

March 2006

Aftermarket Solutions, Ref. No. [343]

Distribution Switchboards (Low Voltage)

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**Pow-R-M-S/F Switchboard
with Fixed SPB Breakers**

Assemblies and Circuit Breakers



WRI Switchboard, St. Louis Vintage with Fixed Molded Case Breakers (Pow-R-I is of similar look)



Pow-R-M-S/F Switchboard with Fixed SPB Breakers

Distribution switchboards can be a free-standing structure(s) or close coupled as the secondary section of a power center or substation. Power distribution switchboards primarily use individually mounted, fixed or draw-out devices. Service distribution switchboards primarily use main devices as individually mounted, fixed or drawout with group mounted molded case circuit breakers. Numerous combinations of devices can be used depending on the specification. Class III (Power Distribution) and Class II (Service Distribution) switchboards are commonly used descriptions for the class of distribution switchboards. Distribution switchboards are built in accordance with all applicable provisions of UL® 891 and NEMA® PB-2.

Product History

Distribution switchboards have been around since the 1950s. Most of the original switchboards were custom assembled with very little standardization of design.

From the mid-1970s through the 1980s, distribution boards became somewhat more standardized and were manufactured in St. Louis, MO. These vintages included:

- WRI
- WF/WRP
- Pow-R-Gear

“WRI” used individually-mounted, molded case circuit breakers for both mains and feeders.

“WF/WRP” used group-mounted, molded case circuit breakers or FDP fusible switches for the feeders. For the mains, this design used either DS, SPB, bolted-pressure switch (CBC-type), or MCCBs.

“Pow-R-Gear” used SPB drawout, insulated-case power circuit breakers for both mains and feeders.

Some specialty switchboards, including generator-control, were manufactured in Cincinnati, OH until the plant was closed in 1985.

During the mid-1980s, some of the switchboard manufacturing was moved to a plant in Visalia, CA and another plant in Sumter, SC. Those designs included WF/WRP and WRI.

During the late 1980s and early 1990s the switchboard products were relocated to two different locations:

- Asheville, NC
- Sumter, SC

The products that moved to Asheville included the “Pow-R-Gear” which later evolved into the “Pow-R-M-S” design (the “Pow-R-M-S/F” is the fixed-mounted version). Also included in the move to Asheville was the “WRI” product, which later evolved into the “Pow-R-I” design. The “Pow-R-I” design was short-lived and in 1991 it evolved into two different products: the “Pow-R-M-S/F” mentioned above and the “Pow-R-Line i” mentioned in the next paragraph.

The first product that moved to Sumter, SC was the “WF/WRP,” which evolved into the “Pow-R-Line C” design — it uses Series C MCCBs. The second product evolved from Asheville’s “Pow-R-I” and is called the “Pow-R-Line i” design.

Product Description

Cutler-Hammer® Low Voltage Distribution Switchboards from Eaton’s electrical business serve to switch power and protect circuits in industrial and commercial distribution systems. Distribution switchboards can be classified into two categories, Power Distribution and Service Distribution. The power distribution switchboards typically use insulated case SPB or air DS power circuit breakers as mains and individually compartmentalized feeders. The service distribution switchboards use insulated case SPB, air DS, molded case (all types), and fusible switches as mains and molded case circuit breakers as feeders.

Product History Time Line

Page	Product	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	Present
15-5	WF/WRP Switchboard											
15-3	WRI Switchboard											
15-4	Pow-R-Gear Switchboard											
15-5	Pow-R-line C Switchboard											
15-4	Pow-R-M-S Switchboard											
15-3	Pow-R-I Switchboard											
15-5	ES Switchboard											
15-3	Pow-R-M-S/F Switchboard											
15-3	Pow-R-Line i Switchboard											

Figure 15-1. Product History Time Line for Distribution Switchboards

WRI, Pow-R-I, Pow-R-M-S/F and Pow-R-Line i



WRI Switchboard with Individually Mounted Molded Case Breakers



Pow-R-Line i Switchboard with Individually Mounted Molded Case Breakers

Product Description

This class of switchboard is commonly called a Class III switchboard. Generally speaking, this means individually mounted main and feeder devices.

The WRI switchboard that was built by Westinghouse in St. Louis, MO consisted of rear and front accessible enclosures with all sections flush front to rear. The WRI board was designed for mounting away from the wall. Main devices could be DS, SPB, SCB-II or molded case circuit breakers and (CBC) bolted pressure or FDP fusible switches. Individually mounted feeders could be either FDP fusible switches or molded case circuit breakers. The WRI design moved to Asheville, NC as the Pow-R-I design with little change, except fusible was not offered with Pow-R-I. Some different structural and bussing methods were used on the Pow-R-I also.

