At the Repair Bench – Heathkit® IT-5283 Signal Tracer – March 2024

As is well-known by now, I have a tendency to take on unusual projects, especially those that others cannot seem to repair. This was the case recently with a Heathkit® IT-5283 Signal Tracer (Figure 1) that came in for repair. It was shipped to me in "inoperative" condition, with no other information except that the owner purchased it on *ebay.com* and was disappointed when he was not able to get it to work at all. He is a hobbyist, but is not much of a repair technician, though he did say that he took voltage measurements with a fresh pair of batteries, but could not find *any* operating voltages anywhere on the main (and only) circuit board.

Figure 1 - Heathkit® IT-5283

The IT-5283 is one of a five-piece test equipment family of about an early- to mid-1970's vintage. The family includes a multimeter, an audio signal generator, an RF signal generator, an RLC bridge, and this signal tracer. All five units share a common design as regards form factor and appearance, residing in two-piece plastic enclosures. The kit builder had the option of powering the units either from a pair of nine-volt snap-top batteries, or from a specialized five-output power supply that offered ±9VDC to each of its five output cables. The power supply, Heathkit® model IPA-5280-1, is very hard to come by today, but it is not very hard to duplicate. Each of the five output cables was terminated with a Molex® three-pin 0.093" connector. If the kit builder chose to power the kit from the power supply, there were five sets of parts that came with the power supply kit and that were used to modify each of the 5200-series test units to accept power from the power supply. I mention all of this because it is an important point in the repair of this unit.

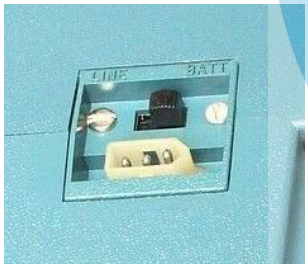

Figure 2 – New rear panel

When the power supply conversion was made to the test equipment, regardless of which specific model it was, a removable blocking panel would be taken out of the back of the enclosure, and a replacement panel would then be installed in its place. The new panel (Figure 2) held a slide switch used to select between battery power (for portability) and the line power from the power supply. In addition, this panel also held the mating Molex® three-pin connector so that the power supply cable could be tied in to the unit. OK – more about this later… just remember this detail.

When I received this unit for repair, there were no batteries installed, so I put a fresh set of nine-volt batteries into the snap connectors, got out the voltmeter and my signal generator, and set out to test the unit. I set the signal generator for a one-volt peak-to-peak signal at one kilohertz, connected its output to the signal tracer input, and turned it on. Needless to say, there was nothing – not even static or noise – from the signal tracer. So far, my findings matched what the owner told me – no operation.

I opened up the housing to access the circuit board, and got out a schematic of the unit (Figure 3) from my Heathkit® library, and started to check for voltages on the printed circuit board (PCB). Once again, the owner was correct in that there was absolutely nothing alive on the PCB. Knowing that I had a pair of good batteries, I went to the power switch, which is a section of the rotary function selector switch on the front panel. The switch was badly oxidized, so I cleaned it

