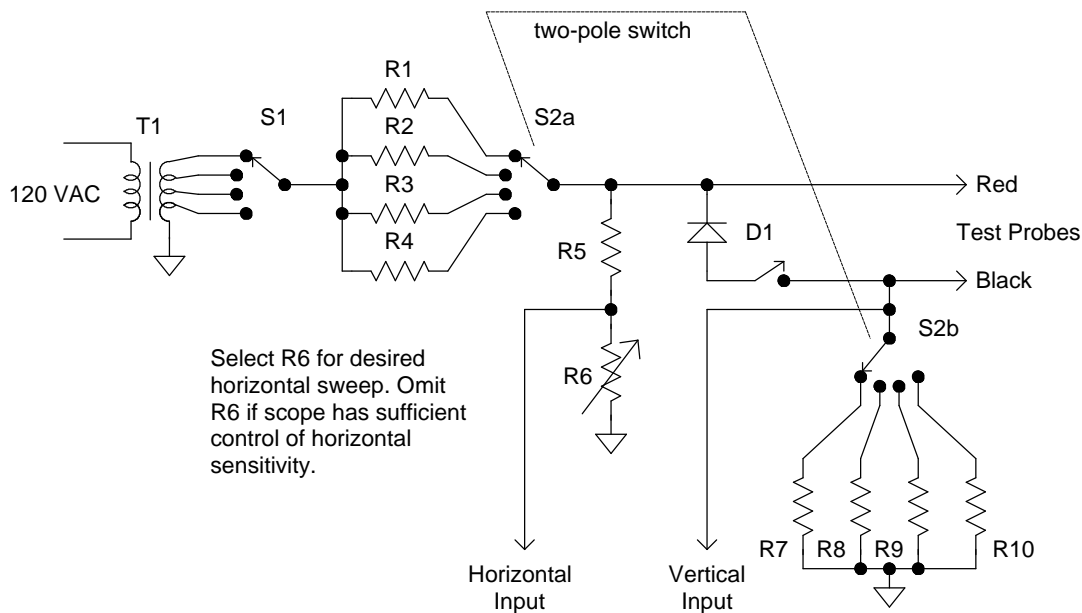


V/I Curve Tracer



The V/I Curve Tracer is an indispensable tool for troubleshooting circuits and testing components. The circuit traces the current versus voltage curve for the component under test on an ordinary oscilloscope. The peak-to-peak test voltage is adjusted by selecting different taps on a power transformer and the test current is limited by a selected series resistor. The voltage and current ranges are not critical and a single voltage version built with no switches will prove quite useful. The “deluxe” version shown in the schematic provides four test voltages with current ranges from a few hundred microamps to a few hundred milliamps. An optional diode is included in the output to limit the voltage swing to a single polarity to prevent reverse breakdown when checking delicate devices.

T1: Unless you plan to test high-power devices, T1 may be a small power transformer with a few different secondary voltages. The prototype depicted in the schematic has four secondary taps but a center-tapped 24VAC transformer will give two useful test voltages of about 17 and 33 volts peak. Avoid voltages much above 24VAC to reduce risk of shock.

S1: A single-pole switch with enough positions to accommodate the desired number of test voltages.

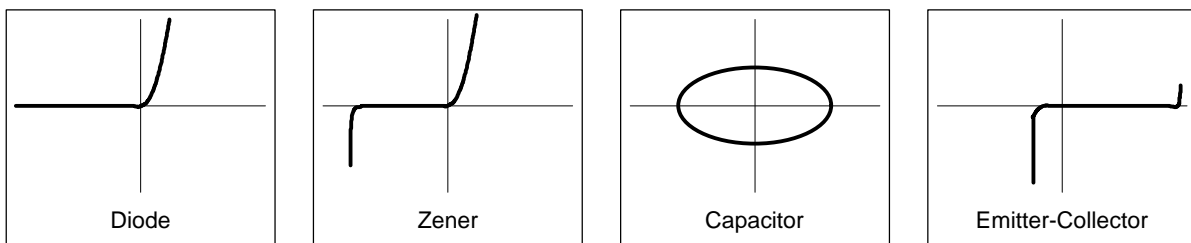
S2: A two-pole switch with enough positions to accommodate the desired number of test current ranges. Note that the switch selects resistor pairs: R1 & R7, R2 & R8, R3 & R9, R4 & R10.

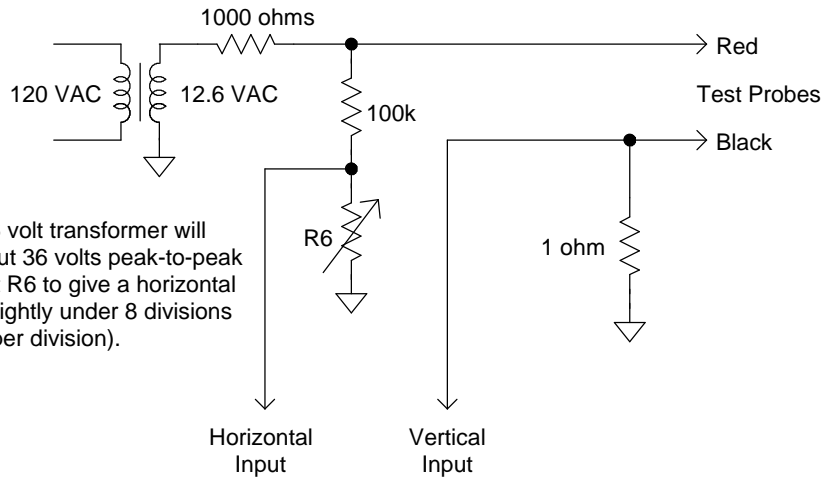
R1 - R4: These resistors limit the test current. R1 could be a 100 ohm, 10 watt resistor for a high power range capable of testing incandescent lamps (and quickly zapping semiconductors!). R1 works with the current sensing resistor R7. The current sensing resistors should be about 1000 times smaller than the series resistors so R7 should be 0.1 ohms if R1 is 100 ohms. The power dissipated in the current sensing resistors will be small so any style may be used.

Try R2 = 1000 ohms, R3 = 10,000, and R4 = 100,000 ohms.

Following the 1/1000 guideline gives R8 = 1 ohm, R9 = 10 ohms, R10 = 100 ohms. Note that these current sense values give four ranges from 100mA to 100uA with about 10 mV per vertical division for the oscilloscope. If the oscilloscope does not have a vertical sensitivity of 10 mV per division, the current sense resistors (R7 - R10) may be increased.

D1: A silicon diode capable of handling the highest test current and voltage. A 1N4002 should work well for most applications. When the diode is in the circuit, it will limit the negative swing to under -1 volt.





The 12.6 volt transformer will give about 36 volts peak-to-peak so select R6 to give a horizontal sweep slightly under 8 divisions (5 volts per division).

Set the vertical sensitivity to 5mV/div for a vertical sensitivity of 5mA/div.



Here is a simple version with a single voltage range of about 18 volts peak and a current limit of about 18 milliamps peak. The transformer is an ordinary "filament" transformer or similar with a single secondary. This one-range tracer is quite useful for quick checking of zeners, transistor junctions, LEDs, and most other semiconductors.