The Pow-R-I product was split in 1991. Switchboards requiring main and individually mounted feeders using SPB breakers and the RD Series C breaker were incorporated in the Pow-R-M-S/F design using the same design as the drawout Pow-R-M-S switchboard except fixed devices. The smaller current individually mounted devices were incorporated into the Pow-R-Line i design introduced in 1991 at Sumter, SC.

Table 15-1. Ratings

Device	Rating
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WRI/Pow-R-I

Switchboard Bus	800 – 4000 A
Protective Devices	400 – 4000 A
Voltage	120 – 600 V
Interrupting Capacity	30 – 200 kA

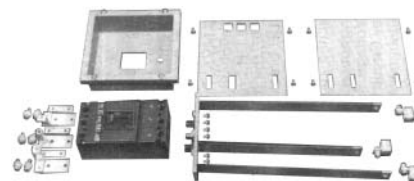
Pow-R-M-S/F

Switchboard Bus	800 – 5000 A
SPB/RD Breaker	400 – 5000 A
Voltage	240 – 600 V
Interrupting Capacity	42 – 100 kA

Pow-R-Line i

Switchboard Bus	800 – 4000 A
Protective Devices	70 – 4000 A
Voltage	240 – 600 V
Interrupting Capacity	30 – 200 kA

Replacement Capabilities



Parts for WRI Switchboard

New Circuit Breakers

New SPB, DS and RD molded case circuit breakers are available for replacement provisions or to fill existing cells. All breakers are newly manufactured.

Circuit Breaker Cell Provisions

These are used to convert blank cell compartments into breaker cell compartments. Provisions are no longer available for WRI dated 1967 or earlier but might be available for newer versions. Cell provisions are no longer available for Pow-R-I and Pow-R-M-S/F (fix-mounted). Provisions are sometimes available for the Pow-R-Line i design. In all cases, care must be taken to properly identify the original shop order before proceeding or making final determination.

Repair Service for SPB Breakers

Factory authorized non-warranty repair for all SPB breaker frames.

Class 1 Reconditioning for DS Breakers

Repairs are available for DS circuit breakers. This service includes trip unit replacements.

Circuit Breaker Parts

An extensive inventory of newly manufactured breaker renewal parts are available for SPB, DS and RD molded case circuit breakers.

Technology Upgrades

IQ and PowerNet™

Communications Retrofits

Cutler-Hammer IQ products replace existing analog meters, instruments, and protective relays with microprocessor-based solid-state true rms sensing devices. IQ products can be furnished as components for field installation on the switchgear. The IQ products include the IQ Analyzer, IQ DP-4000, IQ 200 and IQ 300. Communications can then be tied to the Cutler-Hammer PowerNet system.

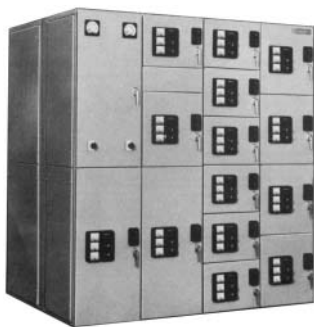
Digitrip Trip Unit Retrofit Kits

Trip unit retrofit kits are available for all SPB and DS breaker frames. Refer to **Pages 17-31 to 17-34** of this publication.

Clipper Power System

Transient voltage surge suppression system. Refer to **Page 15-6** of this publication.

Pow-R-Gear, Pow-R-M-S and SPB



*Pow-R-Gear Switchboard, St. Louis Vintage
with Drawout SPB Breakers*



*Pow-R-M-S Switchboard, Current Asheville
Design with Drawout SPB Breakers*

Product Description

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Pow-R-Gear, and now Pow-R-M-S, switchboards were/are designed exclusively for the Systems Pow-R Breaker line of encased power circuit breakers. These switchboards were/are designed for high current applications and include the following features: drawout breaker elements, individual breaker compartmentalization, in-gear breaker contact inspection and minimum floor space design. Both versions were/are manufactured in accordance with all applicable provisions of UL 891 and NEMA PB-2 covering low voltage distribution switchboards.

The primary differences between the original Pow-R-Gear and its successor Pow-R-M-S are: structural (frame design), trip units (Pow-R-Gear used the Pow-R-Trip 7; Pow-R-M-S uses the Digitrip RMS sensing trip family), bus design (Pow-R-Gear used aluminum of varying heights; Pow-R-M-S uses bolted copper of full height) and vertical spacing (Pow-R-Gear accommodated six-high 800 ampere breakers, Pow-R-M-S accommodates four-high 800 ampere breakers).

