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Magnum PXR low-voltage switchgear

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Powering Business Worldwide

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Product Description

Rear Access Switchgear

Rear Access Switchgear

Product Offering

- UL® 1558
- 2000–10,000 A bus
- 800–6000 A breakers
- 100 and 150 kA bus designs
- 600 Vac design
- Indoor enclosures
- Outdoor aisle and aisleless enclosures

Application Description

- Healthcare
- Commercial construction
- Machine building
- Infrastructure
- Data centers
- Mining, minerals and metals
- Education
- Oil and gas
- Electric utilities
- Pulp and paper
- Industrial and manufacturing
- Food and beverage
- Transportation
- Government
- Water/wastewater

Features and Benefits

- **Improved uptime**
  Higher interrupting ratings and withstand ratings, better coordination capability
- **Improved maintainability**
  Dedicated secondary terminals with separate access door and front-accessible control wireway
- **Increased reliability**
  Modular design allows for reduced parts for both structures and breakers
- **Increased safety**
  Complete enhanced performance suite of options
- **Reduced installation cost**
  Front-accessible controls and wiring enables rapid installation and commissioning

Optional Features

Automatic Transfer and Intelligent Control

Increase uptime and simplify switchgear design by specifying one of Eaton's pre-engineered automatic transfer and intelligent control packages for Magnum PXR low-voltage switchgear. The packages are designed with features to meet typical customer applications while still maintaining the flexibility to meet specific requirements. The packages are available on front and rear access in standard and arc-resistant designs.

Enhanced Safety

Zone Selective Interlocking

The Power Xpert® Release (PXR) zone selective interlocking (ZSI) capability provides positive system coordination without time delays. ZSI allows the breaker closest to the fault to trip without any preset time delay.

Arcflash Reduction Maintenance System™

Eaton's Arcflash Reduction Maintenance System employs a separate, dedicated analog trip circuit that eliminates micro-processor latencies, resulting in clearing times that are faster than standard instantaneous tripping.

Integrated High Resistance Grounding

High resistance grounding can add the safety of a grounded system while minimizing the risk of service interruptions due to grounds.

Thermal Monitoring

Optional thermal monitoring system to allow users to detect potential issues before they become a problem, as well as detecting intermittent issues that are missed using standard infrared windows by having monitoring 24/7.

Standards and Certifications

- Assembly designed to UL 1558, CSA®, ANSI C37.20.1 and C37.51
- Breaker designed to UL 1066, ANSI C37.13, C37.15 and C37.17
- Seismic Certified to UBC, IBC and California Building Code to exceed Zone 4
- ABS certified

Ratings

Table 20.7-1. Voltage Ratings (AC)

System Voltage	Maximum Voltage
208/240 480 600	254 508 635

Table 20.7-2. Available Bus Ratings

Cross Bus Ampacity	Bus Bracing kA
2000 3200 4000	100, 150
5000 6000 8000 10,000	100, 150

Overview

Eaton's Magnum PXR switchgear is backed by 70 years of switchgear development that has set the industry standard for quality, reliability, maintainability and extended operating life, when it comes to protecting and monitoring low-voltage electrical distribution systems. Magnum PXR switchgear is designed to meet the changing needs of our customers by providing:

- Lower installation and maintenance costs
- Higher interrupting ratings and withstand ratings
- Better coordination capability
- Increased tripping sensitivity
- Enhanced safety measures
- Higher quality, reliability and maintainability
- Communications and power quality monitoring and measuring capabilities
- Flexible layouts that maximize use of capital by minimizing equipment footprint

Magnum PXR switchgear can meet the needs of general applications, service entrances, harsh environments, multiple source transfers, special grounding systems and many others.

With a modern design, Magnum PXR metal-enclosed low-voltage switchgear and Magnum circuit breakers with Power Xpert Release trip units provide:

- 100% rated, fully selective protection
- Integral microprocessor-based breaker tripping systems
- Easy to set up pickups, timers and other functions via programming on the front LCD screen with navigation arrows, or through the micro-B USB connection and the Power Xpert Protection Manager (PXPM) software
- No need for external test kits with secondary injection testing via PXPM
- Two-step stored-energy breaker closing
- Standard 100 kA short-circuit bus bracing
- Optional 150 kA short-circuit bus bracing
- Optional metal barriers to isolate the cable compartment from the bus compartment
- Both indoor and outdoor aisle and aisleless enclosures
- Full range of safety solutions dealing with arc flash hazard and operator error

Magnum PXR Switchgear

Many other features for coordinated, safe, convenient, trouble-free, and economical control and protection of low-voltage distribution systems are also provided.

Magnum circuit breakers with PXR are designed to:

- ANSI Standards C37.13, C37.16, C37.17, C37.50
- UL 1066

Magnum PXR switchgear conforms to the following standards:

- CSA® C22.2, No. 31-10
- IEEE® C37.20.1
- ANSI C37.51
- UL® Standard 1558 and UL Standard 891
- American Bureau of Shipping (ABS)
- Built in an ISO® certified facility

Maximum ratings for Magnum PXR switchgear are 600 Vac, 10,000 A continuous cross bus and 100 kA short-circuit capacity.

Seismic Qualification

Refer to www.eaton.com/seismic for information on seismic qualification for this and other Eaton products.

Structure Features

Standard finish: Gray paint finish (ANSI 61) using a modern, completely automated and continuously monitored electrostatic powder coating. This continually monitored system includes spray de-grease and clean, spray rinse, iron phosphate spray coating spray rinse, non-chemical seal, oven drying, electrostatic powder spray paint coating and oven curing.

Integral base: The ruggedly formed base greatly increases the rigidity of the structure, reduces the possibility of damage during the installation of the equipment, and is suitable for rolling, jacking and handling. A lifting angle is permanently welded into the bus compartment structure for increased strength. The bottom frame structure members are indented to allow the insertion of a pry bar.

Heavy-duty door hinges: Each breaker door is mounted with hinge pins. Removal of the door is easily accomplished by just lifting the hinge pin. This allows easy access to the breaker internal compartment for inspection and maintenance.

Rear cover/doors: In Magnum PXR switchgear, standard rear bolted covers are provided. They are split into two sections to facilitate handling during removal and installation. Optional rear doors are also available.

Through-the-door design: The following functions may be performed without the need to open the circuit breaker door—lever the breaker between positions, operate manual charging system and view the spring charge status flag, close and open breaker, view and adjust trip unit and read the breaker rating nameplate. Through-the-door Kirk keys further increase safety and provide interlocking capability.

Breaker door interlock: Door interlocks are designed to prevent access to potential live parts when the switch is set to the CONNECTED position. To avoid interference during testing and commissioning, the door interlock does not engage when in the TEST position.

Through-the-Door Design

Cassette design: The breaker cassette supports the breaker in the cell, as well as on the movable extension rails when the breaker is placed into or removed from the cell. The extension rails allow the breaker to be drawn out without having to de-energize the entire switchgear lineup.

Accessibility: When the door is open or removed, each breaker compartment provides front access to isolated, vertical wireways, primary disconnects, cell current transformers and other breaker compartment accessories for ease of field wiring and troubleshooting field connections.

Four-position drawout: Breakers can be in connected, test, disconnected or removed position. The breaker can be moved between the connected, test and disconnected positions while the compartment door is closed.

Closing spring automatic discharge: Mechanical interlocking automatically discharges the closing springs when the breaker is removed from its compartment.

Optional safety shutters: Positive acting safety shutters that isolate the breaker connections to the main bus when the breaker is withdrawn from the cell is an option offered for additional safety beyond our standard design. They reduce the potential of accidental contact with live bus. Insulating covers ("boots") are furnished on live main stationary disconnecting contacts in compartments equipped for future breakers.

Breaker inspection: When withdrawn on the rails, breaker is completely accessible for visual inspection; tilting is not necessary. The rails are permanent parts of every breaker compartment.

Interference interlocks: Supplied on breakers and in compartments where the compartments are of the same physical size. Interference interlocks ensure an incorrect breaker cannot be inserted.

Optional key interlock (switchgear mounted): This mechanism holds the breaker cell mechanically trip-free to prevent electrical or manual closing. Breaker can be stored in compartment, and completely removed for maintenance or for use as a spare without disturbing the interlock. Modification of the breaker is not required.

Bus Features

Buses and connections: Vertical and cross bus ratings in Magnum PXR switchgear are based on a UL and ANSI standard temperature rise of 65 °C above a maximum ambient air temperature of 40 °C.

Bus ampacities: Vertical and main bus ratings in Magnum PXR are 2000, 3200, 4000 and 5000 A. In addition, a 6000, 8000 and 10,000 A main bus rating is available. Vertical section bus is sized per main cross bus maximum rating or by ANSI C37.20.1 to a maximum of 5000 A.

Bus bracing: Standard bracing is 100 kA. The "U" shaped bar is the heart of the Magnum PXR vertical bus. This configuration provides a much higher mechanical strength. To further demonstrate the strength and rigidity of this bus system, it has been verified through testing to withstand 85 kA short-circuit for a full 60 cycles.

Silver and tin plating: Bolted, silver-plated copper bus is standard. The plating is over the entire length of the bar, not just at the joints. Optional tin-plated copper bus is available.

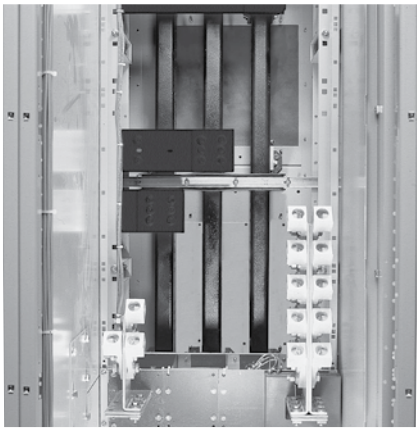
Bus joints: All joints are bolted and secured with Belleville-type spring washers for maximum joint integrity. These washers reduce the potential of joint hardware loosening during the change of joint temperature associated with variations of the loads. Optional maintenance-free hardware is also available.

Full neutral: For four-wire applications, the neutral bus is rated 100% of main bus rating as standard. Neutral ratings up to a maximum of 10,000 A are available as an option. Additionally, four-pole breakers can be used in conjunction with four-wire systems.

Ground: A ground bus is furnished the full length of the switchgear assembly and is fitted with terminals for purchaser's connections.

Glass reinforced polyester and Ultramid® standoff insulation system: Glass reinforced polyester has been used on both low and medium voltage switchgear for decades. By combining this industry proven material with Ultramid insulation, a total system providing exceptional mechanical and dielectric withstand strength, as well as high resistance to heat, flame and moisture, is produced. Substantial testing to demonstrate accelerated effects of heating and cooling on the mechanical and dielectric properties of this system prove it to provide superior performance for decades of trouble-free operation.

Optional epoxy bus coating: For applications requiring additional bus protection in harsh environments, Magnum PXR switchgear is designed for the addition of optional conductor insulation covering, in addition to providing full UL air clearance without insulation. This material is applied during the assembly of the bus, and covers all vertical and horizontal phase bus bars. Removable boots provide access to section-to-section bus joints for inspection and maintenance purposes.



Optional Insulated Bus

Barriers: Optional grounded metal barriers isolate the main bus and connections from the cable compartment providing added safety to the workers while reducing the potential of objects falling into the bus compartment. In addition, vertical barriers between cable sections can be added to reduce potential hazards. Barriers are removable to give access to the bus compartment for inspection and maintenance. Barriers can be either solid metal or vented for ease of infrared scanning.

Optional Bus Compartment and Vertical Section Barriers

Wiring Features

Cable compartment: The cable compartment gives ample room for terminating the power cables. Removable top roof sheets allow for easy conduit hub installation. The floor of the cable compartment is open to allow cable entry from underground duct banks. Optional floor plates are available.

In addition to cable, Pow-R-Way® busway and nonsegregated bus duct can be terminated in the compartment.

Lug pad: The lugs are located on the breaker run-backs to accommodate lug orientations at a 45° angle to reduce the bending radius of the cable needed for making the connections, thus reducing installation and maintenance time. Mechanical setscrew type lugs are standard. Optional NEMA two-hole compression lugs are available as an option.

Control wireway: An isolated vertical wireway is provided for routing of factory and field wiring in each switchgear section. Breaker secondary terminal blocks are mounted as standard above each circuit breaker. The terminal blocks are rated 30 A, and will accept bare wire, ring or spade terminals for wire size ranges of #22–#10. Extruded loops are punched in side sheets of the vertical wireway to allow securing of customer control wiring without the use of adhesive wire anchors.

Control circuits may be wired in all cells without removing the circuit breaker. In addition, power circuits may be connected in the rear of the switchgear at the same time control circuits are being wired in the front of the switchgear.

Control wire: Standard wire is Type SIS insulated stranded copper, extra flexible No. 14 AWG minimum. Type VW-1 wire is available.

Control wire marking: Each wire is imprinted with ink cured under ultraviolet light for durability and for easy identification by the user. The enhanced solvent resistance and durability of the aerospace grade UV cure ink has been tested for severe environments. The imprinting is made every 3.00 inches (76.2 mm) along the length of the wire to make field troubleshooting easier. The point of origin, wire designation and point of destination are imprinted in the following format: <origin zone/wire name/destination zone>.

Each device has a uniquely designated zone. "<" indicates the direction of the wire origination and ">" indicates the direction of the wire destination. As an option, wire name marking can be made using sleeve type or heat shrink sleeve type.

Control Wire Marking

Secondary terminal compartment: There are 84 finger-safe secondary connections for a standard and double-frame Magnum PXR breaker and 72 for a narrow-frame Magnum PXR breaker. The customer's secondary terminal connections are located at the front of the structure behind a separate door providing access to these connections without the need to open the breaker compartment door. The additional updated connections also serve as a rejection feature from the previous Magnum circuit breaker designs.

Short-circuiting terminal blocks: One provided for each set of instrumentation or relaying application current transformers.

Shipping split connection: At each shipping split, the control connections are made with plug-in terminal blocks rated 600 V, 30 A. The terminal blocks mechanically interlock without removing the line or load connections. This method of making the shipping split control connections increases the speed of installation and reduces the potential of incorrect connections.

Instrumentation/Metering Features

Flexibility: Magnum PXR switchgear allows for a variety of metering options.

See **https://www.eaton.com/content/dam/eaton/products/low-voltage-power-distribution-controls-systems/power-energy-meters/metering-devices-protective-relays-software-and-connectivity-v3-t9-ca08100004e.pdf** for Metering and Power Management products.

- Analog switchboard type meters such as ammeters and voltmeters
- Electronic power metering such as the Power Xpert Meter 4000/6000/8000 series and Power Xpert Meter 1000 and 3000 series
- Panels for ease of visibility

Voltage transformers: Voltage transformers are rated 10 kV BIL, and are protected by both primary and secondary fuses. The primary fuses are of the current limiting type.

Current transformers: Current transformers for metering and instrumentation are mounted in the breaker compartments and are front accessible. Secondary wiring between the current transformer and the standard shorting terminal block is color-coded for ease of identification. Bus mounted CTs are available for metering and relaying.

Control power transformers: Control transformers are provided when required for AC control of circuit breakers, space heaters and/or transformer fans. Like voltage transformers, they are protected by current limiting primary fuses. Non-current limiting fuses are used on the secondary side to protect branch circuits.

