

Low-voltage power distribution and control systems > Panelboards >

Column panelboards

Pow-R-Line 1X-LX and 2X-LX

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Panelboards Overview

Choices to quickly change feeder breakers in electrical distribution equipment have evolved over the years. While using drawout switchgear with power air circuit breakers remains a highly reliable solution, requests for drawout molded case circuit breakers (MCCBs) have increased. And, customers need a wall-mounted panelboard solution with front-accessibility and front-connected equipment to meet space requirements and application needs.

Eaton's drawout MCCB Pow-R-Line® 4DX (PRL4DX) panelboard provides this solution.

This is the first design to offer two- and three-pole MCCBs in a mechanical drawout design. Breaker ratings from 20 A to 600 A use unique drawout cassettes. Breakers are inserted and removed via a mechanical removal system similar to other drawout designs associated with switchgear; however, these breakers are horizontally mounted in a traditional panelboard group-mounted manner.

Market and Segment Applications

While the drawout MCCB panelboard design may be substituted for nearly any traditional application with feeder MCCBs, it has been specifically designed to meet the needs of several industries, including:

- Electrical distribution systems where a changeout of circuit breakers is needed to upgrade equipment to a new process
- Data centers
- Industrial facilities to minimize downtime
- Institutions
- Laboratories
- Healthcare facilities
- Critical load applications

Standards and Certifications

- UL® 67 Listed for wall-mounted applications from 600 A to 1200 A
- National Electrical Code®

Available Ratings

The panelboards are rated at 240 Vac, 480 Vac and 600 Vac. Fault current is available up to 200 kAIC at 240 Vac, 100 kAIC at 480 Vac and 65 kAIC at 600 Vac. The short-circuit current rating of the panelboard is determined by the low short-circuit current rating of the lowest rated overcurrent device in the panelboard.

Boxes and trims are UL 50 Listed and labeled. Both the box and the trim are painted ANSI-61 light gray. Deadfront covers are also painted ANSI-61 light gray to match box and trim.

Drawout feeder MCCBs are available in two- and three-pole offerings from 20 A to 600 A. Main breakers above 600 A are fixed-mounted using a traditional bolt-on design. Main breakers 600 A and below are available with either the traditional fixed-mounted, bolt-on design or in a drawout cassette. For drawout mains or feeders above 600 A, please use Eaton's switchboard offering.

Panelboard Options

- Copper and silver-plated copper
- Copper lugs
- Density-rated bus
- Ground bars
- Customer-owned meters
- Service entrance equipment construction
- Surge protective devices
- Seismically qualified panelboards

General Construction Features

Eaton's assembled panelboards are designed for sequence phase connection of branch circuit devices. This allows complete flexibility of circuit arrangement (single-, two- or three-poles) to allow balance of the electrical load on each phase.

Sturdy, rigid chassis assembly ensures accurate alignment of interior with panel front; prevents flexing and minimizes possibility of loosening or damage to current carrying parts during and after installation.

Four point in-and-out adjustment of panel interior is provided to meet critical depth dimensions on flush installations. This compensates for possible misalignment of box at installation.

Main lugs are mechanical solderless type and approved for copper and aluminum conductors.

Enclosures

Boxes are code-gauge galvanized steel except for column type panelboards, which include a painted box finished in ANSI-61 light gray to match the trim. Standard panelboard cabinets are designed for indoor use. Alternate types are available for outdoor and special purpose applications.

All enclosures are furnished in accordance with UL standards and include wiring gutters with proper wire bending space. Special cabinets can be provided at an additional charge.

The box dimensions shown are inside dimensions. For outside dimensions, add 0.25-inch (6.4 mm).

Standard panelboard boxes are supplied without knockouts (blank endwalls).

EZ™ Trim

The EZ Box and EZTrim are provided standard for Pow-R-Line 1X and Pow-R-Line 2X lighting panelboards, as well as Pow-R-Line 3X and Pow-R-Line 3E mid-range panelboards.



EZ Trim Provides Standard Door-in-Door Construction With No Exposed Hardware or Sharp Ridges. No Tools are Required for Installation.

The trims for lighting and appliance branch circuit panelboards and small power distribution panelboards include a door with rounded corners and concealed hinges. A flush-type latch and lock assembly is included. All locks are keyed alike. These trims are available in both surface and flush mounted designs.

Fronts for power distribution panelboards use a unique breaker front cover design in which each device has a dedicated bolt-on steel cover. The individual covers form a single deadfront for the panelboard that is used in conjunction with two wiring gutter covers to complete the trim. A door is not finished as part of the standard offering on these panelboards but can be provided, for an additional charge, using a deeper than standard box.

Combination AFCI Circuit Breakers

Eaton's 125 Vac AFCI single- and two-pole, 15 A and 20 A bolt-on breakers in panelboards meet Article 210.12 of the NEC®. See the NEC for definitions and details.

Column Panelboards

Pow-R-Line 1X-LX and Pow-R-Line 2X-LX column panelboards are designed to fit within the structural I-beam of a facility and offer branch circuits up to 100 A.

Application Considerations and Definitions

Standards

All Eaton's panelboards are designed to meet the following applicable industry standards, except where noted:

1. Underwriters Laboratories
 - a. Panelboards: UL 67
 - b. Cabinets, boxes and trims: UL 50

Note: Only panelboards containing UL listed devices can be UL labeled.

2. National Electrical Code
3. NEMA Standards: PB 1
4. Federal Specification W-P-115c
 Circuit breaker— Type I Class 1
 Fusible switch— Type II Class 1

Panelboard Selection Factors

In selecting a panelboard, the following factors must be considered:

- a. Service (voltage and frequency).
- b. Interrupting capacity (fully or series rated).
- c. Ampere rating of main.
- d. Ampere ratings of branches.
- e. Installation environment.
- f. Codes and standards mandates.

Panelboard Short-Circuit Rating

The short-circuit rating of Eaton's assembled panelboards are test verified by, and listed with, Underwriters Laboratories. Generally, these ratings are that of the lowest interrupting rated device in the panel.

Certain exceptions to this rule exist where branch devices have been UL tested in combination with specific main devices having a higher interrupting rating. Where these defined main breaker and branch breaker combinations are used, the **series short-circuit rating** of the assembled panelboard will be the same as the series tested rating of the approved rated main breaker. Available main and branch breaker combinations are tabulated on **Page 22.7-20** through **Page 22.7-28**. All combinations shown are UL tested and listed.

These series ratings apply to panels having main devices, or main lug only panelboards fed remotely by the device listed in the series ratings chart as the main, for which UL listed tests were conducted.

Selective Coordination

Please refer to Molded Case Circuit Breakers Design Guides for detailed information on overcurrent protective device combinations for use on selectively coordinated systems.

Service Entrance Equipment

NEC Articles 230.F and G, and UL, require that:

- a. Panels used as service entrance equipment must be located near the point where the supply conductors enter the building.
- b. A panelboard having main lugs only shall have a maximum of six service disconnects to de-energize the entire panelboard from the supply conductors. Where more than six disconnects are required, a main service disconnect must be provided.
- c. Must include connector for bonding and grounding neutral conductor.
- d. A service-entrance-type UL label must be factory installed.
- e. Ground fault protection of equipment shall be provided for solidly grounded wye electrical services of more than 150 V to ground, but not exceeding 600 V phase-to-phase for each service disconnecting means rated 1000 A or more.

Service entrance panels must be identified as such on the order entry to the manufacturing location.

Column Type Panelboards

The same general code restrictions apply as for standard width panels except where trough extensions are used.

Multi-Section Panelboards

When more than 42 overcurrent protective devices are required, two or more separate enclosures may be required. Separate fronts for each box are standard.

Interconnecting Multi-Section Panelboards

When a panelboard, for connection to one feeder, must be furnished in more than one section (box), each section must be furnished with main bus and terminals of the same rating, unless a main overcurrent device is provided in each section.

Sub-feed or through-feed provisions must also be added to provide connection capability to the second section.

Note: Sub-feed or through-feed lugs cannot be used on any panelboard that is not protected by a single main overcurrent device either in the panelboard or immediately upstream, i.e., service entrance panelboards with main lugs only using the six disconnect rule.

Sub-Feed Lugs (Figure 22.7-1)

Sub-feed lugs are one means of interconnecting multi-section panels. The sub-feed (second set of) lugs are mounted directly beside the main lugs. These are required in each section except the last panel in the lineup. The feeder cables are brought into the wiring gutter of the first section and connected to the main lugs. Another set of the same size cables are connected to the sub-feed lugs (Section 1) and are carried over to the main lugs of the adjacent panel. Cross connection cables are not furnished by Eaton. Sub-feed lugs are only available on main lug only panels.

Note: Sub-feed lugs may not be used on main lug only (six disconnect rule) service entrance panels.

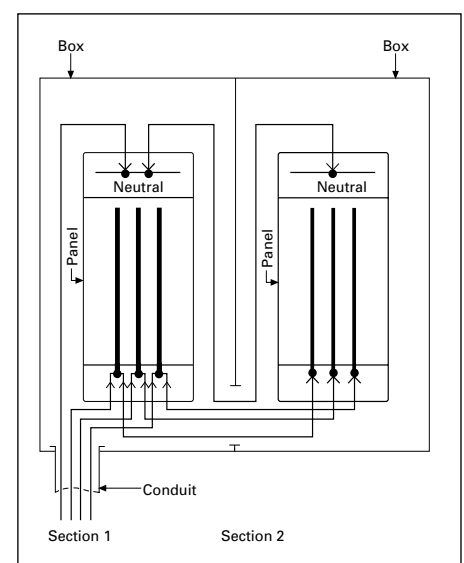


Figure 22.7-1. Sub-Feed Lugs

Through-Feed Lugs (Figure 22.7-2)

Through-feed lugs are another method to interconnect multi-section panelboards. The incoming feeder cables are connected to the main lugs or main breaker at the bottom of panel (Section 1). Another set of lugs (through-feed) are located at the opposite end of the main bus. The interconnecting cables are connected to the through-feed lugs in Section 1 and are carried over to the main lugs in Section 2. The connection arrangement could be reversed, i.e., main lugs at top; through-feed lugs at bottom end of panel. Cross cables are not furnished by Eaton.

Note: Through-feed lugs may not be used on main lug only (six disconnect rule) service entrance panels.

