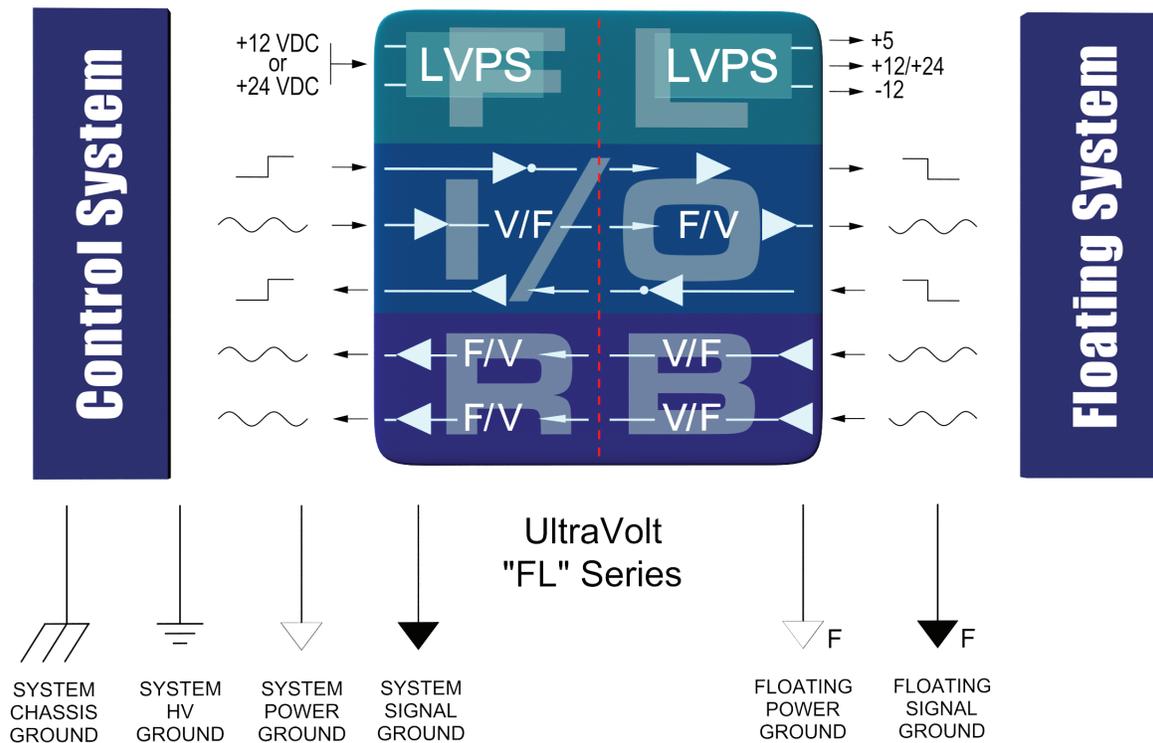


### Introduction

15FL power supplies have the unique capability of providing up to 15 kilovolts of isolation between the input and output. These power supplies are low-voltage DC-to-DC converters that provide an isolated 12V or 24V floating power source. 15FL units can be used to float circuitry on a high voltage of up to 15kV. Analog and digital communications are available between the ground-referenced circuitry and the isolated, or floating, circuitry. The most common use of the 15FL is floating one UltraVolt HVPS on the output of another UltraVolt HVPS. When the FL unit is paired with an UltraVolt FIL Series, a filament power supply referenced to the output of a high voltage power supply can be controlled with high levels of precision.

The 15FL uses a 7-pin header for control and power input and another 7-pin header for the isolated power output. When the 15FL is ordered with the -I/O and -R/B options, the interface is provided on a double-row, 14-pin header on both the ground side and the isolated side.

For a higher level of accuracy and linearity as well as an additional analog control channel, see the 15EFL module ([EFL Series](#)).



**Figure 1: Function Diagram of the FL Series**

## Ground-side pin functions

### First row pins:

**Pin 1, Power Ground:** Use this pin for the input power return. Do not allow input power return current to flow through the Signal Ground connections. The Power Ground and Signal Ground are joined internally. There is no electrical connection between these grounds and the floating grounds.

**Pin 2, Input Power:** The input voltage on the 15FL is available at either 12Vdc nominal or 24Vdc nominal. See the [FL Series data sheet](#) for input voltage tolerance and information on de-rated operation outside the normal input voltage range.

**Pin 3, LVPS Enable/Disable:** A voltage between 0V and 3V will disable the 15FL power supply. A voltage between 3.9V and 12V will enable the unit. If the pin is left open, the power supply will default to an enabled state. Grounding the enable/disable pin will disable the unit. The input characteristics can be modeled as a 1k $\Omega$  resistor driving the base of a PNP transistor.

**Pin 4, TTL up channel (-I/O option only):** The TTL up channel is a digital link between the ground-referenced circuitry and the floating circuitry. It is commonly used to drive the enable pin on a floating HVPS. The output of this digital link is Pin 11 on the floating side. This logic channel can be used to communicate serially with a floating microcontroller as well. The threshold for the input is logic low between 0V and 1V and logic high between 2.5V and 15V. The digital links are inverted.

