



Figure 1

MEASURING EXTREMELY SMALL CURRENTS WITH THE FE149

Very small currents from 0 to 100 nanoamps (0.1 microamps) may be measured using the FE149 in conjunction with a 1.5 volt battery. Leakage currents of transistors and diodes and leakage of paper and electrolytic capacitors can be measured with the method below.

To make nanoamps measurements, depress the plus DC VOLTAGE button and the 1.5 volt range button. Connect a 1.5 volt battery across the input leads; the meter should now read full scale or slightly higher. Connect a transistor, diode or capacitor between one battery terminal and the FE149 input. Observe battery polarity when connecting the device to be measured to obtain an accurate indication. Read the 0 to .5 DC scale of the meter and multiply the reading by 200 to obtain the current in nanoamps. For example:

a germanium diode leakage indication is .48 $.48 \times 200 = 96$ nanoamps
 a silicon diode leakage indication is .1 $.1 \times 200 = 20$ nanoamps

MEASURING HIGH VOLTAGE WITH THE FE149

CAUTION: High voltage is dangerous and extreme caution should be observed when making measurements. Be sure that the ground lead of the FE149 is connected to the ground of the unit to be measured before you measure the high voltage present. If the ground lead is not connected, you are merely extending the high voltage closer

to you. Stand away from the unit you are measuring and keep one hand in your pocket as a safety measure. If you are measuring the high voltage in a color TV receiver, it is especially dangerous because the high voltage supply (often 30,000 volts) is regulated and will not load down to a safe level if you should accidentally come across it.

The optional 39A21 High Voltage Probe is used to extend the DC ranges of the FE149 to 50,000 volts. It contains a 1,485 megohm 3% resistor to give a 100 X multiplier for any range of the FE149. Special ranges of 5KV, 15KV, and 50KV are marked right on the front panel. Do not measure voltages higher than 50KV with the 39A21 High Voltage Probe, as the maximum rating of the resistor is 50KV.

The special high voltage extension for the 39A21 is included with the probe. This extension simply plugs on to the end of the probe and allows the probe to sneak under the rubber caps found on the high voltage connection to the CRT in TV receivers.

Special clips are supplied with the 39A21 that will mount on the back of the FE149 with self tapping screws. These clips will hold the 39A21 High Voltage probe to the FE149 when not in use. Simply mount the clips with the screws provided in the holes in the back of the FE149 case. The 39A21 probe will slip in and out of the clips, but will not be dislodged from the FE149 when it is transported from job to job.

To use the High Voltage probe with the FE149, simply plug the positive test lead from the FE149 into the handle of the 39A21 where it will engage an internal jack. Use sufficient pressure when plugging in to insure that complete contact is made. Connect the ground lead of the FE149 to the unit to be measured, depress the + DC Volts button (- DC if you are measuring a negative high voltage) and the range button of 5KV, 15KV, or 50KV depending upon the voltage to be measured.

To read the actual voltage, multiply the reading on the .5 volt scale by 10K for the 5KV range, the 1.5 volt scale by 10K for the 15KV range and the .5 volts scale by 100K for the 50KV range.

The 39A21 High Voltage probe can also be used to measure voltages of 50, 150, 500, or 1000 volts DC with an input impedance of 1,500 megohms. To obtain this high input impedance, depress the range button of .5, 1.5, 5, or 15 and measure the voltage using the 39A21. Multiply the reading on the meter by 100 to obtain the voltage.

CHECKING THE BATTERIES OF THE FE149

The 9.6 volt rechargeable battery in the FE149 can readily be checked by merely depressing the BATT button on the function switch with the FE149 turned on. If the meter reads in the green area on the lower scale of the meter, the battery is charged to the proper voltage level and the measurements made with the FE149 will be correct. If the meter reads below the green area, the battery is low and should be charged up. To charge up the battery, simply plug the special cord into the FE149 and the other end into a 105 to 125 volt AC source. The OFF-ON switch must be in the ON position and the function switch can be in any position except the BATT position. In this position, the battery is disconnected from the charging source. The battery will be charging at any time the FE149 is turned on and plugged into the power line. The charge circuit will limit the current to prevent overcharge of the battery and any possible damage. The FE149 may be used while the battery charges.

The Ohms battery can be checked by setting the Ohms zero on the RX10 range and then push the RX1 range. If the meter indication falls more than half way into the green "Battery Good" area the ohms battery should be replaced, because readings on low ohms measurements will not be accurate.

REPLACING THE BATTERIES IN THE FE149

The batteries are easy to replace in the FE149. The unit does not have to be removed from its case. Remove the two screws holding the battery door on the rear of the case. This will expose the two batteries. One, a "D" cell, is used for ohms measurement and the other, a 9.6 volt rechargeable battery is used to power the circuit. A