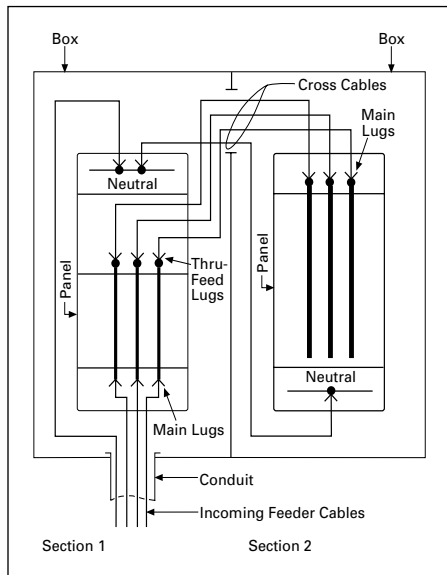


Figure 22.7-2. Through-Feed Lugs

Multiple Section Panelboard—Flush Mounted

Shown below is the standard method for flush mounting multiple section lighting and distribution panelboards using standard flush trims.

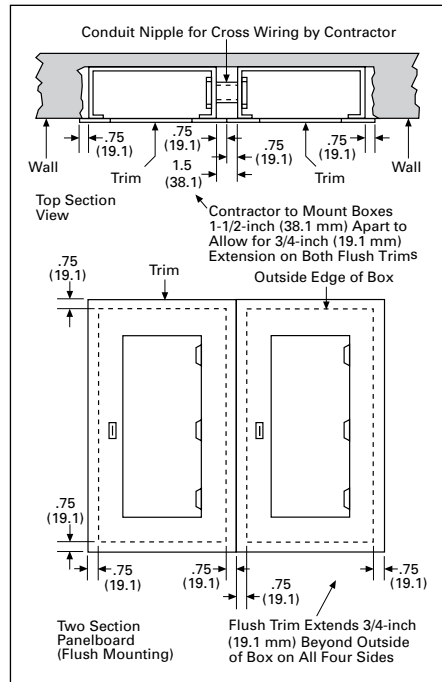


Figure 22.7-3. Multiple Section Panelboard—Flush Mounted—Dimensions in Inches (mm)

Branch Circuit Loading for Lighting Panels

The size of mains and branches should be selected based on the following:

- a. Lighting circuits: NEC Article 210, 215, 220 and 240.
- b. Distribution circuits, actual or continuous loads: NEC Article 384.16.
- c. Motor circuits: NEC Article 430.
- d. Diversity factor.
- e. Provision for future loading.

Overcurrent Protection

National Electrical Code Article 408 states a panelboard shall be protected by an overcurrent protective device having a rating not greater than that of the panelboard. The overcurrent protective device shall be located within or at any point on the supply side of the panelboard.

Exceptions to Article 408 selectively apply. Refer to the National Electrical Code Article 408 for specifics.

Ground Fault Protection

Ground fault protection (GFP) may be added to most panelboards using Eaton's integral molded case circuit breaker GFP and included feeder devices on power panelboards and mains on all panelboards.

Arcflash Reduction Maintenance System™

Eaton's Arcflash Reduction Maintenance System is available on many molded case circuit breakers from 70 A to air power circuit breakers at 5000 A. Recognized by the 2011 National Electrical Code and the National Electrical Safety Code (NFPA 70E), the Arcflash Reduction Maintenance System allows breakers to trip quickly thus significantly reducing the available arc flash potential.

Ambient Temperatures

The primary function of an overcurrent device is to protect the conductor and its insulation against overheating. In selecting the size of the devices and conductors, consideration should be given to the ambient temperature surrounding the conductors within and external to the panelboard. Cumulative heating within the panelboard may cause premature operation of the overcurrent protective devices.

UL test procedures are based, in part, on 80% loading of panelboard branch circuit devices. Article 408 of the NEC limits the loading of overcurrent devices in panelboards to 80% of rating where in normal operation the load will continue for three hours or more.

Further derating may be required, depending on such factors as ambient temperature, duty cycle, frequency or altitude.

Exception: There is one exception to this rule in both UL and NEC. It applies to assemblies and overcurrent devices that have been approved for continuous duty at 100% of its rating. This exception is covered in NEC 210.20 (a). Also see Molded Case Circuit Breakers Design Guides for additional information.

Special Conditions

Standard panelboards, assembled with standard components, are adequate for most applications. However, special consideration should be given to those required for application under special conditions such as:

- Excessive vibration or shock.
- Frequencies above 60 cycles.
- Altitudes above 6600 ft (2012 m).
- Damp environment (possible fungus growth).
- Compliance with federal, state and municipal electrical codes and standards.

Seismic Qualification



Refer to Power Distribution Systems Design Guides for information on seismic qualification for this and other Eaton products.

Harmonic Currents

Standard panelboard neutrals are rated for 100% of the panelboard current. However, because harmonic currents can cause overheated neutrals, an option is provided for neutrals to be rated at 200% (1200 A maximum neutral for 600 A main bus) of the panelboard phase current. Panelboards with the 200% rated neutral are UL listed as suitable for use with nonlinear loads.

Prior to specifying the 200% rated neutral, Eaton recommends a harmonic survey be conducted of the distribution system, be it new or existing.

Surge Protective Devices (SPD)

The quality of power feeding sensitive electronic loads is critical to the reliable operation of any facility. In modern offices, hospitals and manufacturing facilities, the most frequent causes of microprocessor-based equipment downtime and damage are voltage transients and electrical noise.

Electrical loads and microprocessor-based equipment are highly susceptible to both high and low energy transients. High energy transients include lightning induced surges and power company switching. These high energy transients can destroy components instantly.

More frequently the electrical system experiences low energy transients and high frequency noise.

The effects of continual low energy transients and high frequency noise can cause erratic equipment performance or sudden failure of electronic circuit board components.

Eaton can provide protective and diagnostic systems integral to panelboards. The SPD is integrated into the panelboards using a "zero lead length" direct bus bar connection. Integral disconnect is used on all Pow-R-Line 4 panels.



Eaton SPDs May be Integrated into Most Panelboards

The SPD protects sensitive electronic equipment from the damaging effects of high and low energy transients.

For complete product description and available ratings, refer to Surge Protection (SPD) & Power Conditioning Products Design Guides.

Compact Panelboard Meter

Most Eaton panelboards can integrate a compact meter for reading the panelboard power and energy usage. Eaton's Power Xpert Meter 350 has ANSI 12.20 0.5% accuracy, a bright backlit LCD display, real energy pulse output, phase loss alarm and optional RS-485 communication capability.

Pow-R-Line 1X-LX



Pow-R-Line 1X-LX Column Type

General Description

Panelboard Ratings

Voltage

- 240 Vac maximum

Main Lugs

- 100 and 225 A

Main Breakers

- 100 and 225 A

Branch Breakers

- 15–100 A (bolt-on)

Short-Circuit Current Ratings (Symmetrical)

- 240 Vac: 10 kA and 22 kA fully rated
- 240 Vac: 22–200 kA series rated

Service

- Three-phase, four-wire 208Y/120 V and 240/120 V delta
- Single-phase, three-wire 120/240 V
- Single-phase, two-wire 120 V
- Three-phase, three-wire 208 and 240 V

Mains

For available mains, refer to **Table 22.7-1**.

Main breakers, 100 A, Types BAB and QBHW are horizontally mounted, same as branch breakers. All other main breakers are vertically mounted.

Branch Circuits

For available branch devices, refer to **Table 22.7-2**.

Main Lugs Only

The short-circuit rating of the MLO assembled panelboard will be fully rated based upon the lowest rated branch device or may be series rated with an approved upstream device.

Main lugs only ampere ratings:
 100 and 225.

Main Circuit Breakers

The short-circuit rating shown is that of the main breaker only. The short-circuit rating of the assembled panelboard is the rating of the lowest fully rated main or branch device or the rating of an approved series rated combination.

Series Rated Combinations

Refer to series rating tables beginning on **Page 22.7-20** for the approved series rated combinations available for the branch circuit breakers listed in **Table 22.7-2**.

Table 22.7-1. Main Circuit Breakers

Breaker Frame Amperes	Breaker Type	Interrupting Rating (kA Symmetrical) at 240 Vac
100	BAB	10
100	QBHW	22
100	PDG2xF	18
150	PDG2xG, PDG3xG	65
150	PDG2xM	100
150	PDG2xP	200
225	PDD2xF	22
225	PDD2xG, PDG2xG	65
225	PDD2xM, PDG2xM	100
225	PDD2xM, PDG2xP	200

Table 22.7-2. Branch Circuit Breakers

Breaker Type	Ampere Rating	Number of Poles	Interrupting Rating (kA Symmetrical)		
			120 Vac	120/240 Vac	240 Vac
BAB	15–70	1	10	—	—
BAB	15–100	2	—	10	—
BAB	15–100	2, 3	—	—	10
BAB-D ①	15–60	1, 2	10	10	—
BAB-C ②	15–30	1, 2	10	10	—
BABRP ③	15–30	1, 2	10	10	—
BABRSP ③	15–30	1, 2	10	10	—
QBGF	15–50 ④	1, 2	10	10	—
QBGFEP	15–50 ④	1, 2	10	10	—
QBCAF ⑤	15–20	1	10	10	—
QBHW	15–70	1	22	—	—
QBHW	15–100	2	—	22	—
QBHW	15–100	2, 3	—	—	22
QBHGF	15–30 ④	1, 2	22	22	—
QBGFEP	15–30 ④	1, 2	22	22	—
QBHCAF ⑤	15–20	1	22	22	—

① HID (High Intensity Discharge) rated breaker.

② Switching neutral breaker. Single-pole device requires two-pole space, two-pole device requires three-pole space.

③ Solenoid operated breaker.

④ 50 A is two-pole only.

⑤ Arc fault breaker.

Pow-R-Line 2X-LX



Pow-R-Line 2X-LX Column Type

General Description

Panelboard Ratings

Voltage

- 240 Vac
- 480Y/277 Vac maximum

Note: PRL2X panelboards are suitable for use on three-phase, three-wire applications when derived from a three-phase, four-wire 480Y/277 Vac service where the neutral is not brought to the panelboard. For three-phase, three-wire 480 Vac delta services, use a PRL3X panelboard.

- 250 Vdc maximum

Main Lugs

- 100 and 225 A

Main Breakers

- 100 and 225 A

Branch Breakers

- 15–100 A

Short-Circuit Current Ratings (Symmetrical)

- 240 Vac: 65 kA fully rated
- 240 Vac: 100–200 kA series rated
- 480Y/277 Vac: 14 kA fully rated
- 480Y/277 Vac: 22–150 kA series rated
- 250 Vdc: 10 kA and 14 kA fully rated

Service

- Three-phase, four-wire 208Y/120 V and 240/120 V delta and 480Y/277 V
- Single-phase, three-wire 120/240 V
- Single-phase, two-wire 120 V
- Three-phase, three-wire 208 and 240 V
- Two-wire 125 Vdc
- Two-wire 250 Vdc

Mains

For available mains, refer to **Table 22.7-3**.

