14760 Battery Eliminator

Purpose:

This device is designed to provide regulated low-voltage power for simple motor applications and experimentation with electronics.

Contents:

One (1)	Battery Eliminator unit
One (1)	Set alligator leads
One (1)	AC power adapter

Operation:

Connect the AC power adapter to the port on the supply's side and turn the voltage control knob counterclockwise to full stop (0V, see fig.1). Plug the adapter into any 110-120V/60Hz outlet. The unit's output posts will accept banana plugs, bare wire, or spade lugs. Consult table 1 for load connection types of common TSS apparatus.

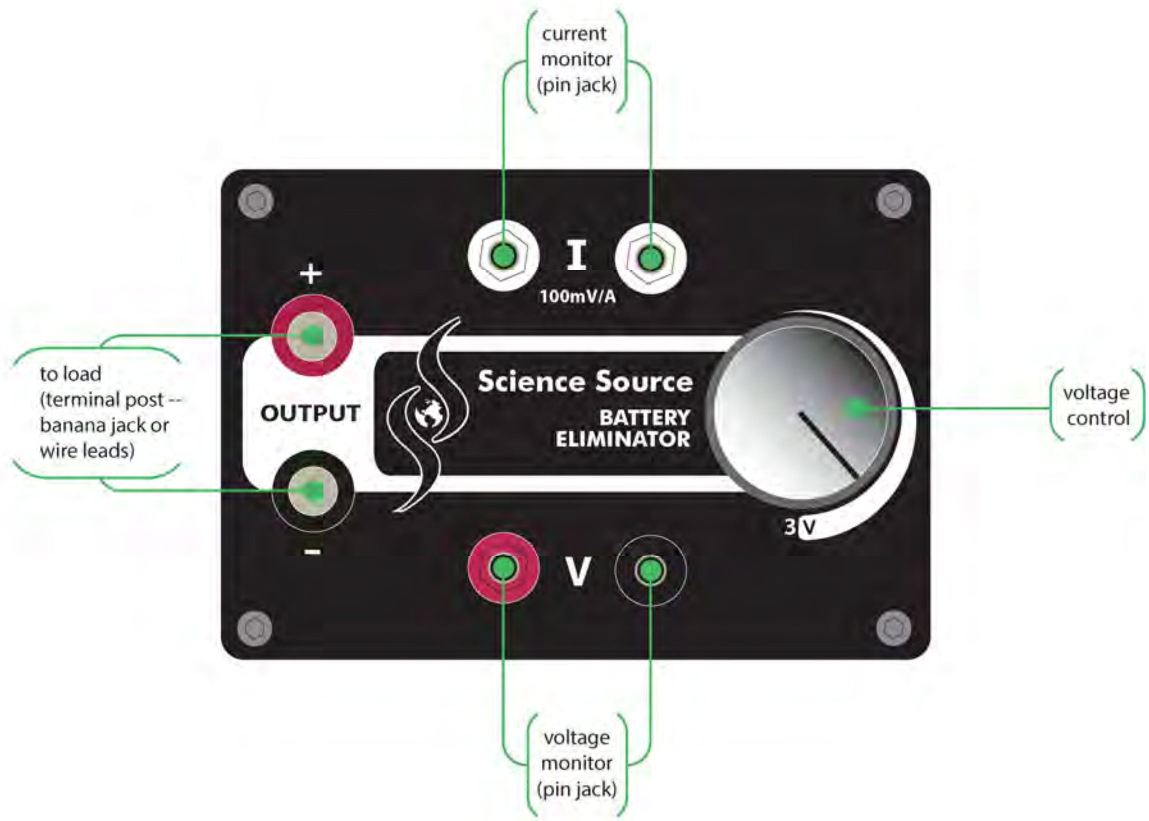


Figure 1

Voltage can be adjusted between 0 and 3.0V. The supply is voltage regulated, meaning that it will provide a nearly constant voltage, independent of load, for currents up to 1 ampere. It has a current limiting circuit to prevent damage to its internal components in the case of current overload or an accidental short circuit.

If the current limit of 1A has been reached, the unit acts as a *current source*, delivering a constant current. Voltage will be dependent on the resistance of the circuit's load, following Ohm's Law,

$$V = IR \qquad (1)$$

where V is DC voltage (volts), I is DC current (amperes), and R is resistance (ohms). At currents less than 1A, the supply operates as a *voltage source,* and will deliver a constant voltage. Current can be determined by rearranging eq.1:

$$I = \frac{V}{R} \qquad (2)$$

The behavior of an idealized supply in these modes is visible in the shape of a plot of voltage vs. load current with the supply set at 3.0V (fig.2A). The slope of the curve is nearly zero from 0A to the maximum 1A. Applying Ohm's Law above, setting the supply to 3.0V and drawing 1A would require a load resistance of 3Ω. Lower loads (eg, the 1Ω line, with slope in ohms, following eq.1) produce a lower voltage at 1A, determined by where their curves intersect. Higher resistance loads (eg, 75 Ω) intersect with the horizontal portion of the supply curve and so determine current at 3V. Note, however, that the behavior of the actual circuit in the 14760 truncates the high-wattage region of the output curve, as seen in fig. 2B.

