Hickok Models 539B/C Progression and Characteristics

The Hickok 539/539A were the first testers in the 539 series, which themselves were the descendants in a long line of Hickok testers. Variants of the 539A were developed into the Western Electric KS-15560 and KS-15750. Hickok marketed a commercial tester identical to the KS-15750 as the RD-1575. The development sequence of those testers is another matter. This document addresses the other development path of the 539A; the 539B and C. The following is to the best of my knowledge from servicing, calibrating and observing the characteristics of these testers for many years. Additional information may be added or changes made as more information becomes available. A photograph is included which shows an early 539B on the left and a 539C on the right.

Introduction

Hickok must have kept track of the details of configuration of their products in order to respond to parts requests, but that information and dates of manufacture apparently were not shared outside the company. Serial numbers were not generally recorded on the equipment itself; they were usually stamped in a metal plate attached to the case with screws. The possibility of switching cases and plates among testers complicates dating. Manufacturers of other items in the tester sometimes marked dates on those items which can be useful in estimation of manufacturing dates. Sometimes numbers were ink stamped in large numbers on the rear face of the panel, but only in rare instances do these numbers match the serial number. The best available information on the dates of manufacture of Hickok testers appears in "Tube Testers and Classic Electronic Test Gear", Alan Douglas, Copr. 2000.

539B

There were two basic versions of the 539B, the first was characterized by 152- as the beginning of the serial number followed by a 4 digit number. Original manuals include a schematic, Hickok drawing 870W dated 8-25-55. This had the early style multi-stack switches in the first 5 switch spaces on the panel; the setting numbers were visible through small windows in the panel. The switches had 10 positions, 1-9 with 0 as off for the elements, letters for the filaments. The switch travel was blocked at 9; it was not possible to rotate the switch through 360 deg. Otherwise, the two versions were much the same, although the early version had chokes wound on 100Ω resistors in the element feeds. The early version had wooden bases for the wound resistors (sometimes referred to as "spools"); the resistance wire was a brownish, taupe color. These resistors could vary from their original values, but most of them are OK.

Every example of the first version of the 539B I have seen have rectangular meters in the bias and line voltage positions. The original type of larger gm meter is seen in the photo of the 539B. This was a special meter manufactured by Hickok and had physical characteristics that were unique in the industry. When those meters fail, they can be equipped with new Simpson movements and retain their exact original appearance. The AC line and DC bias meters, also

manufactured by Hickok, fit standard industry cutout and mounting dimensions. The later round Hickok meters are sealed and cannot be opened without destroying them.

The second version had 182- has the beginning of the serial number followed by a 5 digit number; most manuals include a schematic Hickok drawing 933W dated 9-19-58. These had a new type element switch with only front and rear switching contact elements in one wafer - located in the first 5 switch spaces on the panel. This switch had 12 positions, 11 active, adding X and Y positions, with 0 for off; 360 deg. rotation was possible. There are 24 contact spaces around the 360 deg. circle; the last 4 terminals on the switches are not wired. Switch settings continued to be visible through windows in the panel. This was an ingenious switch, much simpler than the first, but in my experience, more likely to become unstable than the older 5 stack switch. The later version also had naked 47Ω ½ watt carbon resistors in the screen and grid leads, mounted on the Shorts switch. As in other Hickok testers, these resistors - including the grid feed resistor - are commonly burned or damaged and can cause instability in test readings. Some will actually test good and then separate when touched. They should always be replaced with much more durable resistors than the originals. These later versions also have much cleaner appearing ceramic spools, a bit smaller than the earlier ones. My experience is that these spools are quite likely to become unstable. Apparently, early in its production, the second variation switched from rectangular bias and line voltage meters to round meters, as seen in the photograph of the 539C.

