User Manual **MN013016EN**

Effective June 2024
Supersedes December 2022

Magnum PXR and Power Defense SB low voltage power circuit breakers user manual

For use in ANSI/UL applications

Narrow frame

Double narrow frame

Standard frame

Double-wide frame

Powering Business Worldwide

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Purpose

This instructional booklet is expressly intended to cover the installation, operation, and maintenance of Magnum PXR and Power Defense SB (PD-SB) circuit breakers. These circuit breakers may be supplied as part of complete switchboard assemblies or as separate components. This manual applies only to the circuit breaker and (if drawout) its mating cassette. In the case of fixed versions of Magnum PXR and PD-SB circuit breakers, certain sections of this manual, referring to such items as position interlocks and the drawout mechanism, will not apply.

Trip units associated with Magnum PXR and PD-SB power circuit breakers will be addressed in a general manner in this manual. Specific trip unit details and time-current characteristic curves are covered in separate documents specific to the trip units.

Magnum PXR and PD-SB circuit breaker accessory items are discussed briefly in this manual. Field installation instructions for such items, however, are covered in individual instructional leaflets specific to the accessory. This information is also available from the Eaton website at www.eaton.com/magnumpxr or www.eaton.com/powerdefensesb.

For application information, consult Eaton or see applicable product guides, technical documents, application publications, and/or industry standards.

Safety

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this equipment.

⚠ WARNING

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS MANUAL ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO ENSURE THAT PERSONNEL ARE ALERT TO WARNINGS. IN ADDITION, CAUTIONS ARE ALL UPPER CASE AND BOLDFACE.

All possible contingencies that may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding the particular installation, operation, or maintenance of particular equipment, contact the local Eaton representative.

Section 1: Introduction

General information

The Magnum PXR and PD-SB power circuit breakers can be fixed or drawout air circuit breakers using an electronic tripping system. All breakers are designed for use in both switchboard and metal-enclosed switchgear assemblies having a maximum voltage of 635 Vac. Magnum PXR (MPS and MPN) and PD-SB (SPS and SPN) circuit breakers are available in four physical frame sizes with continuous current ratings from 800 A through 5000 A (Magnum PXR available through 6000A), and interrupting capacities from 42 kA to 100 kA. The four physical frame sizes have common height and depth dimensions, differing only in width (**Figure 1**). Circuit breaker nameplates provide complete rating information. All Magnum PXR and PD-SB circuit breakers are 100% rated, UL® Listed, and are built and tested in an ISO® 9002 certified facility to applicable NEMA®, ANSI, IEEE®, and UL standards (**Table 1**, **Figure 2**, and **Figure 3**).

Magnum PXR and PD-SB circuit breakers use a rigid frame housing of engineered thermoset composite resins that has high-strength structural properties, excellent dielectric characteristics, and arc tracking resistance.

MPS, MPN, SPS, and SPN drawout circuit breakers are a through-the-door design, having three breaker positions with the compartment door closed (CONNECT, TEST, DISCONNECT) and one position out of its compartment on extension rails (REMOVE). The operating mechanism is a two-step stored energy mechanism, either manually or electrically operated.

When withdrawn on captive compartment cassette extension rails, MPS, MPN, SPS, and SPN circuit breakers can be inspected, accessory items added, and minor maintenance performed. The inside of the compartment can also be inspected with the circuit breaker on its extension rails.

⚠ NOTICE

PLEASE READ AND UNDERSTAND THESE INSTRUCTIONS BEFORE ATTEMPTING TO UNPACK, INSTALL, OPERATE, OR MAINTAIN THIS EQUIPMENT. STUDY THE BREAKER AND ITS MECHANISM CAREFULLY BEFORE ATTEMPTING TO OPERATE IT ON AN ENERGIZED CIRCUIT.

