UNDERSTANDING HOT SWAP N+1 REDUNDANCY

OVERVIEW

Power systems users are always trying to find the right balance of power, performance, and price. To make the right decision for the application, users need to have a clear idea of what the capabilities are of the power system that they are considering. Many people assume that all power supplies are created equal, which is not the case. Especially in fault tolerant systems, there is a large variance in what some manufacturers call a 'fault tolerant' system. This application note describes common fault tolerant power features, and presents the advantages of the ICT hot-swappable N+1 redundant DC system.

WHAT IS AN N+1 SYSTEM?

Redundant power supplies are used in applications where the system cannot be interrupted by the failure of a single component. Even the best non-redundant power supplies that use current limiting, voltage limiting, over-temperature shutdown, and input surge/spike protection, can fail.

A redundant power supply is often called an N+1 power supply, and consists of two or more power supply modules contained in a single chassis. The power supply is usually specified so that if one module goes down, the remaining modules have the capacity to supply the load. The failure of a module should not cause any disturbance to the DC load that the powers supply is running.

When modules are paralleled to power a load, it is very important that they share that load equally. If one of the modules takes a substantially larger share of the load, it will be much more prone to failure, while the other modules power less than their share of the load.

BENEFITS OF N+1 POWER SYSYTEMS

Advantages of the ICT approach to N+1 systems include:

1. The ICT N+1 system makes use of a technique called active current sharing, where an active circuit continuously monitors the current output of all modules on the bus, and adjusts each module to maintain a good balance.

2. Unlike some N+1 systems, there is no internal wiring between modules or from modules to the back plane that reduces reliability of the system. The entire ICT power system terminates in a high-power, high-quality bus, capable of supporting the full load current. This also facilitates hot-swapping of the power modules without having to remove the system from the rack to change a module.

3. Some N+1 systems in the market today that offer only fixed, non-hot swappable internal power modules do not use Or-ing diodes which is essential if the system requires true redundancy. The Or-ing diode guarantees that no matter what type of failure occurs in the module, it will not drag the DC bus down, or worse. Plus, in order to replace a failed power module, these power supplies must be shut down and taken out of the rack to access the modules.

NOT ALL N+1 SYSTEMS ARE CREATED EQUAL

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Some manufacturers call their power supplies N+1 or redundant, however it is important to understand what is required to build a truly redundant power supply. Key things to look for include:

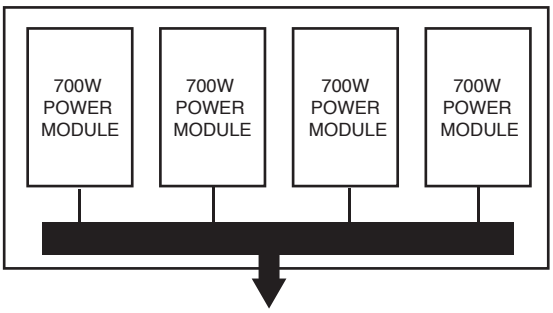
1. Does the power supply use active current sharing?

2. Does the power supply use high-quality, high-power connectors that are capable of supporting the entire output current?

3. Does the power supply use an output Or-ing diode to completely isolate a failed power module from the rest of the circuit? Some brands that claim to be N+1 redundant do not. What this means is that if one power module fails, the bus could send a short through the failed module into the rest of the system, with potentially catastrophic results.

SYSTEM SIZING

It is important to size the power supply for the application requirement, especially where redundancy is needed. For example, ICT N+1 systems can be ordered with up to 4 modules of 700W each installed, meaning that it could be configured as an 2.8KW power supply. However, the concept of redundancy means that there should always be one power module in reserve, so the proper sizing would be to use a 4 module N+1 system to power a maximum load of 2.1KW, as illustrated in the following diagram:



TOTAL SYSTEM POWER
2100 Watts (3 X 700)
with Redundancy

WHO NEEDS N+1 REDUNDANCY?

Customers who need to power radio base stations, fixed wireless broadband networks, small cell or other types of DC equipment tied to mission critical communications, are prime candidates for N+1 power supplies.

DC power systems with hot-swappable power modules offer a much higher degree of reliability and qualify of service to customers, as failed power modules can be easily replaced without any disruption to service. Plus, unlike other N+1 power supplies on the market, ICT offers redundant power systems in 48 volt DC nominal output as well as 12 and 24 volt.

In addition, the ICT Modular Power Series provides Ethernet communications capability that allows for power monitoring remotely, plus the ability to install battery or load distribution modules. Four output load modules can be monitored and power-cycled remotely as well, improving quality of service and reducing unplanned maintenance visits to remote site locations.

FOR MORE INFORMATION

To obtain information about the ICT Modular Power Series family of power supplies, and to find specifications and model numbers, visit our website and click on DC Power Systems.

Visit www.ict-power.com, or call 604-856-6303.

ICT Modular Power Series
Hot Swappable DC Power System

Innovative Circuit Technology Ltd.
26921 Gloucester Way, Langley, BC, Canada V4W 3Y3
Tel: 604-856-6303 | Fax: 604-856-6365 | Email: sales@ictcorporate.com | www.ict-power.com