

Appendix A

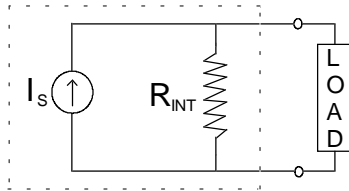
HP E3631A : Triple Output DC Power Supply

Function

The basic function of a DC Power Supply is to drive either a DC voltage or current. They are used often in powering circuits for testing purposes. It's handy to use a DC Power Supply when batteries are unnecessary for testing purposes (this saves on discarded batteries). The DC Power Supply also has better regulation than batteries, so it's output impedance is lower and more consistent.

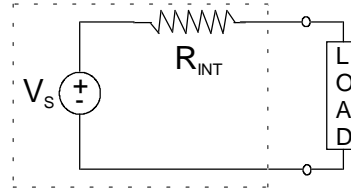
Equivalent Circuit

All powersupplies, even batteries, have the simplified circuit models shown below. One is used when dealing with the DC voltage source, the other with the DC current source.



DC Current Supply Model
(Norton supply)

$R_{INT} \rightarrow$ BIG



DC Voltage Supply Model
(Thevenin supply)

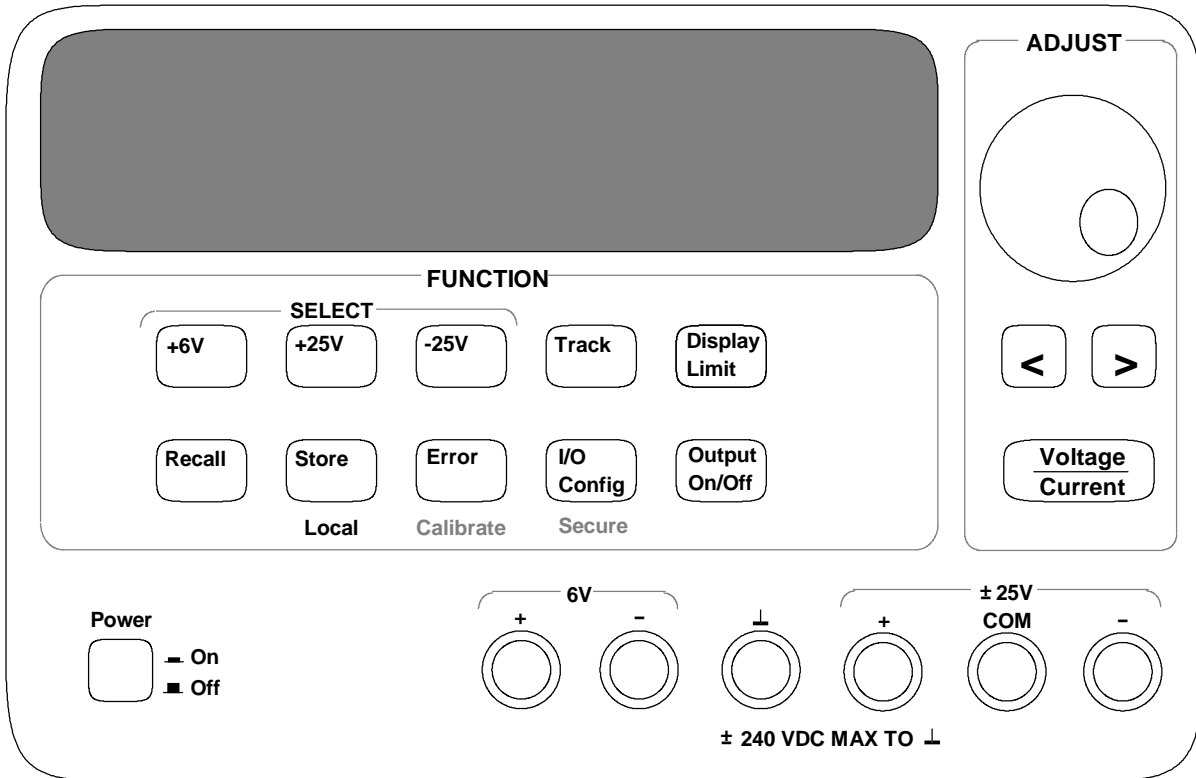
$R_{INT} \rightarrow$ small

Notice how the resistor is in parallel with the device for the current supply's internal resistance, and is in series with the device for the voltage supply's internal resistance. There are a few reasons why this must be the case. In the current source, if the resistance was in series, the output would see no change in the amount of current being driven once a load is attached! Similarly the resistance wouldn't be seen in the case of a voltage source if it was parallel to the voltage source.