Type GHB main breakers are horizontally mounted, same as branch breakers. All other main breakers are vertically mounted.

Branch Circuits

For available branch devices, refer to **Table 22.7-4**.

Main Lugs Only

The short-circuit rating of the MLO assembled panelboard will be fully rated based upon the lowest rated branch device or may be series rated with an approved upstream device.

Main lugs only ampere ratings: 100 and 225.

Main Circuit Breakers

The short-circuit rating shown is that of the main breaker only. The short-circuit rating of the assembled panelboard is the rating of the lowest fully rated main or branch device or the rating of an approved series rated combination.

Series Rated Combinations

Refer to series rating tables beginning on **Page 22.7-20** for the approved series rated combinations available for the branch circuit breakers listed in **Table 22.7-4**.

Table 22.7-3. Main Circuit Breakers

Breaker Frame Amperes	Breaker Type	Interrupting Rating (kA Symmetrical)		
		240 Vac	480Y/277 Vac	125/250 Vdc
100	GHB	65	14	14
100	PDG2xF	18	14	10
150	PDG2xG, PDG3xG	65	35	10
150	PDG2xM	100	65	22
150	PDG2xP	200	100	22
225	PDD2xG	65	—	—
225	PDG2xG, PDG3xG	65	35	10
225	PDD2xM	100	—	—
225	PDG2xM	100	65	10
225	PDD2xM	200	—	—
225	PDG2xP	200	100	10

Table 22.7-4. Branch Circuit Breakers

Breaker Type	Ampere Rating	Number of Poles	Interrupting Rating (kA Symmetrical)				
			120 Vac	240 Vac	277 Vac	480Y/277 Vac	125/250 Vdc
GHB	15–100	1	65	—	14	—	14
GHB	15–100	2, 3	—	65	—	14	14
GHQ	15–30	1, 2	65	—	14	—	—
HGHB	15–30	1	65	—	25	—	—
GHQRSP ①	15–20	1, 2	65	65	14	14	—
GHBS ①	15–30	1, 2	65	65	14	14	—

① Solenoid operated breaker.

Circuit Breaker Technical Data

Table 22.7-5. Electrical Characteristics of Circuit Breakers

Circuit Breaker Ratings				UL Listed Interrupting Ratings (kA rms Symmetrical)						
Type	Ampere Rating	Number of Poles	Volts AC	AC Rating, Volts					DC Rating, Volts ①	
				120/240	240	277	480	600	125	250
BAB, HQP	15-70 15-100	1 2	120 120/240	10 10	— —	— —	— —	— —	— —	— —
BAB-H, HQP-H	15-100	2, 3	240	—	10	—	—	—	—	—
BABRP, BABRSP	15-30 15-30	1 2	120 120/240	10 10	— —	— —	— —	— —	— —	— —
QBGF, QPGF, QPGFEP QBGFEP	15-50 15-50	1 2	120 120/240	10 10	— —	— —	— —	— —	— —	— —
QBAF, QBAG	15-20 15-20	1 2	120 120/240	10 10	— —	— —	— —	— —	— —	— —
QBHW, QPHW	15-70 15-100	1 2	120 120/240	22 22	— —	— —	— —	— —	— —	— —
QBHW-H, QPHW-H	15-100	2, 3	240	—	22	—	—	—	—	—
QBHGF, QPHGF, QPHGFEP QBHGFEP	15-30 15-30	1 2	120 120/240	22 22	— —	— —	— —	— —	— —	— —
QBHAF, QBHAG	15-20 15-20	1 2	120 120/240	22 22	— —	— —	— —	— —	— —	— —
GHB	15-100 ② 15-100	1 2, 3	277 480Y/277	65 —	— 65	14 —	— 14 ③	— —	14 —	— 14
GHQ	15-30	1, 2	277	65	—	14	—	—	—	—
HGHB	15-30	1	277	65	—	25	—	—	—	—
GHBGFEP	15-60	1	277	—	—	14	—	—	—	—
GHQRSP	15-100 15-100	1 2	277 480Y/277	65 —	— 65	14 14	— 14 ③	— —	— —	— —
GHBS	15-30 15-30	1 2	277 480Y/277	65 —	— 65	14 14	— 14 ③	— —	— —	— —
PDG2xF	15-100 15-100	1 2, 3	277 480	— —	— 18	14 —	— 14	— —	10 —	— 10
PDG2xG, PDG3xG*	15-150 15-225	1 2, 3	277 600	— —	— 65	35 —	— 35	— 18	10 —	— 10
PDD2xF PDD2xG	100-225 100-225	2, 3 2, 3	240 240	— —	22 65	— —	— —	— —	10 10	— —

High Interrupting Capacity Circuit Breakers

PDG2xM	15-150 15-225	1 2, 3	277 600	— —	— 100	65 —	— 65	— 25	10 —	— 22
PDD2xM	100-225	2, 3	240	—	100	—	—	—	10	—

Current Limiting Circuit Breakers

PDG2xP PDD2xM	15-225 100-225	2, 3 2, 3	600 240	— —	200 200	— —	100 —	35 —	— 10	22 —
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① DC ratings apply to substantially non-inductive circuits.

② DC rated single-pole, 15-70 A only.

③ Rating 480Y/277 Vac maximum.

Terminal Wire Ranges, Pressure-Type Al/Cu Terminals Except as Noted

Where copper-aluminum terminals are supplied on designated panelboard types, best results are obtained if a suitable joint compound is applied when aluminum conductors are used.

Table 22.7-6. Standard Main Lug Terminals

Panel Type	Wire Size Ranges for Ampere Capacity						
	100 A	225 A	250 A	400 A	600 A	800 A	1200 A
Pow-R-Line 1X, 1XF, 1RX	#12-1/0	#6-300 kcmil	—	(2) #4-500 kcmil	(2) #4-500 kcmil ①	—	—
Pow-R-Line 2X, 2XF, 2RX	#12-1/0	#6-300 kcmil	—	(2) #4-500 kcmil	(2) #4-500 kcmil ①	—	—

① Not applicable PRL 1XF, 1RX, PRL 2XF, 2RX.

Note: Optional 750 kcmil mechanical screw-type terminals are available upon request. Panelboard dimensions may be affected. Refer to Eaton.

Table 22.7-7. Standard Main Breaker and Branch Breaker Terminals

Breaker Type	Ampere Rating	Wire Size Ranges
BAB, QBHW, BABRSP	15-70	#14-#4
HQP, QPHW	90-100	#8-1/0
PDD2xF, PDD2xG PDD2xM, PDD2xM ②	100-225	#4-4/0 or #6-300 kcmil
PDG2xF, PDG2xG PDG2xM, PDG2xP ②, HFDDC ③	15-100 125-225	#14-1/0 #4-4/0
GHB, HGHB, GHQ, GHQRSP	15-50 25-100	#14-1/0 #10-1/0

② Suitable for DC applications only.

③ LHH is 400 A maximum.

Table 22.7-8. Fusible Switch Terminals

Ampere Rating	Wire Size Ranges
30	#14-1/0
60	#14-1/0
100	#14-1/0
200	#4-300 kcmil

Power Xpert Release Trip Unit for Molded Case Circuit Breakers

Description

Eaton's Power Xpert Release (PXR) trip units are programmable communicating microprocessor-based low-voltage electronic trip unit systems for Eaton molded case circuit breakers. PXR trip units are available in four models: PXR 10, PXR 20, PXR 20D and PXR 25.

Standards and Certifications

The PXR trip units are listed by Underwriters Laboratories (UL) and Canadian Standards Association (CSA) for use in Frame PD-2, PD-3, PD-4, PD-5 and PD-6 molded case circuit breakers. All PXR units have also passed the IEC 60947-2 test program that includes EMC testing. All trip units meet the low-voltage and EMC directives and carry the CE mark.

Features

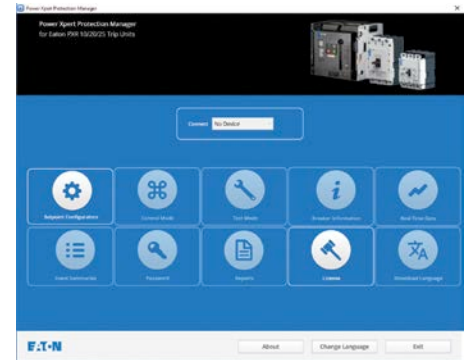
The PXR electronic trip units provide an enhanced and easy-to-use interface that enables end users and maintenance engineers to more easily change set points, test and configure circuit breakers, and review energy and power information. Also, the Power Xpert Protection Manager software provides the capability of secondary injection tests and reports on-demand without the need of expensive test kits.

Advanced features include:

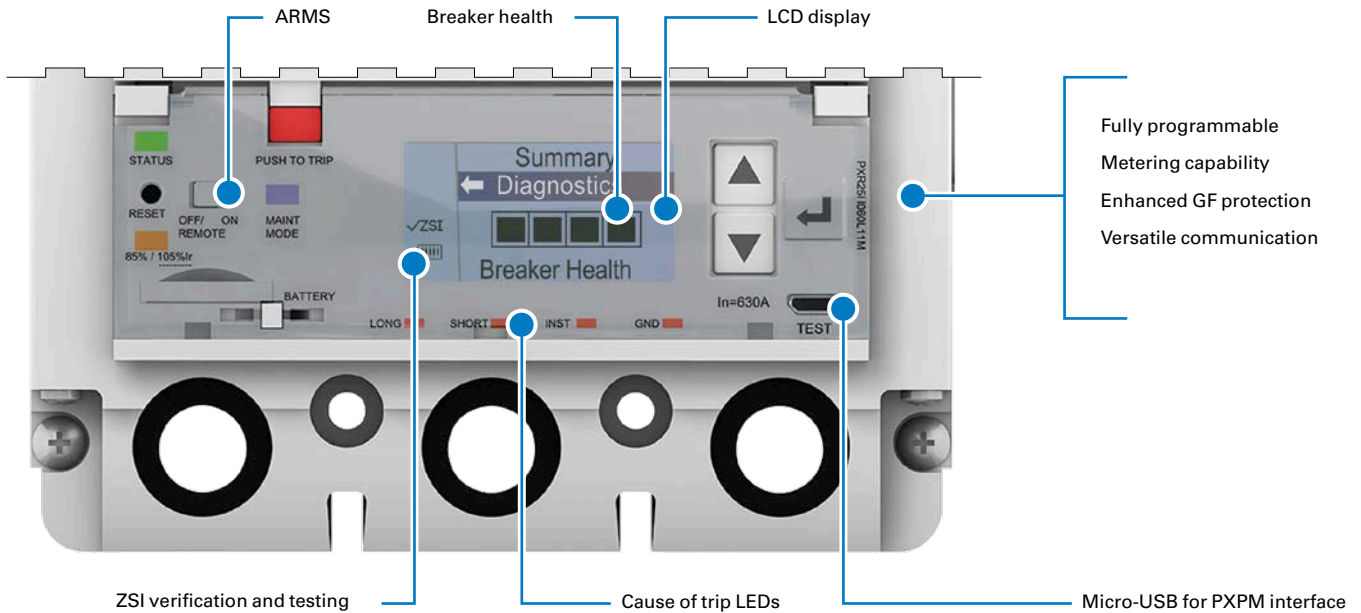
- Industry-first breaker health algorithms provide real-time monitoring and communication of breaker condition
- Cause of trip LED indication and trip event data storage
- Zone selective interlocking (ZSI) verification and testing indication
- Adjustable Arcflash Reduction Maintenance System™ (ARMS) settings
- LCD display with programmable settings



