49 bulb. So make sure both bulbs are good, and that they are the right ones.

Inspect the power cord carefully and replace it if necessary. Double check the cord where it connects to the line adjust pot. It gets very hot in this spot and the insulation tends to crumble. If you have to replace the cord, the kind of rubber covered power cord Hickok used, looks nicest. You can find it at Home Depot or an electrical supply house. Don't use some light duty material from a lamp. If you put a polarized plug on the new cord, the hot lead (the one that goes to the narrow prong of the plug) is the wire (often colored black) that goes to the ON/OFF switch. The same thing applies when you install a three conductor grounded plug. In this case the hot lead goes to the switch, and the ground lead may be attached to a convenient screw on the tester chassis. On some testers, like the 6000 series, the ON/OFF switch is on the line adjust pot—so on those models that's where the hot lead goes. The point of all this is that modern electrical practice demands that you do not put a switch in the neutral lead. This was not a convention that could be observed before polarized plugs and receptacles became commonplace. It's clearly safer to always switch the hot lead—so be sure to do it that way.

Operating Tips

Make sure the roll chart you are using is the right one for your tube tester, because settings are not always interchangeable between models. Data for the models 533, 600, and 605 cannot be used with the 533A, 600A, 605A, and 800. The first testers used a 5-volt signal, while the later testers used a 2.5-volt signal. This makes the data different. The term "English" when used with tube testers refers to an English-reading Good/Replace scale on a tube tester quality meter, rather than a scale that reads in micromhos. This can be very confusing. Another source of confusion is the number printed on the chart for the mutual conductance reading of a tube. On the smaller testers (like the 600A) this number is what a typical new tube will test (and do remember that tubes varied a great deal from brand to brand). On larger testers like the 539 series and the 752, the number on the chart is the reject point. Tubes reading below the reject point are candidates for replacement. Weak tubes may work fine in certain applications—so don't be in a hurry to throw them out! On the other hand, shorted tubes should be quickly discarded.

The subject of the tube "getter" often comes up. The getter is a material applied to absorb gases remaining or released when the tube was made and used. Most times, but not always, it has that familiar silver appearance. There were a number of different types of getters used—so don't assume from appearance, that a tube is bad.

OK—you have the proper data. Turn on the tester, and allow a 2-5 minute warm up. Make all the settings for the tube you want to test. Make sure you have the filament voltage set properly. It's pretty easy to test a 12AX7, and then a 6L6 and forget to switch the filament voltage from 12 volts back to 6. I find it's a good practice to leave the filament setting on 6 volts when not in use. Place the tube in the socket and the filament should begin to glow. Give the tube time to warm up— 45 seconds is plenty for most tubes. Press the line adjust button and set the line voltage to the mark on the meter. Some testers like the 6000 read the line voltage all the time.

It is crucial that the line adjust be set (and rechecked) with the tube warmed up, for an accurate reading. Now check the tube for shorts. There may be several switch positions to check, or neon lights to observe. Models differ, so consult your manual. ***If a tube is shorted, STOP! The tester may be seriously damaged if you proceed with a shorted tube.*** If no shorts are detected, press the proper button to read the tube quality. Note that different buttons are used to test diodes, rectifiers, and amplifying tubes. Check your manual for the exact procedure. There is a slight difference at this point with the 539 series of testers. You need to press the locking button and touch up the line voltage and bias. The extra meters on the 539 are there so that voltages can be adjusted with plate current flowing.

There is an additional test for Gas (grid current). The procedure varies from model to model. This test is especially recommended for output tubes, like a 6L6. It is also good to check for on AVC controlled tubes in RF and IF stages, such as a 6K7, 6SK7, and 12BA6. You are testing to see if there is current flowing in the grid circuit of the tube—which should not happen. The grid on a vacuum tube is an electrostatic device, and no current should flow. Grid current is caused by three types of tube defects: leakage from the grid to another tube element, contamination of the grid with material from the cathode, or loss of vacuum or gas inside the tube bulb. Grid current upsets the bias of a tube, often causing it to overconduct. This overconduction causes the tube to get hotter, which then increases the grid emission and produces a runaway effect where the tube or associated parts may burn up.

If the fuse bulb lights up at any time—stop what you are doing immediately, and consult the manual. Yes, you have to look at it—because the reason for the lit bulb depends to some extent on the model of the tester. You may have some setting wrong, or be pressing the wrong button. Perhaps the tube you are testing is not what you think it is.

ANSWERS TO COMMON QUESTIONS

Will my Hickok give a comparable gm reading to what I find in the tube manual?

Sometimes yes, often no. Tube testers apply a standard set of conditions to each tube tested. These conditions vary from typical circuit or tube manual conditions. The expected reading for a tube is determined by the roll chart for the tester—not the tube manual.

I have a model 600A and a friend of mine has a 539C. We both tested the same tube and got very different readings. Which tester is right?

Both testers may be calibrated correctly and working properly, yet yield very different readings. For instance a 6CB6 may test 2100 on the 600A and 5800 on the 539C—Both readings are correct, based on the model tester. If you take two well calibrated Hickoks of the *same* model, they will usually test within 5-10% of each other.

Is there a quick way to see if my tester is close to being calibrated properly?

The most critical voltage in a Hickok is the AC signal voltage, which is applied to grid of the tube under test. If this signal voltage is off, the tester will not read properly. Set the tester up for a 6L6—but don't put a tube in. Set the bias and shunt controls to 0. Let the unit warm up and set the line adjust. Measure the AC RMS voltage between pin 8 (cathode) and pin 5 (grid) on the octal socket of the tester. You must have a very accurate digital meter like a Fluke for this. If you have a 533, 600, or 605 you should see 5 volts. If you have a 533A, 600A, 605A, 800, 800A the voltage should be 2.5 volts. If you have a 752 or 539 the signal voltage will vary from .25 volts RMS to 2.5 volts—depending on the position of the range switch. Consult the manual for your tester. The closer the voltage is to the desired figure the better. There are many other voltages that could serve as a calibration check—but this one is the most critical.