The transition between these two versions of the B might not have been cleanly defined; I have not seen any that differ from the characteristics described here. Photographs of testers that differ from these descriptions can be seen on the Internet, but I believe that is due to meter replacements that result in cosmetic variations from their original production. The differences between the earlier rectangular and round meters are apparent. The most significant changes from the first to the second variants appear to be the element switches and the 152 to 182 change in the first three spaces of the serial number. The meter type is another gray area, but a 539B with round ac line and bias meters is most likely to be a later one.

539C

The 539C added nuvistor, novar and compactron sockets and deleted the acorn; serial numbers have been observed starting with 292, 323, 396 and 443. The only schematic I have seen is drawing 901-281W with no date; it has been observed in manuals copyright 1963 and 1968. According to Douglas, (pg. 53), the C started in 1962 - I believe the C and late version B were in production simultaneously for an extended period. The C also added two more positions to the element switch (making W, X, Y and Z positions) and had the position markings engraved on the front panel - no windows. Otherwise, they are much the same as the later version of the B, including the unstable spools and the 47Ω element resistors. With this expansion of switch positions, the switches were getting quite crowded because of the new positions that had to be accommodated around the 360 deg. switch rotation; there are 28 contact spaces on the C switches. Spacing is so close that the switch contacts can touch each other if the rivets are not

tight and there is side pressure on a terminal from the wiring. Because of the close spaced terminals and small contact elements, chasing contact problems on these switches can be a nightmare.

Every example of the C I have seen has the round meters in the bias and line voltage positions. Some 539Cs (as in the photograph) were equipped with a smaller clear plastic gm meter. The meter scales on the B and C are the same; it is crowded even on the earlier meters with the larger black plastic case. The original meters can fail or stick with age, but the plastic cased meters are often in trouble; these were apparently not manufactured by Hickok. I suspect that these meters could appear on late Bs as well as Cs at random depending on Hickok's production conditions. This is important because nearly all clear plastic meters need to be replaced; to my knowledge, they cannot be rebuilt. They are also less desirable than the older, larger, black cased meter because of the cramped scale; their smaller size also exposes two screw heads in the panel, covered by the larger meter. The large black cased meters can be rebuilt with new movements, but the cost is significant. A tester equipped with the plastic meter can be retrofitted with a larger meter, using a good used one or a bad meter with a serviceable case and scale that can be rebuilt.

Clear plastic cased meters (in OEM construction) have been seen on many other Hickok testers, e.g., the 533A which Douglas shows as having been produced into 1959. Some other testers, e.g., the 6000/6000A were exclusively provided with this type of clear plastic cased meters.

There were some very late Cs that have some of the under panel component locations revised from earlier versions, but no changes in the electricals. A 539C with the smaller clear plastic case and component rearrangements has been observed with a serial number starting with 443. A sometimes useful identification bit of trivia – most large case Hickok testers had the line cord pass through a hole in the case to exit the storage space in the top of the case. With the 539C, the cord exits the front panel near the power switch. This makes it possible to identify a C from a distance before you can see the details of the panel marking or the sockets.

The 539B and C were almost always provided in a black carrying case, but could optionally be ordered with a gray aluminum case. It is rare to see one of these, but testers originally ordered with a metal case were equipped with two stainless lifting rings, one on each side of the panel.

Selection of a Tester

Some general information follows that may be useful for anyone considering purchase of one of these testers. It must be kept in mind that these instruments are complex electrical devices; the most perfect remaining examples are 60+ years old. Even though the Hickok testers were generally very durable, age takes its toll on equipment of this type. Many of them have been used extensively and some have been stored for many years in unfavorable conditions. Many that have been used lightly and kept in favorable environments, when serviced properly can continue to provide reliable service. Most that are for sale are offered for good reason; they have

problems that will be expensive to repair. Buying one of these for reselling at a profit is rarely an appropriate business decision. The best reason for obtaining one of these testers is to use it in your activities of testing tubes.

There are almost no hard and fast rules for evaluating one of these testers. There are, however, a number of critical issues, tests that can be done and observations that can be made to inform a decision. Unfortunately, most of these cannot be done without direct access to the tester in order to exercise and inspect it. If possible, part of any inspection should include removal from its case to allow visual inspection of the underside of the panel and the inside of the case.