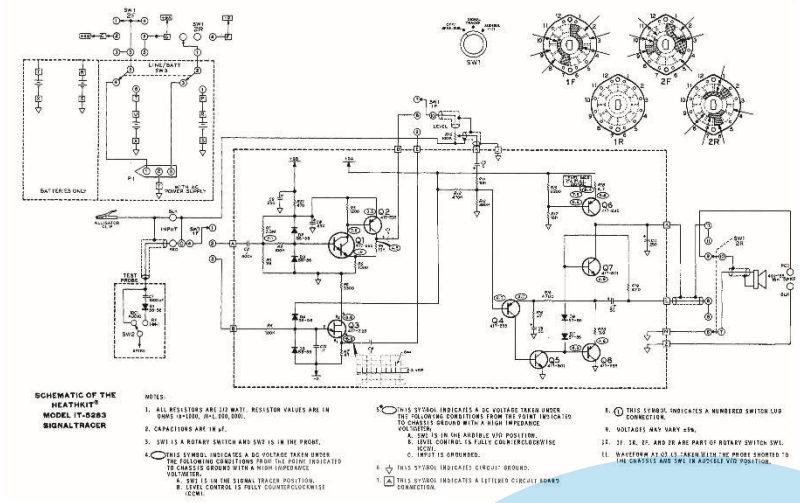

Figure 3 - IT-5283 schematic diagram

up with some DeoxIT®, but that was not the problem, as I was not even getting power *to* the switch. The only thing between the batteries and the power switches (there are actually two power switch sections in the selector switch, one for +9VDC and one for -9VDC) is the PCB, the power source selector switch on the back panel, and the wiring between them. A quick look at the power source selector slide switch showed that it was installed (or wired) backwards, so that the "BATTERY" position was actually indexed to the "LINE" indication on the panel. A simple fix for this one, I thought. Simply dismount the switch, rotate it 180°, and remount it. Once I saw that problem, I simply moved the switch to the correct position (I would turn it around later) and continued with my testing.

When the power switch was turned on, I now had power to the PCB at both voltage levels as appropriate for the function selector switch position. However, as I quickly discovered when I powered up the signal generator again, there was still no output at all from the signal tracer speaker – not even static or noise – the same as earlier.

I started probing the PCB (Figure 4) for actual voltages in accordance with the schematic, and I quickly found that the operating voltages for transistors Q6, Q7, and Q8 were very low, with no voltage present at all on Q8. According to the schematic, there is a 250µF electrolytic capacitor (C11) that is connected to the collectors of Q6 and Q7, and if shorted or very leaky, would drag those terminals, and by extension Q8, right down to low levels. I removed that capacitor and tested it. It turned out to be *extremely* leaky, testing out more like a 98Ω resistor than like a capacitor. I replaced it with a 220µF 25V electrolytic from my inventory, and the unit came alive.

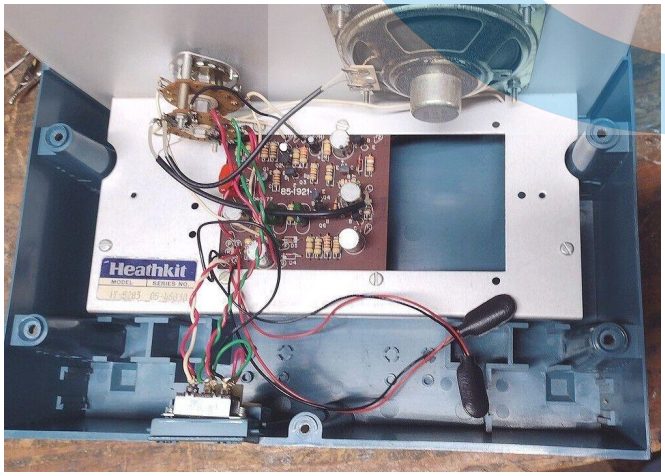

Figure 4 - IT-5283 interior, showing mounted PCB

I was not finished there, however, as although it was alive, it was extremely noisy when the level (gain) potentiometer was rotated, and from time to time there was a loud "pop" in the speaker as well. Some more investigation turned up another failed capacitor, this one a 10µF electrolytic in the level control circuit. I replaced it with a like 10µF 16V electrolytic capacitor from my inventory, and the "pop" was gone. Some DeoxIT® spray took care of the noisy level potentiometer as well.

With two of the seven electrolytic capacitors in this unit having failed, I opted to replace all of the electrolytics, three (total) 250µF (replaced by 220µF), two 50µF (replaced by 47µF), and two (total) 10µF capacitors. Once that was completed, I went over the rest of the unit to check for any other problems, and I found one wire in the "LINE" power circuit that was not soldered to the PCB. It was in the hole in the PCB, and because it was solid rather than stranded wire, it stayed in place, but the circuit would have been problematic at best, if it worked at all. Of course, I soldered this wire in place properly. I then remounted the power source selector switch in its proper orientation, gave the unit a good cleaning, and buttoned it up. Finished!

Truth be told, I have to wonder if the original builder of this unit ever got it to work at all, or if the builder just never noticed that the power source selector switch was backwards. While that individual may have known and not cared that it was backwards, that little problem sure caused some grief for at least one later owner of the unit. It is a safe bet that the current owner never noticed the backwards switch, as he was lost as to why there was no incoming supply voltage to the PCB.

It takes a systematic approach to any problem if you want to find a solution to the problem. It certainly does not pay to just go jumping from place to place, and guessing or assuming anything. Know what you have, and know what you expect to find. Then, when you don't find what you expected to find, look for the reason why the result is different. With a logical and systematic approach, you will find the answer.