⚠ WARNING

MAGNUM AND POWER DEFENSE CIRCUIT BREAKERS SHOULD NOT UNDER ANY CIRCUMSTANCES BE APPLIED OUTSIDE THEIR NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS COULD RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

Narrow frame

Double narrow frame

Standard frame

Double-wide frame

Figure 1. Family of Magnum PXR low voltage power circuit breakers (800–6000 A)

Safety features

Magnum PXR and PD-SB circuit breakers and associated drawout equipment are manufactured with built-in interlocks and safety related features. They are provided to reduce hazards to operating personnel and provide proper operating sequences.

① Low voltage power circuit breaker family name
② Breaker family designation number
③ Breaker frame size in amperes
④ Interrupting capacity rating
⑤ Factory equipped accessories

Figure 2. Typical Magnum PXR nameplate

⚠ WARNING

MAGNUM AND POWER DEFENSE CIRCUIT BREAKERS ARE ROBUST AND ARE PROVIDED WITH SAFETY FEATURES. NEVERTHELESS, THE VOLTAGES, CURRENTS, AND POWER LEVELS AVAILABLE IN AND AROUND THIS EQUIPMENT WHEN IT IS IN OPERATION ARE EXTREMELY DANGEROUS AND COULD BE FATAL. UNDER NO CIRCUMSTANCES SHOULD INTERLOCKS AND OTHER SAFETY FEATURES BE MADE INOPERATIVE, AS THIS MAY RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

Safety practices

To protect personnel associated with the installation, operation, and maintenance of this equipment, the following practices must be followed:

1. Only qualified electrical personnel familiar with the equipment, its operation, and the associated hazards should be permitted to work on the equipment. Additionally, only qualified personnel should be permitted to install or operate the equipment.
2. Always be certain that the primary and secondary circuits are de-energized or the circuit breaker is removed to a safe work location before attempting any maintenance.
3. For maximum safety, only insert a completely assembled breaker into an energized cell.
4. Always ensure that drawout circuit breakers are in one of their designed cell positions, such as CONNECT, TEST, DISCONNECT, or REMOVE. A circuit breaker permitted to remain in an intermediate position could result in control circuits being improperly connected, resulting in electrical failures.

Table 1. Magnum PXR ratings at 240, 480, 600 V

Maximum amperes	Breaker designation	Interrupting rating	Short-time rating
800	MPN-408	42 kA	42 kA
	MPN-508	50 kA	50 kA
	MPN-608	65 kA	65 kA
	MPN-C08	100 kA (240 V, 480 V) ①	65 kA
	MPS-408	42 kA	42 kA
	MPS-508	50 kA	50 kA
	MPS-608	65 kA	65 kA
	MPS-808	85 kA	85 kA
	MPS-C08	100 kA	85 kA
1200	MPN-412	42 kA	42 kA
	MPN-512	50 kA	50 kA
	MPN-612	65 kA	65 kA
	MPN-C12	100 kA (240 V, 480 V) ①	65 kA
	MPS-512	50 kA	50 kA
	MPS-612	65 kA	65 kA
	MPS-812	85 kA	85 kA
	MPS-C12	100 kA	85 kA
1600	MPN-416	42 kA	42 kA
	MPN-516	50 kA	50 kA
	MPN-616	65 kA	65 kA
	MPN-C16	100 kA (240 V, 480 V) ①	65 kA
	MPS-516	50 kA	50 kA
	MPS-616	65 kA	65 kA
	MPS-816	85 kA	85 kA
	MPS-C16	100 kA	85 kA
2000	MPN-620	65 kA	65 kA
	MPN-C20	100 kA (240 V, 480 V) ①	65 kA
	MPS-620	65 kA	65 kA
	MPS-820	85 kA	85 kA
	MPS-C20	100 kA	85 kA
2500	MPS-625	65 kA	65 kA
	MPS-825	85 kA	85 kA
	MPS-C25	100 kA	85 kA
3000	MPS-630	65 kA	65 kA
	MPS-830	85 kA	85 kA
	MPS-C30	100 kA	85 kA
3200	MPS-632	65 kA	65 kA
	MPS-832	85 kA	85 kA
	MPS-C32	100 kA	85 kA
4000	MPN-640, 4N, 4A	65 kA	65 kA
	MPN-840, 4N, 4A	85 kA ①	85 kA
	MPN-C40, 4N, 4A	100 kA ①	100 kA
	MPS-840, 4N, 4A	85 kA	85 kA
	MPS-C40, 4N, 4A	100 kA	100 kA
5000	MPN-65N	65 kA	65 kA
	MPN-85N	85 kA (240 V, 480 V) ①	85 kA
	MPN-C5N	100 kA (240 V, 480 V) ①	100 kA
	MPS-850, 5N, 5A	85 kA	85 kA
	MPS-C50, 5N, 5A	100 kA	100 kA
6000	MPS-860, 6N, 6A	85 kA	85 kA
	MPS-C60, 6N, 6A	100 kA	100 kA