Instrumentation—secondary terminal compartment door: Devices, such as control pushbuttons, indicating lights, switches and analog meters can be mounted on these panels, within space limitations.

Devices Mounted on Secondary Terminal Compartment Door

Instrument compartment door: Devices, such as electronic power metering and analog switchboard type meters that do not fit on the secondary terminal compartment door, are mounted on the instrument compartment door or on a panel of a blank cell.

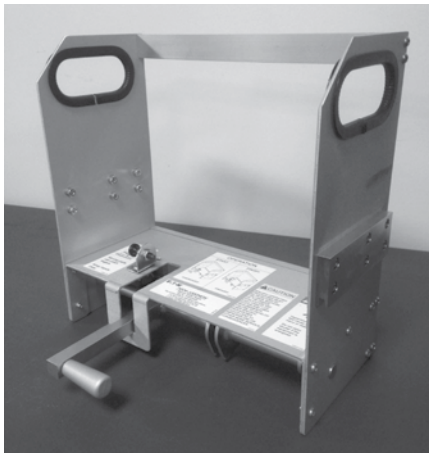
Accessories and Options

Switchgear accessories: Standard accessories furnished with each Magnum PXR switchgear assembly include:

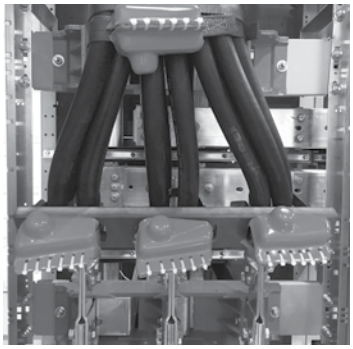
- One breaker racking tool
- Insulating covers or "boots" furnished on live main stationary disconnecting contacts in compartments equipped for future breakers
- Removable cover to block opening in the door when the breaker is temporarily removed from its compartment

Optional Accessories

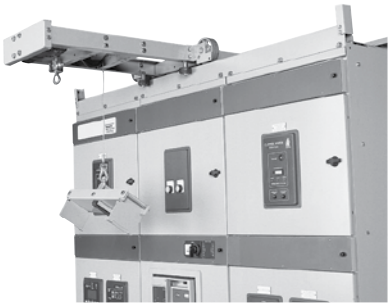
- Traveling type circuit breaker lifter, rail-mounted on top of switchgear
- Floor-running portable circuit breaker lifter and transfer truck with manual lifting mechanism. This requires approximately 84.00 inches (2133.6 mm) deep front aisle space
- Test cabinet for electrically operated breakers, with pushbuttons, control cable and receptacle, for separate mounting
- Optional space heaters to be placed in the bottom of the breaker, cable and bus compartments. Space heaters are provided as standard in outdoor gear to reduce condensation
- Remote racking device (MRR1000) for both breaker racking and operation (open/close) from a safe distance. Mounts to any existing Magnum PXR breaker. Uses standard 120 V, 15 A, single-phase, 60 Hz supply, available from any outlet



Magnum Shutter Module



Cable Lashing Device



Optional Switchgear Mounted Lifter

MRR1000 Remote Racking Device

Enhanced Switchgear Options

- Infrared scanning windows for bus thermal scans
- Optional thermal monitoring for 24/7 viewing and alerting versus basic IR windows
- Maintenance-free (Torque-&-Forget) bus hardware
- Lug booting that provides additional protection against accidental contact to live parts in the cable compartment
- Grounding balls and covers for protecting maintenance personnel downstream of switchgear feeder breakers
- Pendant for remote open and close of electrically operated breakers

Grounding Balls and Covers

Remote Control Pendant

Circuit Breakers

Eaton's type MPS power circuit breakers constitute a complete, modern and rugged line of low-voltage power circuit breakers using Eaton's DE-ION® principle of arc extinction. The breaker family is distinguished by its similarity of appearance and operation frame to frame. All frame sizes are either manually or electrically operated. Refer to **www.eaton.com/CAG** for detailed information on Magnum circuit breakers with Power Xpert Release trip units.

Breaker Features

Four Physical Frame Sizes

Narrow, standard, double narrow and double to promote breaker application in compact modular enclosures and to improve enclosure density.

Contacts

Magnum PXR has silver tungsten moving contacts and silver graphite stationary contacts. The contacts provide a long-wearing, low-resistance joint. The contacts are protected from arcing damage even after repeated interruptions by the "heel-toe" action, which causes the integral arcing contacts to mate before the main contacts part. The arcing contacts then part last, striking the arc away from the main contacts.

The main contacts are of the butt type and are composed of multiple fingers to give many points of contact without alignment being critical.

Stored-Energy Mechanism

A cam-type closing mechanism closes the breaker. It receives its energy from a spring that can be charged by a manual handle on the front of the breaker or by a universal electric motor.

Release of the stored energy is accomplished by manually depressing a button on the front of the breaker or electrically energizing a releasing solenoid.

Arc Chute

There are three basic means of extinguishing an arc: lengthening the arc path; cooling by gas blast or contraction; deionizing or physically removing the conduction particles from the arc path.

The DE-ION principle is incorporated in all Magnum circuit breakers with PXR. This makes faster arc extinguishing possible for a given contact travel, ensures positive interruption and minimum contact burning.

Levering Mechanism

The worm gear levering mechanism is self-contained on the breaker drawout element and engages slots in the breaker compartment. A standard 3/8-inch (10 mm) drive set is used to lever the breaker between the connected, test and disconnected positions.

Mechanical interlocking is arranged so that levering cannot be accomplished unless the breaker is in the opened position.

Protection During Levering Operation
When levering the breaker between the connected, test and disconnected positions, the operator is protected from contact with live parts by the breaker door.

True two-step stored energy closing: Refers to the sequence required to charge and close the breaker.

1. The breaker closing springs are charged either through the manual-charging handle or by the optional charging motor. The breaker is mechanically interlocked to prevent closing of the breaker until the closing springs are fully charged.
2. With the closing springs fully charged, the breaker can then be closed by pressing the manual close pushbutton on the breaker, or by the optional spring release coil through a remote electrical signal.

This means that the energy required to open the breaker is always restored following a closing operation.

"Stored energy" is energy held in waiting, ready to open or close the breaker within five cycles or less. The unique cam and spring design provides necessary energy for a single close-open sequence as well as the energy for multiple charge-close operations such as this possible sequence: charge-close-recharge-open-close-open.

The closing springs are interlocked with the breaker racking mechanism to ensure the closing springs are discharged before the breaker can be removed from the compartment.

Provisions for padlocking: All breakers include provision for padlocking open to prevent electrical or manual closing. This padlocking can secure the breaker in the connected, test or disconnected position by preventing levering of the breaker.

Ease of inspection and maintenance: Magnum circuit breakers with PXR are designed for maximum accessibility and the utmost ease of inspection and maintenance.

Manually operated breakers: Manually operated breakers are equipped with a manual charging handle to charge the closing springs. Manual closing and tripping pushbuttons are used to operate the breaker. Remote closing and tripping can be accomplished by installing optional electric spring release and shunt trip coils. The breaker closing springs must be charged manually, then remote closing and tripping signals can be sent to the breaker.

Electrically operated breakers: Electrically operated breakers are equipped with a spring charging motor and electrically operated spring release and shunt trip coils. The breaker manual charging handle can be used to charge the closing springs when power is not available to the charging motor.

Optional Breaker Accessories

- **Shunt trip device (ST):** Provides for remote electrically controlled breaker opening when energized by a rated voltage input
- **Spring charge motor (MOT):** Charges the breaker closing springs automatically, facilitating remote or local closing. The motor assembly includes its own cut-off switch that changes state at the end of the charging cycle. This contact can be wired out for external indication
- **Spring release device (SR):** Provides for remote electrically controlled breaker closing when its coils are energized by a rated voltage input
- **Undervoltage release (UVR):** Trips the breaker when an existing voltage signal is lost or falls below an established threshold
- **Auxiliary switch:** Up to 6a/6b auxiliary individual dedicated contacts are available for customer use to indicate if the breaker is in the OPEN or CLOSE position
- **Mechanical trip indicator flag:** The red trip indicator flag pops out to provide local visual indication when the PXR trip unit acts to trip the breaker on an overcurrent condition. Available in two options: an interlocked version that mechanically locks out the breaker until the indicator is manually reset and a non-interlocked version for indication only
- **Overcurrent trip switch (OTS/bell alarm):** Provides two Form C contacts that change state when the PXR trip unit acts to trip the breaker. The contacts are available for external indication or customer use and are manually reset by the mechanical trip indicator
- **Padlockable pushbutton cover:** Permits padlocking hinged cover plates to block access to the PUSH ON and PUSH OFF buttons on the breaker faceplate
- **Mechanical operations counter:** Records mechanical operations of the breaker over its installed life
- **Latch check switch:** Provides one Form C contact that changes state when the breaker is ready to close. Can be wired to the spring release device for fast transfer applications or wired for external ready-to-close indication

Magnum PXR Switchgear—Trip Units

Power Xpert Release (PXR) trip unit. Eaton's PXR trip units feature a dependent curve that is depicted in the nameplate by a blue shaded area of the trip curve. The dependent curve affords better protection flexibility. Additionally, all of the trip units have, as standard, thermal memory, 50/60 Hz operation and thermal self-protection at 90 °C.

PXR integral microprocessor-based breaker overcurrent trip systems: Provide maximum reliability with true rms sensing as standard, gives excellent repeatability and requires minimum maintenance.

PXR 20

Trip functions: Magnum PXR trip units provide maximum flexibility and are available in the following configurations dependent on the PXR module chosen. For PXR 20, LSI and LSIG, and for PXR 25, LSI and LSIG. Please note that with the flexibility of the PXR trip units, the A letter is no longer needed as the ground fault functionality is completely programmable. In each case, either the short delay or instantaneous (not both) functions may be defeated. This reduces the need for spare breaker inventories and provides maximum usage of interchangeable breakers.

PXR 20: Enables the user as many as nine phase and ground current protection settings for maximum flexibility in trip-curve shaping and multi-unit coordination, and adds zone selective interlocking. Unit is programmable via dials on the front of the unit, an LCD display with navigation buttons, and via micro-B USB and PXPM software. Provides 0.5% accuracy current metering, ability to enable/disable ground fault, along with the Arcflash Reduction Maintenance System.

PXR 25: Provides programmability for more sophisticated distribution systems. Adds Arcflash Reduction Maintenance System.

- Increased protection and coordination capabilities
- Systems monitoring information including power factor, voltage current, harmonic distortion values, and waveform capture with a three-line, (eight characters per line) with an LCD display
- Multiple programmable contacts for customer use (quantity changes based on double/standard versus narrow frames)
- Time stamping of trip events for improved troubleshooting and diagnostics
- Accuracy of 0.5% on metered values and 1% on energy and power
- Systems diagnostic information
- Multiple communications options including ModbusTCP, PROFIBUS and PROFINET—Communication Accessory Modules (CAMs) currently not available in low voltage switchgear, only Modbus via PX dashboard is configured
- Breaker health menu
- Additional protection functions:
  - ❏ Undervoltage/overvoltage
  - ❏ Underfrequency/overfrequency
  - ❏ Voltage unbalance
  - ❏ Reverse power

Zone selective interlocking: The Digitrip RMS zone selective interlocking (ZSI) capability provides positive system coordination without time delays. ZSI allows the breaker closest to the fault to trip without any preset time delay. The breaker closest to the fault trips first, while the remainder of the distribution system remains online, thus avoiding unnecessary and costly downtime.

Arcflash Reduction Maintenance System

The Arcflash Reduction Maintenance System Maintenance Mode function of the Power Xpert Release trip units can reduce arc flash incident energy that is generated on a fault condition. This is accomplished by a parallel trip circuit that, when armed, provides a fast-acting response to the fault. This is separate from the normal system protection setting of instantaneous. The PXR Arcflash Reduction Maintenance System Maintenance Mode operates at the same time as the normal LSIG protection. For most fault conditions as shown in the **Figure 20.7-1** time-current curve, the Arcflash Reduction Maintenance System protection will override the LSI protection and the normal LSIG protection provides an added backup function. Eaton's Arcflash Reduction Maintenance System employs a separate, peak-sensing trip circuit that eliminates trip unit's microprocessor latencies, resulting in clearing times that are faster than standard instantaneous tripping. This provides superior arc flash reduction compared to competitors' systems that simply lower the standard instantaneous pickup set point or employ ZSI tripping.

There are three ways to arm the Maintenance Mode setting. One method is locally at the trip unit front panel. Both the PXR 20 and the PXR 25 have a two-position switch on the front of the trip unit for the Maintenance Mode. Turning the switch to the ON position will locally arm the function. The setting for the level of reduction is in the SYSTEM submenu of programmable settings (PGM SET).

For the second method, a remote switch or external relay contact wired through the breaker secondary terminals can remotely arm the Maintenance Mode protection function. A high-quality gold-plated or palladium contact is required in this application.

The third method is via a communication device. The trip unit display will show a confirmation screen that verifies the Maintenance Mode function has been set. A Dashboard or Dashboard Lite display interface module can be used as one of the communication methods to arm the protection function remotely from a safe distance.

The Arcflash Reduction Maintenance System setting has five unique settings (1.5, 2.5, 4.0, 6.0, 10.0 x I_n) for the pickup of the reduction setting. This setting level can be used to prevent inrush currents or load surges from triggering the Maintenance Mode function. The PXR trip units are now able to go to a new lower setting of 1.5 X the frame rating I_n for the maximum reduction of arc flash energy. For all three arming methods, the PXR trip units provide a local indication as a blue LED ring around the ON/OFF switch to confirm the Maintenance Mode function is on or off. In addition, one of the three programmable relays in the frame module of the breaker can be set to indicate the status of the Maintenance Mode protection. This normally open relay contact allows the user to wire in an external stack light or annunciator for remote indication.

The Maintenance Mode function will provide fast tripping even when the regular Instantaneous is set to OFF. The instantaneous LED position is also used to indicate a trip initiated by the Maintenance Mode setting. The LCD display, if powered, will indicate the message Maintenance Mode Trip.

