Lab - Row 1

Introducing the 4 Channel DC Bench Power Supply

Introduction:

Keysight's 4-channel power supply offer up to 32V and 10A per channel or 160W per channel. The E36441A is capable of outputting a maximum power of 400W. The E36441A also has low distortion and great stability. In this lab, you will learn how to use each of the function that comes with Keysight's E36441A.

Required Equipment:

- E36441A 4 Channel Bench Power Supply

Electronic Industrial Solutions Group Center of Excellence (EISG COE)
Lab R.1.1
Output Tracking, Datalogger, Output Listing and Output Sequencing

Output Tracking allows multiple output channels to adjust simultaneously, maintaining a fixed relationship between their voltages or currents. Datalogger records voltage, current, or other parameters over time for later analysis, useful in monitoring performance or detecting trends. Output Listing enables preprogrammed sequences of output settings to be executed step-by-step, useful for automated testing. Output Sequencing goes further by defining precise timing and dependencies between outputs, ideal for complex workflows like powering up multi-stage systems.

Notes:
When starting each of the operations turn off then turn on the power supply to reset the power supply to default settings.

A. Output Tracking Operation

1. Press the **Output Settings** key to enter output settings, then press **Tracking On** to enable output tracking.

2. Press the **Colored 2, 3, 4** hard buttons and you should be able to observe the Tracking is enabled for all channels as shown in the Figure below, there will also be a small indicator on the top of the display.

3. Press **Meter View** to go back to main menu.

4. Choose 1 of the channels and key in 5 V using the number pad then press **Enter** to program that output, the other output will also automatically set to 5 V.

5. The default current after turning on is 1A so leave it unchanged, however if current changes are required you will have to key in the current value to all channel individually as the tracking does not work.

6. Press **All On/Off** hard button to simultaneously turn on all channels of the power supply.

7. You should now be able to observe the voltage output of all channels to be the same in the meter view.

B. Data Logger Operation

1. Press **Meter View** to go back to main menu.

2. Press the **Data Logger** key to enter datalogger menu.

3. Press the **Right Arrow** hard key then press **Select** to select output voltage of channel 2, repeat this step twice to select channel 3 and 4 output voltage. Ensure that the four channel voltage outputs are selected including channel 1.

4. Press the **Datalog Run/Stop** to start logging the data.

5. Using the voltage and current settings from the output tracking step press **All On/Off** to turn on all channels after a few seconds press the button again to turn it off.

6. Press **Auto Scale** to see all 4 channels clearly.

7. Use the current rotary knob located below the 3 and 4 colored button to scale the horizontal axis, turn clockwise to zoom in and counterclockwise to zoom out.

8. Press the **Marker ON|OFF** soft button to toggle on the markers, use the voltage rotary knob to adjust the m1 marker and use the current rotary knob for m2 marker. Here we are using it to measure the down programming speed of channel 4 which is 200ms.

C. Output Listing Operation

1. Press **Meter View** to go back to main menu.

2. Press the **Output LIST** soft button to enter the output list menu.

3. Press **Right Arrow** hard button twice then key in 1 using the number pad to change the duration of each steps to 1 second.

4. Then press **Add** twice to create 2 new steps to the list.

5. Using the arrow and number keypad, navigate to the second step and key in 10 V for the second step and key in 5 V for the third step.

6. Press **Properties** then press **V-Mode** and **I-Mode**, change both mode to List.

7. Press **Trig Src** and set the trigger source to List Run/Stop Key

8. Press **Down Arrow** hard button again to continuous and Press **Select** to tick and enable continuous mode.

9. Press **Back** to exit properties settings.

10. Press **All On/Off** to turn on all channels.

11. Press **Meter View** to exit output list menu and enter the datalogger then press **Datalog Run/Stop**. Then press **List Run/Stop** to start the list and press **Auto Scale**. Using the current rotary knob adjust the zoom until the signal can be observed. You should be able to observe a signal as shown below. You can untick the other channels for a clearer view of channel 1.

