# *DC Power Supply Guide*
## *Tektronix PS2520G & PS2521G*

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# 1 – Basic Information

This guide provides basic instructions for operating the Tektronix PS2520G and PS2521G DC power supplies. The PS252xG series provide these features:

- Three independent DC output sources

- Series and parallel connection capability / Overvoltage and overcurrent protection

- Push-button controls and a numeric keypad / Four-digit voltage and current displays

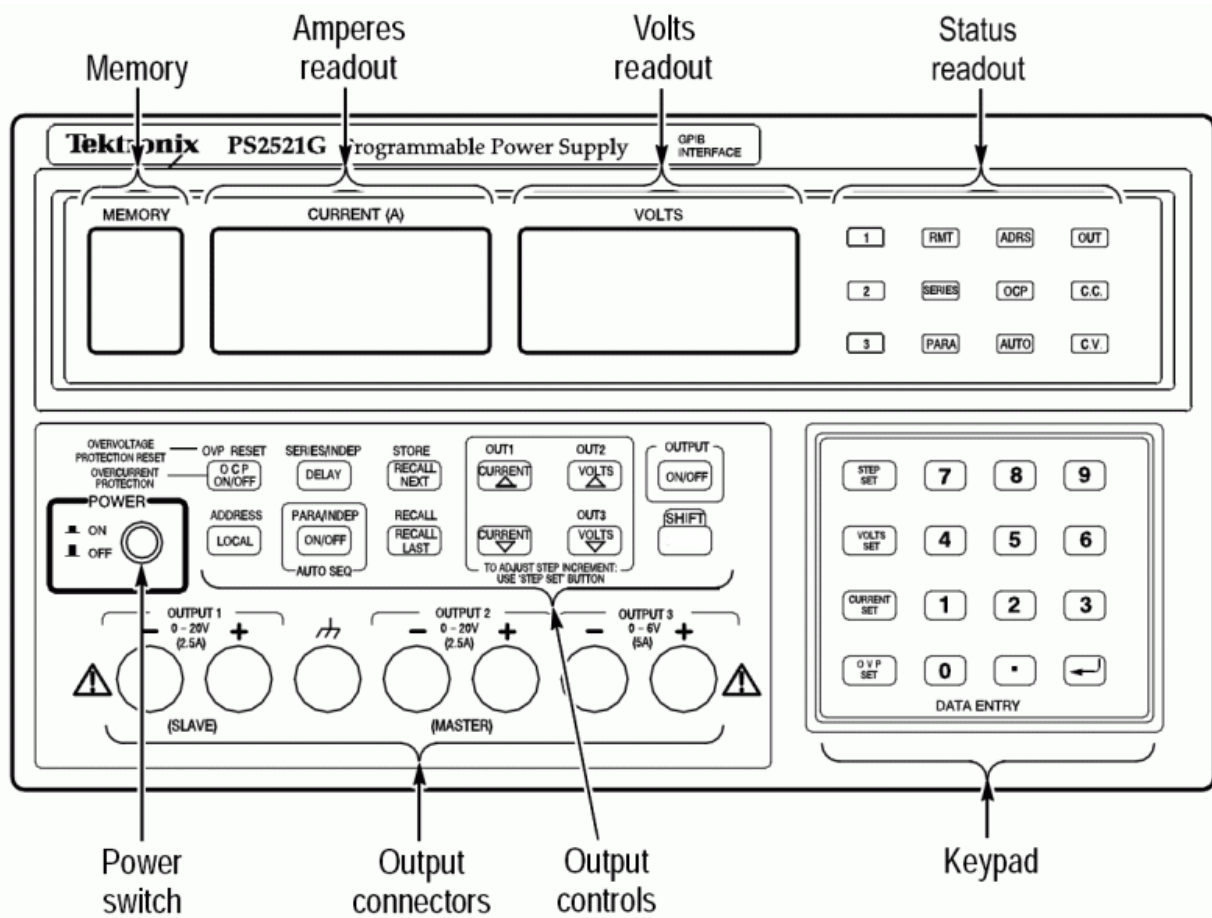- Programmable over GPIB

# 2 – Instrument Front Panel



**Figure 1: Tektronix PS2521G front panel**
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> Note*:*   All of the output sources share the same readouts and controls.  The *selected output source* is the one currently chosen by the user for display on the readouts.  Changes made to power supply settings apply only to the selected source.

## Power Switch

This switch turns the entire power supply either on or off.

## Output Connectors

The power supply has three sets of output connectors – one for each independent output source.  A set consists of a pair of negative and positive terminal posts.  In addition, there is a single ground terminal post that is connected to chassis ground[1].

## Output Controls

The output controls are push-buttons for setting up the power supply.  Each button's main function is printed on the face of the button.  Some of the most used controls are:

- SHIFT
  Some buttons have an alternate function that is printed above the button.  Pushing SHIFT before pressing the button will choose the alternate function.