Maintenance Mode Setting

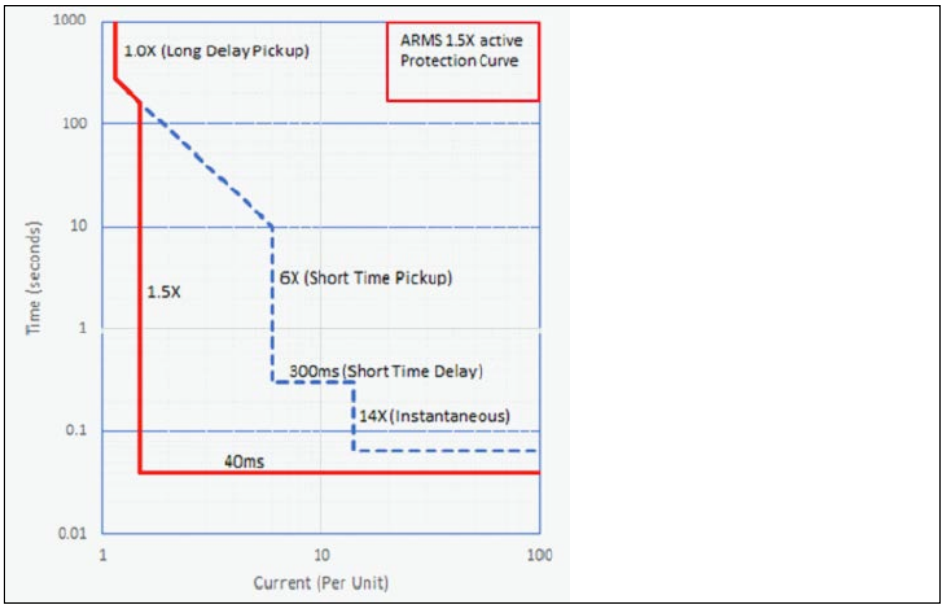


Figure 20.7-1. Arcflash Reduction Maintenance System Time-Current Curve

Table 20.7-3. Magnum PXR Switchgear Class UL 1066 Low-Voltage Power Circuit Breakers

Frame Amperes	Breaker Type	Frame Type	rms Symmetrical Current Ratings kA 50/60 Hz ①			Short-Time Withstand Rating	Fixed Internal Instantaneous Trip	Available Current Sensor and Rating Plugs for PXR Trip Unit (Establishes Breaker I_n Rating)
			Interrupting at 254 Vac	Interrupting at 508 Vac	Interrupting at 635 Vac			
800	MPN-408 MPN-608 MPN-C08	Narrow Narrow Narrow	42 65 100	42 65 100	42 65 65	42 65 20	— — 18 x I_n	100, 200, 250, 300, 400, 600, 800
	MPS-408 ② MPS-608 ② MPS-808 ② MPS-C08 ②	Standard Standard Standard Standard	42 65 85 100	42 65 85 100	42 65 85 100	42 65 85 85	— — — 85	
1600	MPN-416 MPN-616 MPN-C16	Narrow Narrow Narrow	42 65 100	42 65 100	42 65 65	42 65 30	— — 18 x I_n	100, 200, 250, 300, 400, 600, 800, 1000, 1200, 1600
	MPS-616 ② MPS-816 ② MPS-C16 ②	Standard Standard Standard	65 85 100	65 85 100	65 85 100	65 85 85	— — 85	
2000	MPN-620 MPN-C20	Narrow Narrow	65 100	65 100	65 65	65 35	— 18 x I_n	100, 200, 250, 300, 400, 600, 800, 1000, 1200, 1600, 2000
	MPS-620 ② MPS-820 ② MPS-C20 ②	Standard Standard Standard	65 85 100	65 85 100	65 85 100	65 85 85	— — 85	
3200	MPS-632 ② MPS-832 ② MPS-C32 ②	Standard Standard Standard	65 85 100	65 85 100	65 85 100	65 85 85	— — 85	100, 200, 250, 300, 400, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000, 3200
4000	MPN-640 MPN-840 MPN-C40	Double Narrow Double Narrow Double Narrow	65 85 100	65 85 100	65 65 65	65 85 100	— — —	2000, 2500, 3200, 4000
	MPS-840 ② MPS-C40 ②	Double Double	85 100	85 100	85 100	85 100	— —	
5000	MPS-850 ② MPS-C50 ②	Double Double	85 100	85 100	85 100	85 100	— —	2500, 3200, 4000, 5000
6000	MPS-C60 ②	Double	100	100	100	100	—	3200, 4000, 5000, 6000

① Interrupting ratings shown based on breaker equipped with integral PXR trip unit. Interruption ratings for non-automatic breakers are equal to the published short-time withstand rating. These interruption ratings are based on the standard duty cycle consisting of an open operation, a 15-second interval and a close-open operation, in succession, with delayed tripping in case of short-delay devices. The standard duty cycle for short-time ratings consists of maintaining the rated current for two periods of 0.5 second each, with a 15-second interval of zero current between the two periods.

② 4-pole configuration available.

Metering Devices

Power Xpert Meter 1000

Power Xpert Meter 3000

Power Xpert Meter 4000/6000/8000

The Power Xpert 1000 Meters

The Power Xpert Meter 1000 series power and energy meters monitor the most critical aspects of an electrical distribution system. This premier metering instrument uses the latest in advanced technology to make it simple to use, powerful, scalable and highly flexible.

The Power Xpert Meter 1000 (PXM1000), 1100 (PXM1100), 1200 (PXM1200) and 1300 (PXM1300) deliver a cost-effective solution for energy and sub-metering applications. These three-phase meters provide high accuracy and advanced features in the standard 4-inch form factor and can be expanded with multiple modular I/O options.

Meter series benefits include:

- Utility billing accuracy that will help meet stringent customer specifications
- Ease of use in multiple applications
- Can be field expanded with multiple modular protocols:
  - I/O options (DI/DO, RO, AI/AO)
  - Communications options (8 GB, ModbusTCP/IP, BACnet/IP, COMTRADE, Dual RJ-45, EtherNet/IP, IPV6)

The Power Xpert 3000 Meter

The Power Xpert Meter 3000 (PXM3000) provides an extensive array of data, including power quality, energy and demand readings so you can manage energy utilization to help reduce peak demand charges and power factor penalties, and to identify excessive energy consumption.

Utilizing both a premier web interface with cloud storage and onboard data storage up to 4 GB, the PXM3000 allows you to keep your data at your fingertips to help reduce your overall energy usage and better manage your energy costs.

Key features include:

- Rich web interface
- Multiple protocols including Modbus RTU/TCP and BACnet/IP
- Onboard historical data charts
- Onboard waveform display
- Optional digital/analog inputs and outputs
- Storage of up to three custom data logs

Power Xpert Meter 4000/6000/8000

The Power Xpert Meter 4000/6000/8000 series is an internet-enabled (including a built-in web server) power quality and energy meter with comprehensive power and energy measurement, and integrated quality analysis.

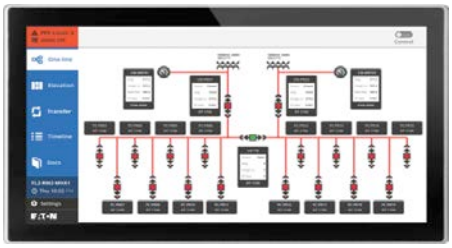
These meters allow you to use a standard web browser to surf the meter and visualize a waveform and analyze trends.

Meter series benefits include:

- Accurate detection of fast transients
- Early warning of impending problems
- At-a-glance view of power quality
- Reduces power monitoring cost
- Supports continuous, non-disruptive monitoring
- Accessible via the ethernet
- Uses industry-standard communication protocols

Communications

PXG900



Dashboard

Power Xpert Gateway 900

Ethernet communications available via Power Xpert Gateway PXG900.

- ModbusTCP connection
- Basic web browser view
- Optional 12-inch display

Power Xpert Dashboard

- The Power Xpert Dashboard is an intelligent collection of views displayed on a single touchscreen from switchgear-mounted devices including meters, relays, trip units and transfer controls
- The Dashboard can be integral to the switchgear assembly or remotely mounted
- Detail information about each breaker is displayed
- Remote enabling of the Arcflash Reduction Maintenance System via communication as a standard
- Ability to configure/monitor alarms for various devices
- Remotely open/close circuit breakers through control mode
- Initiate a transfer scheme in a main-tie-main switchgear for uninterrupted power supply

Automatic Transfer

Programmable Logic Controller

ATC-900

Automatic transfer and intelligent control packages are as follows:

- Eaton ATC-900 controller
  - Automatic transfer for a two source lineup with no tie breaker
  - Additional option for a 7-inch screen available
- Eaton programmable logic controller (PLC) with Eaton touch screen
  - Automatic transfer for main-tie-main arrangement
  - Standard sequence provided with configurable options
  - Custom sequence of operations available
- Eaton Power Systems Control (offered through Eaton's Engineering Services & Systems)
  - Custom automatic transfers
  - On-site commissioning
  - Integration into existing networks

For information on automatic transfer and intelligent control solutions, visit:

High Resistance Grounding

General Description

Where continuity of service is a high priority, high-resistance grounding can add the safety of a grounded system while minimizing the risk of service interruptions due to grounds. The concept is a simple one: provide a path for ground current via a resistance that limits the current magnitude, and monitor to determine when an abnormal condition exists. This provides for maximum continuity of service, because no tripping occurs for the resistance limited ground fault.

The ground current path is provided at the point where the service begins, by placing resistance in the connection from system neutral to ground. Control equipment continuously measures ground current; a relay detects when the current exceeds a predetermined level. An alarm alerts building personnel that a ground exists. The system has built-in fault tracing means to assist in finding the source of the ground. An integral transformer provides control power from the primary source.

Standard Features

- Current sensing ground fault detection (1–5 A pickup/0.5–20 second delay)
- Ground current transformer (10/10 ratio)
- Control circuit disconnect switch (fused)
- Lockable door handle
- Ground current ammeter (0–10 A, 1% accuracy)
- Indicating lights:
  - Red (ground fault)
  - Green (normal)
  - White (pulse)
- Adjustable pulsing timer (0–10 seconds)
- Tapped resistors (1–5 A)
- Three-position selector switch (normal, pulse, test)
- Control switch for manual or automatic reset
- Ground fault contacts (1NO/1NC)
- Shorting terminal block for ground current transformer
- UL label
- Rated for use up to 200 kA fault current system
- Front accessible
- Nylon flag type wiremarkers
- Three “zig-zag” or “wye-broken delta” grounding transformers for systems without a neutral point

Integrated HRG

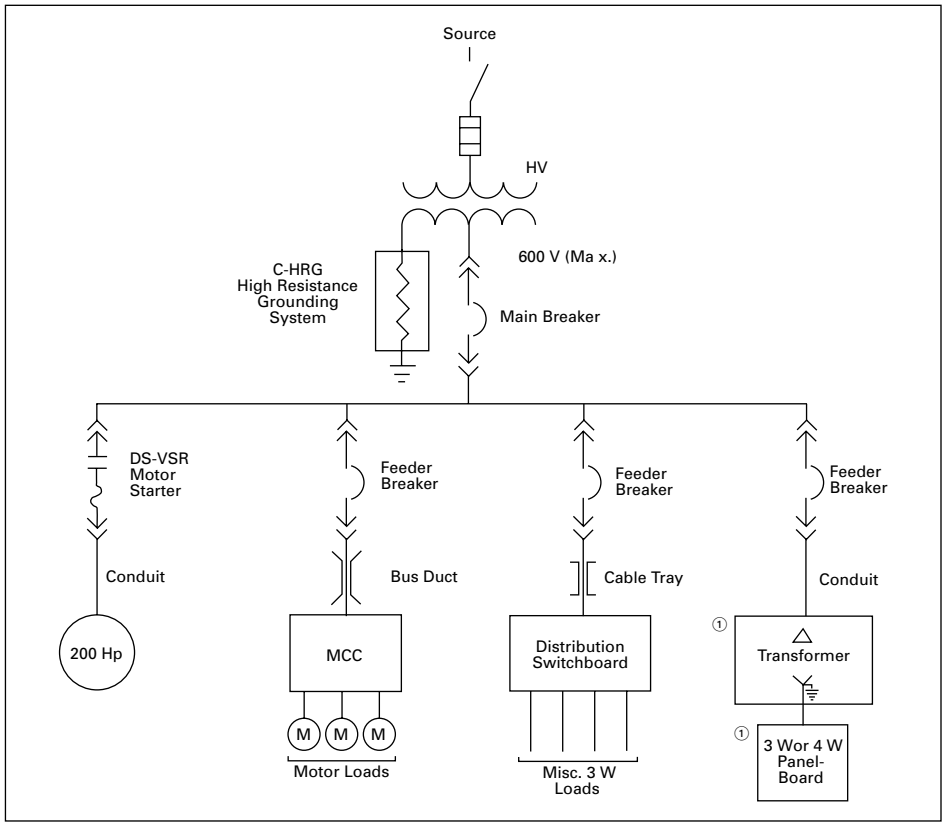


Figure 20.7-2. Typical Distribution System

① Phase-to-neutral loads require a delta-wye distribution transformer. The neutral on the secondary side of this transformer must be solidly grounded.

Surge Protection Devices

Integrated SPDs

Eaton integrates our industry-leading SPD Series surge protective devices into panelboard and switchboard assemblies. Lead length is kept to a minimum to maximize SPD performance. Integrated SPD units are UL listed and labeled to UL 1449 3rd Edition.

Key features include:

- Thermally protected metal oxide varistor (MOV) technology
- 20 kA nominal discharge current (I_n) rating (maximum rating assigned by UL)
- 50 through 400 kA surge current capacity ratings
- Three feature package options (basic, standard, and standard with surge counter)
- 200 kA short-circuit current rating (SCCR)
- 10-year warranty

The breadth of the SPD Series' features, options and configurations ensures that the correct unit is available for all electrical applications, including service entrances, distribution switchboards, panelboards and point-of-use applications.

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

Table 20.7-4. Side-By-Side Comparison of the SPD Series' Available Feature Packages

Feature Package Comparison	Basic	Standard	Standard with Surge Counter
Surge protection using thermally protected MOV technology	■	■	
Dual-colored protection status indicators for each phase	■	■	
Dual-colored protection status indicators for the N-G protection mode	■	■	
Audible alarm with silence button		■	■
Form C relay contact		■	■
EMI/RFI filtering, providing up to 50 dB of noise attenuation from 10 kHz to 100 MHz		■	■
Surge counter with reset button			■

Power Xpert SPD

- The Power Xpert SPD is an advanced monitoring display to track and record surge events and remaining protection status on each phase
- Surge events are categorized as low, medium and high in accordance to the IEEE standard C62.41.These events are logged with time and date stamps
- The RJ45 ethernet port provides communication between the surge device and the LAN connection, ModbusTCP/IP or BACnet/IP protocols
- Ability to access the remote webpage through Power Xpert Gateway 900 or Power Xpert Dashboard
- Email alarm notifications are available when configured through Power Xpert Gateway 900 or Power Xpert Dashboard

Breaker Layouts

Magnum PXR Rear-Accessible Switchgear

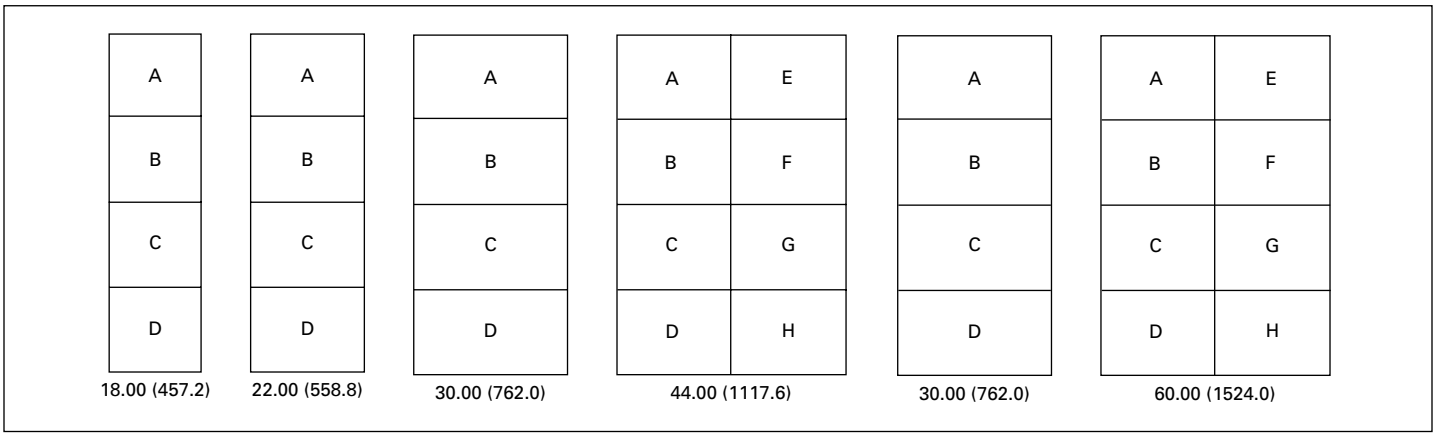


Figure 20.7-3. Breaker Structures—Dimensions in Inches (mm)