12. Press **List Run/Stop** to stop the list.

D. Output Sequencing Operation

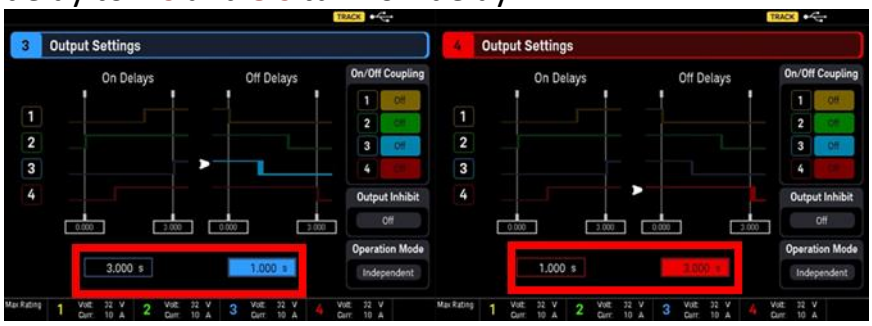
1. Press **Meter View** to go back to main menu. Ensure the power supply is turned off.

2. Press **Output Settings**, then press **Tracking On/Off** to toggle on tracking so we don't need to set the output settings multiple times.

3. Press the **1** hard button above to select channel 1, then use the number pad to key in 2 s of turn-on delay for channel 1 and leave the turn-off delay at 0 s.

4. Then press on the **Green Channel 2** button to enter channel 2 output settings, keep the turn-on delay at 0 s and change the turn-off delay to 2 s.

5. Using the arrow and number keypad change the channel 3 turn-on delay to 3 s and 1 s turn-off delay, change the channel 4 turn-on delay to 1 s and 3 s turn-off delay.



6. Press **Meter View** to go back to main menu.

7. Select a channel and set the voltage to 5 V using the number keypad and enter data logger mode, select all channel output voltage then run the data logger.

8. While the data logger is running press **All On/Off** to turn on the output, after a few seconds press it again to turn off the output.

9. Adjust the signals' offset by pressing **Auto Scale** then you will observe that all channels have varying turn off and turn on delay.

E. Slew Rate Adjustment Operation

1. Press **Meter View** to go back to main menu.

2. From Meter View, press **Source Settings**, then ensure you are selecting channel 1 and press **Voltage Slew** to enter voltage slew rate settings.

3. Press **Voltage Rise MAX** to turn off maximum on slew rate then use the number keypad to change the slew rate to 1 V/s.

4. Press **Meter View** to go back to main menu and change the voltage to 5 V using the number keypad.

5. Enter the datalogger and ensure channel 1 output voltage is selected before starting the data logging. While it is running turn on channel 1 and press **Auto Scale**, once the logging is completed use the markers to measure the voltage rise time, since the slew rate is 1V/s and the output voltage is 5V you will observe that the voltage takes approximately 5 seconds to reach 5V.

F. Voltage and Current Protection Operation

1. Press **Meter View** to go back to main menu.

2. Press **Source Settings**, then ensure you are selecting channel 1. Press **Protection** and then **OCP State** to turn on overcurrent protection. Overvoltage protection should be turned on by default but if it is not on, press **OVP State** to turn it on.

3. Using the arrow and keypad buttons, set the value of OV Protection to 10V.

4. Press **Meter View** to go back to main menu.

5. Ensure you are selecting channel 1 and change the voltage to 11V. Press **On** button for channel 1 to turn the power supply on.

6. If the slew rate is still the same from the previous section, you will observe the voltage increase until it hits 10V. Then the power supply will turn itself off and the OVP error will be highlighted in the top right corner of the power supply

7. To turn off the error and make the channel 1 functional again, press **Source Settings**. Ensure you are selecting channel 1. Press **Protection** and then **Protection Clear** to clear the protection error. Also make sure to set the OV Protection back to 35V (max) again.

G. On/Off Coupling Operation

1. Press **Meter View** to go back to main menu.

2. Press **Output Settings** then **On/Off Coupling**.

3. To toggle on coupling just press the **Coupling** soft button for the corresponding output. For this guide we will be toggling on channel 1 and channel 2 coupling.

4. Press **Meter View** to exit to main menu and enter datalogger. Ensure that V1 and V2 is ticked, then press **Datalog Run** to start logging. While the datalogger is running press the yellow **On** button below the arrow keypad to turn on channel 1, as soon as you do so you will observe that the green **On** button also turning on which turns on channel 2. The same occurs when turning off channel 1, channel 2 will also simultaneously turn off hence proving that the 2 channel on/off is coupled.

5. Note: If you observe that the slew rate is 1V/s for both channels 1 and 2 because of the previous section, it is applied to channel 2 as well because Output Tracking was set to On previously when setting the slew rate.

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