Arcflash Reduction Maintenance System (ARMS)



Power Xpert Protection Manager (PXPM) Software



PXR 25 Trip Unit Features

- Fully programmable
- Metering capability
- Enhanced GF protection
- Versatile communication

Table 22.7-9. Power Xpert Release (PXR) Features

Features	PXR 10	PXR 20	PXR 20D	PXR 25
Protection types	LSI	LSI/LSIG	LSI/LSIG	LSI/LSIG
Status indication	Standard	Standard	Standard	Standard
USB secondary injection testing	Standard	Standard	Standard	Standard
Programmable by USB port (PXPM)	Standard	Standard	Standard	Standard
Independent instantaneous adjustment	Standard	Standard	Standard	Standard
Adjustable L, S, I, G pickup and time		Standard	Standard	Standard
Cause of trip indication	Available through USB port (PXPM)	Standard	Standard	Standard
Load alarm indication with 2 levels		Standard	Standard	Standard
Programmable load alarm levels			Standard	Standard
Ground fault protection and alarm		Optional	Optional	Optional
Arcflash Reduction Maintenance System (ARMS) Available PD3, PD4, PD5, PD6		Optional	Optional	Optional
Zone selective interlocking (ZSI) with indication		Optional	Optional	Optional
Programmable relays		Optional	Standard	Standard
Modbus RTU communication		Optional	Standard	Standard
CAM module communication		Optional	Optional	Optional
Rotatable LCD display			Standard	Standard
Breaker health and diagnostic monitoring		Available through USB port (PXPM)	Standard	Standard
Voltage metering accurate to 0.5%				Standard
Power and energy metering accurate to 1%				Standard

Metering and Surge Protective Devices



Power Xpert Meter 350

Power Xpert Meter 350

The Power Xpert Meter 350 (PXM350) is a revenue grade energy meter that delivers a cost-effective solution for energy and submetering applications. This DIN rail mounted, three-phase energy meter provides high accuracy in a small form factor. The user-friendly LCD display is ideal for building energy management, energy monitoring and metering systems.

Meter features include:

- Data collection and management for energy and multi-parameters measurement
- Demand measurement and forecasting of current, active power, reactive power and apparent power
- System event logging with configurable parameter alarms
- LCD display with backlight support
- Electronic and physical sealing to prevent tampering

For more information on other available power meters, visit www.eaton.com/meters.



Integrated Surge Protective Devices

Integrated Surge Protective Devices

Eaton integrates our industry-leading surge protective devices (SPD) into switchboards. Lead length is kept to a minimum to maximize SPD performance. SPD units are available with ratings up through 400k, and are UL listed and labeled to UL 1449 3rd Edition.

All switchboards with integrated SPD units are connected to a lineside overcurrent protective device for disconnecting means. When applied on the lineside of a service entrance main, the disconnecting means does not count as a service disconnect per National Electrical Code Article 230.71[A].

For complete SPD product description, application and ratings, visit www.eaton.com/spd.

Pow-R-Line 1X-LX Layout Guide



Technical Data and Specifications

Bussing

100–225 A: copper is standard.

Boxes

Boxes are made from code-gauge steel.

Blank ends are supplied as standard.

Trims

Trims are made from code-gauge steel and painted ANSI 61 gray.

Doors have three-point catch and lock.

Neutral Bars

When column type panels are furnished with trough extensions and pull box, the neutral bar will be placed in the pull box unless otherwise specified.

When troughs and pull box are not furnished, the neutral bar will be located on the panel at the same end as the main.

Modifications

Table 22.7-10. Sub-Feed Breakers (One Per Panel)

Ampere Rating Space	Breaker Type	Interrupting Rating (kA Symmetrical) at 240V
150	PDG2xG, PDG3xG	65
150	PDG2xM	100
150	PDG2xP	200
225	PDD2xF	22
225	PDD2xG, PDG2xG	65
225	PDD2xM, PDG2xM	100
225	PDD2xM, PDG2xP	200

Cabinets

Boxes and trims are code-gauge steel. ANSI-61 light gray painted finish.

Boxes are furnished without knockouts.

Standard depth is 6.00 inches (152.4 mm). Standard width is 8.63 inches (219.1 mm).

Top and Bottom Gutters

4.50 inches (114.3 mm) minimum.

Left Side Gutter

4.50 inches (114.3 mm) minimum.

Pull Box

Pull box is furnished without knockouts.

Shunt Trips

Shunt trips are available on BAB, and QBHW breakers. BAB and QBHW require one additional pole space for shunt trip, i.e., single-pole is two-pole size, two-pole is three-pole size and three-pole is four-pole size.

Ground Bar

Standard bolted in box. Aluminum is standard, copper is available as an option.

Assembled Circuit Breaker Panelboards

Box size, box and trim catalog numbers for standard column type panelboards listed are available from **Table 22.7-11**.

Instructions

- Using description of the required panelboard, select the rating and type of main required.
 - 100 A panelboards— **Table 22.7-11**.
 - 225 A panelboards— **Table 22.7-11**.
- Count total number of branch circuit poles, including provisions, required in the panelboard. Do not count main breaker poles. Convert two- or three-pole branch breakers to single poles, i.e., three-pole breaker, count as three poles.

Determine sub-feed breaker or through-feed lug requirements.
- Select the panelboard main ampere rating from **Table 22.7-11**.
- Panelboard Type from first column, main breaker Frame and Designation, if applicable from second column, and sub-feed breaker Frame and Designation, if applicable, from the third column.
- From Step 2, determine the number of branch circuits in Column 4.
- Read box size numbers across columns to the right. All panels are surface mounted.

Table 22.7-11. Panelboards—Dimensions in Inches (mm)

Panelboard Types	Main Breaker Types Mounting: (H) = Horizontal (V) = Vertical	Sub-Feed Breaker Types Vertical Mounting	Maximum Number of Branch Circuits Including Provisions	Box Dimensions A		
				Height	Width	Depth
100 A						
Main breaker	BAB, QBHW (H)	—	27 39	69.00 (1752.6) 81.00 (2057.4)	8.63 (219.1) 8.63 (219.1)	6.00 (152.4) 6.00 (152.4)
Main lugs or main breaker	PDG2xF PDG2xG, PDG3xG PDG2xM (V)	— —	30 42	69.00 (1752.6) 81.00 (2057.4)	8.63 (219.1) 8.63 (219.1)	6.00 (152.4) 6.00 (152.4)
Main lugs or main breaker with 100 A through-feed lugs or sub-feed breaker		PDD2xF, PDD2xG PDD2xM, PDG2xF PDG2xG, PDG3xG, PDG2xM	30 42	78.00 (1981.2) 90.00 (2286.0)	8.63 (219.1) 8.63 (219.1)	6.00 (152.4) 6.00 (152.4)
225 A						
Main lugs or main breaker	PDG2xF PDG2xG, PDG3xG, PDGD2xM (V)	— —	30 42	69.00 (1752.6) 81.00 (2057.4)	8.63 (219.1) 8.63 (219.1)	6.00 (152.4) 6.00 (152.4)
Main lugs or main breaker with 225 A through-feed lugs or sub-feed breaker		PDD2xF, PDD2xG, PDD2xM, PDG2xF, PDG2xG, PDG3xG, PDG3xM	30 42	78.00 (1981.2) 90.00 (2286.0)	8.63 (219.1) 8.63 (219.1)	6.00 (152.4) 6.00 (152.4)

① For horizontal mounted mains (BAB Type), use main lug table, include space in branch section for mains.

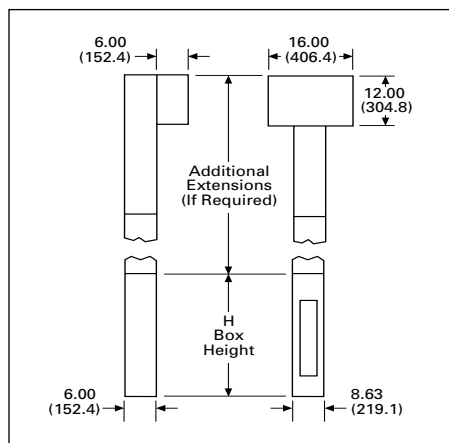


Figure 22.7-4. Trough Extension — Dimensions in Inches (mm)

Trough Extension

When extension troughs are used, the NEC requires that the number of conductors in wireways shall not contain more than 30 conductors at any cross section, unless the conductors are for signal circuits or are control conductors between a motor and its starter and used only for starting duty. The sum of the cross-sectional areas of all contained conductors at any cross section of a wireway shall not exceed 20% of the interior cross-sectional area of the wireway.

The derating factors specified in the NEC shall not be applicable to the 30 current-carrying conductors at 20% fill specified above.

Pow-R-Line 2X-LX Layout Guide



Modifications

Table 22.7-12. Sub-Feed Breakers (One Per Panel)

Ampere Rating Space	Breaker Type	Interrupting Rating (kA Symmetrical)	
		240V	480V
150	PDG2xG, PDG3x	65	35
150	PDG2xM	100	65
150	PDG2xP	200	100
225	PDG2xG	65	—
225	PDD2xG, PDG3x	65	35
225	PDD2xM	100	—
225	PDG2xM	100	65
225	PDD2xM	200	—
225	PDG2xP	200	100

Technical Data and Specifications

Bussing

100–225 A: copper is standard.