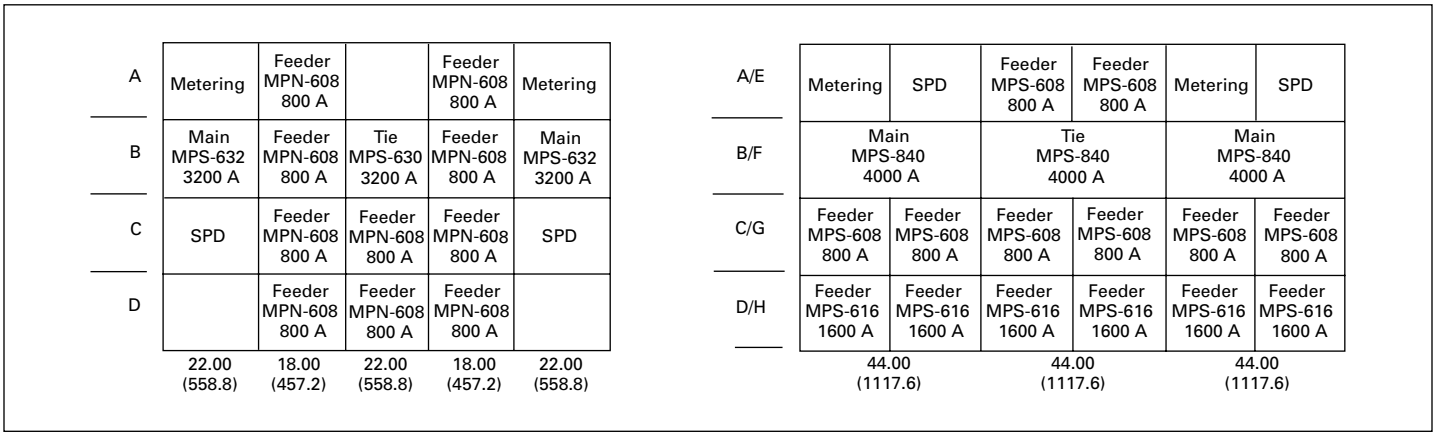


Figure 20.7-4. Main-Tie-Main Typical Layouts—Dimensions in Inches (mm)

Note: Breaker and cell utilization should keep load amperes below rating of a main breaker due to vertical bus limitations. Cable used in the conduit areas are limited to 75 °C ampacity values per the NEC for ampacity calculations. Any cell not used as a feeder breaker may be a blank, or a feeder breaker provision for future breakers, or SPD surge. Section bus sized per main bus rating (maximum) or by ANSI C37.20.1.

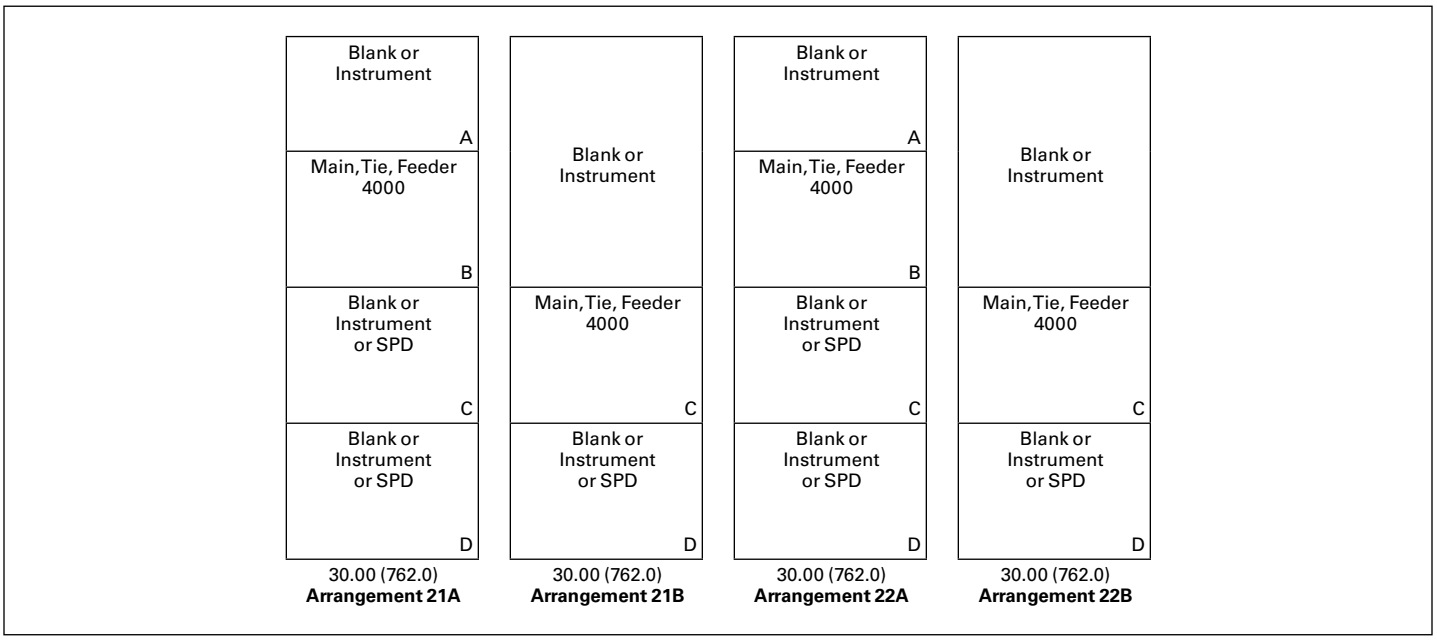


Figure 20.7-5. Typical Structure and Breaker Arrangements—4000 A, MPN Mains, Ties, Feeders and Miscellaneous—Dimensions in Inches (mm)
Note: Minimum structure depth is 72 inches (1829 mm).

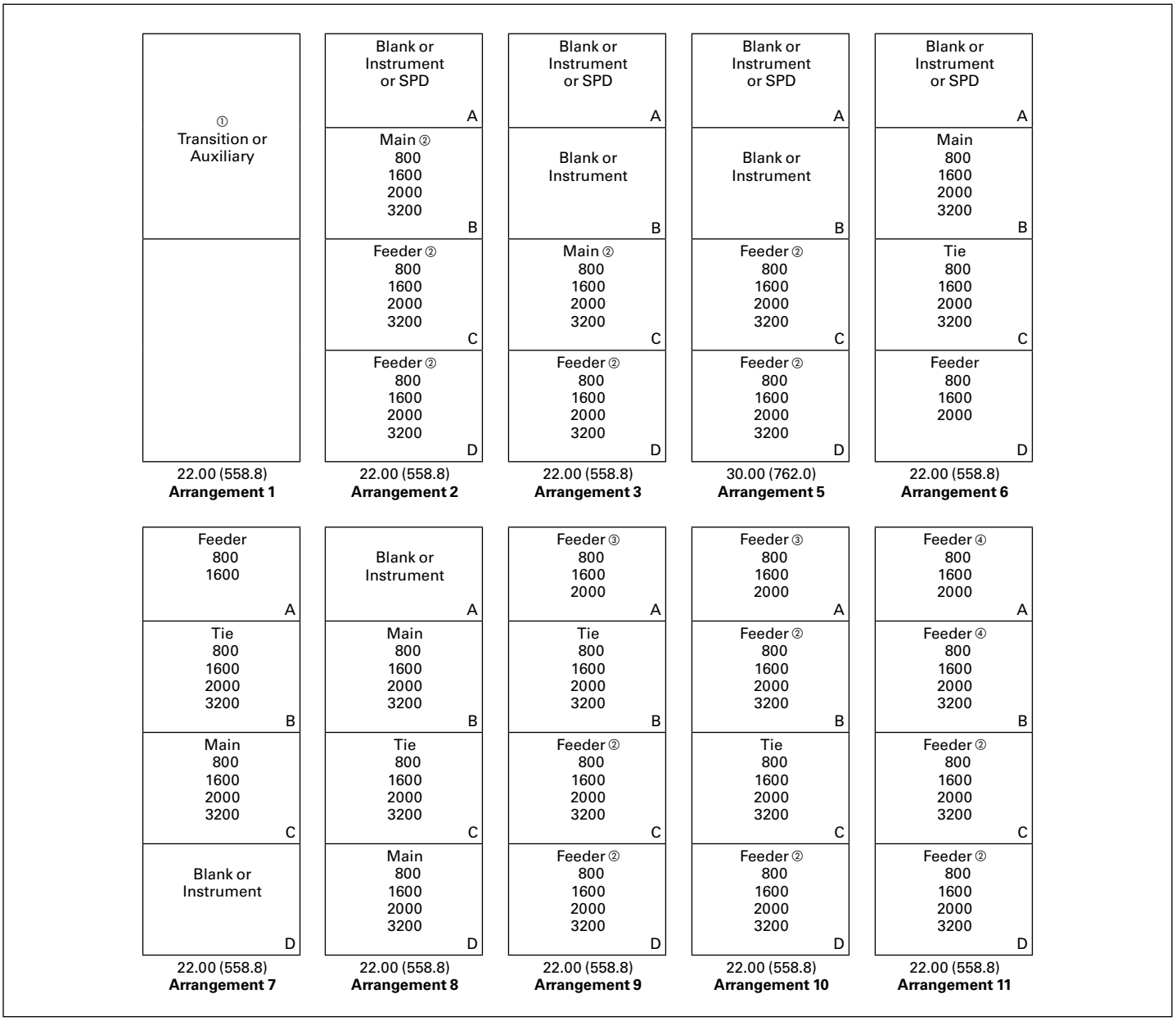


Figure 20.7-6. Typical Structure and Breaker Arrangements—Magnum PXR Mains, Ties, Feeders and Miscellaneous, 3200 A and Below—Dimensions in Inches (mm) ⑤

① A transition section is required when close-coupling to an Eaton sourced liquid filled transformer. A transition section is required when close coupling to non-Eaton sourced transformers. A transition section is required when close coupling to other distribution equipment.

② A maximum of two 3200 A breakers are permitted per 22.00-inch (558.8 mm) width of switchgear, one of which must be a main or tie. For a 3200 A frame breaker mounted in the same enclosure with a 4000 A or 5000 A main or tie, contact Eaton.

③ Contact Eaton for placement of 2000 A frame breaker in this compartment.

④ A maximum of three 2000 A breakers are 22.00-inch (558.8 mm) width of switchgear. If three are required, positions B, C and D must be used.

⑤ Any 22.00-inch (558.8 mm) wide compartment can be a blank or instrument compartment.

Note: Breaker and cell utilization should keep load amperes below rating of a main breaker due to vertical bus limitations. Cable used in the conduit areas are limited to 75 °C ampacity values per the NEC for ampacity calculations. Any cell not used as a feeder breaker may be a blank, or a feeder breaker provision for future breakers, or SPD surge. Section bus sized per main bus rating (maximum) or by ANSI C37.20.1.

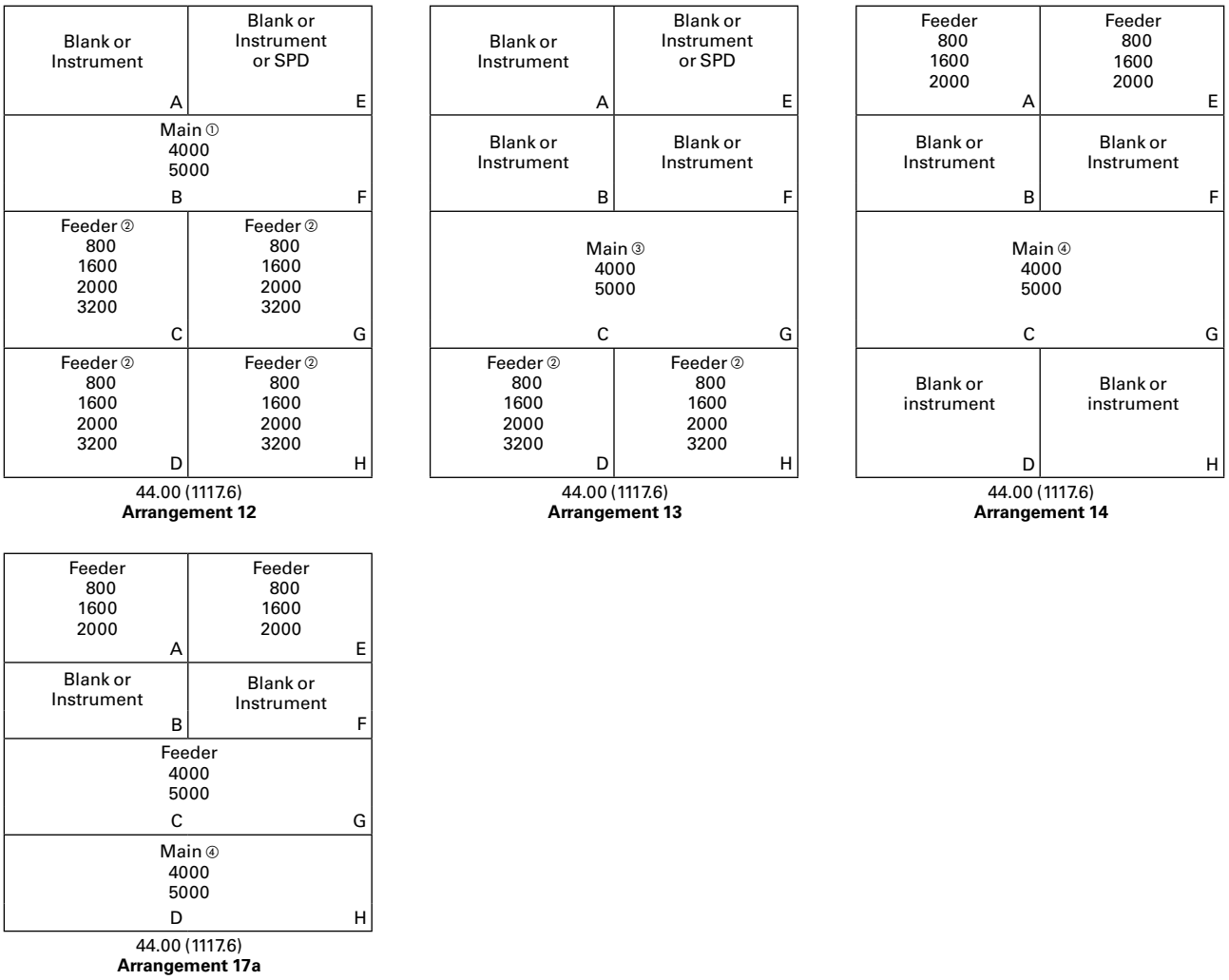


Figure 20.7-7. Typical Structure and Breaker Arrangements—Magnum PXR Mains, 4000 A and 5000 A—Dimensions in Inches (mm) ⑤

① If you have four-wire service and service entrance requirement, busway connection or cable connection, the bus or cables must enter from the top.

