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www.amtex.com.au

Application Notes

Output Parallel Operation

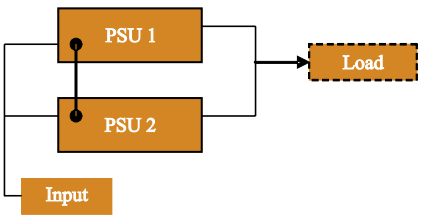
There are two reasons why you would need to operate power supplies or DC/DC converters in parallel.

One is to provide more current than available from a single unit. For example, you have two 300W power supplies but your system needs 600W. Normally you would use one 600W unit. However, if a single 600W unit is not available, you will have to use your two 300W units in parallel.

Many people make the mistake of thinking that all units can be easily paralleled. That is not the case. Ask your supplier if their power supply has power sharing capability. Active Power Sharing means that the power supply has a terminal that allows it to be connected to a second or third unit. **(see Fig 1.)** Connecting the power share terminals between the two units allows the power supplies to communicate with each other and adjust their output voltages so that the load is shared evenly, typically within 10%.

If you were to connect two units without such a feature, the unit with the higher output voltage will start supplying all the current until it reaches its current limit setting, normally set at 105-120% of rated current. Its voltage would then drop until it matches the voltage of the second unit. The second unit will now also start supplying current, however the first unit is still sitting in an overload condition and will eventually fail.

Figure 1.



The **second reason** to connect units in parallel, is to provide a back-up should one unit fail. This is also called **N+1 redundancy.** N is the number of units you need to power the load, plus 1 as the back-up. If for example you need to power a load of 600W with redundancy, you could use 2 x 300W + 1 x 300W solution, or 1 x 600W + 1 x 600W.

In both cases, all units working in parallel also require an output isolation diode for a fault tolerant system. **(see Fig 2.)**

The output isolation diodes can be installed outside the power supply by the end user, although some manufactures like Amtex offer power supplies and DC/DC converters with built-in redundancy diodes.

Such redundant power supplies are not volume produced and are normally more expensive than standard units, but many end users take this option as a hassle free solution.

Another consideration when connecting units in parallel for **N+1 redundancy** is to have some form of monitoring the output voltage, in the event of a failure.

Although there are many ways to achieve this, the most common is to provide a voltage free relay contact, that monitors the voltage on the anode side of the redundancy diode.

In an **N+1 redundancy** application some general rules should also be followed.

- The output voltage of each unit should be set as equal as possible.
- The output connection to the load should normally be made in a star formation, and do not loop one power supply to the next.
- Ensure that the output lead lengths are as equal as possible.

Figure 2.

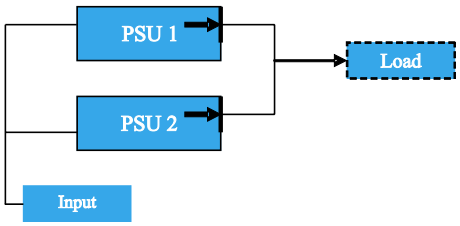


Fig 3 illustrates an N+1 redundant system with the power supplies installed in a 19in rack assembly, fully wired, that allows the modules to be replaced under load conditions. This is referred to as a **Hot-Swap** system. The great benefit of this approach is that replacing a faulty module takes only minutes and there is no need to shut-down the equipment.

And as always, communicate with your power supply company. They are in the best position to assist you with the most suitable solution for your next **N+1 redundancy or parallel application.**