① 65kA @ 600V

Table 2. Power Defense SB ratings at 240, 480, and 600V

Maximum amperes	Breaker designation	Interrupting rating	Short-time rating
800	SPN-408	42 kA	22 kA
	SPN-508	50 kA	22 kA
	SPN-608	65 kA	22 kA
	SPN-C08	100 kA (240 V, 480 V) ①	22 kA
	SPS-408	42 kA	22 kA
	SPS-508	50 kA	22 kA
	SPS-608	65 kA	22 kA
	SPS-808	85 kA	22 kA
	SPS-C08	100 kA	22 kA
1200	SPN-412	42 kA	25 kA
	SPN-512	50 kA	25 kA
	SPN-612	65 kA	25 kA
	SPN-C12	100 kA (240 V, 480 V) ①	25 kA
	SPS-512	50 kA	25 kA
	SPS-612	65 kA	25 kA
	SPS-812	85 kA	25 kA
	SPS-C12	100 kA	25 kA
1600	SPN-416	42 kA	30 kA
	SPN-516	50 kA	30 kA
	SPN-616	65 kA	30 kA
	SPN-C16	100 kA (240 V, 480 V) ①	30 kA
	SPS-516	50 kA	30 kA
	SPS-616	65 kA	30 kA
	SPS-816	85 kA	30 kA
	SPS-C16	100 kA	30 kA
2000	SPN-620	65 kA	35 kA
	SPN-C20	100 kA (240 V, 480 V) ①	35 kA
	SPS-620	65 kA	35 kA
	SPS-820	85 kA	35 kA
	SPS-C20	100 kA	35 kA
2500	SPS-625	65 kA	42 kA
	SPS-825	85 kA	42 kA
	SPS-C25	100 kA	42 kA
3000	SPS-630	65 kA	50 kA
	SPS-830	85 kA	50 kA
	SPS-C30	100 kA	50 kA
3200	SPS-632	65 kA	50 kA
	SPS-832	85 kA	50 kA
	SPS-C32	100 kA	50 kA
4000	SPN-640, 4N, 4A	65 kA	65 kA
	SPN-840, 4N, 4A	85 kA (240 V, 480 V) ①	65 kA
	SPN-C40, 4N, 4A	100 kA (240 V, 480 V) ①	65 kA
	SPS-840, 4N, 4A	85 kA	65 kA
	SPS-C40, 4N, 4A	100 kA	65 kA
5000	SPN-65N	65 kA	65 kA
	SPN-85N	85 kA (240 V, 480 V) ①	65 kA
	SPN-C5N	100 kA (240 V, 480 V) ①	65 kA
	SPS-850, 5N, 5A	85 kA	85 kA
	SPS-C50, 5N, 5A	100 kA	85 kA

① 65kA @ 600V

Qualified personnel

For the purpose of operating and maintaining low voltage power circuit breakers, a person should not be considered qualified if the individual is not thoroughly trained in the operation of the circuit breaker and how it interfaces with the assembly in which it is used. In addition, the individual should have knowledge of the connected loads.

For the purpose of installing and inspecting circuit breakers and their associated assembly, a qualified person should also be trained with respect to the hazards inherent to working with electricity and the proper way to perform such work. The individual should be able to de-energize, clear, and tag circuits in accordance with established safety practices.