② A maximum of two 3200 A breakers are permitted per 22.00-inch (558.8 mm) width of switchgear, one of which must be a main or tie. For a 3200 A frame breaker mounted in the same enclosure with a 4000 A or 5000 A main or tie, contact Eaton.

③ Service entrance option is not available with feeder breakers mounted in this structure.

④ If you have four-wire service and service entrance requirement, busway connection or cable connection, the bus or cables must enter from the bottom.

⑤ Any 22.00-inch (558.8 mm) wide compartment can be a blank or instrument compartment with the following exception: A 44.00-inch (1117.6 mm) wide instrument compartment must be adjacent to another 44.00-inch (1117.6 mm) wide compartment in the structure.

Note: Breaker and cell utilization should keep load amperes below rating of a main breaker due to vertical bus limitations. Cable used in the conduit areas are limited to 75 °C ampacity values per the NEC for ampacity calculations. Any cell not used as a feeder breaker may be a blank, or a feeder breaker provision for future breakers, or SPD surge. Section bus sized per main bus rating (maximum) or by ANSI C37.20.1.

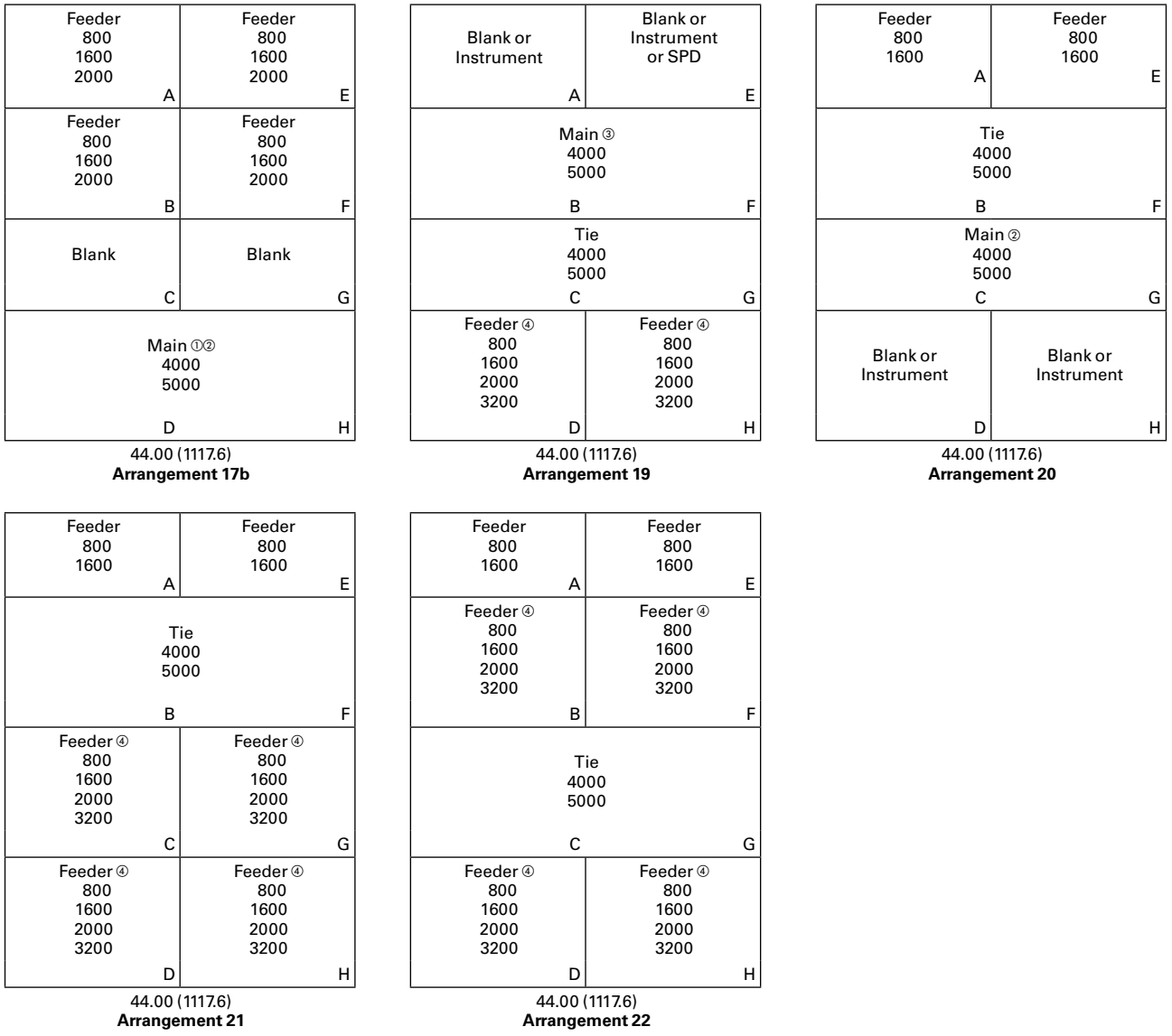


Figure 20.7-8. Typical Structure and Breaker Arrangements—Magnum PXR Mains and Ties, 4000 A and 5000 A—Dimensions in Inches (mm) ⑤

① Fixed-mounted main breakers are not permitted in the "D" position.

② If you have four-wire service and service entrance requirement, busway connection or cable connection, the bus or cables must enter from the bottom.

③ If you have four-wire service and service entrance requirement, busway connection or cable connection, the bus or cables must enter from the top.

④ A maximum of two 3200 A breakers are permitted per 22.00-inch (558.8 mm) width of switchgear, one of which must be a main or tie. For a 3200 A frame breaker mounted in the same enclosure with a 4000 A or 5000 A main or tie, contact Eaton.

⑤ Any 22.00-inch (558.8 mm) wide compartment can be a blank or instrument compartment with the following exception: A 44.00-inch (1117.6 mm) wide instrument compartment must be adjacent to another 44.00-inch (1117.6 mm) wide compartment in the structure.

Note: Breaker and cell utilization should keep load amperes below rating of a main breaker due to vertical bus limitations. Cable used in the conduit areas are limited to 75 °C ampacity values per the NEC for ampacity calculations. Any cell not used as a feeder breaker may be a blank, or a feeder breaker provision for future breakers, or SPD surge. Section bus sized per main bus rating (maximum) or by ANSI C37.20.1.

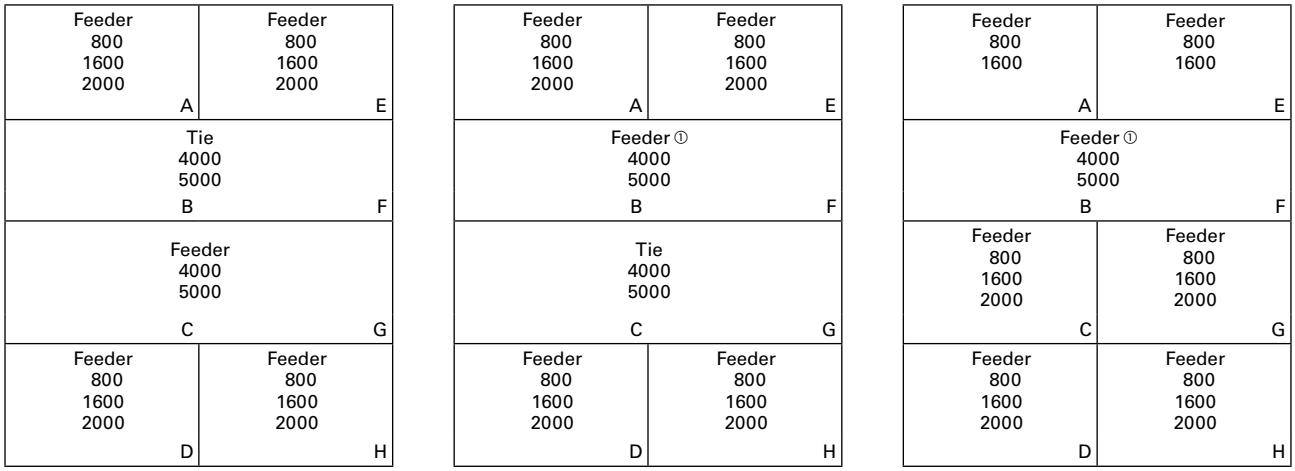


Figure 20.7-9. Typical Structure and Breaker Arrangements—Magnum PXR Ties and Feeders, 4000 A and 5000 A—Dimensions in Inches (mm) ②

① "B" and "D" position feeders must be reverse fed.

② Any 22.00-inch (558.8 mm) wide compartment can be a blank or instrument compartment with the following exception: A 44.00-inch (1117.6 mm) wide instrument compartment must be adjacent to another 44.00-inch (1117.6 mm) wide compartment in the structure.

Note: Breaker and cell utilization should keep load amperes below rating of a main breaker due to vertical bus limitations. Cable used in the conduit areas are limited to 75 °C ampacity values per the NEC for ampacity calculations. Any cell not used as a feeder breaker may be a blank, or a feeder breaker provision for future breakers, or SPD surge. Section bus sized per main bus rating (maximum) or by ANSI C37.20.1.

Magnum PXR Rear-Accessible Switchgear

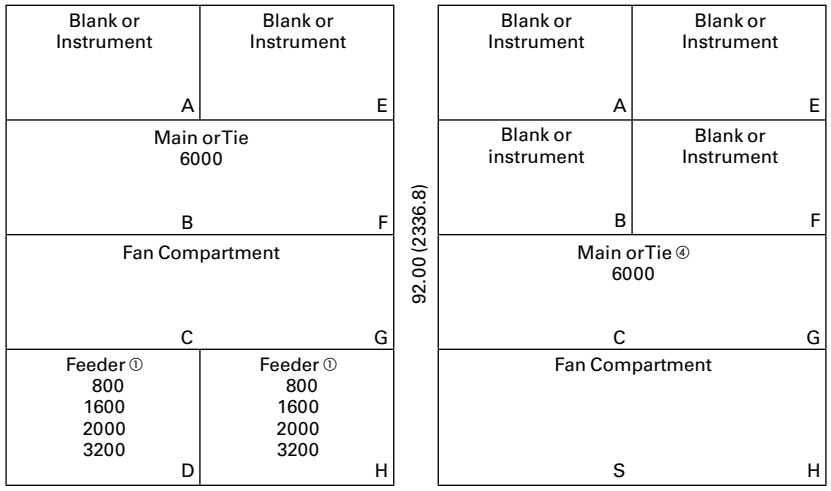


Figure 20.7-10. Typical Structure and Breaker Arrangements—Magnum PXR Mains and Ties, 6000 A —Dimensions in Inches (mm) ③

① A maximum of two 3200 A breakers are permitted per 22.00-inch (559 mm) width of switchgear, one of which must be a main or tie. For a 3200 A frame breaker mounted in the same enclosure with a 4000 A, 5000 A or 6000 A main or tie, contact Eaton.

② When a top-of-gear breaker lifter is used, height is 99.00 inches (2514.6 mm) total.

③ Any 22.00-inch (558.8 mm) wide compartment can be a blank or instrument compartment with the following exception: 44.00-inch (1117.6 mm) wide instrument compartment must be adjacent to another 44.00-inch (1117.6 mm) wide compartment in the structure.

④ May need a 44.00-inch (1117.6 mm) wide section on both sides of the tie for layout to be correct.

Note: Breaker and cell utilization should keep load amperes below rating of a main breaker due to vertical bus limitations. Cable used in the conduit areas are limited to 75 °C ampacity values per the NEC for ampacity calculations. Any cell not used as a feeder breaker may be a blank, or a feeder breaker provision for future breakers, or SPD surge. Section bus sized per main bus rating (maximum) or by ANSI C37.20.1.

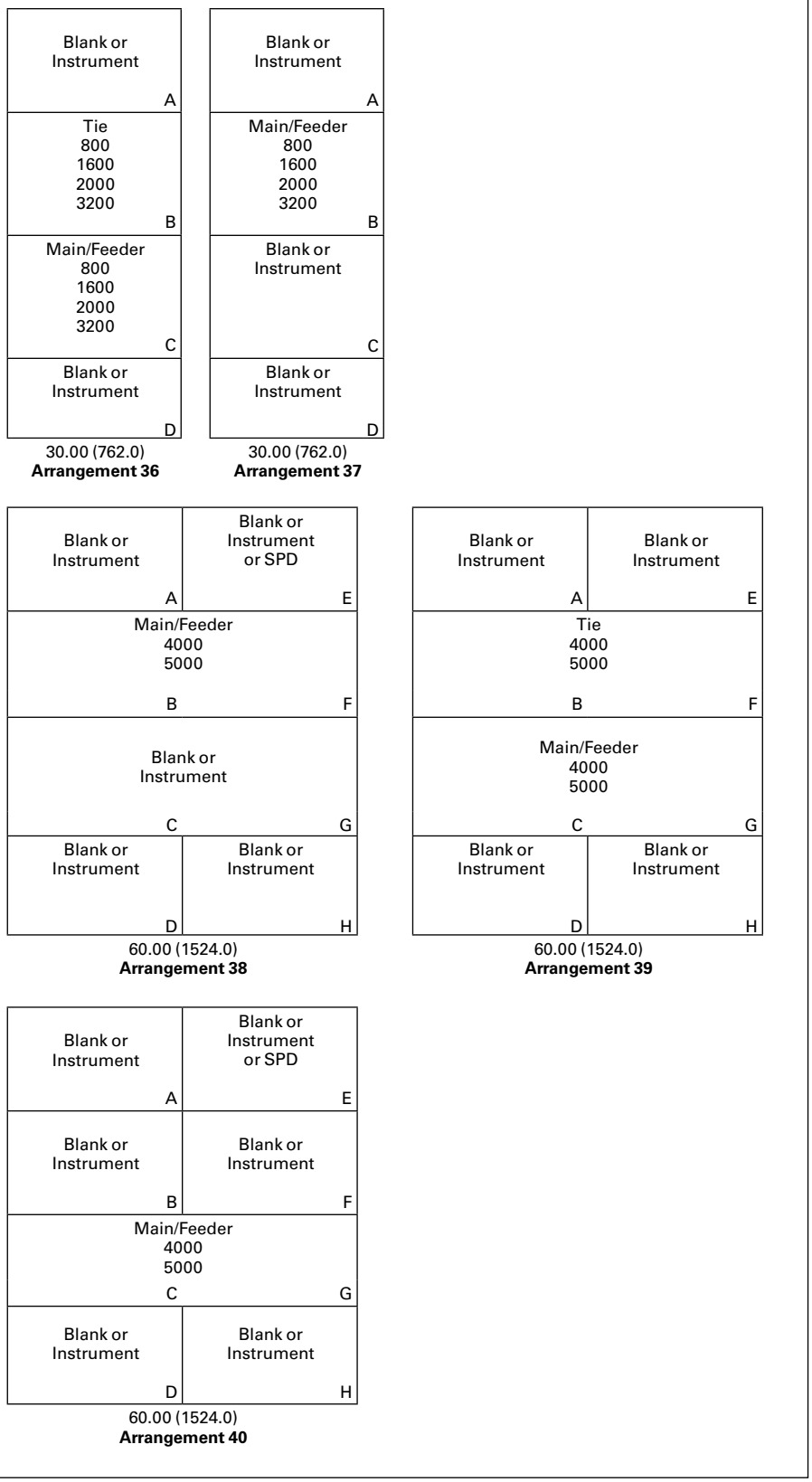


Figure 20.7-11. Typical Structure and Breaker Arrangements—Magnum PXR 4-Pole Breakers—Dimensions in Inches (mm)