Another feature of DC Current supplies is the desire to have a *large* resistance. If the load placed on the supply had a larger resistance than the internal resistance, most of the current would find a path through the internal resistance and not through the load! For DC Voltage supplies, a *small* resistance is desired. If the internal resistance is larger than the load's resistance, most of the voltage drop would also appear internally and not across the load!

Control Layout

In order to make the most of your experience with the DC Power Supply, it's good to know about all of the buttons, knobs, and outputs.



Outputs

6V: The 6V outputs are for a variable 0-6V supply. This supply is useful because it has no common ground like the $\pm 25V$ supply. It can be used as a floating voltage source just like a battery is a floating voltage source. The positive and negative terminals are indicated by + and - respectively. This can also be used as a 0-5A supply

⚡ : I have no idea what this output is used for.

$\pm 25V$: The $\pm 25V$ outputs are for positive and negative supplies centered around a common ground. The letters "COM" indicate that the middle output is the common ground. In this case the voltage is not floating, and the voltages are centered about the electric socket's ground (usually an earth ground)¹. Both the positive and negative values about "COM" are adjustable and are labeled by + and - respectively. These sources can also be used as 0-1A supplies.

¹ This is usually the same ground used by oscilloscopes, so if you don't connect the oscilloscope ground clip to the "COM" voltage, you may inadvertently set nodes to the same voltage as "COM". This is a common error and can cause shorts and improper behavior in circuits.

Power Button

Power: This button turns the power supply on and off. Don't use this if you only want to turn off the outputs.

Function Buttons

Output On/Off: This button toggles the voltage and current supplied to the outputs off and on. When you are modifying the circuit and don't need power running through it, it's best to turn the outputs off. The outputs are set to *off* when the power supply is first turned on.

Select: These buttons (6V, +25V, and -25V) all select which voltage output to manipulate and display.

Voltage/Current: This toggles between showing voltage and current values on the display.

Display Limit: Temporarily brings up the voltage & current limit options so that they can be adjusted.

Adjust Controls

Circular Knob: This increases (turn clockwise) or decreases (turn counter-clockwise) the selected digit on the display.

“<”: This selects the digit to the left of the currently selected digit.

“>”: This selects the digit to the right of the currently selected digit.

Quick Start Instructions

When you first turn on the HP E3631A DC Power Supply, “OUTPUT OFF” appears in the display. This tells us that there is no voltage or current being sent to the output presently.

Operation as a Voltage Source

Press the “**Display Limit**” button to modify the limits appropriately. Any decent voltage source can output a large amount of current is necessary. Select the current limit using the “**Voltage/Current**” button, and make it as large as possible. This makes the voltage limit the primary output limitation, and it determines the output of the supply. Now change the voltage limit as necessary to get the proper output.

Operation as a Current Source

Press the “**Display Limit**” button to modify the limits appropriately. Any decent current source can output a large voltage as required to keep current flowing. Select the voltage limit using the “**Voltage/Current**” button, and make it as large as possible. This makes the current limit the primary output limitation, and it determines the output of the supply. Now change the

current limit as necessary to get the proper output. Don't forget to turn on the outputs using the **"Output On/Off"** button.

Operation as either a Voltage or Current Source

While operating as either a voltage or current source, the dominating limit can be changed without selecting the limit using **"Display Limit"**. The power supply automatically chooses the correct value, either current or voltage, to change.

Common Usage Errors and Problems

n/a