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EDITION 2

Assembly Manual

Zener Diode Tester

K-3051

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DICK SMITH ELECTRONICS PTY LTD

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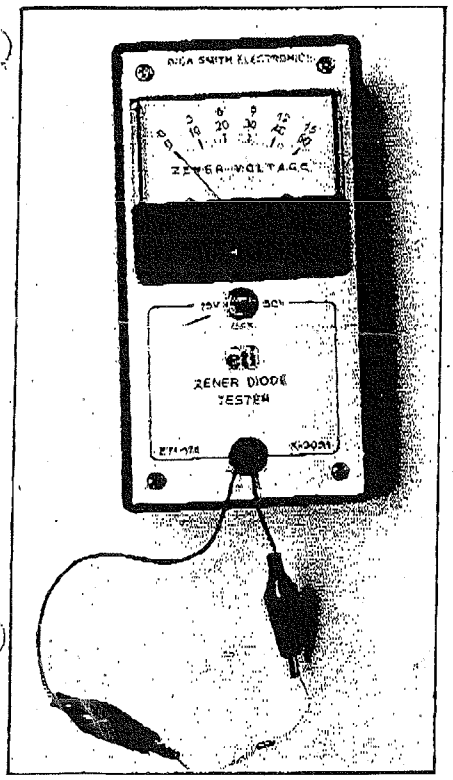


THE ETI-176 IS A simple, battery-powered meter used to measure the zener breakdown voltage of a device connected across its test clips. It is invaluable when sorting devices with indistinct or unfamiliar type numbers and is suitable for measuring devices with zener voltages of up to 50 volts. To improve reading accuracy the meter has two ranges; 0-15 volts and 0-50 volts. If a more accurate reading is required, an analogue or digital voltmeter can be connected directly across the zener while it is connected to the tester.

Ideally, zener diodes should be tested at their manufacturer's rated test current. Because of the diode's "dynamic resistance" the measured breakdown voltage is somewhat dependent upon the current at which it is measured. As a rule of thumb, the test current is roughly that current which causes the zener to dissipate about a quarter of its rated power dissipation. Therefore, to properly test zener diodes, a voltmeter, high voltage power supply and potentiometer or a variable current source would br required. Even if this equipment was readily available, its use would become rather cumbersome, particularly if more than a few devices had to be tested. Additionally, to correctly adjust the test equipment, you would need to know what type of zener you are measuring before you make the measurement to determine what type of zener it is! An easy-to-use unit of the simplicity of the ETI-176 cannot hope to achieve "lab-standard" accuracy with a wide range of zeners, but in practice the small differences between rated and measured zener voltages are of little concern.

Construction

Begin construction by examining the pc board for broken or bridged tracks. When you are satisfied with this, start loading the components, working up to the largest, with the proviso that delicate components like semiconductors ought to be left until last. Be careful to get the polarity of the big 470 µF capacitor, the diodes and the transformer correct. To finish off, cut five lengths of wire to about 150 mm and solder them onto the board in accordance with the wiring diagram. Don't solder the probes on at this stage. You will find this exercise easier if you tin the ends of the wires before you insert them into the holes. Complete this stage by soldering the battery leads into place.

Next step is to place the label on the meter scale. Carefully disassemble the meter scale and attach the label on the original meter scale. Then trim the edges if necessary and re-assemble the meter taking care not to bend or brake the pointer.

Now mount the meter and the 15/off/50 switch, and insert the rubber gromet for the probes. Pull the probes through their hole, and solder them onto the board (Make sure the clips are on the side with the scotchcal, not the other way around!) Now solder the leads to the switch and the meter. You will find this process a lot easier if you have used multicoloured wire.

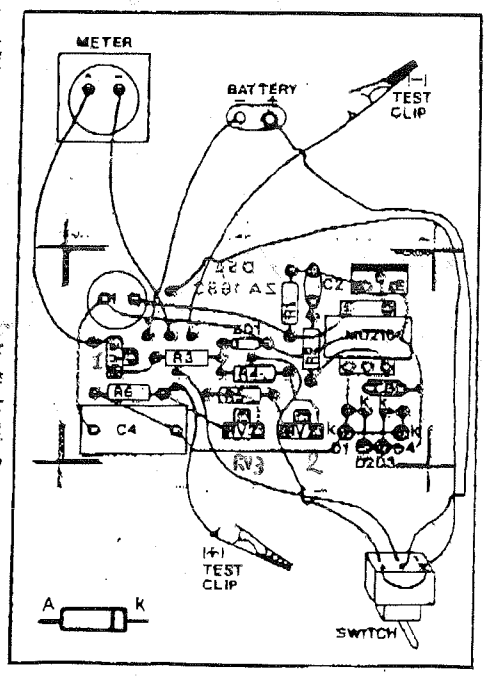
Finally, ensure the switch is in on the off (centre) position and connect the battery. The needle should not deflect and the transistor should stay cold. If either is not the case, disconnect the battery immediately and go back over your work, checking it carefully. If all is well, proceed to calibration.

Calibration

Note that two zener diodes have been included for the calibration procedure. (12V 400mW — 1N 963, 30V 1W — 1N 4751).

Firstly, with the switch set to the 50V range and the test leads open-circuit, set RV2 and RV3 to maximum resistance and adjust RV1 so the meter reads just over full scale deflection.