Boxes

Boxes are made from code-gauge steel.

Blank ends are supplied as standard.

Trims

Trims are made from code-gauge steel and painted ANSI 61 gray.

Doors have three-point catch and lock.

Neutral Bars

When column type panels are furnished with trough extensions and pull box, the neutral bar will be placed in the pull box unless otherwise specified.

When troughs and pull box are not furnished, the neutral bar will be located on the panel at the same end as the main.

Cabinets

Boxes and trims are code-gauge steel. ANSI-61 light gray painted finish.

Boxes are furnished without knockouts.

Standard depth is 6.00 inches (152.4 mm).

Standard width is 8.63 inches (219.1 mm).

Top and Bottom Gutters

4.50 inches (114.3 mm) minimum.

Left Side Gutter

3.31 inches (84.2 mm) minimum.

Pull Box

Pull box is furnished without knockouts.

Shunt Trips

Shunt trips are available on GHB, and FD breakers. PDG2xG breakers with shunt trips require three-pole frame.

Ground Bar

Standard bolted in box. Aluminum is standard, copper is available as an option.

Assembled Circuit Breaker Panelboards

Box size, box and trim catalog numbers for standard column type panelboards listed are available from **Table 22.7-13**.

Instructions

- Using description of the required panelboard, select the rating and type of main required.
 - 100 A panelboards— **Table 22.7-13**.
 - 225 A panelboards— **Table 22.7-13**.
- Count total number of branch circuit poles, including provisions, required in the panelboard. Do not count main breaker poles. Convert two- or three-pole branch breakers to single poles, i.e., three-pole breaker, count as three poles. Determine sub-feed breaker or through-feed lug requirements.
- Select the panelboard main ampere rating from **Table 22.7-13**.
- Panelboard type from first column, main breaker frame and designation, if applicable from second column, and sub-feed breaker frame and designation, if applicable, from the third column.
- From Step 2, determine the number of branch circuits in Column 4.
- Read box size numbers across columns to the right. All panels are surface mounted.

Table 22.7-13. Panelboards—Dimensions in Inches (mm)

Panelboard Types	Main Breaker Types Mounting: (H) = Horizontal (V) = Vertical	Sub-Feed Breaker Types Vertical Mounting	Maximum Number of Branch Circuits Including Provisions	Box Dimensions ●		
				Height	Width	Depth
100 A						
Main breaker	GHB (H)	— —	27	69.00 (1752.6)	8.63 (219.1)	6.00 (152.4)
			39	81.00 (2057.4)	8.63 (219.1)	6.00 (152.4)
Main lugs or main breaker	PDG2xF, PDG2xG PDG3xG, PDG2xM (V)	— —	30	69.00 (1752.6)	8.63 (219.1)	6.00 (152.4)
			42	81.00 (2057.4)	8.63 (219.1)	6.00 (152.4)
Main lugs or main breaker with 100 A through-feed lugs or sub-feed breaker		PDG2xG, PDG3xG PDG2xM, PDG2xP	30	78.00 (1981.2)	8.63 (219.1)	6.00 (152.4)
			42	90.00 (2286.0)	8.63 (219.1)	6.00 (152.4)
225 A						
Main lugs or main breaker	PDG2xF, PDG2xG, PDG3xG, PDG2xM (V)	— —	30	69.00 (1752.6)	8.63 (219.1)	6.00 (152.4)
			42	81.00 (2057.4)	8.63 (219.1)	6.00 (152.4)
Main lugs or main breaker with 225 A through-feed lugs or sub-feed breaker		PDG2xG, PDG3xG PDG2xM, PDG2xP	30	78.00 (1981.2)	8.63 (219.1)	6.00 (152.4)
			42	90.00 (2286.0)	8.63 (219.1)	6.00 (152.4)

① For horizontal mounted mains (BABType), use main lug table, include space in branch section for mains.

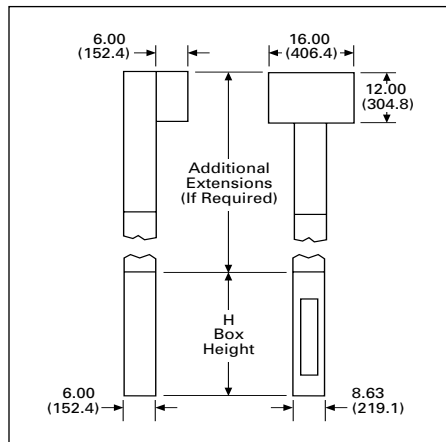


Figure 22.7-5. Trough Extension—Dimensions in Inches (mm)

Trough Extension

When extension troughs are used, the NEC requires that the number of conductors in wireways shall not contain more than 30 conductors at any cross section, unless the conductors are for signal circuits or are control conductors between a motor and its starter and used only for starting duty. The sum of the cross-sectional areas of all contained conductors at any cross section of a wireway shall not exceed 20% of the interior cross-sectional area of the wireway.

The derating factors specified in the NEC shall not be applicable to the 30 current-carrying conductors at 20% fill specified above.

Series Rated Combinations

UL permits panelboards to be labeled with a short-circuit rating of up to 200,000 A symmetrical where UL listed combinations of main and branch circuits are used.

These combinations consist of main breakers or fusible devices connected ahead of, and in series with approved conventional devices.

Two arrangements are acceptable and comply with UL standards for panelboards. The main circuit breaker may be installed in the panel as a main device (**Figure 22.7-6**), or it may be mounted remote (**Figure 22.7-7**) from the panel. In either case, the approved main and branch combinations must be followed. These arrangements are acceptable and are UL listed having been tested in accordance with UL standards.

From the tables on **Page 22.7-20** through **Page 22.7-28** specific combinations of main devices (upstream) and branch devices (downstream), series connected and electrically adjacent in the system, may be selected to qualify the assembled panelboard for the short-circuit ratings shown. Series ratings apply **only** to those Eaton breakers listed and published.

Do not use "Classified" breakers.

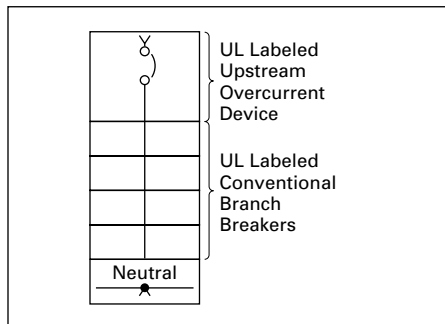


Figure 22.7-6. Main Device

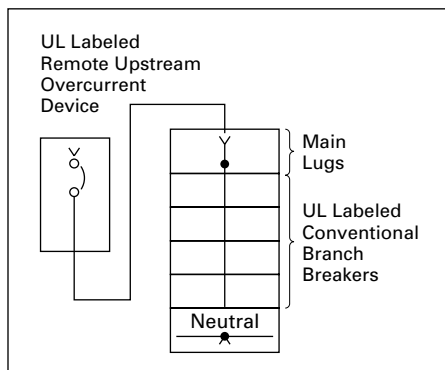


Figure 22.7-7. Mounted Remote

Industry standards and the NEC require protection of the entire electrical distribution system from damage due to short-circuit faults. Article 230.205 of the NEC states that service entrance equipment shall be suitable for the short-circuit current available at its supply terminals. The entire distribution system is required to meet this standard. Series rated systems have become an effective method of meeting these requirements.

There are three protection systems used to protect low voltage power distribution equipment. They are:

- Fully rated protection
- Fully rated, selectively coordinated protection
- Series rated protection

Fully Rated Protection—Where all overcurrent devices are rated for the full prospective short-circuit current at their line side terminals throughout the system.

Selectively Coordinated Protection—A fully rated system where the overcurrent device closest to the fault will open first, thus isolating the faulty circuit.

Series Rated Protection—A short-circuit interrupting rating assigned to a combination of two or more over-current protective devices that are connected in series and in which the rating of the downstream device(s) in the combination is less than the series rating.

Series ratings are also known in the industry as integrated ratings, series combination ratings and series connected ratings.

UL Issues

In a series rated system, all of the overcurrent devices in series in the protective scheme must have been tested and listed by Underwriters Laboratories for series combination use in the system.

All Eaton's series ratings are in full compliance with all applicable requirements of the latest editions of UL 489, 891 and 67.

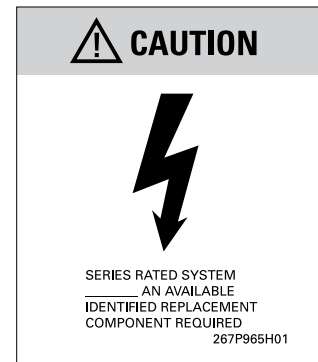
The UL Recognized Component Directory (the Yellow Book) contains breaker manufacturers' series connected listings. These are intended **ONLY** as a guideline for use by others who are responsible for their own testing, labeling and listing. Therefore, the UL Recognized Component Directory cannot be used to interpret series connected ratings in assembled equipment. The assembled equipment must also be UL tested for series ratings.

Code Issues

The fault current contribution of motors connected between series rated breakers must be considered. Article 240.86 in the NEC states that for series ratings, the sum of the motor full-load currents cannot exceed 1% of the interrupting rating of the lower rated circuit breaker. The actual fault current contribution from induction motors is about four times their full-load current (impedance value of 25%). For example, if the downstream branch circuit breakers used in a series rated combination have an interrupting rating of 14,000 A rms symmetrical for a 480 V system, the maximum allowable motor contribution to that panel from the branch circuit breakers is 140 A (1%). For typical induction motors, this is equivalent to a total horsepower at 480 V of approximately 115 horsepower.

Requirements of the NEC (NFPA-70) for series ratings may be met by equipment marked with ratings adequate for the available fault current at the point of application in the electrical system. Eaton panelboards and switchboards are marked consistent with NEC Article 240.83.

Additionally, Article 110.22 requires field marking on equipment where series ratings are used. This label is supplied standard with all Eaton panelboards and switchboards.



NEC Required Caution Label

Note: The NEC requires the installer to properly apply and complete this label. Label(s) must be placed on all equipment where series ratings are used.

Fuse Application Considerations

Fuses can be used instead of circuit breakers in fully rated, selectively coordinated and series connected protection systems. See the tables on **Page 22.7-26** through **Page 22.7-28** for fuse breaker data applied to series connected designs.

Don't apply fuses using the up-over-down method, which has been recommended by some fuse manufacturers for sizing a current-limiting fuse that protects a downstream molded case circuit breaker with a specified rms symmetrical interrupting rating. The method can lead to erroneous and unsafe conclusions, and should not be used.