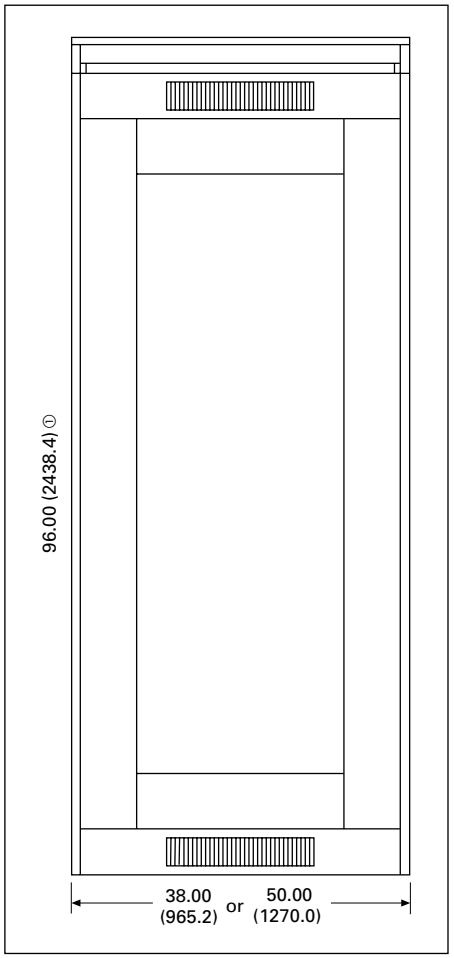


Figure 20.7-12. Integrated Group-Mounted Molded Case Circuit Breaker Switchboard

① When a top-of-gear breaker lifter is used, height is 99.00 inches (2514.6 mm) total.

Note: Structures using molded case breakers for distribution will be UL 891 rated with 30-cycle bus bracing.

Structure Dimensions

Conduit Area Location

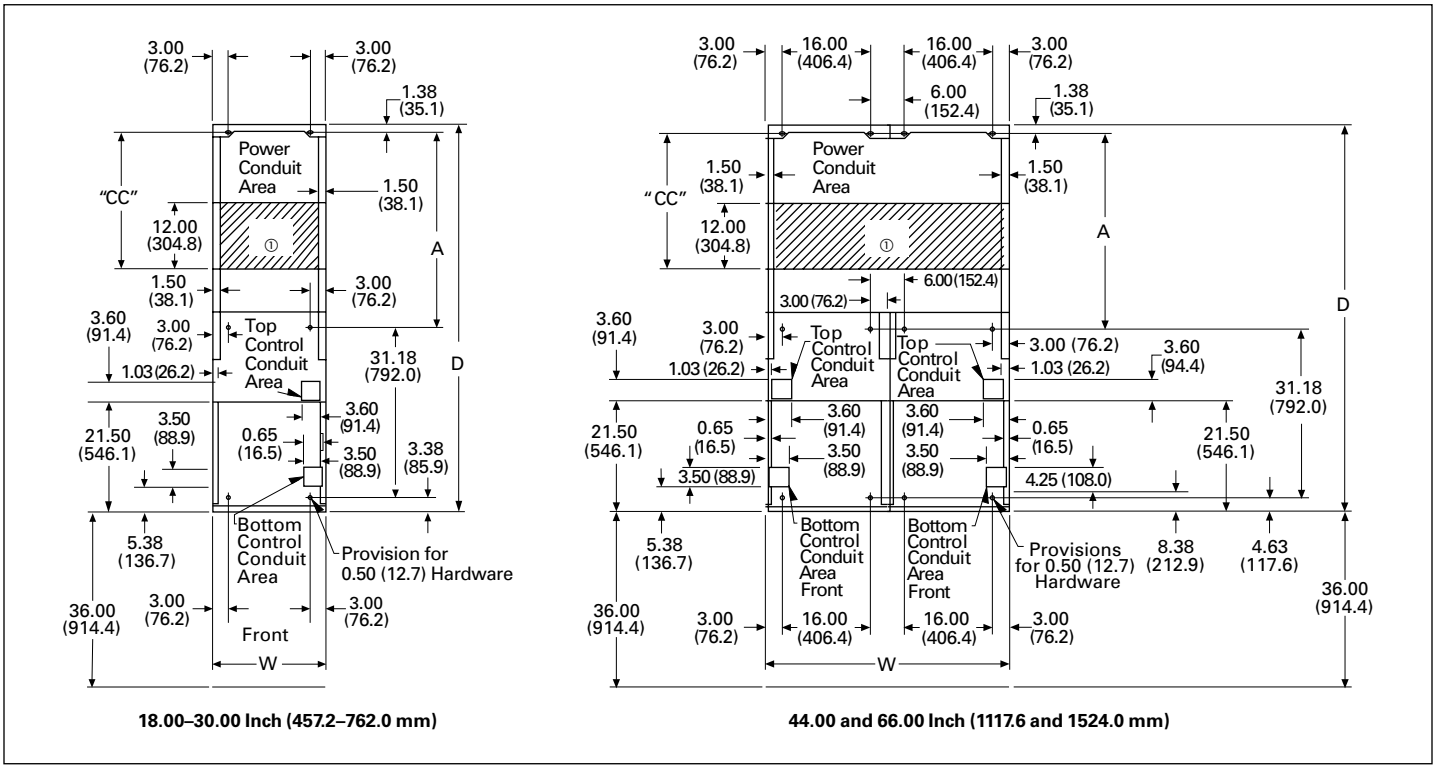


Figure 20.7-13. Floor Plans and Available Conduit Space—18.00, 22.00, 30.00, 44.00, 60.00 Inch (457.2, 558.8, 762.0, 1117.6, 1524.0 mm) Wide Rear-Access Structures—Dimensions in Inches (mm)

① This dimension is reduced by 12.00 inches (304.8 mm) when vertical section is close coupled to a dry-type transformer due to secondary bus connections.

Note: See **Table 20.7-5** for further information on cable and conduit recommendations.

Table 20.7-5. Rear-Access Structure Dimensions in Inches (mm)

W	D	A	CC	Recommended Number of Conduits
				4.00 Inch (101.6 mm)
18.00 (457.2)	54.00 (1371.6) 60.00 (1524.0) 66.00 (1676.4) 72.00 (1828.8) 78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	18.00 (457.2) 24.00 (609.6) 30.00 (762.0) 36.00 (914.4) 42.00 (1066.8) 48.00 (1219.2) 54.00 (1371.6)	7.30 (185.4) 13.30 (337.8) 19.30 (490.2) 25.30 (642.6) 31.30 (795.0) 37.30 (947.4) 43.30 (1099.8)	2 4 6 8 10 12 16
22.00 (558.8)	54.00 (1371.6) 60.00 (1524.0) 66.00 (1676.4) 72.00 (1828.8) 78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	18.00 (457.2) 24.00 (609.6) 30.00 (762.0) 36.00 (914.4) 42.00 (1066.8) 48.00 (1219.2) 54.00 (1371.6)	7.30 (185.4) 13.30 (337.8) 19.30 (490.2) 25.30 (642.6) 31.30 (795.0) 37.30 (947.4) 43.30 (1099.8)	3 6 9 12 15 18 21
24.00 (609.6)	60.00 (1524.0) 66.00 (1676.4) 72.00 (1828.8) 78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	24.00 (609.6) 30.00 (762.0) 36.00 (914.4) 42.00 (1066.8) 48.00 (1219.2) 54.00 (1371.6)	9.08 (230.6) 15.08 (383.0) 21.08 (535.4) 27.08 (687.8) 33.08 (840.2) 39.08 (992.6)	5 8 12 15 18 21
30.00 (762.0)	54.00 (1371.6) 60.00 (1524.0) 66.00 (1676.4) 72.00 (1828.8) 78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	18.00 (457.2) 24.00 (609.6) 30.00 (762.0) 36.00 (914.4) 42.00 (1066.8) 48.00 (1219.2) 54.00 (1371.6)	7.30 (185.4) 13.30 (337.8) 19.30 (490.2) 25.30 (642.6) 31.30 (795.0) 37.30 (947.4) 43.30 (1099.8)	4 8 12 16 20 24 28
44.00 (1117.6)	54.00 (1371.6) 60.00 (1524.0) 66.00 (1676.4) 72.00 (1828.8) 78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	18.00 (457.2) 24.00 (609.6) 30.00 (762.0) 36.00 (914.4) 42.00 (1066.8) 48.00 (1219.2) 54.00 (1371.6)	7.30 (185.4) 13.30 (337.8) 19.30 (490.2) 25.30 (642.6) 31.30 (795.0) 37.30 (947.4) 43.30 (1099.8)	7 14 21 28 35 42 49
60.00 (1524.0)	54.00 (1371.6) 60.00 (1524.0) 66.00 (1676.4) 72.00 (1828.8) 78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	18.00 (457.2) 24.00 (609.6) 30.00 (762.0) 36.00 (914.4) 42.00 (1066.8) 48.00 (1219.2) 54.00 (1371.6)	7.30 (185.4) 13.30 (337.8) 19.30 (490.2) 25.30 (642.6) 31.30 (795.0) 37.30 (947.4) 43.30 (1099.8)	8 16 24 32 40 48 56

Section Views

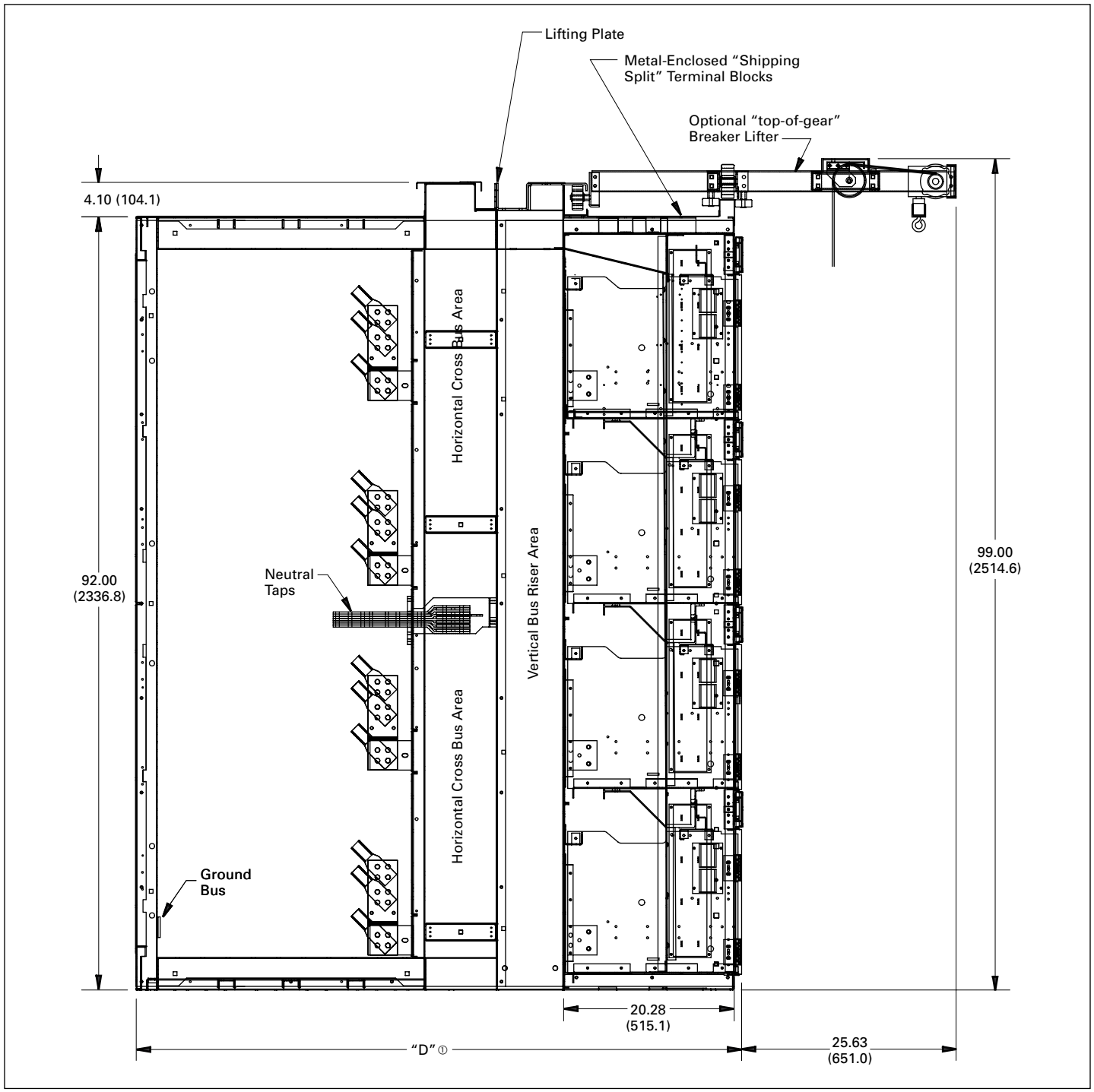
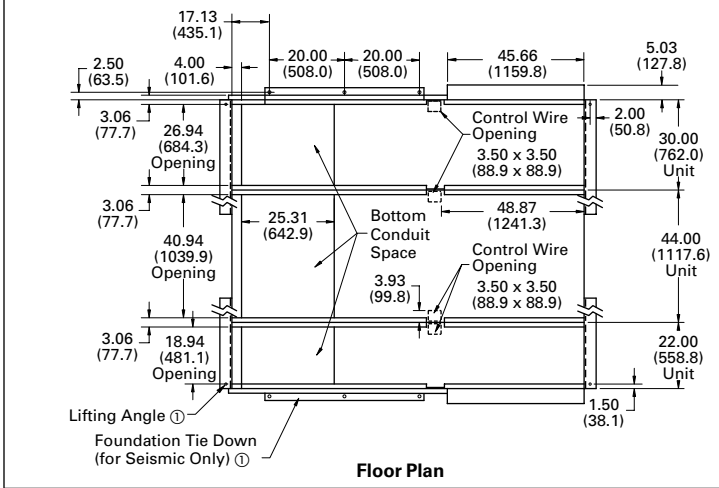


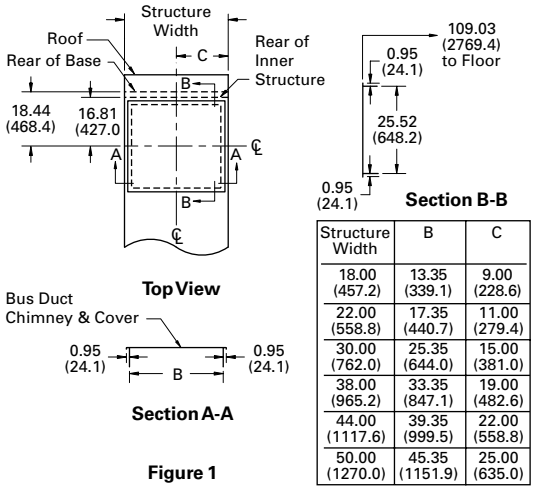
Figure 20.7-14. Section View of a Typical Structure with Magnum Circuit Breakers with Power Xpert Release Trip Units

① See **Table 20.7-5 on Page 20.7-27** for depth information and recommended number of cables.

