

Avoid Power Related Damage

Using Overcurrent Protection with a Multiple Output Power Supply

Allowing a device to consume too much current is the most common way to destroy a device. Power supplies have multiple safety features to prevent a device from receiving too much current. The most common is setting a current limit and having the power supply transition to the constant current mode at the limit. We covered the constant current (CC) transition in tip 1 of “Build Your Power Supply Skill Set 5992-2716EN.” A second protection method is to use overcurrent protection (OCP). When using a multiple output power supply to provide several voltages to a device, it is often desirable to shut down all the outputs on an overcurrent condition. Three functions — OCP, fault output signal, and the inhibit function — work together to shut down all the outputs.

Overcurrent protection

Over current protection shuts down a power supply output when it exceeds the current limit. OCP is a latching protection, which requires clearing before the output is re-enabled. Adding a delay allows the device to operate at the current limit for the time set.

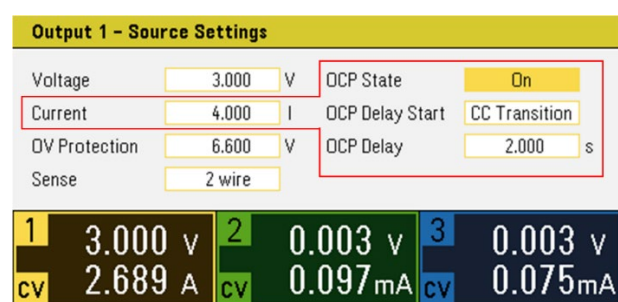


Figure 1. Configuring overcurrent protection with a four-amp limit and a two-second delay



Modern power supplies offer layers of protection for your device. When using a multiple output power supply use these three functions together — overcurrent protection, fault out, and inhibit to shut down all outputs.

Some devices in normal operation can draw a high amount of current for a short period. The delay allows the higher current to be drawn without shutting down the output. During the delay, the power supply will transition to constant current mode and will not exceed the ampere limit.

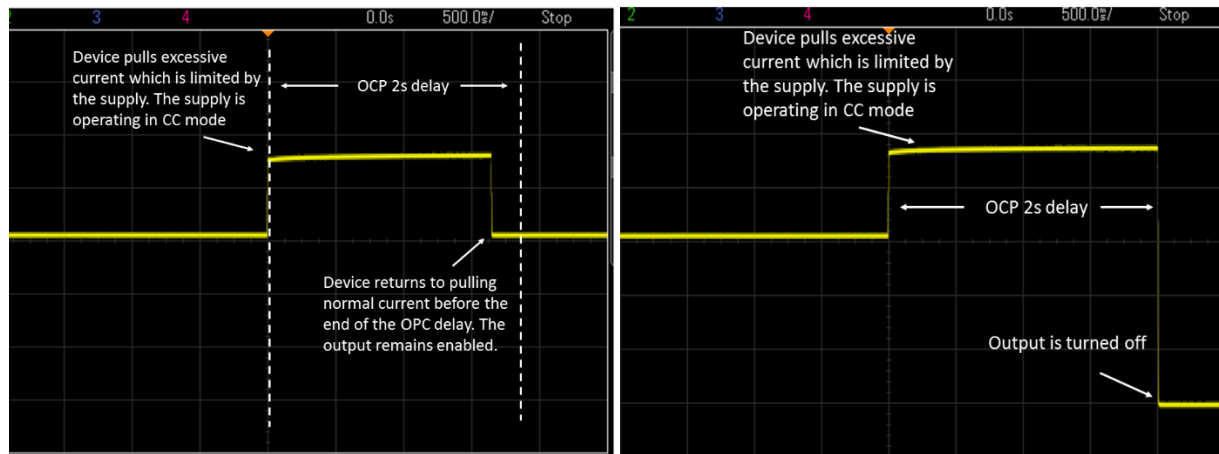


Figure 2. Left — OCP condition ends before delay; right — OCP condition persists, output is shut down

The OCP event on output one does not affect the other outputs. Each of the outputs on a multiple output power supply can be configured separately with or without an overcurrent limit and an overcurrent delay.

Fault-out Signal

The fault-out signal is a 5 V signal used to notify other instruments of an overvoltage, overcurrent, or over temperature event. The signal can be configured normally high (negative polarity) or normally low (positive polarity). Pin one on the digital I/O port is the signal and pin 2 is the common out. Figure 5 shows the digital I/O setup screen. Figure 3 shows the fault-out signal with negative polarity. The fault out signal will stay set until all faults are cleared.