Other publications and documentation

In addition to this instructional booklet, other printed information and documentation is available and supplied as appropriate. Additional documentation for Magnum PXR and PD-SB circuit breakers is available on the website at www.eaton.com/magnumpxr and www.eaton.com/powerdefensesb. This is included, but not limited to, trip unit manuals and time/current curves, accessory instructions, and renewal parts data.

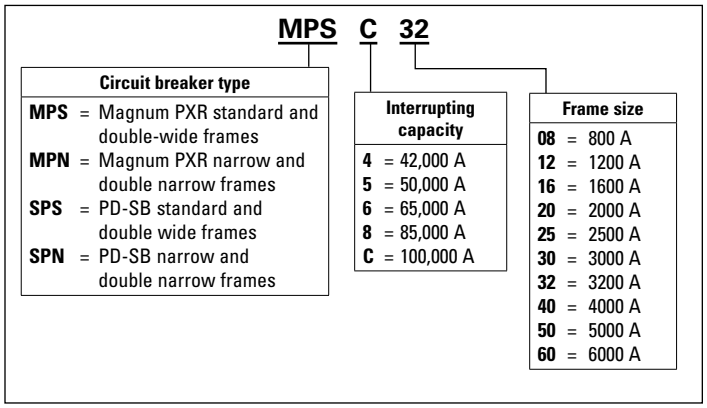


Figure 3. Typical Magnum PXR and PD-SB designation example

Section 2: Receiving, handling, and installation

General information

Magnum PXR and PD-SB power circuit breakers, when supplied as part of an assembly, may be shipped already installed in their respective breaker compartments. Receiving and handling of this equipment is addressed in an assembly instruction manual supplied with the assembled equipment. This instruction manual applies to only the circuit breakers.

Suggested tools

A large number of different tools are not required to properly install and maintain Magnum PXR and PD-SB circuit breakers. The following tools are, however, suggested:

- Flat blade screwdriver
- Phillips head screwdriver
- 3/8-inch socket (ratchet) wrench
- 10 mm socket
- 17 mm socket
- Secondary wiring removal tool (**Figure 58**)

Unpacking the circuit breaker

Before beginning to unpack new Magnum PXR and PD-SB circuit breakers, read and understand these directions. Following the directions will ensure that no damage is caused.

Shipping containers should be inspected for obvious signs of rough handling and/or external damage incurred during the transportation phase. Record any observed damage for reporting to the transportation carrier and Eaton, once the inspection is completed. All reports and claims should be as specific as possible and include the order number and other applicable nameplate information.

Every effort is made to ensure that Magnum PXR and PD-SB circuit breakers arrive at their destination undamaged and ready for installation. Care should be exercised, however, to protect the breakers from impact at all times. Do not remove protective packaging until the breakers are ready for inspection, testing, and/or installation.

When ready to inspect and install a Magnum PXR or PD-SB circuit breaker, carefully remove the banding straps and lift off the cardboard box. Remove any additional packing material and internally packed documentation. The circuit breaker and/or cassette are mounted to a wooden shipping pallet.

On drawout circuit breakers shipped without a cassette, two shipping clamps hook into the breaker side plates and are held to the pallet with four lag screws (**Figure 4**). Remove the lag screws and clamps. Save the screws and clamps for future shipment of the breaker. On empty cassettes, remove the four or five lag screws and/or machine screws that pass through the floor pan of the cassette holding it to the wooden pallet. On drawout breakers shipped in a cassette, first remove the breaker from the cassette using the levering mechanism and drawout rails. After the breaker is removed, the machine screws passing through the floor pan can be removed.

On fixed breakers, remove the lag screws passing through the mounting feet that hold the breaker to the pallet.

Circuit breakers are designed to be easily lifted from the wooden pallet using an appropriate lifting yoke and overhead or portable lifting device (**Figure 5**).