Outdoor Walk-in Switchgear

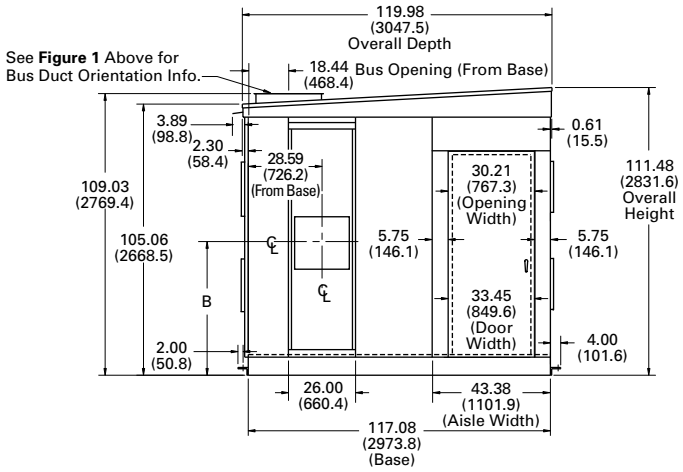


Floor Plan

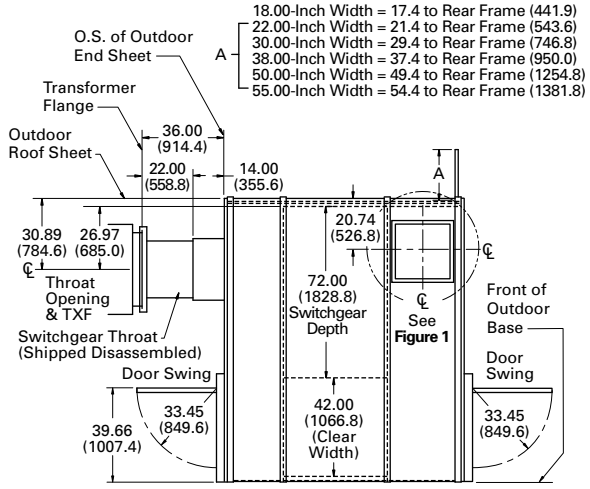


Structure Width	B	C
18.00 (457.2)	13.35 (339.1)	9.00 (228.6)
22.00 (558.8)	17.35 (440.7)	11.00 (279.4)
30.00 (762.0)	25.35 (644.0)	15.00 (381.0)
38.00 (965.2)	33.35 (847.1)	19.00 (482.6)
44.00 (1117.6)	39.35 (999.5)	22.00 (558.8)
50.00 (1270.0)	45.35 (1151.9)	25.00 (635.0)

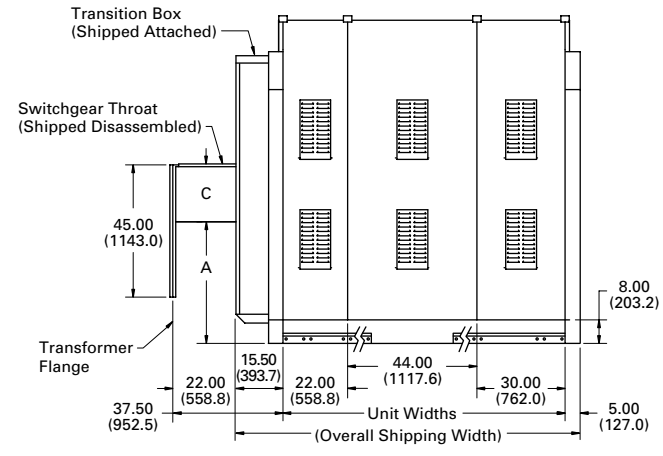
Figure 1



Side View



Top View



Front View

Available Rear Access Structure Widths

Structure	Weight lb (kg) (not including breakers)
End Trims (one set per lineup)	1500 (681)
18-inch (457.2 mm) wide breaker structure	2500 (1135)
22-inch (558.8 mm) wide breaker structure	2600 (1180)
30-inch (762.0 mm) wide breaker structure	2700 (1226)
44-inch (1117.6 mm) wide breaker structure	5200 (2361)
22-inch (558.8 mm) wide auxiliary structure	2300 (1044)
22-inch (558.8 mm) wide transition structure	2300 (1044)
38-inch (965.2 mm) wide utility structure	2700 (1226)
50-inch (1270.0 mm) wide utility structure	3200 (1453)
Transformer throat	150 (68)

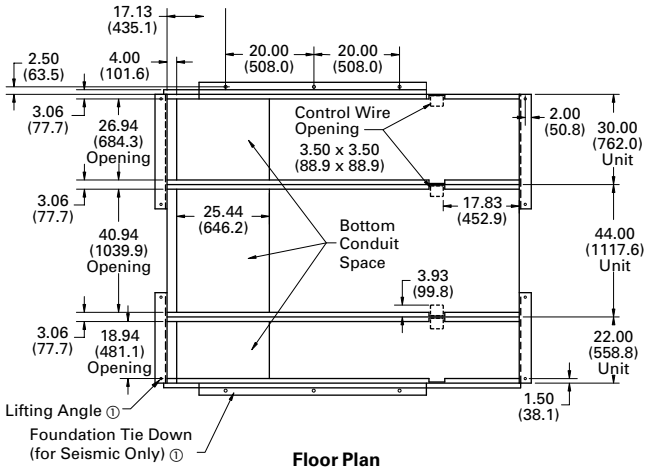
Reference Drawing: 9255C35

Figure 20.7-15. Outdoor Walk-in Enclosure—Dimensions in Inches (mm)

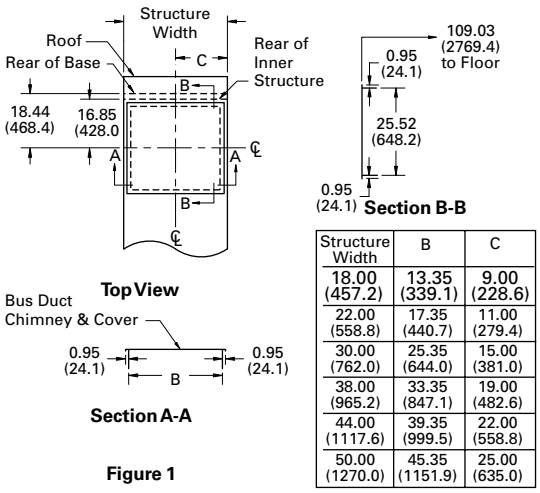
① 0.75-inch (19.1 mm) hardware recommended in all tie down locations.

A	B	C	Centerline of copper connection from bottom of structure
41.38 (1051.1)	51.23 (1301.2)	19.70 (500.4)	55.00 (1397.0)
46.63 (1184.4)	57.00 (1447.8)	18.70 (203.2)	55.00 (1397.0)
52.63 (1336.8)	63.00 (1600.2)	18.70 (203.2)	61.00 (1549.4)

Outdoor Non-Walk-in Switchgear

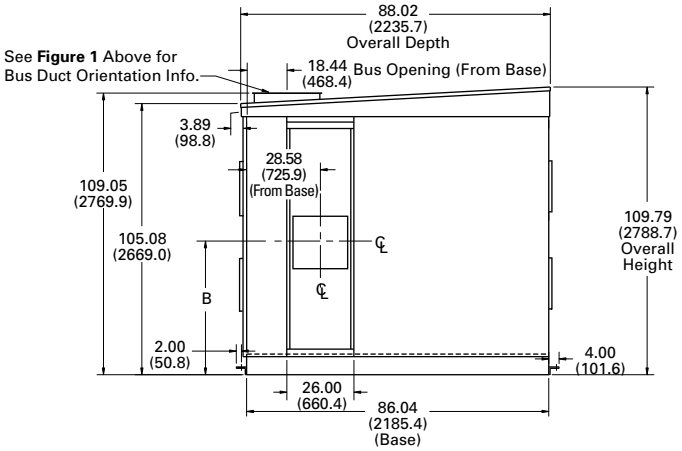


Floor Plan

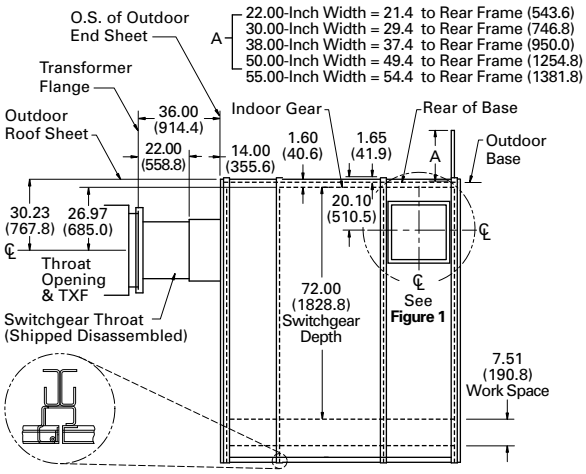


Structure Width	B	C
18.00 (457.2)	13.35 (339.1)	9.00 (228.6)
22.00 (558.8)	17.35 (440.7)	11.00 (279.4)
30.00 (762.0)	25.35 (644.0)	15.00 (381.0)
38.00 (965.2)	33.35 (847.1)	19.00 (482.6)
44.00 (1117.6)	39.35 (999.5)	22.00 (558.8)
50.00 (1270.0)	45.35 (1151.9)	25.00 (635.0)

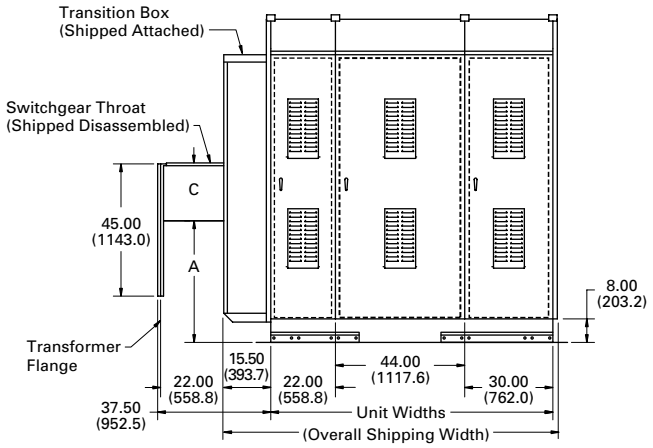
Figure 1



Side View



Top View



Front View

Available Rear Access Structure Widths

Structure	Weight lb (kg) (not including breakers)
End Trims (one set per lineup)	1500 (681)
18-inch (457.2 mm) wide breaker structure	2500 (1135)
22-inch (558.8 mm) wide breaker structure	2600 (1180)
30-inch (762.0 mm) wide breaker structure	2700 (1226)
44-inch (1117.6 mm) wide breaker structure	5200 (2361)
22-inch (558.8 mm) wide auxiliary structure	2300 (1044)
22-inch (558.8 mm) wide transition structure	2300 (1044)
38-inch (965.2 mm) wide utility structure	2700 (1226)
50-inch (1270.0 mm) wide utility structure	3200 (1453)
Transformer throat	150 (68)

Reference Drawing: 9255C06

Figure 20.7-16. Outdoor Non-Walk-in Enclosure—Dimensions in Inches (mm)

① 0.75-inch (19.1 mm) hardware recommended in all tie down locations.

A	B	C	Centerline of copper connection from bottom of structure
41.38 (1051.1)	51.23 (1301.2)	19.70 (500.4)	55.00 (1397.0)
46.63 (1184.4)	57.00 (1447.8)	18.70 (203.2)	55.00 (1397.0)
52.63 (1336.8)	63.00 (1600.2)	18.70 (203.2)	61.00 (1549.4)

Document References

Instruction manual IB01901001E for Eaton's Magnum PXR front- and rear-access low-voltage switchgear, including installation, inspection, operation and testing.