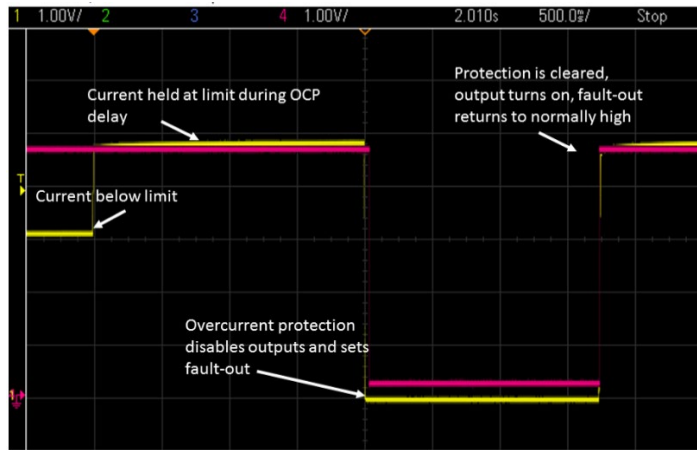


Figure 3. When OPC disables channel 1, yellow, fault-out, red is set low

Turning off all outputs on OCP

The inhibit function shuts down all outputs when it receives an external signal. Most test systems use the inhibit function to connect an external emergency shutoff switch to the power supply. In our application, the fault-out signal is routed to the inhibit-in connector by connecting pin one (fault-out) to pin three (inhibit-in) and pin two (fault-out common) to common. With the pins connected, when a fault occurs, it will cause the inhibit function to turn off all the outputs.

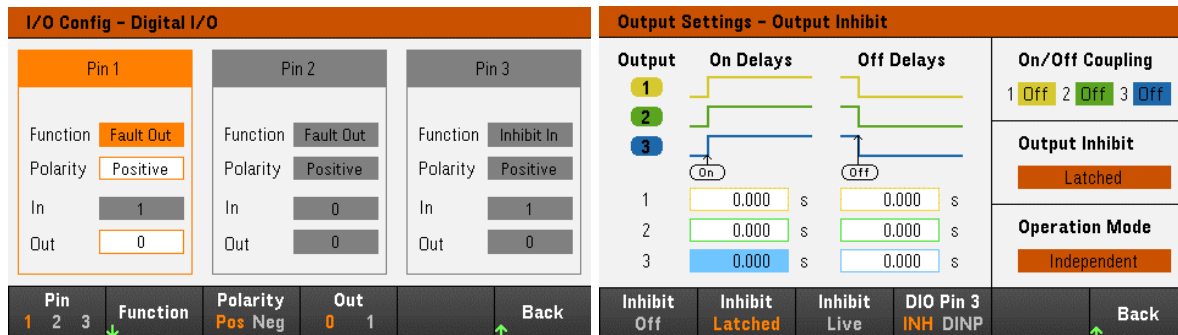


Figure 4. Left — the configuration for the digital I/O port; right — inhibit setup screen

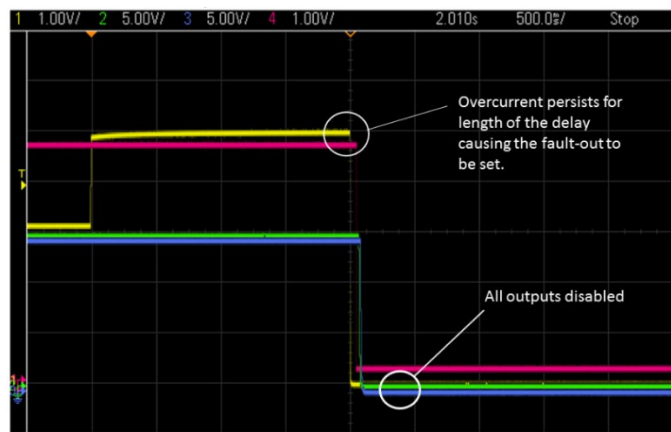


Figure 5. Channel 1, yellow, creates an OCP fault; fault out, red, disables all channels

Re-enabling the outputs

To re-enable the outputs, follow the steps below. Using the order provided eliminates unnecessary steps.

1. Remove the fault condition. In our case, the overcurrent is on output one.
2. Clear the inhibit signal by turning it off.
3. Clear the protection on all channels. Protection clear causes the output to go from "Off" back to its set voltage. See figure 6. Output three has had the protection cleared and went from "Off" back to sourcing 15 V.
4. At this point, the channels should be active, and the fault-out signal no longer set.

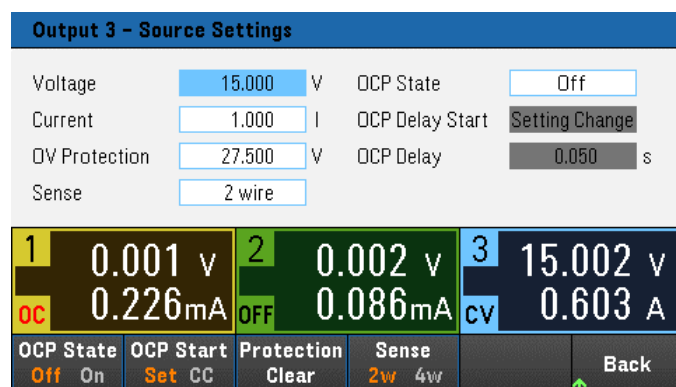


Figure 6. Protection clear has re-enabled output three; output one and two remain off

Conclusion

When multiple voltages power a device, it is often desirable to turn off all the power supply outputs when a fault occurs. If using more than one power supply, daisy chain the digital IO ports such that all outputs, even across mainframes, will be shut down on an overcurrent event. Provide additional protection for a device by using these three functions together – OCP, fault-out and the inhibit function – to shut down all the outputs.

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