The critical items that are most likely to condemn one of these testers are the plate power transformer, the meters, and sometimes the unique bias pot. These testers have two transformers; the filament transformer is unlikely to fail and can be replaced with a salvaged transformer. The only known source for a replacement plate power transformer is a salvaged unit from another tester. The smaller meters can be replaced with salvaged originals; some can be replaced with later or new meters that are identical in electrical function but not identical in appearance to the originals. Reproduced meters that are identical in appearance and electrical function are available but expensive. The larger black style Hickok gm meter can be rebuilt if the meter case is serviceable – but that is also expensive. If a clear plastic gm meter is faulty, it must be replaced.

Testing

The first step in electrical evaluation is rotate the power adjust knob full counterclockwise, plug it in and turn it on. There are no electrolytic capacitors in the primary circuit of a Hickok; there is no need to use a Variac to gradually bring up the line voltage. Rotate the line voltage adjust control clockwise and see if the meter responds properly. The fuse bulb should illuminate only dimly, even with the line voltage adjust control fully clockwise. If this is OK, adjust the Power Adjust control to the red line test mark. Then push the Line Test button; the meter should move upscale to read the line voltage at the AC input. If this is not OK, but the pilot light is on, the meter is bad, but further testing might still be done. If the pilot light is on, but the meter does not respond, turn the Power Adjust control all the way up. The fuse lamp should glow dimly. Then turn the control down until the bulb is close to going out completely. Further testing can be done with the control set to that point. If the meter test is passed, set the line voltage meter to the red line test mark.

Switch the Bias Range switch to 10V and 50V, adjust the Bias Volts control to full up and full down. If the bias meter does not respond, the meter is likely bad. If the meter does respond and swings freely as the control is adjusted on both the 10V and 50V scales, the meter is probably good, the screen/bias voltage supply is working and the adjustment pot is probably OK.

Even if the bias test fails, the following test can be done. Switch the Function Switch to the H (VR Test) position. Position the Shorts switch to the Tube Test position. The gm meter should

swing up and adjustment of the VR Volts & Mils knob should adjust the meter from zero to nearly full scale. If that works, the high voltage power supply is working and the tester is probably functional. If all these tests are passed, test a tube and see if the tester responds appropriately.

Physical Inspection

The photographs are of testers in good condition as found. Inspect the front panel carefully for signs of corrosion and rust around the screw heads. Inspect the finish of the panel, especially above and below the thumbwheel of the roll chart. If there is heavy polishing of the panel in those areas, the tester has been used extensively. If possible, inspect the underside of the panel. Check carefully for rust and other indications of water exposure, and evidence of poor quality or incomplete service work. Check to see that the roll chart is in place and functions properly. It can be expected to be tight at either end of its travel but should be able to be taken to the STOP warnings at each end of its travel. Check to verify that the chart applies to the tester in which it is mounted.

Decisions, Decisions

Failure of one or more of these tests does not necessarily negate the decision to purchase a particular tester, depending on the cost to acquire it. If you need to have one of these repaired, you should have a reliable, experienced source do the work. The most important single factor is the tester's physical condition. To make it worthwhile to purchase and maintain one of these units, you should choose one that looks good and passes the majority of the tests stated above.

Conclusion

The 539B/C testers use the same basic gm test circuit and test conditions going back to that remarkable Job Barnhart invention in 1934. Many refinements and enhancements were made during the evolution of these testers. These testers have many shortcomings that are typical of all "suitcase" testers when it comes to obtaining accurate gm readings. Nonetheless, the 539B and C are still widely used and highly regarded. When in good operating condition and properly calibrated, they can provide valuable test information on a variety of tubes; in good condition these testers hold their value well. If you already have a 539B or C, or are considering obtaining one, this information may be of value to you. If you want to buy, sell or have one of these or other testers repaired and calibrated, I will be glad to be of assistance.

Paul Hart
pkharthave@gmail.com
770-299-1640
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