Typical Breaker Schematics

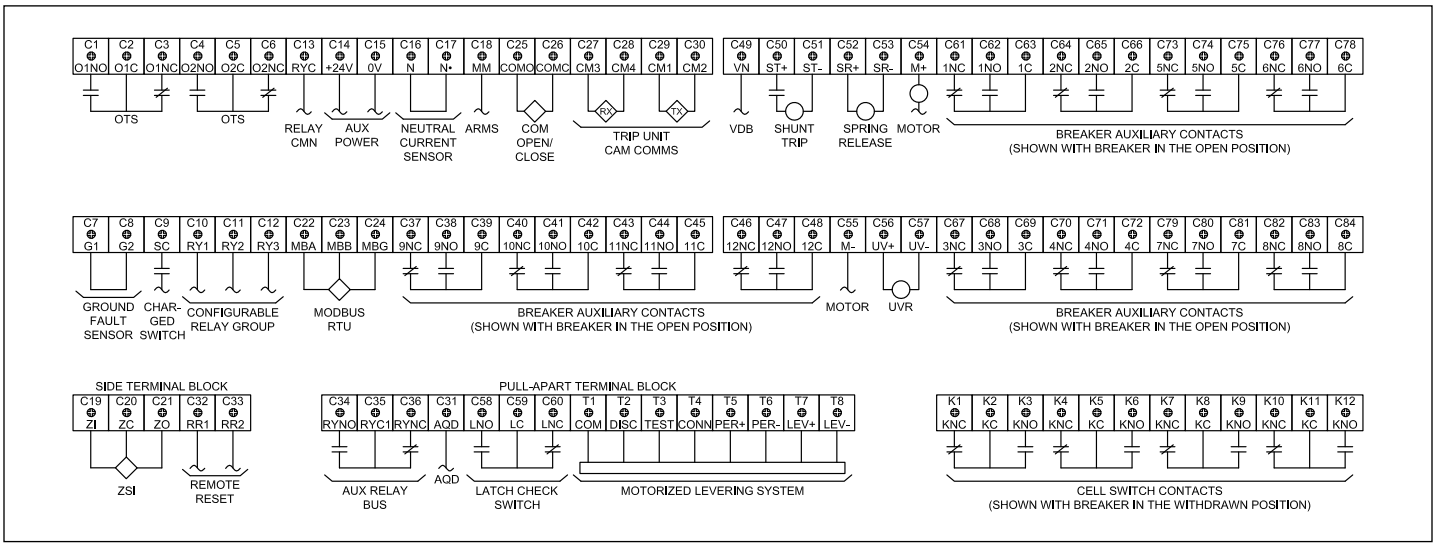


Figure 20.7-17. Typical Magnum PXR Secondary Terminal Block Connection Diagram

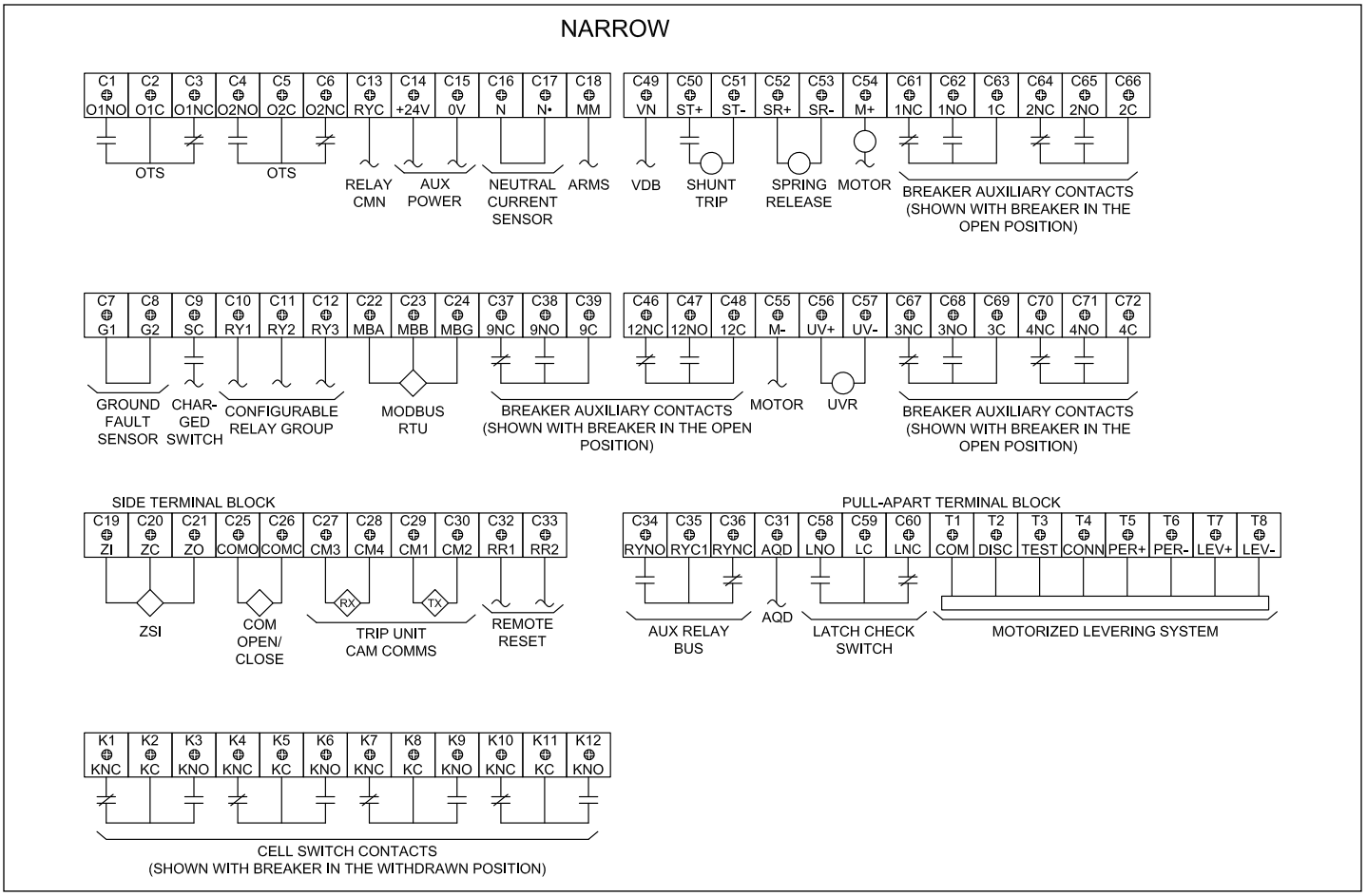


Figure 20.7-18. PXR Secondary Layout for Narrow Frame

Heat Loss

Table 20.7-6. Heat Loss Data ①

Estimated Heat Loss Per Breaker (Watts)

Breaker Frame	Drawout Mounting Only
800	150
1600	329
2000	374
3200	719
4000	749
5000	1000
6000	1440

Estimated Heat Loss Per Structure (Watts) ①

Loss is based on fully loaded vertical and cross bus rating in a structure as given below.		
Rating	**Vertical Bus**	**Cross Bus**
2000	410	288
3200	1623	1163
4000	1097	1169
5000	1410	886
6000	2030	1265
8000	—	2240
10,000	—	3500

① For lower than maximum load currents, watt loss may be estimated by reducing the full load loss by the following:

$W_L=(I_L/I_{FL})^2 W_{FL}$

Where:

W_L=Load Watts

W_{FL}=Full Load Watts

I_L=Actual Load Current

I_{FL}=Full Load Current

Vertical section bus is sized per main cross bus maximum rating or by ANSI C37.20.1 to a maximum of 5000 A. (4000 A in 18.00-inch [457.2 mm] structure.)

Note: In addition to the available bus bracings shown in **Table 20.7-2**, the bus has been tested for short-circuit values of 85 kA for a full 60 cycles.

Closing Times of Magnum PXR Breakers

- 5 cycles or less

Opening Times - Dependent on Function Used

- Standard instantaneous: 60 ms+
- ARMS trip: 40 ms maximum
- Shunt trip: 50 ms maximum
- Trip signal from an Eaton Arc Flash Relay: ~67 ms

Center of Gravity

For seismic calculations, the following dimensions should be used to locate the center of gravity for indoor Magnum PXR switchgear.

Table 20.7-7. Center of Gravity Location

Dimensions in Inches (mm)		
Vertical	**Left-to-Right**	**From the Front**
60.00 (1524.0)	Center of lineup	26.00 (660.4)

Table 20.7-8. Magnum PXR Indoor Rear Switchgear Structure Approximate Weights (Standard Construction Less Breakers) ①

Width in Inches (mm)	Depth in Inches (mm)	Approximate Weight in lb (kg)
Breaker Structure		
18.00, 22.00 and 24.00 (457.2, 558.8 and 609.6)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	1250 (568) 1300 (591) 1350 (614)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	1400 (639) 1450 (659) 1500 (682)
30.00 (762.0)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	1900 (864) 2000 (909) 2100 (955)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	2200 (1000) 2300 (1045) 2400 (1091)
44.00 (117.6)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	2500 (1136) 2600 (1182) 2700 (1227)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	2800 (1273) 2900 (1318) 3000 (1364)
60.00 (1524.0)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	3800 (1727) 4000 (1818) 4200 (1909)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	4400 (2000) 4600 (2091) 4800 (2182)
Auxiliary/Transition Structures		
12.00 (304.8)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	475 (216) 500 (227) 525 (239)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	550 (250) 575 (261) 600 (273)
18.00, 22.00 and 24.00 (457.2, 558.8 and 609.6)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	950 (432) 1000 (455) 1050 (477)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	1100 (500) 1150 (523) 1200 (545)
30.00 (762.0)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	1700 (773) 1750 (795) 1800 (818)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	1850 (840) 1900 (864) 1950 (886)
Utility Structures		
38.00 (965.2)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	1600 (726) 1625 (738) 1650 (749)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	1675 (760) 1700 (772) 1725 (783)
50.00 (1270.0)	60.00 (1542.0) 66.00 (1676.4) 72.00 (1828.8)	1650 (749) 1675 (760) 1700 (772)
	78.00 (1981.2) 84.00 (2133.6) 90.00 (2286.0)	1725 (783) 1750 (795) 1775 (806)

① See **Table 20.7-10** on the following page for breaker weights.

Table 20.7-9. Magnum PXR Front Access Construction Switchgear Structure Approximate Weights (Less Breakers) ①

Width in Inches (mm)	Depth in Inches (mm)	Approximate Weight in lb (kg)
Breaker Structure		
18.00, 22.00 and 24.00 (457.2, 558.8 and 609.6)	40.00 (1016.0)	1100 (500)
30.00 (762.0)	40.00 (1016.0)	1750 (795)
44.00 (1117.6)	40.00 (1016.0)	2200 (1000)
Cable Compartment		
18.00, 22.00 and 24.00 (457.2, 558.8 and 609.6)	40.00 (1016.0)	800 (363)
30.00 (762.0)	40.00 (1016.0)	1550 (705)
44.00 (1117.6)	40.00 (1016.0)	1600 (727)

① See **Table 20.7-10** for breaker weights.

Table 20.7-10. Magnum Circuit Breakers with Power Xpert Release Trip Units Weights

Breaker	Drawout in lb (kg)
Narrow	
MPN-408 MPN-508 MPN-608	130 (59) 130 (59) 130 (59)
MPN-C08 MPN-416 MPN-516	145 (66) 130 (59) 130 (59)
MPN-616 MPN-C16 MPN-620 MPN-C20	130 (59) 145 (66) 145 (66) 145 (66)
Standard	
MPS-408 MPS-608 MPS-808	130 (59) 130 (59) 145 (66)
MPS-C08 MPS-616 MPS-816	145 (66) 130 (59) 145 (66)
MPS-C16 MPS-620 MPS-820	145 (66) 145 (66) 145 (66)
MPS-C20 MPS-632 MPS-832 MPS-C32	145 (66) 175 (79) 175 (79) 175 (79)
Double Wide	
MPN-640 MPN-840 MPN-C40	310 (141) 310 (141) 310 (141)
MPS-840 MPS-C40 MPS-850	310 (141) 310 (141) 310 (141)
MPS-C50 MPS-C60	310 (141) 310 (141)

Note: Impact weight equals 1.5 times breaker static weight. Three-pole frame weight given; four-pole frame weight equals 1.33 times more.

Standards

Magnum circuit breakers with PXR meet or exceed all applicable requirements of ANSI Standards C37.13, C37.17, C37.50 and CSA.

System Voltage and Frequency

Magnum circuit breakers with PXR are designed for operation on AC systems only, 60 Hz or 50 Hz, 635 V maximum.

Continuous Current Ratings

Unlike transformers, generators and motors, circuit breakers are maximum-rated devices and have no built-in temporary overload current ratings. Consequently, it is vital that each application take into consideration the maximum anticipated current demand, initial and future, including temporary overloads.

The continuous rating of any Magnum circuit breaker with PXR is limited to the frame size current rating, whichever is the lesser. For instance, an MPS-616 1600 A frame breaker with 800 A sensors has a maximum continuous rating of 800 A, but the same breaker with 1600 A sensors is limited to 1600 A maximum.

All current ratings are based on a maximum ambient air temperature of 40 °C (104 °F).

Ambient Temperature

The temperature of the air surrounding the enclosure should be within the limits of: –30 °C (–22 °F) to +40 °C (+104 °F).

Altitude

The breakers are applicable at their full voltage and current ratings up to a maximum altitude of 6600 ft (2012 m) above sea level. When installed at higher altitudes, the ratings are subject to the following correction factors in accordance with ANSI C37.20.1.

Table 20.7-11. Altitude Derating Factors

Altitude		Voltage Correction	Current Correction
Feet	**Meters**		
6600	2012	1000	1000
7000	2134	0.989	0.998
7500	2286	0.976	0.995
8000	2438	0.963	0.993
8500	2591	0.950	0.990
9000	2743	0.933	0.987
9500	2896	0.917	0,983
10,000	3048	0.900	0.980
10,500	3200	0.883	0.977
11,000	3353	0.867	0.973
11,500	3505	0.850	0.970
12,000	3658	0.833	0.967
12,500	3810	0.817	0.963
13,000	3962	0.800	0.960

All low-voltage air power circuit breakers are tested per the ANSI Standard C37.1 for a system X/R ratio of 6.6 maximum. It is common within low-voltage systems to experience power factor and X/R values outside the range of the standard values, and thus a means to evaluate published product ratings is necessary.

For applications of power breakers within distribution systems having calculated X/R ratios higher than 6.6, the derating of the air power breakers kAIC rating is required. Per IEEE sanctioned methodology, the calculated short circuit current at the point of interest is increased by the **Table 20.7-12** multiplying factors (MF) to yield an "apparent value of short circuit current," which is then compared to the published breaker ratings. Only breakers having published ratings higher than the "apparent fault current" can be safely applied.

For example, if unfused air power breakers rated 65 kAIC were being considered within a 480/277 Vac distribution system where the X/R at the point of breaker application is 14.25 and the calculated fault current was determined to be 60 kA, the determination of the suitability of these breakers yields:

Apparent Fault Current = 60 kA x MF
= 60 kA x 1.112
= 66.72 kA

and therefore because 66.72 kA exceeds the 65 kAIC rating, the breakers are not adequate and higher rated kAIC breakers would need to be applied.

Table 20.7-12. Air Power Breaker Derating

System X/R Ratio	System % PF	Derating and Multiplying Factors for Air Power Breakers			
		Fused		Unfused	
		Derating	MF	Derating	MF
1.73	50.0	1.000	1.000	1.000	1.000
3.18	30.0	1.000	1.000	1.000	1.000
3.87	25.0	1.000	1.000	1.000	1.000
4.90	20.0	1.000	1.000	1.000	1.000
6.59	15.0	0.939	1.065	1.000	1.000
8.27	12.0	0.898	1.114	0.962	1.000
9.95	10.0	0.870	1.149	0.937	1.067
11.72	8.5	0.849	1.178	0.918	1.089
14.25	7.0	0.827	1.209	0.899	1.112
19.97	5.0	0.797	1.255	0.874	1.144

Unusual Environmental and Operating Conditions

Special attention should be given to applications subject to the following conditions:

1. Damaging or hazardous fumes, vapors, etc.
2. Excessive or abrasive dust.

   For such conditions, it is generally recommended that the switchgear be installed in a clean, dry room, with filtered and/or pressurized clean air. This method permits the use of standard indoor switchgear and avoids the derating effect of non-ventilated enclosures.
3. Salt spray, excessive moisture, dripping, etc.

   Drip shields in equipment rooms and space heaters in indoor weatherproof enclosures, may be indicated, depending upon the severity of the conditions.
4. Excessively high or low ambient temperatures.

   For ambient temperatures exceeding 40 °C, and based on a standard temperature rise of 65 °C, the continuous current ratings of breaker frame sizes, and also buses, current transformers, etc., will be subject to a derating factor calculated from the following formula:

   $$\sqrt{\frac{105^\circ \text{ Total—Special Ambient, } ^\circ\text{C}}{105^\circ \text{ Total—40 } ^\circ\text{C Standard Ambient}}}$$

   Circuit breakers are not adversely affected by very low outdoor ambient temperatures, particularly when energized and carrying load currents. The standard space heaters in weatherproof switchgear will raise the temperature slightly and prevent condensation.

   Electrical components such as relays and instruments, however, must be applied within the manufacturer's specified limits.
5. Exposure to seismic shock.

   Magnum PXR assemblies and breakers have been certified for applications through International Building Code 2018 (IBC) and California Building Code 2019 (CBC). Assembly modifications may be required, so such conditions must be specified.
6. Abnormally high frequency of operation.

   In line with above, a lesser number of operations between servicing, and more frequent replacement of parts, may be indicated.

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