Discharging the Primary Source: The primary source consists of a rectifier having an emf of about 9.5 volts and a significant internal resistance. With both the rectifier switch and the variable resistance switch in the off position, and with the variable resistance turned as far counter-clockwise as possible, connect the rectifier to the 120 VAC line, the 15-volt scale of the voltmeter directly across the rectifier output, the 1.5-amp scale of the ammeter between one pair of binding posts midway along the board, and a wire jumper between the other pair of binding posts. Turn the rectifier on and observe the voltmeter reading. This reading is essentially, but not exactly, the emf of the primary source. Now turn on the switch near the variable resistance, noting that there is now a current through the ammeter and that the terminal potential difference across the source has decreased. Gradually increase the current to the maximum possible value, noting that the terminal potential difference continues to decrease as the current increases. (See Note.)

Charging the Secondary Source: The secondary source has an emf of about 4.6 volts and an internal resistance of about 17 ohms. With both switches in the off position and the variable resistance turned as far counter-clockwise as possible, remove the wire jumper connecting one pair of binding posts and connect in its place the secondary source with its polarity in opposition to that of the primary source. Also, change the ammeter to the 0.15-amp scale and connect the 15-volt scale of the voltmeter directly across the secondary source. Turn on the primary source and note the reading of the voltmeter. This reading is essentially, but not exactly, the emf of the secondary source. Now close the switch near the variable resistance, noting that there is now a current through the ammeter and that the terminal potential difference across the secondary source has increased. Gradually increase the current to the maximum possible value, noting that the terminal potential difference across the secondary source continues to increase as the current increases. (See Note.)

Note: The internal resistance of the primary source varies with current. It is therefore useless to attempt to determine its value. However, the secondary source has an essentially fixed resistance. It is therefore possible, if the lecturer desires, to determine the emf and the internal resistance of this source by observing corresponding readings of current and terminal potential difference at two widely different currents.