

APPLICATION NOTE - 1013

Topic: AC and DC DISTRIBUTION PANELS

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INTRODUCTION

Distribution Panels are used all over the world in both Commercial and Industrial applications. They are used to divide and/or distribute both AC and DC power to various loads of different current ratings. These Panelboards are similar to those in your home except on a much larger scale.



A variety of AC and DC Panelboards

(Photo courtesy of AMETEK HDR Power Systems, Inc.)

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In today's world, circuit breakers are the most common form of branch circuit protection being used. Circuit breakers can normally be reset from their tripped position once a fault or overload has cleared. The circuit breaker can be "re-used". Circuit breakers can also act as a switch that can isolate the branch circuit it is protecting. For most applications, the advantages offered by the circuit breaker make it the preferred method for protecting branch circuit wiring and the electrical devices it feeds.

AC DISTRIBUTION PANELS

AC Distribution Panels can be simply made using circuit breakers just as your home utilizes. However, critical loads that utilize UPS systems for protection from power outages and other types of power problems should use a different form of branch circuit protection for their protected loads. Larger UPS systems, typically 5 kVA and above, normally feed the output of the UPS system into a distribution panel that distributes power to the critical loads through it's branch circuits.

Should a fault or overload occur during a power outage, the UPS inverter must supply the power to clear the fault by opening a breaker or blowing a fuse within the output distribution panel. Unlike most applications where the utility has infinite power to clear the fault, UPS systems are limited in the amount of current they can produce to clear a fault. When the UPS reaches beyond it's overload rating and into the current limit point, the voltage begins to decay. Now the race is on to see how long it will take the available current of the UPS to open the branch circuit protector versus how long the devices being protected by the UPS can go without voltage and not be affected.

Most molded case circuit breakers used as branch breakers in Panelboards take 2-3 cycles (up to 50 milliseconds) before they will open under short circuit or fault conditions. Fast-acting fuses, such as the Ferraz/Shawmut A25X™ design have much faster clearing characteristics, typically one-fourth cycle - about 4 milliseconds.

The solution is simple. Since your loads are important enough that they are being protected by a UPS, make sure the rest of the UPS installation and ancillary equipment are designed and coordinated to work together. Use fuses for your branch circuit protection to make your UPS system and installation as reliable as possible.

Fused Switch AC Panelboards are AC distribution panels that are designed for reliability by using a fuse for branch circuit protection and a molded case switch in line with the fuse so that an individual branch circuit can be isolated via a switch. These types of panels can also be equipped with blown fuse indicators so that blown fuses can be spotted and replaced easily.

DC DISTRIBUTION PANELS

DC Distribution Panels are used at Power Plant Generation, Steel Mills and other types of industrial applications that utilize DC power throughout the facility. The DC voltage is developed from one or more Battery Chargers/Rectifiers or DC Generators. These sources of DC power are often combined on the same bus for capacity or redundancy and their power is distributed throughout the plant for running DC motors, charging batteries, operating switch gear, alarm/annunciator panels, emergency inverters, emergency lighting, DC lube oil pumps, cranes, etc.

The DC distribution panel acts as the main hub for the DC power. The power is fed into the Panelboards from the Charger/Rectifier and DC generators. It is then distributed into branch circuits that can be isolated by opening a specific branch circuit breaker. Circuit Breakers are also used to isolate a DC source from the bus so that maintenance can be safely performed on the source equipment and/or the equipment on a particular branch circuit. The circuit breaker also serves as a means of over current protection for the individual circuits.

These panels are often equipped with DC voltmeters and DC ammeters as well as ground fault detection, breaker position indicators and the capability to provide local and remote status. Blocking diodes can also be included to prevent back feeding of power to the DC source.