Figure 4. Shipping clamps for drawout circuit breaker

Figure 5. Magnum circuit breaker with lifting yoke attached (Magnum DS shown)

Storing the circuit breaker

If it is necessary to store a circuit breaker before installation, do so in its original shipping container. Keep the circuit breaker in a clean dry place. Ensure there is ample air circulation and heat, if necessary, to prevent condensation. It is very important that the circuit breaker not be exposed to dirt or moisture.

⚠ NOTICE

A CIRCUIT BREAKER THAT HAS BEEN STORED FOR ANY LENGTH OF TIME SHOULD BE OPERATED A MINIMUM OF FIVE TIMES BEFORE IT IS PLACED IN SERVICE.

Lifting circuit breaker

⚠ CAUTION

DO NOT ATTEMPT TO LIFT CIRCUIT BREAKERS WITH ORDINARY CRANE HOOKS, ROPES, CHAINS, OR OTHER SUCH DEVICES. FAILURE TO FOLLOW THIS CAUTION COULD RESULT IN DAMAGE TO VITAL PARTS, SUCH AS ARC CHUTES, BARRIERS, AND WIRING, OR THE ENTIRE CIRCUIT BREAKER.

To closely examine, install, or just become more familiar with the circuit breaker, carefully lift and place the circuit breaker on a solid work surface capable of handling the circuit breaker's weight (**Table 3**) or on the captive drawout extension rails of the breaker compartment (**Figure 5**). This is accomplished by using the appropriate lifting yoke and lifter. The lifting yoke consists of two steel hooks specially shaped to hook under the integral molded lifting handles on both sides of the circuit breaker (**Figure 15**). Every effort should be made during lifting to minimize circuit breaker swing and tilt.

If the circuit breaker is to be lifted onto compartment extension rails, follow the instructions on **page 11**, "Installing the drawout circuit breaker."

Table 3. Basic circuit breaker weights (lifting and support reference only)

	Weight (lb)					
	Fixed		Drawout		Universal cassette	
Breaker model ①	Three-pole	Four-pole	Three-pole	Four-pole	Three-pole	Four-pole
MPN-408	95	120	107	136	61	70
MPN-508	95	120	107	136	61	70
MPN-608	95	120	107	136	61	70
MPN-C08	95	120	108	136	61	70
MPS-408	114	141	130	161	117	123
MPS-508	118	146	138	172	117	123
MPS-608	118	146	138	172	117	123
MPS-808	128	160	155	194	117	123
MPS-C08	128	160	155	194	117	123
MPN-412	95	120	107	136	61	70
MPN-512	95	120	107	136	61	70
MPN-612	95	120	107	136	61	70
MPN-C12	95	120	108	136	61	70
MPS-512	118	146	138	172	117	123
MPS-612	118	146	138	172	117	123
MPS-812	128	160	155	194	117	123
MPS-C12	128	160	155	194	117	123
MPN-416	95	120	107	136	61	70
MPN-516	95	120	107	136	61	70
MPN-616	95	120	107	136	61	70
MPN-C16	95	120	108	136	61	70
MPS-516	118	146	138	172	117	123
MPS-616	118	146	138	172	117	123
MPS-816	128	160	155	194	117	123
MPS-C16	128	160	155	194	117	123
MPN-620	95	120	107	136	61	70
MPN-C20	95	120	107	136	61	70
MPS-620	128	160	155	194	117	123
MPS-820	128	160	155	194	117	123
MPS-C20	128	160	155	194	117	123

Table 33. Basic circuit breaker weights (continued)

	Weight (lb)					
	Fixed		Drawout		Universal cassette	
Breaker model	Three-pole	Four-pole	Three-pole	Four-pole	Three-pole	Four-pole
MPS-625	150	190	189	240	123	150
MPS-825	150	190	189	240	123	150
MPS-C25	150	190	189	240	123	150
MPS-630	150	190	189	240	123	150
MPS-830	150	190	189	240	123	150
MPS-C30	150	190	189	240	123	150
MPS-632	150	190	189	240	123	150
MPS-832	150	190	189	240	123	150
MPS-C32	150	190	189	240	123	150
MPN-640, 4N, 4A	177	225	214	271	106	125
MPN-840, 4N, 4A	177	225	214	271	106	125
MPN-C40, 4N, 4A	177	225	214	271	106	125
MPS-840, 4N, 4A	237	319	303	366	199	250
MPS-C40, 4N, 4A	237	319	303	366	199	250
MPN-65N	177	225	295	393	106	125
MPN-85N	177	225	295	393	106	125
MPN-C5N	177	225	295	393	106	125
MPS-850, 5N, 5A	276	360	343	441	212	266
MPS-C50, 5N, 5A	276	360	343	441	212	266
MPS-860, 6N, 6A	276	360	343	441	212	266
MPS-C60, 6N, 6A	276	360	343	441	212	266