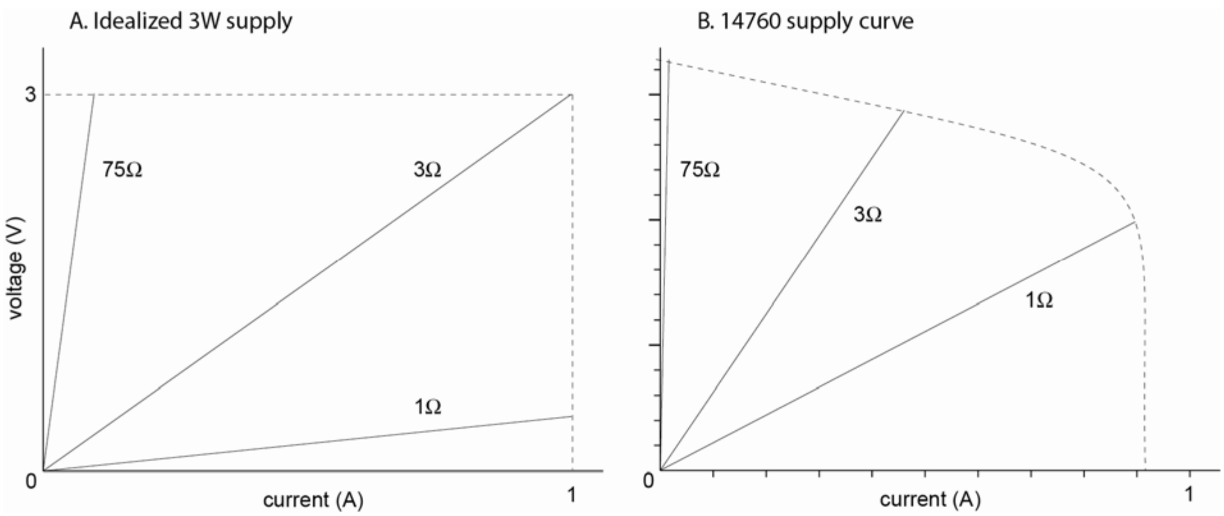


Figure 2

Monitoring voltage and current:

The pin jacks on the supply front will accept most common multimeter probes. Output voltage is monitored from the lower jacks, marked **V**. Load current may be monitored from the upper jacks, marked **I**. This current monitoring point measures the voltage across a shunt resistor of a very precisely determined value. In this way, following Ohm's Law, we can measure current in the circuit using voltage as a proxy. This eliminates the need to have an ohmmeter placed into the circuit in series -- the supply will operate without a meter or bridge in place. The conversion of voltage shown on a meter to current in the circuit is 100mV/A, or:

$$I = \frac{V}{100}$$

where *I* is current in amperes and *V* is voltage in **millivolts**.

Table 1

Apparatus	Part No.	Motor connection	Freq. class
Energy Transfer	15150	wire leads	1
DC Recording Timer	15215	battery box	
String Vibrator	15240	battery box	
Adjustable Wave Generators	15440, 15445	pins	
Variable Phase Wave Generator	15490	teminal post	
Angular Momentum Apparatus	18600	battery box	
Ripple Tanks	15401, 15415	banana plug	II

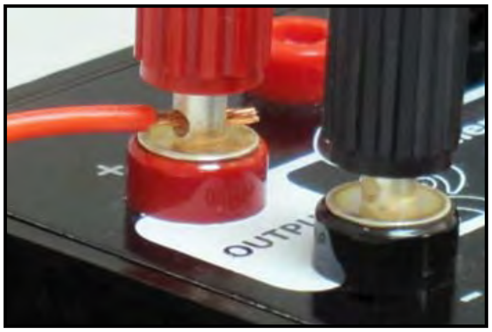
Table 1 gives a summary of frequently used TSS motorized apparatus. Their commonality of motor allows for a convenient **estimation** of operating frequency from the supply. Both class 1 and class II motors exhibit a relatively linear response of frequency to voltage.

Class I: $f = 50.0V - 4.2$

Class II: $f = 13.3V - 5.3$

The presence of the y-intercept indicates the linear portion of the motor's response does not begin at zero. For class I motors, linear response begins at approximately 0.25V, class II at 0.5V.

Connections:



Bare leads to terminal posts:
Thread the neatly twisted wire through the post and secure by tightening the post nut.

Two options for connecting alligator clips to terminal posts.

Alligator clips to a battery box:
Identify the ends of the battery path. Wires are frequently soldered or crimped to those points. In general, the negative end will employ a coil spring or spring strip, the positive a simple contact surface. Attach the black clip to the spring or other contiguous portion of the negative contact. Attach the red clip to the final positive contact surface.

Alligator clips to pins.