# 68 Milliohms Adapter

☐ Few experimenters have the equipment to measure resistances of less than one ohm, and even fewer of them could care to do so. But the ability to measure resistance in the milliohm range can be very handy. For instance, motor manufacturers routinely check their coils with milliohmmeter. Since the next resistance is proportional to the length of wire on the coil form, measuring the resistance provides a simple, non-destructive method for checking the number of turns on a coil. With a milliohmmeter you can even check the relative quality of switch contacts and solder joints.

Current source Q1 drives a constant 10-milliamp current through whatever resistance lies between probes P1 and P2. U1 amplifies the voltage generated across the resistance by the current flowing through it. You read the voltage at IC1's output on your VOM and multiply by the appropriate scale factor—10V/ohm with S1 up, 1V/ohm with S1 down—to get the resistance. Before reading, short the probes together, and adjust R4 for zero output. Use needle-type probes, since they easily pierce surface oxide films (which can introduce significant resistance of their own). Keep the output voltage below one volt; in other words, the **maximum** resistance you can measure is one ohm, so set the VOM to the 1-volt scale.

**PARTS LIST FOR MILLIOHMS ADAPTER**

**C1**—1.0-uF mylar capacitor
**C2, C3**—0.1-uF ceramic disc capacitor
**D1**—6.6-VDC ½-watt zener diode
**D2-D6**—1N914 silicon diode
**IC1**—741 op amp
**P1, P2**—test probes
**Q1**—2N3906 PNP transistor
**R1**—1,800-ohm, ¼-watt resistor (all fixed resistors 5%, unless otherwise noted.)
**R2**—470-ohm, ¼-watt resistor
**R3**—66,000-ohm linear taper potentiometer
**R4**—62,000-ohm, ¼-watt resistor
**R5**—100-ohm, ¼-watt resistor
**R6**—1,000-ohm, ¼-watt resistor
**R7**—100,000-ohm, ¼-watt resistor
**S1**—SPDT toggle switch