① For Power Defense SB breakers, breaker model will begin with SPS or SPN. Listed weights are applicable for both product lines.

Circuit breaker inspection

All circuit breakers, once removed from their shipping containers, should be visually inspected for any obvious damage.

The current rating label that is applied to the battery cover on the trip unit frame should match the current rating programmed into the trip unit. Check to make sure that this match exists. The circuit breaker current rating (I_n) can be easily changed as described in Section 7 of MN013015EN.

Installing the drawout circuit breaker

In structures equipped for drawout circuit breakers, a bolted-in cassette with movable extension rails supports the circuit breaker (**Figure 5** and **Figure 6**). The extension rails must first be pulled all the way out. Once the rails are fully extended, the circuit breaker can be carefully placed on the extension rails.

⚠ CAUTION

IT IS IMPORTANT TO TAKE GREAT CARE WHEN PLACING A DRAWOUT CIRCUIT BREAKER ON ITS EXTENSION RAILS. IF THE CIRCUIT BREAKER IS NOT PROPERLY SEATED ON THE EXTENSION RAILS, IT COULD FALL FROM THE RAILS, CAUSING EQUIPMENT DAMAGE AND/OR BODILY INJURY.

Carefully lower the circuit breaker down onto the extension rails. Be certain that the circuit breaker's four molded drawout rail supports are fully seated in the extension rail cutouts on both sides (**Figure 6**). Do not remove the lifting yoke from the circuit breaker until it is properly seated on the rails.

Once the circuit breaker is on the extension rails and the lifting yoke is removed, proceed with the rest of the circuit breaker installation.

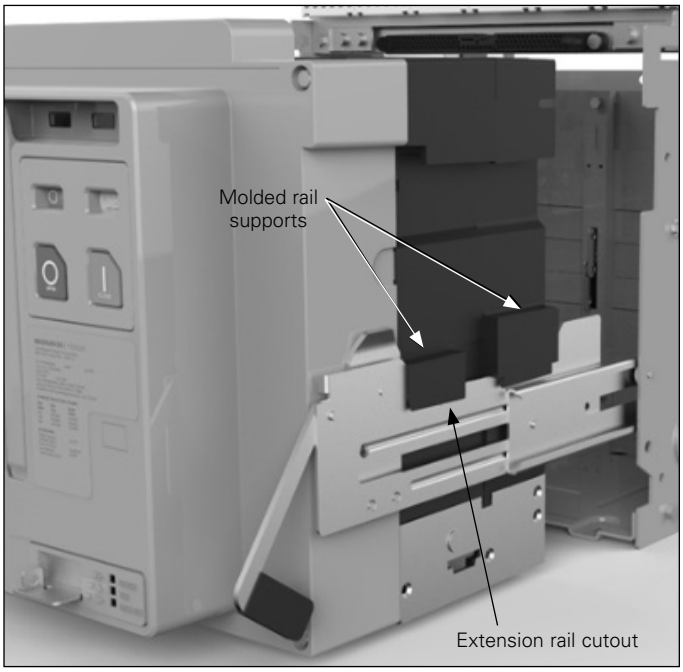


Figure 6. One side of drawout circuit breaker properly seated on extension rail

Rejection interlocks

Within any one physical frame size, Magnum PXR and PD-SB type drawout circuit breakers come in a variety of continuous current and interruption ratings, some of which are incompatible with others. Double-wide circuit breakers also come with several phase sequence options that are also incompatible. To prevent the insertion of circuit breakers with (1) inadequate interrupting capability, (2) with physically incompatible primary disconnects, or (3) with an incompatible phase sequence, rejection interlock key plates are provided on both the circuit breaker and the cassette. The key plate on the circuit breaker is pre-assembled at the factory; but the cassette-side rejection plate and the key pattern must be assembled and installed by the switchboard builder.