Example: Assume a specific type of current-limiting fuse rated 2000 A. Then using the figure below:

1. Draw a vertical line from the prospective short-circuit current of 200 kA to intersect the typical peak let-through curve at "A."
2. Draw a horizontal line left from Point "A" to intersect the "prospective peak" curve at "B."
3. Drop a vertical line from "B" to intersect the horizontal axis and read the recommended rating, 65 kA rms, concluding that a circuit breaker with a 65 kA interrupting capacity will be protected by a specified 2000 A current-limiting fuse.

This conclusion is wrong when the downstream service has a blow-open contact assembly, as does a molded case circuit breaker or similar device.

The reason: The up-over-down method ignores dynamic impedance (the inherent current-limiting of the downstream molded case circuit breaker). Such impedance is developed directly by the forces of the let-through current created when the contacts are blown open.

For proper application of current-limiting fuses, always refer to recommendations by the manufacturer of the circuit breaker, which are based on actual test data.

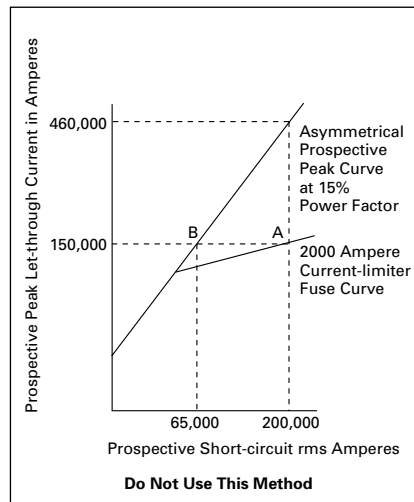


Figure 22.7-8. Old Up-Over-Down Chart

Applying Series Ratings

The following is provided to use the series rating tables on the following pages.

- Step 1. Determine the available system voltage and fault current.
- Step 2. Select the appropriate table using the system voltage.
- Step 3. Use the appropriate "Series Equipment Rating" column equal to, or greater than, the available fault current, to determine the allowable combinations of main (upstream) and branch (downstream) overcurrent devices. Main devices are shown in bold/shaded areas. Respective branch breakers are shown directly below their associated main device. If a rating is not initially found in a column, first look to the columns to the right for higher "Series Equipment Ratings" within the same table. If still not found, use ratings from table of a higher system voltage (higher numbered tables).

Example 1:

240 V, three-phase, three-wire, AC system with available fault current of 37,438 A. Main (upstream) device is a three-pole, 150 A, PDG2xG breaker. The branch (downstream) breakers are two- and three-pole, 20, 30 and 60 A, 240 V, BAB breakers.

1. Go to the 240 V table (**Table 22.7-15**).
2. Look down under the 42 kA column. This rating is not shown.
3. Look to the columns to the right. This rating is shown under the 65 kA column, and therefore is valid.

Example 2:

480Y/277 V, three-phase, four-wire, AC system with available fault current of 62,097 A. Main (upstream) device is a three-pole, 250 A breaker. The branch (downstream) breakers are two- and three-pole, 60, 70 and 100 A FDB breakers.

1. Go to the 480Y/277 V table (**Table 22.7-18**).
2. Look down under the 65 kA column. This rating is not shown.
3. Look to the columns to the right. This rating is still not shown.
4. Look at the table with the next higher system voltage (480 V, **Table 22.7-19**).
5. This rating is shown under the 65 kA column, and therefore is valid.

Example 3:

208Y/120 V, three-phase, four-wire, AC system with available fault current of 56,438 A. Main (upstream) device is a three-pole, 225 A, PDD2xG breaker. The branch (downstream) breakers are single-pole, 20 A BAB (120/240 V), and two- and three-pole, 70 A BAB (240 V).

1. Go to the 240 V table (**Table 22.7-15**).
2. Look under the 65 kA column. This rating is shown under the 65 kA column, and therefore is valid for the two- and three-pole (240 V) breakers.
3. Look at the 120/240 V table (**Table 22.7-14**) for the single-pole (120/240 V) rating.
4. Look under the 65 kA column. This rating is shown under the 65 kA column, and therefore is valid for the single-pole (120/240 V) breakers.

Other Applications of Series Ratings

Series ratings can also be applied under the following guidelines:

Any FULLY RATED breaker can be applied upstream, downstream, or in the middle of, any of the series ratings stated in the tables.

Any series rating stated in the tables may have additional branch breakers of the EXACT SAME TYPE further downstream in that rating.

COMBINING SERIES RATINGS is allowed under certain conditions. Main and branch series ratings may be combined if:

Breakers A, B and C are in series respectively from main to branch.
 Breakers A and B series rate together, breakers A and C series rate at the same interrupting rating level (or higher), it is allowable to use A, B and C together at the A-B series rating.

It is improper to combine series ratings under the following condition:

Breakers A, B and C are in series respectively from main to branch. Breakers A and B series rate together, breakers B and C series rate at the same interrupting rating level (or higher), it is **NOT** allowable to use A, B and C together at the A-B or B-C series rating. However, combining multiple overcurrent devices as in this example, can be accomplished if all devices in the series combination have been tested together and listed in triple rating **Table 22.7-27**.

Main devices shown centered at top in shaded area, respective branch devices shown directly below.

Table 22.7-14. 120/240 Vac—Breaker/Breaker Series Ratings

Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.

Main Breaker Maximum Amperes	Series Equipment Rating—kA Symmetrical									
	18	22	42	65	100	200				
100	PDG2xF BAB HQP QBGF QBGFT QBCAF	QBHW QPHW BAB HQP QBGF QPGF QBAG QBHW QBGFT QPGFT		GB, GHB BAB HQP QBGF QPGF QBAG QBHW QPHW QBHW QPHW QBGFT QPGFT QBCAF		FB-P BAB HQP QBGF QPGF QBAG QBHW QPHW PDG2xF PDG2xG QBGFT QPGFT			FCL BA HQP QBGF QPGF QBAG QBHW QPHW GB, GHB GHQ PDG2xF PDG2xG PDG2xM QBGFT QPGFT QBCAF	
125				BRX BAB (15–70 A) BAB (90–100 A) HQP (15–70 A) HQP (90–100 A)		EGH GHQ, GHB				
150	BAB HQP QBGF QBAG QBGFT QBCAF			PDG3xG* BAB HQP QBHW QPHW		BAB HQP GHB PDG2xF PDG2xG (15–150 A) QBHW QPHW				
200						LA-P BAB HQP QBHW QPHW PDG2xF PDG2xG				

Table 22.7-14. 120/240 Vac—Breaker/Breaker Series Ratings (Continued)

Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.

Main Breaker Maximum Amperes	Series Equipment Rating—kA Symmetrical										
	18	22	42	65	100	100	200	200	200	200	
225		PDD2xF BAB HQP QBGf QPGF QBHGf QPHGf QBHW QPHW QBAG QBGfT QPGfT QBHGfT QPHGfT	BAB HQP QBGf QPGF QBHGf QPHGf QBHW QPHW QBAG QBGfT QPGfT QBHGfT QPHGfT QBCAF	PDD2xG, PDG2xG BAB HQP QBGf QPGF QBAG QBHW QBHGf QBGfT QPHGf QBCAF	FDE QBGf QPGF QBAG QBHGf QBGfT QPHGf QBCAF QPHGfT	BAB HQP QBHW QPHW	PDD2xM BAB ① HQP ① QBGf QPGF QBAG QBGfT QPGfT QBCAF	BAB HQP QBGf QBAG QBHW QPHW QBHGf GB, GHB GHQ, GHQRSP PDG2xF, EGS PGD2xG QBGfT QPGfT QBCAF	PDG2xP BAB HQP QBHW QPHW BAB HQP QBGf QBAG QBHW QPHW QBHGf GHB, PDG2xF PDG2xG (15–150 A) QBGfT EGS PDG3xG* (15–150 A) QBCAF QBHGfT QPGF QPGfT QPHGfT QPHGfT	PDG2xP GB, GHB GHQ PDG2xF PDG2xG PDG2xM EGS EGH	
250				JD BAB (15–70 A) HQP (15–70 A) QBHW QPHW PDG2xF	BAB HQP QBHW QPHW	QBGf QPGF QBAG QBHGf QPGfT QBCAF	GB, GHB PDG2xF PDG2xG EGS	BAB HQP QBHW QPHW		GB, GHB PDG2xF PDG2xG PDG2xM EGS EGH	
400		PDD3xGy BAB HQP QBGf QPGF QBAG QBGfT QPGfT	PDG3xG* PDF3xG BAB (15–70 A) HQP (15–70 A) QBHW QPHW	PDG3xM* PDF3xM BAB (15–70 A) HQP (15–70 A) QBHW QPHW	PDD3xGy PDF3xG PDG2xF	KDPDG3xP BAB (15–70 A) HQP (15–70 A)	PDG3xM* PDF3xM GB, GHB PDG2xF PDG2xG EGS ②	PDG3xP* QBHW QPHW		PDG3xP GB, GHB PDG2xF PDG2xG PDG2xM EGS EGH	LCL BAB HQP QBGf QPGF QBAF QBAG QBHW QPHW GB, GHB PDG2xF PDG2xG PDG2xM QBGfT QPGfT QBCAF
600							PDG2xF				
800							PDG4xM PDG2xF				
1200							PDG5xM PDG5xM-C PDG2xF PDD2xF PDD2xG				

① Single-pole version is restricted to 15–70 A.

② Not valid with PDF3xM.

Series Rated Combinations

Table 22.7-15. 240 Vac—Breaker/Breaker—Series Ratings

For single- and two-pole 120/240V rated breakers (BA, BAB, HQP, QBHW, QPHW), see **Table 22.7-14**.

Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.