Next, with the switch set on the 15V range, connect the 12V zener diode across the test clips. Adjust RV2 for a correct reading on the 15V scale. Now switch to



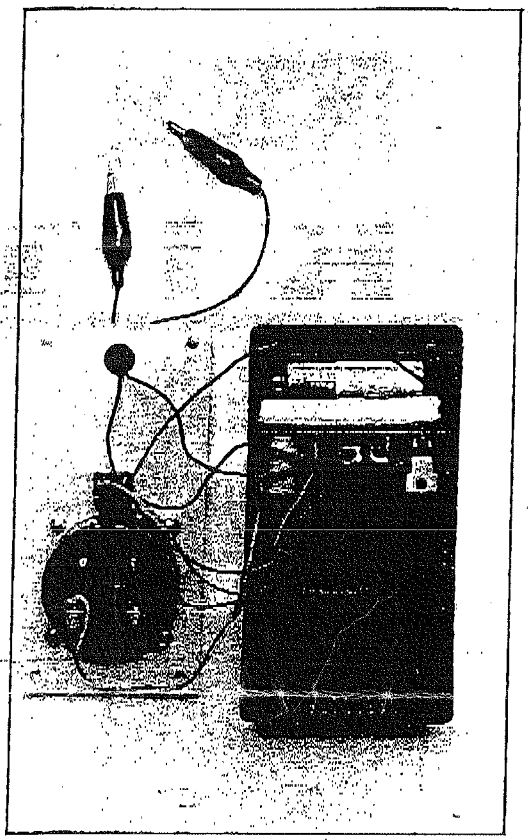
the 50V range and connect the 30V zener across the test clips. Adjust RV3 for a correct reading. This completes the setup procedure.

Operation

The open-circuit voltage at the test clips is about 100 volts and is current limited to about 8mA. While being quiet safe, there is sufficient current to cause a slight "tingle" if the test clips are touched while the unit is turned on. For this reason, it is recommended that connections only be made to the unit while the power-range switch is in the "Off" position.

As zener diodes are reverse breakdown devices, the cathode of the diode (usually the end with the stripe) is connected to the Red test clip and the anode of the diode is connected to the Black test clip.

After connecting the device to the test clips, switch the power/range switch to the 50 volt range and read the voltage from the meter scale. If the indicated voltage is less than 15 volts, the meter can be switched to the lower range for improved resolution. If the reading is less than about 1 volt, check that the test clips are not reversed. If the reading is greater than 50 volts, the zener may be a high-voltage type or it may be open circuit.



PARTS LIST

Resistors

(all ¼W unless otherwise specified)

3 x 10K Resistor (R1,R2,R6) .... ☐
1 x 47K Resistor (R3) .... ☐
1 x 82K Resistor (R4) .... ☐
1 x 330K Resistor (R5) .... ☐

Capacitors

1 x 470uf 16V Electro Cap RB (C1) .... ☐
2 x .1uf Ceramic Cap 50V (C2,C3) .... ☐
1 x .1uf 630V Greencap (C4) .... ☐

Semi-conductors

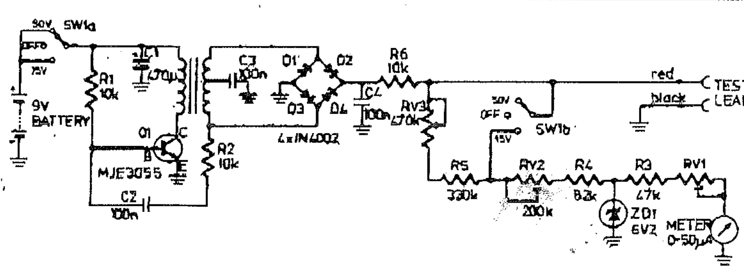
4 x 1N4002 Diode (D1,D2,D3,D4) .... ☐
1 x MJE3055 Transistor (Q1) .... ☐
1 x 6V2 Zener 400mv (ZD1) .... ☐
1 x 12V Zener 400mv 1N963 * .... ☐
1 x 30V Zener 1 watt 1N4751 * .... ☐
* Required for calibration procedure

Miscellaneous

2 x 200K mini trimpot vert (VR1,VR2) .... ☐
1 x 470K/500K mini trimpot vert (VR3) .... ☐
1 x DPDT C/OFF switch (SW1) .... ☐
1 x M0216 T/Former 1K CT/8R (TFMR) .... ☐
P.C.B., F/Panel, meter 0-50VA, zippy box, grommet, battery snap, solder, rainbow cable, alligator clips red and black. Meter face plate.

HOW IT WORKS

An oscillator is formed by Q1 and a transformer having about 1:10 turns ratio. The voltage across the secondary of the transformer is rectified by a diode bridge and results in 80-100 volts dc across capacitor C4, depending on the condition of the 9V battery. This voltage is presented to the zener diode via the current limiting resistor R6. Across the zener diode under test is the voltmeter circuit which scales the voltage into two ranges chosen by the 15V/50V switch. ZD1 acts with RV1 as a meter voltage protection circuit, should there be no connection at the test clips. The maximum available test current is around 8mA. The actual current in the zener-under-test will vary according to its zener voltage.



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