**Pin 5, Signal Ground:** The Signal Ground and Power Ground are common inside the power supply. This pin should be used as reference for all analog signals. If input power current is allowed to flow through this pin, offsets can occur, which will degrade accuracy.

**Pin 6, Analog communications up (-I/O option only):** An isolated analog communication channel is provided on -I/O optioned units. A 0V to 10V signal between this pin and Signal Ground will result in a 0V to 10V signal (floating pin 13) on the isolated side of the 15FL, which is referenced to the floating Signal Ground (floating pin 12). There is no direct electrical connection between the analog input signal and the analog output signal. This function is commonly used to provide the remote adjust voltage to a floating high-voltage power supply (HVPS).

**Pin 7, +5V reference voltage:** The internal +5V reference is provided for external use through a 464 $\Omega$  resistor.

### Second Row Pins (-R/B Option)

The 15FL is available with the -R/B option. This option adds communications back from the floating-side circuitry to the ground side. The -R/B adds the second row of pins on both sides of the unit and provides two analog down channels and one TTL down channel.

**Pin 8, Analog down channel 1 output (+):** This is the output of one of the analog down communications channels; the input is on the floating pins. A 0V to 10V signal input on the floating-side channel 1 will result in a 0V to 10V signal on this pin with reference to the Signal Ground on pin 5.

**Pin 9, Analog down channel 1 output (-):** This pin provides the compliment to the voltage on pin 8. A 0V to 10V signal on the floating-side channel 1 input will result in a 0V to -10V signal on this pin with reference to the Signal Ground on pin 5 corresponding to the voltage on pin 8, but inverted.

**Pin 10, Analog down channel 2 output (+):** This is the output of one of the analog down communications channels; the input side is on the floating pins. A 0V to 10V signal input on the high-side channel 2 will result in a 0V to 10V signal on this pin with reference to the Signal Ground on pin 5.

**Pin 11, Analog down channel 2 output (-):** This pin provides the compliment to the voltage on pin 10. A 0V to 10V signal input on the floating-side channel 2 will result in a 0V to -10V signal on this pin with reference to the Signal Ground on pin 5 corresponding to the voltage on pin 10, but inverted.

**Pins 12, and 13:** No Connections

**Pin 14, TTL down channel output:** This pin is the output of the TTL down channel. The logic is inverted. The output is through an open collector circuit with an internal 1k $\Omega$  pull up to +5V. See the [FL Series data sheet](#) for maximum baud rates.

## Floating-side pin functions:

### First row pins (outside pins):

**Pin 8, Floating Power Ground:** Use this connection as the return for the floating output voltage. This pin is joined internally to the Floating Signal Ground. There is no electrical connection between these grounds and the low-side grounds.

**Pin 9, Floating output power (+12V or +24V):** This is the main output voltage for the 15FL DC-to-DC converter. This voltage output is commonly used as the main input power to a floating HVPS or Filament power supply. Use pin 8 for the power return.

**Pin 10, Floating -15V output:** This is a low current -15V fixed output. This voltage is commonly used as the negative rail on operation amplifiers and other analog circuitry. See the [FL Series data sheet](#) for maximum current draw and voltage tolerance.

**Pin 11, Floating TTL Up out (-I/O option):** This pin is the output of the TTL down channel. The logic is inverted. The output is through an open collector circuit with an internal 1k $\Omega$  pull up to +5V. See the [FL Series data sheet](#) for maximum baud rates.

**Pin 12, Floating Signal Ground:** The floating Signal Ground and floating Power Ground are common inside the power supply. This pin should be used as reference for all floating analog signals. If output power current is allowed to flow through this pin, offsets can occur, which will degrade accuracy.

**Pin 13, Floating Analog up out (-I/O option):** This is the output of the analog up communications channel; the input side is on the ground-side pins. A 0V to 10V signal input on the input at Pin 6 on the ground side will result in a 0V to 10V signal on this pin with reference to the floating Signal Ground on pin 12.

**Pin 14, Floating +5.6V reference:** An internal +5.6V source is provided for external use. Please see the [FL Series data sheet](#) for current capacity.

**Pin 1, Floating Analog Down (+) Input 1 (-R/B option):** This pin is the non-inverting input of a differential amplifier. A 0V to 10V signal between (-) input 1 and (+) input 1 will cause a 0V to 10V signal on the ground-referenced side along with its compliment on Pin 8 and Pin 9.

**Pin 2, Floating Analog Down (-) Input 1 (-R/B option):** This is the inverting input of a differential amplifier referenced above on Pin 1.

**Pin 3, Floating Analog Down (+) Input 2 (-R/B option):** This pin is the non-inverting input of a differential amplifier. A 0V to 10V signal between (-) input 2 and (+) input 2 will cause a 0V to 10V signal on the ground-referenced side along with its compliment on Pin 10 and Pin 11.

**Pin 4, Floating Analog Down (-) Input 2 (-R/B option):** This is the inverting input of a differential amplifier referenced above on Pin 3.

**Pin 5, N/C:** No connection.

**Pin 6, N/C:** No connection.

**Pin 7, Floating TTL input down (-R/B option):** This is the input to the digital down link; the output is on Pin 14 on the ground side. The threshold for the input is logic low between 0V and 1V and logic high between 2.5V and 15V. The digital links are inverted.