- SHIFT→OUT1, SHIFT→OUT2, SHIFT→OUT3
  These three buttons determine which output source becomes selected for display and editing.

  Note: The → symbol indicates a sequence of buttons to push.  For example, SHIFT→OUT1 means to push the SHIFT button first, followed by the OUT1 button.

- OUTPUT ON/OFF
  This button enables or disables all of the DC outputs.  Each press of the button toggles the state of the output.  All three outputs are either turned on or turned off simultaneously, regardless of which source is presently selected.

## Keypad

The keypad is used to enter numeric values for the desired voltage and/or current limits of the selected output source.  The digits 0 though 9, the decimal point, and return (↵) are available.

## Amperes and Voltage Readouts

These readouts numerically display the current (in amperes) and voltage (in volts) of the selected output source.  When the output is disabled, the readouts show the current and voltage limits.  When the output is enabled, the readouts display the actual current and voltage.  If an error condition occurs, these readouts will display an error code.

## Status Readout

This is a grid of status lights that show the operating state of the power supply.  The "1", "2", and "3" lights indicate which output source is selected.  The "OUT" light indicates whether the output sources are enabled or disabled.  The "C.V." and "C.C." lights show whether the constant voltage mode or the constant current mode is in effect, respectively.

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[1] The ground post is internally connected to earth ground via the power supply chassis and the power cord.

# *3 – General Operating Procedure*

For safe operation of the DC power supply, follow this procedure:

1.  Turn off the power supply and remove any external connections from the output terminals.

2.  Configure the output terminals for either isolated ground or ground referenced operation.
    (*See Appendix 1: Typical Output Connections*)

3.  Turn on the power supply.

4.  For <u>each</u> output you intend to use

    a.  Select the output.  (The "1", "2", or "3" status light will illuminate.)

    | To select | Buttons to press |
    |-----------|------------------|
    | OUTPUT 1  | SHIFT → OUT1     |
    | OUTPUT 2  | SHIFT → OUT2     |
    | OUTPUT 3  | SHIFT → OUT3     |

    b.  Set the voltage and current limit for the selected output:

    | To set  | Buttons to press |
    |---------|------------------|
    | Voltage | VOLTS SET→ Numeric value → ↵ |
    | Current | CURRENT SET → Numeric value → ↵ |

    Note:  The VOLTS SET, CURRENT SET, and ↵ buttons are located on the keypad.  The
    numeric value consists of digits (and decimal point, if needed) that are entered via the
    keypad.  Data entry is completed by pushing the ↵ button.

5.  Turn off the power supply.

6.  Connect your circuit to the power supply's output terminal posts.

7.  Turn on the power supply.

8.  Enable the outputs.  (The "OUT" status light will illuminate.)

    | Buttons to press |
    |------------------|
    | OUTPUT ON/OFF    |

9.  Test your circuit.

10. Once you are done testing, disable the outputs.  (The "OUT" status light will dim.)

    | Buttons to press |
    |------------------|
    | OUTPUT ON/OFF    |

Note:   Voltage and current limits for all three outputs are stored in non-volatile memory, so the power
        supply retains its last used settings even when it is turned off.

# *4 – Negative Voltages*

To configure the PS252xG to supply negative voltages, the output connectors need to be physically wired in a specific way (*See Appendix 1: Typical Output Connections*).  Regardless of the expected output polarities, all voltage and current level values are entered as positive numbers on the keypad.

# *5 – Overvoltage and Overcurrent Protection*

The power supply has built-in overvoltage protection (OVP) and overcurrent protection (OCP) to prevent excessive voltage or current from being supplied to an output load.  The power supply automatically disables the output if the voltage or current exceeds user-specified values.

This optional procedure for configuring OVP and OCP is not covered in this guide, but instructions for doing so can be found in the full user manual (*See Appendix 3 – References*).

# *6 – Constant Voltage versus Constant Current Output*

The power supply is designed to provide either a constant voltage or a constant current to an attached load.  The voltage limit, current limit, and the magnitude of the load determine whether the power supply attempts to keep the voltage constant or the current constant.

*Example:*

Set the voltage of OUTPUT 2 to 3.1 volts with a maximum current of 0.25 amperes.

1.  Select OUTPUT 2:
    **SHIFT → OUT2**

2.  Set the voltage level of the output to 3.1 V:
    **VOLTS SET → 3.1 → ↵**

3.  Set the current limit of the output to 0.25 A:
    **CURRENT SET→ .25 → ↵**

As long as the load attached to OUTPUT 2 does not use more than 0.25 A of current, the power supply will keep the voltage constant at 3.1 V.  The "C.V." light will be illuminated on the status readout.