Main Breaker Maximum Amperes	Series Equipment Rating—kA Symmetrical								
	18	22	42	65	100	100	100	100	200
100	PDG2xF BAB_H HQP_H	QBHW_H QPHW_H BAB_H HQP_H		GB, GHB BAB_H HQP_H QBHW_H QPHW_H		FB-P BAB_H HQP_H PDG2xF PDG2xG			FCL BAB_H HQP_H QBHW_H QPHW_H GB, GHB PDG2xF PDG2xG PDG3xG* PDG2xM*
125						EGH GHB			
150	FDB BAB_H HQP_H								
200						LA-P BAB_H HQP_H QBHW_H QPHW_H PDG2xF PDG2xG JDB			
225		PDD2xF HQP_H BAB_H QBHW QPHW	HQP_H BAB_H QBHW QPHW CHH BAB_H	PDD2xG BAB_H HQP_H QBHW_H	PDG2xG, PDG3xG* BAB_H HQP_H QBHW_H QPHW_H PDG2xF ^①	PDD2xM, EDC BAB_H HQP_H	PDG2xM BAB_H HQP_H QBHW_H QPHW_H GB, GHB PDG2xF PDG2xG PDG3xG*	PDG2xP BAB_H HQP_H QBHW_H QPHW_H	PDG2xP GB, GHB PDG2xF PDG2xG PDG3xG* PDG2xM
250				JDB BAB_H (15–70A) HQP_H (15–70 A) QBHW_H QPHW_H PDG2xF	BAB_H (15–70 A) HQP_H (15–70 A) QBHW_H QPHW_H	GB, GHB PDG2xF PDG2xG PDD2xG JDB EGS	BAB_H HQP_H QBHW_H QPHW_H		GB, GHB PDG2xF PDG2xG PDG3xG* PDG2xM, PDD2xF PDD2xG PDD2xM JDB EGS, EGH

① Valid on two- and three-pole breaker only. Not valid for single-pole.

Table 22.7-16. 240 Vac—Breaker/Breaker—Series Ratings

For single- and two-pole 120/240 V rated breakers (BA, BAB, HQP, QBHW, QPHW), see **Table 22.7-14**.
 Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.

Main Breaker Maximum Amperes	Series Equipment Rating—kA Symmetrical				
	65	100		200	
400	PDD3xGy, PDG3xG* PDF3xG BAB_H HQP_H QBHW_H QPHW_H PDG2xF	PDG3xM*, PDF3xM QBHW_H ① QPHW_H ① GB, GHB PDG2xF PDG3xG*, PDG2xG PDD2xF, PDD2xG JDB PDD3xGy, PDG3xG* EGS ②	PDG3xP* QBHW_H QPHW_H	PDG3xP GB, GHB PDG2xF PDG2xG, PDG3xG* PDG2xM, PDD2xF PDD2xG, PDD2xM JDB PDG3xG* PDD3xGy PDG3xM*	LCL BAB_H HQP_H QBHW_H QPHW_H GB, GHB PDG2xF PDG2xG, PDG2xM PDD2xF, PDD2xG PDG3xG* PDD2xM, JDB PDD3xGy, PDG3xG* PDG3xM
500		NB-P JDB PDG3xG*, PDD3xGy PDF3xG			
600		HLDB GB ①, GHB ① PDG2xG, PDD2xF PDD2xG, PDG2xF JDB PDG3xG*, PDD3xGy, PDF3xG, LDB		PDD2xF, PDD2xG PDD2xM	
800		NB-P PDG3xG*, PDD3xGy	PDG4xM PDG2xF PDG2xG		
1200		PDG5xM PDD2xF, PDD2xG PDG2xF			PDG5xP PDD2xF, PDD2xG PDD2xM
2500		PDD2xF, PDD2xG			PDD2xF, PDD2xG PDD2xM

① Valid on two- and three-pole breakers only. Not valid for single-pole.

② Not valid with PDF3xM.

Main devices shown in shaded area, respective branch devices shown directly below.

Table 22.7-17. 277 Vac—Breaker/Breaker Series Ratings

Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.
 All ratings in this table apply to single-pole branch breakers only. For two- and three-pole branch breakers, see other tables.

Main Breaker Maximum Amperes	Series Equipment Rating—kA Symmetrical					
	22	25	35	65	100	150
100						FCL GHB GHQ, GHQRSP PDG2xF PDG2xG PDG2xM
125			EGS GHQ, GHB	EGH GHQ, GHB		
225			PDG2xG, PDG3xG* GHB GHQ GHQRSP ① GHBGFEP ①	PDG2xM GHB GHQRSP ② GHBGFEP ② GHQ PDG2xF PDG2xG	PDG2xP GHB PDG2xF PDG2xG PDG2xM	
250	JD, JDB GHB		JD, JDB GHB (15–50 A) GHBGFEP ③	HJD GHB (15–50 A) PDG2xF PDG2xG GHBGFEP	LCL PDG2xP	JDC GHB PDG2xF PDG2xG PDG2xM
400	PDG3xG* PDF3xG GHB	PDG3xM* PDF3xM GHB	PDG3xG* PDF3xG GHB PDG2xF PDG2xG GHQ ④	PDG3xM*, PDF3xM GHB PDG2xF PDG2xG GHQ ⑤	PDG3xP* GHB PDG2xF PDG2xG PDG2xM	LCL GHB PDG2xF PDG2xG PDG2xM

① Not valid with PDG3xG*.

② Not valid with HFDE.

③ Not valid with JDB.

④ Not valid with PDF3xG.

⑤ Not valid with PDF3xM.

Table 22.7-18. 480Y/277 Vac—Breaker/Breaker Series Ratings

Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.
 All ratings in this table apply to two- and three-pole branch breakers only. For single-pole branch breakers, see **Table 22.7-17**.

Main Breaker Maximum Amperes	Series Equipment Rating—kA Symmetrical					
	22	25	35	65	100	150
100						FCL GHB, GHQRSP
125			EGS GHB	EGH GHB		
225			PDG2xG, PDG3xG* GHB, GHQRSP ⑥	PDG2xM GHB, GHQRSP ⑦	PDG2xP GHB	
250	JDB GHB		JDB GHB (15–50 A)	GHB (15–50 A)	GHB	
400	PDG3xG* PDF3xG GHB	PDG3xM*, PDF3xM GHB	PDG3xG* PDF3xG GHB (15–50 A)	PDG3xM*, PDF3xM GHB (15–50 A)	PDG3xP* GHB (15–50 A)	LCL GHB

⑥ Not valid with PDG3xG*.

⑦ Not valid with HFDE.

Main devices shown in shaded area, respective branch devices shown directly below.

Table 22.7-19. 480 Vac—Breaker/Breaker Series Ratings

Main devices are shown centered at top, in shaded area. Respective branch devices shown directly below.
 All ratings in this table apply to two- and three-pole branch breakers only. Not valid for single-pole branch breakers.

Main Breaker Maximum Amperes	Series Equipment Rating – kA Symmetrical				
	25	35	65	100	150
100				FB-P PDG2xF PDG2xG PDG2xM	FCL PDG2xF PDG2xG, PDG3xG* PDG2xM
200				LA-P PDG2xF PDG2xG PDG2xM JDB	
225		PDG2xG, PDG3xM, PDG2xF	PDG2xM* PDG2xF PDG2xG, PDG3xG EGS ①	PDG2xP PDG2xF, EGS, EGH PDG2xG, PDG3xG* PDG2xM	
250	JDB PDG2xF		PDG2xF PDG2xG PDG3xG* JDB EGS	PDG2xF, EGS, EGH PDG2xG, PDG3xG* PDG2xM JDB	LCL PDG3xG*
400		PDG3xG* PDG2xF	PDG3xM* PDG2xF PDG2xG, PDG3xG* JDB PDG3xG* EGS	PDG3xP* PDG2xF, EGS, EGH PDG2xG, PDG3xG* PDG2xM JDB PDG3xG* PDG3xM*	LA-P JDB PDG3xG* PDG3xM*
500				NB-P JDB PDG3xG* PDG3xM*	
600		LDB CLD JDB	HLDB PDG2xG, PDG3xG* JDB PDG3xG* LDB		

① Not valid with HFDE.

Table 22.7-20. 600 Vac—Breaker/Breaker Series Ratings

Main fuse class shown centered at top, in shaded area. Respective branch devices shown directly below.
 All ratings in this table apply to two- and three-pole branch breakers only. Not valid for single-pole branch breakers.

Main Breaker Maximum Amperes	Series Equipment Rating – kA Symmetrical					
	18	25	35	42	50	100
225	PDG2xG	PDG2xM PDG2xG	PDG2xP PDG2xG, PDG3xG* PDG2xM			
250	JDB	PDG2xG JDB	PDG2xG PDG2xM JDB			LCL PDG3xG*
400		PDG3xG* PDF3xG PDG2xG JDB	PDG3xM*, PDF3xM PDG2xG, PDG3xG* PDG2xM JDB	PDG3xP* PDG2xG, PDG3xG* PDG2xM	PDG3xP* JDB PDG3xG* PDG3xM*	LCL PDG2xG, PDG3xG* PDG2xM PDG2xP JDB PDG3xG* PDG3xM* PDG3xP*
600		LDB CLD PDG2xG JDB	HLDB PDG3xG* LDB			

Table 22.7-21. 120/240 Vac—Fuse/Breaker Series Ratings

Main fuse class shown centered at top, in shaded area. Respective branch devices shown directly below.

Main Fuse Maximum Amperes	Series Equipment Rating – kA Symmetrical					
	100			200		
100						R BAB HQP QBHW QPHW GB GHB
200			R GB GHB	J BAB HQP QBHW QPHW	T BAB HQP QBHW QPHW	
400	J BAB HQP QBHW QPHW	T BAB HQP QBHW QPHW		J GB GHB	T GB GHB	

Main devices shown in shaded area, respective branch devices shown directly below.

Table 22.7-22. 240 Vac—Fuse/Breaker Series Ratings

For single- and two-pole 120/240 V rated breakers (BA, BAB, HQP, QBHW, QPHW), see **Table 22.7-14**.

Main fuse class shown centered at top, in shaded area. Respective branch devices shown directly below.

Main Fuse Maximum Amperes	Series Equipment Rating – kA Symmetrical					
	100				200	
100						R BAB_H HQP_H QBHW_H QPHW_H GB GHB
200			R GB GHB	J BAB_H HQP_H QBHW_H QPHW_H	T BAB_H HQP_H QBHW_H QPHW_H	R GB ① GHB ①
400	J BAB_H HQP_H QBHW_H QPHW_H	T BAB_H HQP_H QBHW_H QPHW_H		J GB GHB	T GB GHB	
600			L PDG2xF PDG2xG, PDG3xG* PDD2xG JDB PDD3xGy, PDG3xG*			

① Valid on two- and three-pole breakers only. See **Table 22.7-21** for single-pole.

Table 22.7-23. 277 Vac Fuse/Breaker Series Ratings

Main fuse class are shown centered at top, in shaded area. Respective branch devices shown directly below. All ratings in this table apply to single-pole branch breakers only. For two- and three-pole branch breakers, consult other tables.