Table 15-2. Ratings

Device	Rating
Pow-R-Gear	
Switchboard Bus	800 – 4000 A
Protective Devices	100 – 5000 A
Voltage	120 – 600 V
Interrupting Capacity	100 kA
Pow-R-M-S	
Switchboard Bus	800 – 5000 A
SPB Breaker	400 – 5000 A
Voltage	240 – 600 V
Interrupting Capacity	42 – 100 kA

Chronology

Pow-R-Gear was built by Westinghouse in St. Louis, MO from 1977 to 1990. Pow-R-M-S was built by Westinghouse, and later Cutler-Hammer, in Asheville, NC from 1990 to 2003.

Replacement Capabilities



*Systems Pow-R-Breaker Type SPB-65 with
Pow-R-Trip 7 Trip Unit*

Factory Repair Service for SPB Breakers

These repair services apply to breakers which have exceeded the original factory warranty and are now referred to as non-warranty repairs. The System Pow-R-Breaker family consists of fixed breakers, either front connected or rear connected, and drawout breakers, either behind-the-door or through-the-door design. Four-pole breakers are only available in the fixed design front or rear connected.

The Cutler-Hammer SPB Factory Authorized Non-Warranty Repair Service features:

- Quality SPB repair specified and audited by factory engineers according to procedures.
- Only genuine new Cutler-Hammer replacement parts are used.
- Original factory specifications and design drawings are used by factory trained technicians.

New SPB Circuit Breakers

New SPB breakers are available for replacement or to fill existing vacant cells. All breakers are newly manufactured and are mechanically and electrically the same as the breakers originally specified and supplied.

SPB Breaker Cell Provisions

These are used to convert blank cell compartments into breaker cell compartments. Provisions are usually available for Pow-R-M-S drawout designs. However, provisions are not available for Pow-R-M-S/F fixed designs or for the Pow-R-Gear design. In all cases, care must be taken to properly identify the original shop order before proceeding or making final determination.

SPB Circuit Breaker Parts

An extensive inventory of newly manufactured breaker renewal parts is available for SPB circuit breakers.

Technology Upgrades

Pow-R-Trip 7 Trip Unit Upgrades

Pow-R-Trip 7 was the solid-state trip unit used on Pow-R-Gear switchboards. An upgrade from the Pow-R-Trip 7 trip unit is also available. Modification to the breaker and existing switchboard is required. Refer to **Pages 17-33 to 17-34** of this publication

Digitrip Trip Unit Retrofit Kits

Trip unit retrofit kits are available for all SPB Breaker frames. Refer to **Pages 17-33 to 17-34** of this publication.

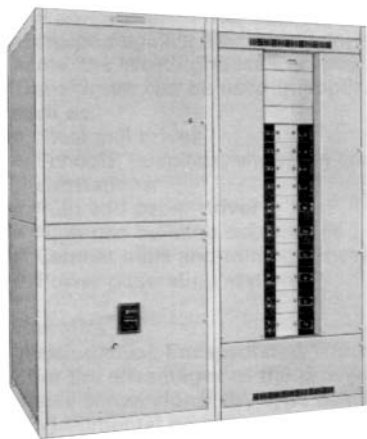
IQ and PowerNet Communications Retrofits

Cutler-Hammer IQ products replace existing analog meters, instruments, and protective relays with microprocessor-based solid-state true rms sensing devices. IQ products can be furnished as components for field installation on the switchgear. The IQ products include the IQ Analyzer, IQ DP-4000, IQ 200 and IQ 300. Communications can then be tied to the Cutler-Hammer PowerNet system.

Clipper Power System

Transient voltage surge suppression system. Refer to **Page 15-6** of this publication.

WF/WRP, ES and Pow-R-Line C



WRP Switchboard, Rear Access with Panel Mounted Molded Case Breakers



Pow-R-Line C Switchboard, Front Access with Panel Mounted Molded Case Breakers

Product Description

This class of switchboard is commonly called a Class II switchboard. Generally speaking, this means individually or panel mounted main and panel mounted feeder devices.

The WF/WRP switchboard that was built by Westinghouse in St. Louis, MO consisted of front or rear accessible enclosures with various depths depending on the devices within the structure. In the front access design, Type WF, the rear of the switchboard was flush for all structures; the rear access design, Type WRP, was flush in the front and rear. The WF/WRP switchboard design accommodated

the use of DS, SPB, Bolted Pressure Switch (CBC), molded case circuit breaker or FDP fusible switches as main devices. Panel mounted feeder devices could be either molded case circuit breakers or FDP fusible switches. The WF/WRP design was moved to Sumter, SC and Visalia, CA, and consequently enhanced with the introduction of the Series C® breaker and some structural and busing changes.

In 1962, Eaton entered the switchboard market with the purchase of Mullenbach. Soon after the Mullenbach acquisition, Eaton entered into an agreement with Westinghouse to supply breakers and fusible devices for panelboards and switchboards. This led to the introduction of the ES switchboard using exclusively Westinghouse molded case circuit breakers.