However, if the load attempts to draw more than 0.25 A of current, the power supply will hold the current at 0.25 A and allow the voltage level to vary.  In this case, the "C.C." light will be illuminated.

# *Appendix 1 – Typical Output Terminal Connections*

- The ground terminal is internally connected to earth ground via the chassis and power cord.

- Although only Output 1 and 2 are shown in the drawings, all of the three outputs work similarly.

- Although not displayed in the equivalent circuit drawings, all practical power supplies have an internal source resistance $R_s$.

- The curved connections can be made by using short lengths of insulated wire.

## Isolated Ground

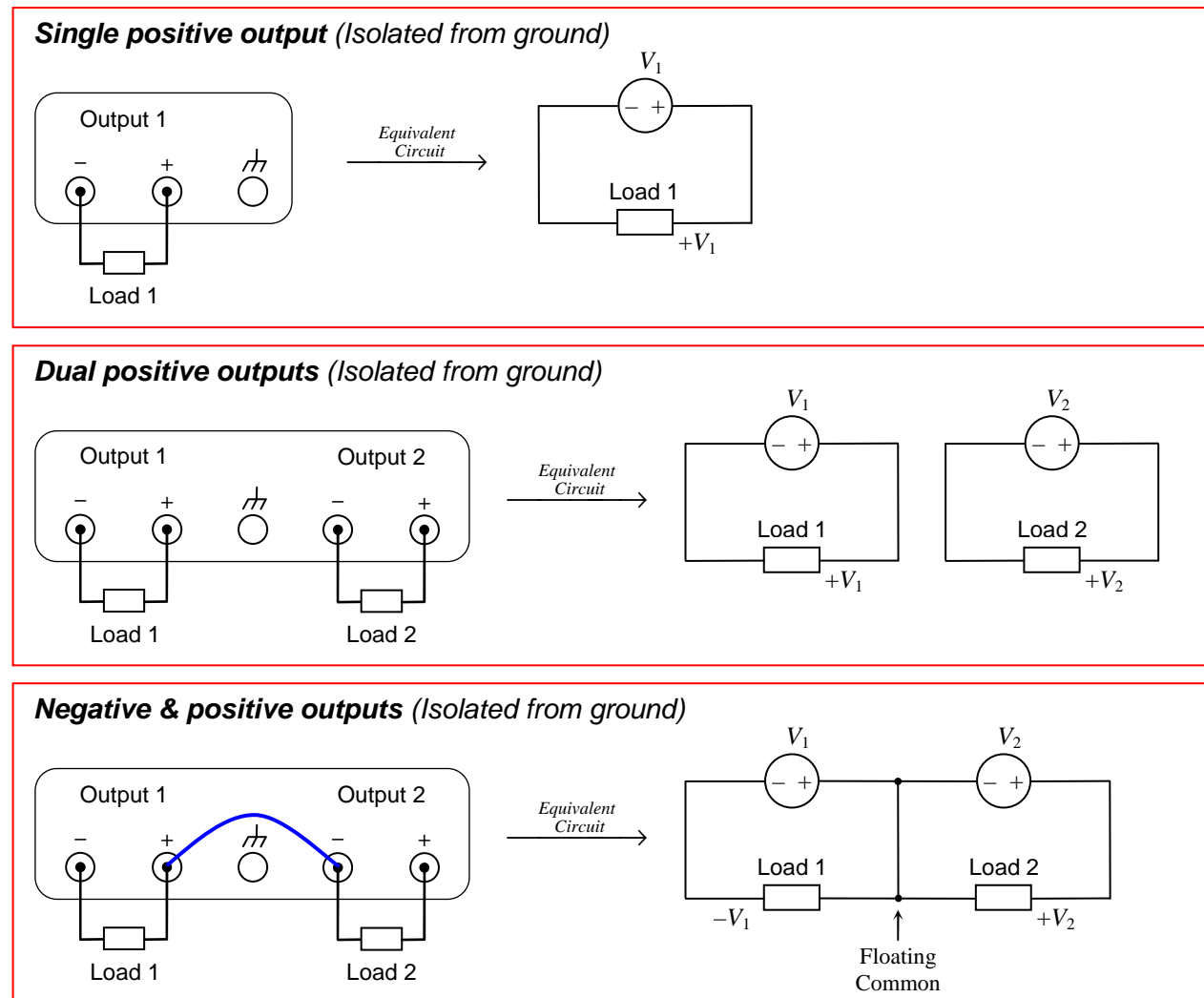This configuration is useful when it is unnecessary or undesirable to connect one of the outputs to ground.