Main Fuse Maximum Amperes	Series Equipment Rating – kA Symmetrical					
	65		100		200	
100			J GHQ GHQRSP	T GHQ GHQRSP		R GHB
200	J GHQ GHQRSP	T GHQ GHQRSP	J PDG2xF PDG2xG PDG2xM	T PDG2xF PDG2xG PDG2xM	R GHB	
400						J GHB
						T GHB

Table 22.7-24. 480Y/277 Vac—Fuse/Breaker Series Ratings

Main fuse class shown centered at top, in shaded area. Respective branch devices shown directly below. All ratings in this table apply to two- and three-pole branch breakers only. For single-pole branch breakers, see **Table 22.7-23**.

Main Fuse Maximum Amperes	Series Equipment Rating — kA Symmetrical					
	65		100		200	
100						R GHB
200				R GHB		
400					J GHB	T GHB
600			J PDG2xF PDG2xG PDG2xM PDG2xP	T GHB PDG2xF PDG3xG* PDG2xG PDG3xG* PDG2xM PDG2xP		

Table 22.7-25. 480 Vac—Fuse/Breaker Series Ratings

Main fuse class shown centered at top, in shaded area. Respective branch devices shown directly below. All ratings in this table apply to two- and three-pole branch breakers only. Not valid for single-pole branch breakers.

Main Fuse Maximum Amperes	Series Equipment Rating — kA Symmetrical					
	100			200		
100				R PDG2xF		
200	J PDG2xF PDG2xG PDG2xM PDG2xP	T PDG2xF PDG2xG PDG2xM PDG2xP				

Table 22.7-26. 600 Vac—Fuse/Breaker Series Ratings

Main fuse class shown centered at top, in shaded area. Respective branch devices shown directly below. All ratings in this table apply to two- and three-pole branch breakers only. Not valid for single-pole branch breakers.

Main Fuse Maximum Amperes	Series Equipment Rating — kA Symmetrical					
	100			200		
100						R PDG2xG PDG3xG* PDG2xM PDG2xP
200	J PDG2xG PDG3xG* PDG2xM PDG2xP	T PDG2xM PDG2xP		R PDG3xG* PDG2xM		
400	J	T		R PDG3xG* PDG3xM* PDG3xP*		
600				J PDG3xG PDG3xM PDG3xP	T PDG3xG* PDG3xM* PDG3xP*	

Table 22.7-27. Triple Series Ratings

Main Fuse Class and Maximum Amperes	Tenant Main Type	Branch Type	System Voltage	Short-Circuit Series Rating (kA, Sym.)
L-6000	PDD3xGy, PDG3xGBGB	K, GDHB, PDG2xF ①	240	100
L-6000	PDD3xGy, PDG3xGGB	K, GDHBB	120/240	100
L-6000	PDD3xGy, PDG3xPG	FD ①, FDB	240	100
L-6000	PDD3xGy, PDG3xG*		240	100
L-6000	JDB	GB, GHB	240	100
L-6000	JDB	GB, GHB	120/240	100
L-6000	PDG2xG	GB, GHB	240	100
L-6000	PDG2xG	GB, GHB	120/240	100
L-6000	PDG2xG	BAB_H, HQP_H, QBHW_H, QPHW_H	240	100
L-6000	PDG2xG	BA, BAB, HQP (15–70 A)	120/240	100
L-6000	PDG2xF	BAB_H, HQP_H	240	100
L-6000	PDG2xF	BA, BAB, HQP	120/240	100

① Valid on two- and three-pole breakers only. Not valid for single-pole.

Panelboard Selection Guide

Table 22.7-28. Product Types

					
Type PRL1X	Fusible Lighting Panelboard PRL1XF	Type PRL1X-LX Column Type	Type PRL2X	Fusible Lighting Panelboard PRL2XF	Type PRL2X-LX Column Type
Bolt-on or plug-on circuit breakers 240Vac maximum	240Vac maximum	Bolt-on circuit breakers 240 Vac maximum	Bolt-on or plug-on circuit breakers 240 or 480Y/277 Vac 125/250 Vdc maximum	240 and 480Y/277 Vac maximum	Bolt-on or plug-on circuit breakers 240 or 480Y/277 Vac 125/250 Vdc maximum
Main lugs only 600 A maximum	Main lugs only 400 A maximum	Main lugs only 225 A maximum	Main lugs only 600 A maximum	Main lugs only 400 A maximum	Main lugs only 225 A maximum
Main circuit breaker 600 A maximum		Main circuit breaker 225 A maximum	Main circuit breaker 600 A maximum		Main circuit breaker 225 A maximum
Branch circuit breakers 100 A maximum Single, two- and three-pole	Branch overcurrent protective devices 30 A maximum, Single-, two- and three-pole utilizing Class CC fuses	Branch circuit breakers 100 A maximum Single-, two- and three-pole	Branch circuit breakers 100 A maximum Single-, two- and three-pole	Branch overcurrent protective devices 30 A maximum, Single-, two- and three-pole utilizing Class CC fuses	Branch circuit breakers 100 A maximum Single-, two-, and three-pole

Table 22.7-28. Product Types (Continued)





			
Retrofit Panelboard PRL-1RX and PRL-2RX	Type PRL3X	Type PRL3E	Type PRL4X
Bolt-on or plug-on circuit breakers 240 or 480Y/277 Vac	Bolt-on circuit breakers 240, 480 or 600 Vac; 250 Vdc maximum	Bolt-on circuit breakers 240 Vac maximum	Circuit breakers or fusible switches; 240, 480 or 600 Vac; 600Vdc maximum
Main lugs only 225 A maximum	Main lugs only 800 A maximum	Main lugs only 600 A maximum	Main lugs only 1200 A maximum
Main circuit breaker 225 A maximum	Main circuit breaker 600 A maximum	Main circuit breaker 600 A maximum	Main circuit breaker 1200 A maximum
Branch circuit breakers 100 A maximum Single-, two- and three-pole	Branch circuit breakers 225 A maximum Single-, two- and three-pole	Branch circuit breakers 125 A maximum Single-, two- and three-pole	Main fusible switch 1200 A maximum Branch circuit breakers 1200 A maximum, Single-, two- and three-pole
			Branch fusible switches 1200 A maximum, Single-, two- and three-pole

Table 22.7-28. Product Types (Continued)




		
Pow-R-Command	Multipoint Metering Distribution Panelboard	Elevator Control Panelboard
Bolt-on or plug-on circuit breakers 240 or 480Y/277 Vac	Bolt-on circuit breakers 600 Vac or 600 Vdc maximum	Bolt-on fusible switches 600 Vac maximum
Main lugs only 400 A maximum	Type PRL4X panelboard specially formatted to provide a compact and flexible multipoint metering solution for 250–1200 A applications	Controls for up to four elevators in a single panelboard
Main circuit breaker 400 A maximum		Main lugs only 800 A maximum
Branch circuit breakers 225 A maximum Single-, two- and three-pole		Branch overcurrent devices 15–200 A fusible switches with Class J fuse clips maximum
Single- and two-pole remote operated circuit breakers		
Integral load switching and dimming controls		Designed to meet specific sections various codes impacting elevators

Table 22.7-29. Panelboard Selection Guide

Panelboard Type	Device Type	Maximum Voltage Rating		Maximum Main Rating, Amperes		Branch Circuits Ampere Range	Short-Circuit Current Ratings rms Symmetrical Amperes, AC	
		AC	DC	Main Lugs Only	Main Device		Fully Rated (kA)	Series Rated (kA)
Pow-R-Line 1X ①	Breaker	240	—	600	600	15–100	10–22	22–200
Pow-R-Line 2X ①	Breaker	240 480Y/277	250	600 400 ②	600 400 ②	15–100 15–100	65 14	65–200 22–150
Pow-R-Line 3X ①	Breaker	240 480 600	250	800 800 800	600 600 600	15–225 15–225 15–225	10–200 14–100 14–35	22–200 22–150 —
Pow-R-Line 3E ①	Breaker	480	250	600	600	15–125	35–65	35–100
Pow-R-Line 4X ①	Breaker	240 480 600	600	1200 1200 1200	1200 1200 1200	15–1200 15–1200 15–1200	10–200 14–200 14–200	22–200 22–150 —
Pow-R-Line 4F ①	Fusible switch	240 600	250	1200 1200	1200 1200	30–1200 30–1200	100–200 100–200	— —
Pow-R-Line 4DX	Breaker	240 480	— —	1200 1200	1200 1200	20–600 Drawout 15–1200 Fixed	100 65	— —
Pow-R-Line 1XF	Fusible switch	240	—	400	400	15–30	200	200
Pow-R-Line 2XF	Fusible switch	480Y/277	—	400	400	15–30	200	200
Pow-R-Line 1X-LX	Breaker	240	—	225	225	15–30	10–22	18–200
Pow-R-Line 2X-LX	Breaker	480Y/277	125/250	225	225	15–30	14	25–150
Pow-R-Line 1RX	Breaker	240	—	225	225	15–100	10–22	22–100
Pow-R-Line 2RX	Breaker	480Y/277	—	225	225	15–100	14	22–150
Elevator control panelboard ①	Fusible	480	—	800	800	15–200	10–200	14–100

① Available with surge protective device (SPD) and metering.

② Amperage rating for DC voltage.

Column Type Modifications



Pow-R-Line 1X-LX Column Type

Modifications Selection Guide

Table 22.7-30. Modifications—Alphabetical Index

Modification	Available on Panelboard Types
	Column Type
Ambient compensating breakers	No
Branch circuit monitoring	No
Bus density	Yes
Cabinets—special: Types 2, 3R, 4, 4X, 12	No
Complete assembly	Yes
Compression type lugs, mains only	Yes
Concealed trim clamps (LT trim)	No
Conduit covers	No
Copper lugs	Yes
Copper main bus	Standard
Directory frame—metal	No
Doors, special	Yes
Electronic trip units	Yes
Fungus-proof	Yes
Ground bar	Yes
Ground fault protection (zero sequence)	No
Handle lockoff device	Yes
Hinges, special (LT trim)	No
Increased dimensions	No
Increased panel bus rating	No
Interiors to fit existing boxes	No
Locks, special (LT trim)	No
Metering devices	Yes
Molded case switches	Yes
Nameplates engraved	Yes
Neutral rated 200%	Yes
Painting and special coating	Yes
Permanent circuit numbers	Yes
Remote control switches (ASCO 920)	No
Service entrance	No
Shunt trips	Yes
Split bus or meter loop	No
Sub-feed breakers	Yes
Sub-feed lugs	No
Surge protective device (SPD)	No
Tamperproof screws (LT trim)	Yes
Terminals, copper only for breakers	Yes
Through-feed lugs	Yes
Time clock space only	No
Touchup paint	Yes

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 Cleveland, OH 44122
 United States
 Eaton.com

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