An Evaluation of the Heathkit IM-17 Solid State Voltmeter

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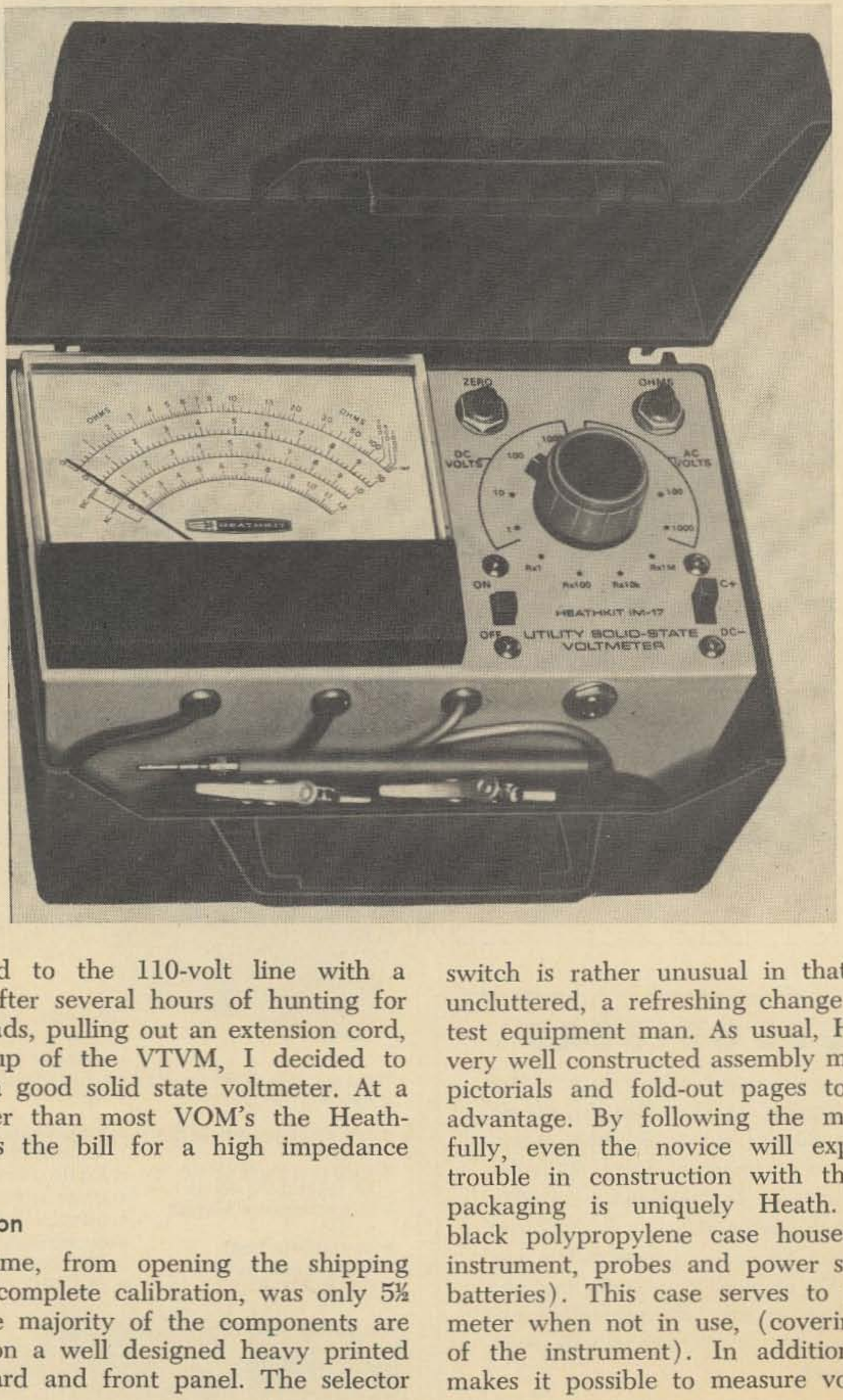

Still tied to the 110-volt line with a VTVM? After several hours of hunting for my test leads, pulling out an extension cord, warming up of the VTVM, I decided to invest in a good solid state voltmeter. At a price lower than most VOM's the Heath-IM-17 fills the bill for a high impedance voltmeter.