**Figure 2: Various isolated ground configurations**
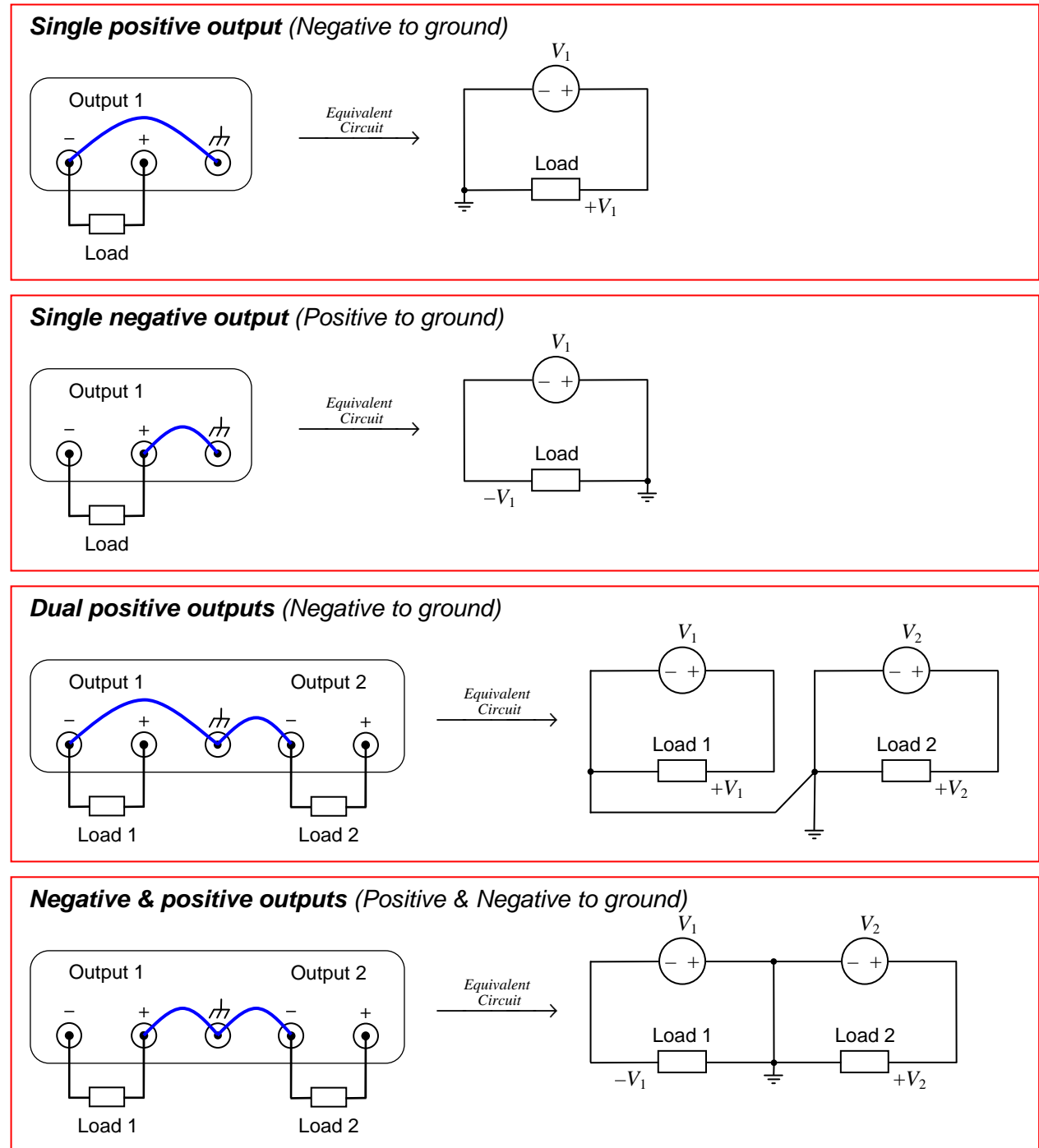
# Ground Referenced

**Figure 3: Various ground referenced configurations**

# *Appendix 2 – Specifications*

| | **PS2520G** | **PS2521G** |
|---|---|---|
| Independent Output Ratings | Two outputs:  0 to 36 V, 0 to 1.5 A<br>One output:  0 to 6 V, 0 to 3 A | Two outputs:  0 to 20 V, 0 to 2.5 A<br>One output:  0 to 6 V, 0 to 5 A |
| Resolution Rating | Voltage: 10 mV<br>Current: 1 mA | Voltage: 10 mV<br>Current: 1 mA |

**Table 1:  Manufacturer's instrument specifications**

# *Appendix 3 – References*

[1]   *Tektronix PS2520, PS2520G, PS2521 & PS2521G User Manual (070-9196-01)*, Tektronix, Inc.

[2]   "Circuit Grounds and Grounding Practices," George Hunka, University of Pennsylvania.
`http://www.ese.upenn.edu/rca/instruments/misctutorials/Ground/grd.html`