In the late 1980s, Westinghouse introduced a new and improved version of the WF/WRP switchboard using the Series C breaker. This new switchboard line, Pow-R-Line C, designates a family of service distribution switchboards incorporating new design concepts that fit the ever increasing need for applications on high short circuit systems, while retaining maximum standardization, safety and convenience throughout the line.

Table 15-3. Ratings

Device	Rating
WF/WRP	
Switchboard Bus	600 – 4000 A
Protective Devices	15 – 4000 A
Voltage	120 – 600 V
Interrupting Capacity	10 – 200 kA
ES	
ES Switchboard Bus	600 – 4000 A
Protective Devices	15 – 4000 A
Voltage	120 – 600 V
Interrupting Capacity	10 – 200 kA
Pow-R-Line C	
Switchboard Bus	600 – 6000 A
Protective Devices	15 – 6000 A
Voltage	208 – 600 V
Interrupting Capacity	10 – 200 kA

Chronology

WF/WRP was introduced by Westinghouse in St. Louis, MO in 1955. In 1988, the design was transferred to Sumter, SC and Visalia, CA as Pow-R-Line C switchboards. Consequently, the Cutler-Hammer Type ES switchboard version, was later introduced in 1991 as a replacement for their version of the WF/WRP switchboard.

Replacement Capabilities

Eaton offers an extensive amount of products to support WF/WRP, ES and Pow-R-Line C switchboards.

Pow-R-Line C Match and Lineup Cubicles

Newly manufactured Pow-R-Line C switchboard structures to match and lineup to existing WF/WRP switchboards. New Pow-R-Line C structures can also connect to existing switchboards (Types ES) with a transition section.

New Circuit Breakers

New SPB, DS and RD molded case circuit breakers are available for replacement or to fill existing vacant cells. All breakers are newly manufactured and are mechanically and electrically the same as the breakers originally specified and supplied.

Circuit Breaker Provisions/Connector

Breaker provisions are required in switchboards when there is an existing space in a structure that is to be filled with a breaker. Provisions/connectors are available for most ratings of the WF/WRP design. Provisions are available for all ratings of the Pow-R-Line C designs including all parts required to complete the cell in accordance with the switchboard as originally supplied.

Factory Repair Service for SPB Breakers

Factory authorized non-warranty repair for all SPB breaker frames. Refer to **Page 15-4** of this publication.

Circuit Breaker Parts

An extensive inventory of newly manufactured breaker renewal parts are available for SPB, DS and RD molded case circuit breakers.

Switchboard Structure Parts

Switchboard parts are available for most designs. Newly manufactured replacement parts (such as doors, breaker provisions, lift trucks, metering, etc.) are available.

Technology Upgrades

Digitrip Trip Unit Retrofit Kits

Trip unit retrofit kits are available for all SPB and DS Breaker frames. Refer to **Pages 17-31 to 17-34** of this publication.

Technology Upgrades (Continued)

Clipper Power System — Visor Series



*Clipper Power System — Visor
Transient Voltage Surge Suppressor*

Product Description

The Cutler-Hammer Clipper Power System is a hybrid Transient Voltage Surge Suppressor (TVSS) used to protect sensitive electronic equipment from the damaging effects of voltage transients and electrical line noise. The Visor's design combines both suppression and filtering elements to provide best-in-class performance. Field installation is required.

Benefits

- Visor can be externally mounted to existing distribution equipment.
- Surge ratings: 100, 120, 160, 200, 250, 300, 400 and 500 kA.
- Standard Type 1/3R enclosure, optional Type 4X and 12.
- Surface or flush mounting.
- Full range of diagnostic and monitoring options.
- Remote mountable display panel.

For more information about Clipper Power Systems, contact your local Eaton Field Sales office.

IQ and PowerNet Communications Retrofits

Cutler-Hammer IQ products replace existing analog meters, instruments and protective relays with microprocessor-based solid-state true rms sensing devices. IQ products can be furnished as components for field installation on the switchboard or can be provided as new replacement front panels. The new replacement front panels available for switchboard assemblies include the IQ devices mounted and wired. The IQ products can be matched in numerous combinations to include the IQ Analyzer, IQ DP-4000, IQ 200 and IQ 300. Communications can then be tied to the Cutler-Hammer PowerNet System.

Further Information

Publication Number	Description
CA08101001E RP01301013E	Electrical Distribution Products and Services Catalog Systems Pow-R Breakers Renewal Parts and Accessories

Pricing Information

Price List for Pow-R-M-S Switchboard — PL 32-624A

Price List for SPB Breakers — PL.22A.01.P.E

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