Construction

Total time, from opening the shipping carton to complete calibration, was only 5½ hours. The majority of the components are mounted on a well designed heavy printed circuit board and front panel. The selector switch is rather unusual in that it is very uncluttered, a refreshing change for an old test equipment man. As usual, Heath has a very well constructed assembly manual using pictorials and fold-out pages to their best advantage. By following the manual carefully, even the novice will experience no trouble in construction with this kit. The packaging is uniquely Heath. A hinged black polypropylene case houses the basic instrument, probes and power supply (two batteries). This case serves to protect the meter when not in use, (covering the face of the instrument). In addition, the case makes it possible to measure voltages both

of which are "hot," since the case does not conduct. An accessory jack is included for other probes, such as high voltage, demodulator, rf, etc.

Circuitry

Basically, this high impedance (11 megohm) meter does not depart from its vacuum tube counterpart in either circuitry or operation. dc and ac voltages are handled in the same manner, with the exception of a half wave peak detector for ac. A string of 1% resistors make up the voltage divider chain. The output of this divider feeds both a protection circuit and the gate of a field effect transistor. The FET is source-coupled to a transistorized balanced bridge. This bridge may be considered as a differential dc amplifier whose current difference (a function of the measured voltage) is measured by a 200 A meter between the emitters of the bridge.

There is one unique circuit worthy of consideration in this instrument. The overload protection circuit which is used in the instrument. It is not immediately apparent how this circuit operates. When either zener is in a nonconducting state, the gate of the FET remains at a high impedance. If, however, the breakdown or the zeners is reached, either Q_1 or Q_2 will conduct depending upon the polarity of the offending voltage, protecting the FET. Another feature found only in higher priced instruments is meter protection (when the meter is not in use). The meter is shorted out when the power switch is placed in the "off" position.

All the components in this kit are of high quality and of a reliable grade. With normal use, this instrument should last a lifetime. The batteries used are a 1.5-volt C battery and an 8.4-volt mercury battery. The mercury battery may be difficult to obtain, however, the standard 9 volt battery (NEDA #1611) will work just as well. I have used both at home. If it is desirable to obtain an 8.4-volt battery, Mallory makes one which should be available from any large sales outlet. The Mallory number is TR 133.

Operation

Calibration of the meter was performed as set forth in the manual without any special precautions. I checked the accuracy with laboratory standard equipment and found that all specs were complied with that were set forth by Heath. The use of the instrument is very easy and will pose no problem to the VTVM user. A large portion of the assembly manual is devoted to the use of the instrument for the novice, and as a review for the advanced test equipment man. Functionally, all knobs are placed in such a way to make the instrument more versatile and impossible to knock out by accidentally hitting either the zero or ohms pot. The ohmmeter, once set on the highest range need not be reset on any other range, and the zero will hold for voltage measurements as well.

Specifications

DC Voltmeter

Ranges	0-1, 0-10, 0-100, 0-1000 volts full scale
Input Resistance	11 megohms on all ranges
Accuracy	±3% of full scale

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AC Voltmeter

Ranges	0-1.2, 0-10, 0-100, 0-1000 volts full scale
Input Resistance	1 megohm on all ranges
Input-Capacitance	Approximately 100 pF (38 pF on 1000 V range)
Accuracy	±5% of full scale
Frequency Response	±1 dB 10 Hz to 1 MHz (from low source impedance)

General

Ohmmeter Ranges	Rx1, Rx100, Rx10k, Rx1M
Ohms Circuit Power Supply	1.5 volts (C-Cells, NEDA #14)
Amplifier Circuit Power Supply	8.4 volt Mercury Cell (NEDA #1611)
Meter	4¼", 200 A, 100 degree movement
Transistor-Diode Complement	1—FET (field effect transistor) 4—silicon transistors (2N3393, or equivalent) 1—silicon diode
Dimensions	8½" wide x 4¼" high x 7¼" deep
Net Weight	2½ lbs.

With the price at only $20, ease of operation, and accuracy, there is no excuse for anyone not being able to make valid measurements of dc, ac, or resistance. It's the biggest bargain in a solid state voltmeter today.

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