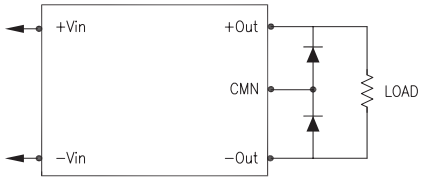
Series Connection

One application of the series connection is using a dual output power converter to create a single output converter as shown in figure 1. The outputs are already series connected by means of the common output terminal. It is only necessary to float the common and connect the load directly across positive and negative output terminals. In this manner, 10, 24, or 30V outputs can be realized from ±5, ±12, or ±15 dual output power converters respectively.
In general, DC/DC converters can be operated with outputs connected in series. Note there will be an addition of ripple voltages at the outputs since the power converters in general will not have synchronous ripple voltages.

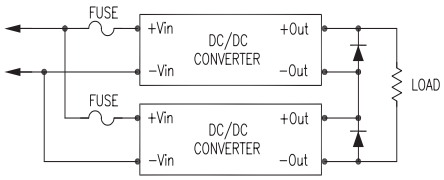
The only other limitation on series connection is that the total output voltage should not exceed the working breakdown voltage of any one of the power converters. This may be substantially less than the dielectric test voltage.

A common practice while using series connection of power converters is to connect reverse biases diodes across the output of each series connected power supply as shown in Figure 2. Diodes placed on the outputs of the modules protect against reverse polarity. This can occur when the modules do not begin delivering power to the load simultaneously.



USING DUAL OUTPUT AS SINGLE OUTPUT

FIGURE 1.



SERIES CONNECTION WITH REVERSE VOLTAGE PROTECTION DIODE

FIGURE 2.

Parallel Connection

Parallel connection of DC/DC converter outputs is more difficult then a series connection. As a general rule, it should not be done unless the power converters are specifically designed for parallel operation or external circuitry is used.

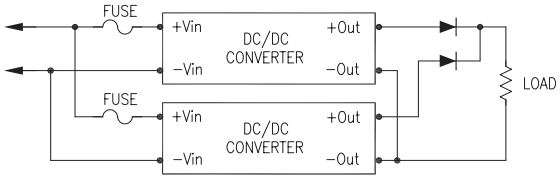
The problem with parallel operation is that it is nearly impossible to get equal load sharing between two power converters. The two output voltages from fixed-output DC/DC converters will not be exactly equal. The converter with the larger output voltage will tend to provide the entire load current.

If the power converters are not designed with load share capability external circuitry should be used. See application note: Adding Power to a Bus.

Redundancy

A good reason for parallel operation of power converters is to provide power redundancy. In figure 3. two power converters have their outputs connected in parallel through two diodes. For 100% redundancy each power converter must be capable of supplying the total load. In this case, it does not matter whether the load current is shared equally; however it is desirable for each output to provide at least part of the load current.

A diode should be fitted to the output of each of the paralleled units in order to isolate the modules from the output bus in the event of a failure.



REDUNDANT PARALLEL CONNECTION WITH DIODE

FIGURE 3.