

**Heathkit of the Month:
by Bob Eckweiler, AF6C****Heath IT-11
Capacitor Checker****Introduction:**

Last month we looked at the rather unknown Heathkit GR-121 Clock Radio. Another area that Heathkit was famous for was their inexpensive electronic test equipment kits. Their first electronic kit brought them into the forefront of electronic kits. It was a 5" oscilloscope built around military surplus 5BP1 and 5BP4 CRTs that were plentiful and inexpensive after the war. The Heathkit O-1 oscilloscope cost \$39.50 in 1947. It had six tubes including the CRT. Two 5Y3GT rectifiers, a gas-filled 884 sweep generator tube and two 6SJ7 amplifier tubes made up the rest of the tube lineup. Heathkit quickly added to its family of test equipment including an RF Signal Generator - G-1, \$19.50; a signal Tracer - T-1, \$19.50; a Sine and Square Wave Audio Generator - G-2, \$34.50; an Electronic (Scope) Switch - S-1, \$34.50 a TV-FM Sweep Generator - G-3, \$24.50, a VTVM - V-1, \$24.50; and a Condenser Checker - C-1, \$19.50. Originally the part numbers for these kits appeared only on their schematic. None were not given in the 1947 or 1948 advertising flyers.

This month we will look at a later version of the C-1 Condenser Checker. It is the IT-11 Capacitor Checker and was introduced by Heathkit in 1961. It remained in production for 27 years until 1988, which shows the versatility and usefulness of this product. In the period between 1947 and 1961 the term 'condenser' was replaced by the more accurate word 'capacitor' - hence the change in the kits name. I purchased my IT-11 in August of 1966 from the Heathkit store in Redondo Beach. The store price then was \$36.50 plus 4% California sales tax. Store

prices were generally higher than the catalog price.

The IT-11 is probably the piece of Heathkit test equipment I use the most now that I have a handheld digital voltmeter that has replaced the Heath VTVM for measuring voltages. Capacitors, especially electrolytic capacitors, tend to fail with age. When using old capacitors from the junk box I always check them first. That has saved me a lot of frustration.



So what does the IT-11 do? It measures capacitance from 10 pF to 1000 μ F. and it checks capacitors for leakage at DC test voltages from 3 to 600 volts. The IT-11 also measures the power factor of electrolytic capacitors. But the IT-11 does even more. It measures resistors from 5 Ω to 50 M Ω ; and with a small supply of known inductors it will measure unknown inductances. You can also measure the turns ratio of power and audio transformers.

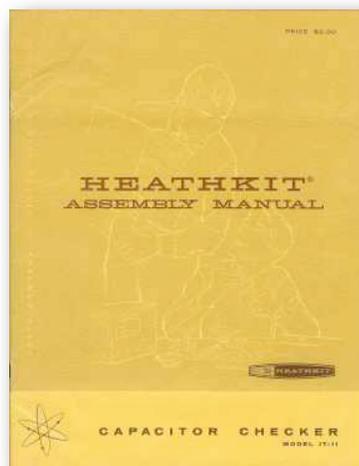
The basic circuit used by the Capacitor Checker is a common AC Wheatstone bridge. The bridge is normally excited by the 60 Hertz power line frequency (more about this later). The bridge is balanced by adjusting a potentiometer with a large calibrated dial. The bridge balance indicator is an "eye tube" that is closed when the bridge is unbalanced and opens at balance. To measure a capacitor you connect it to the "TEST" terminals and select the approximate range on the range switch. You then set the mode switch to "BRIDGE" and turn the

main potentiometer until the “eye” opens. The capacitance can then be read on the scale. If the eye opens at one of the two ends then you must try either a higher or lower range. At the range limits this detects a shorted or open capacitor. Resistors are measured the same way using the resistance positions on the range switch. To measure inductors you must place a known inductor on the “EXT STD” terminals and the inductor to be measured on the “TEST” terminals. Again you adjust the main control until you get the eye to open. The ratio of the known and unknown inductances can then be read on the scale and the inductance easily calculated.

If the IT-11 had a fault it would be reading small capacitors and small to medium inductances. The reason for this is the low bridge excitation frequency. The result is the eye closure is not well defined and accuracy suffers substantially. Fortunately, the IT-12 allows you to use an external signal generator to excite the bridge at frequencies up to 10 KHz at a nominal voltage of 6 volts RMS. At the time I bought the capacitor checker I needed to measure numerous small capacitors and coils. Not owning an audio frequency generator, I ended up building a small unit that plugged into the EXT STD jacks of the IT-11 and produced a 2 KHz signal that would drive the checker. The little box made the “eye” much more responsive when measuring small capacitors and coils.

Though I had originally bought this unit for a specific purpose, it is a piece of test equipment that I have found to be extremely useful quite often. For a short time in the nineties it took a back seat to a fancy Radio Shack DVM that also measured capacitance; but that failed twice when under extended warranty and again almost immediately after the warranty expired. My IT-11 is going on 42 years old and still has the original tubes; I did replace one capacitor - the 2 μ F reference paper capacitor some years back with a more modern and higher accuracy mylar capacitor after the original failed. I also cleaned the switches and main potentiometer once with a neat product called *Army Oil*.

The success of Heathkit can be attributed to three things: the quality of their kit components including the accurately fabricated chassis and other metal parts, their ability to design electronics that were simple to adjust and gave high performance for the dollar, but mostly for their great manuals that detailed construction in such good detail it was hard to go wrong. Actually it was their manuals that helped in the demise of Heathkit. It turned out that their manual writing department was a highly prized asset.



The IT-11 uses three tubes. A 6E5 “Eye” tube, a 6AX4 rectifier (the power supply produces a hefty 600 VDC - though at a low current) and a 6BN6 combination triode and dual diode tube. If anyone has any of these tubes lying around the shack that they don’t need, I’d love to have a set of spares.

Next month we’ll examine another Heathkit - perhaps even one of their numerous ham radio kits.

73, from AF6C



Remember if you come across any old Heathkit Manuals or Catalogs that you do not need, please pass them along to me.

Thanks - AF6C

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