A 6DJ8 that I know is good reads weak on my 600A. What's wrong with my tester?

There's probably nothing wrong with your tester. There may be a lot wrong, however, with the settings shown on the chart. The settings for the 6DJ8 had errors right up to the final versions of the roll chart. The corrected bias setting for the 6DJ8 is 24. Settings for other tubes could be wrong, too. The tester might need calibration—or there could be mistakes in the settings. If you find that your tester seems to provide an unexpected reading for just a very few tubes—suspect the set up data. You might try adjusting the bias so that a known good tube reads in the expected range.

Can I calibrate my tester myself?

It depends on your experience, the equipment you have, and the complexity of the model. A complicating factor is that Hickok testers vary a great deal. One 600A may be quite different from the next. This makes repair much more difficult. Hickok seemed to make many running changes, and this makes it difficult to help people with repair and calibration. It also appears that Hickok did not want others working on their testers—so the company did not make much service data available.

My meter sticks and acts up—can I fix it?

You may have a static charge on the meter case—try antistatic spray first. Sadly, Hickok meters, most of them made by Hickok, have not stood the test of time very well. A common problem is the plating of the internal meter parts. This plating tends to deteriorate and bits of oxidized plating cause the meter to bind. If you are really skilled and have a steady hand you can often remove the offending particles with slivers of masking tape. But keep in mind that it's easy to destroy a meter once it's been opened. Don't get into the meter unless the problem is pretty severe. If you have to tap on a meter every now and then—well, you're probably best off leaving it alone.

My meter movement appears to be open. Is this the end?

Some meters have a series resistor inside the case. If the resistor is open, the meter won't work. Often these resistors are not shown on the schematic. If you need to replace a meter, it can be extremely difficult to get one that works properly. BOTH the full scale current and the series resistance must be correct. In general, replacement quality meters are not available—the best solution is a meter from a parts unit. So—baby a good meter. **Never attempt to check a meter with a VOM, like a Simpson 260.** The ohmmeter function on a standard VOM will apply enough current to damage the meter movement. A DMM like a Fluke is generally safe to use, but placing a resistor—say 1K in series with the meter is a good safety precaution.

I need to ship a tube tester—how should I pack it?

The first rule is to protect the meter. Put some bubble wrap over the face of the meter. You can secure the bubble wrap with freezer tape (which won't leave residue when removed). Make sure there is nothing loose in the case that will move around inside during shipping. Position the plug and cord so it is not over the meter when you close the case. Assume that the tester will be dropped in shipping and pack accordingly. Place the tester in a box with at least 2" clearance around it on all sides, and pack tightly with crumpled newspaper surrounding the tester. Do the same with a second larger box. Now

you have a box within a box, with crumpled newspaper in between. This double boxing method offers good protection for the tester.

I've been turning my tester off between tubes. That must be hard on the tester's own 5Y3 and 83 tubes. Do I need to do that?

There are no air vents in most Hickok cases. The tubes inside the tester generate significant heat, and the interior of the tester will get warmer and warmer, when left on. There's just no place for the heat to go, and the wood cases act as insulation holding the heat in. You can leave the tester on to test a batch of tubes, but don't leave the tester on for hours, or days at a time. A little known fact is that tester readings will tend to vary with the internal temperature of the tester. If you test a 6L6 on a 539B when the tester has just warmed up, and then test the same tube 2 hours later, the reading you obtain will probably be different. This effect is not confined to the 539 models, and is most pronounced on testers in wood cases. This is not a practical issue, and you will still be able to tell a good tube from a bad one. The temperature effect does mean that when matching tubes for mutual conductance, you should test the tubes one right after the other. Don't test one tube, and then the other tube two hours later.

A pin is starting to lift out of a socket when a tube is removed. What should I do?

Sockets on tube testers see heavy use, and they are a definite problem area. There are many types of socket construction. On some larger sockets the loose pin might be able to be secured with a tiny bit of epoxy. You need to degrease the socket, and apply a tiny amount of epoxy to form a ledge that will retain the pin and stop its upward travel.

Even though I've cleaned the pins, one socket is having problems. When I rock the tube, the meter swings all over the place. Help!

This is a very common problem with two basic causes. The obvious cause is that the socket itself is loose and worn out. The less obvious cause is a poor contact where the wires are soldered to the socket inside the tester. There could be a broken wire, or a poor solder joint. If the socket itself is worn, there are two options. First, the socket may be tightened. This requires an "O" ring pick, a high power magnifier, skill, AND luck. The method for tightening will depend on the socket construction, and it's just too hard to describe in writing. Practice on some old sockets before operating on your Hickok. Just as in meter repairs—there are no guarantees with this type of thing. Option two is to replace the socket. This sounds easy—but it is not. The job is complicated by the many types of sockets used, and the lack of room inside many testers.

I hope this information will help you to preserve and enjoy your Hickok tube tester. If your tester needs servicing, you can contact me directly. Email is most convenient: *chris@airpump.com*

Chris Haedt

NOTES

Novus plastic polish and Caig DeoxIt are available from Antique Electronic Supply in Tempe, Arizona. There are two type of DeoxIt that I use. The first type is in a spray can and I use that for cleaning with a swab or pipe cleaner. There is also a concentrate available, which is nice to apply to items already cleaned, like tube pins.

My thanks to Avery Comarow for his assistance editing this article, and some fine questions too.