⚠ CAUTION

DO NOT DISABLE REJECTION INTERLOCKS. DOING SO AND USING A LOWER CAPACITY CIRCUIT BREAKER IN AN INCOMPATIBLE CASSETTE COULD RESULT IN AN ELECTRICAL FAULT, WHICH COULD RESULT IN DEATH, BODILY INJURY, AND/OR EQUIPMENT DAMAGE.

The rejection interlocks are steel pins in the floor of the circuit breaker cassette. As the circuit breaker is pushed into the structure, the mating pins on the bottom of the circuit breaker move past a set of corresponding pins in the cassette if the circuit breaker and the cassette are compatible. If the circuit breaker and the cassette are mismatched, the rejection pins will block the insertion of the circuit breaker into the cassette before the levering-in mechanism is engaged.

Before attempting to push the circuit breaker into the DISCONNECT position, compare the positioning of rejection interlock pins in the cassette in keeping with those outlined in Table 1 of IL2C13863 (for MPN and SPN breakers) and/or Table 1 of IL2C15760 (for MPS and SPS breakers), and the information supplied on the circuit breaker's nameplate. Proceed if the circuit breaker and the cassette are compatible.

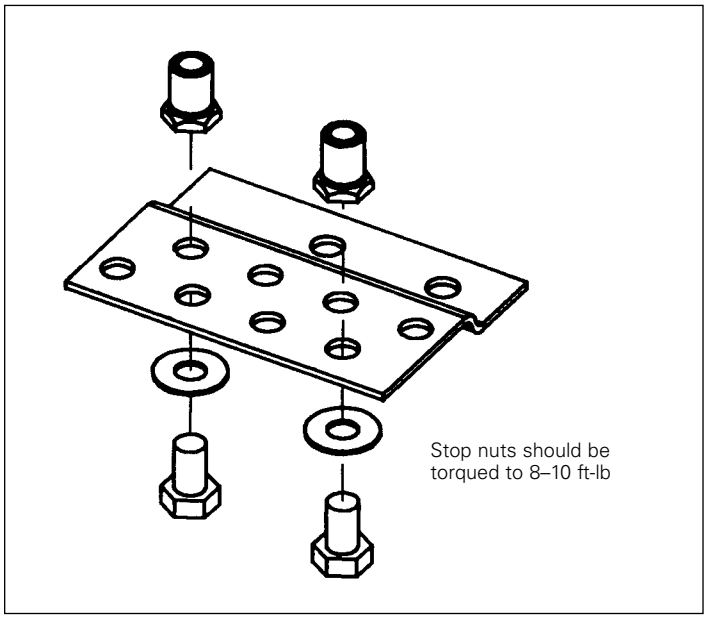


Figure 7. Cassette rejection interlock pin positioning/installation

Circuit breaker positioning

Magnum PXR and PD-SB drawout circuit breakers have four normal positions:

- REMOVE (withdrawn) (**Figure 8**)
- DISCONNECT (**Figure 9**)
- TEST (**Figure 10**)
- CONNECT (**Figure 11**)

The REMOVE position is a position outside the compartment on the cassette's drawout rails where the circuit breaker is not engaged with the levering mechanism. The DISCONNECT, TEST, and CONNECT positions are reached by means of the levering mechanism.

With the breaker solidly positioned on the cassette's extension rails and the levering-in mechanism in the DISCONNECT position, carefully and firmly push the circuit breaker into the compartment as far as it will go. The outer (recessed) portion of the circuit breaker faceplate should align with the GREEN target line (labeled DISC) on the inside top left wall of the cassette (**Figure 12**).

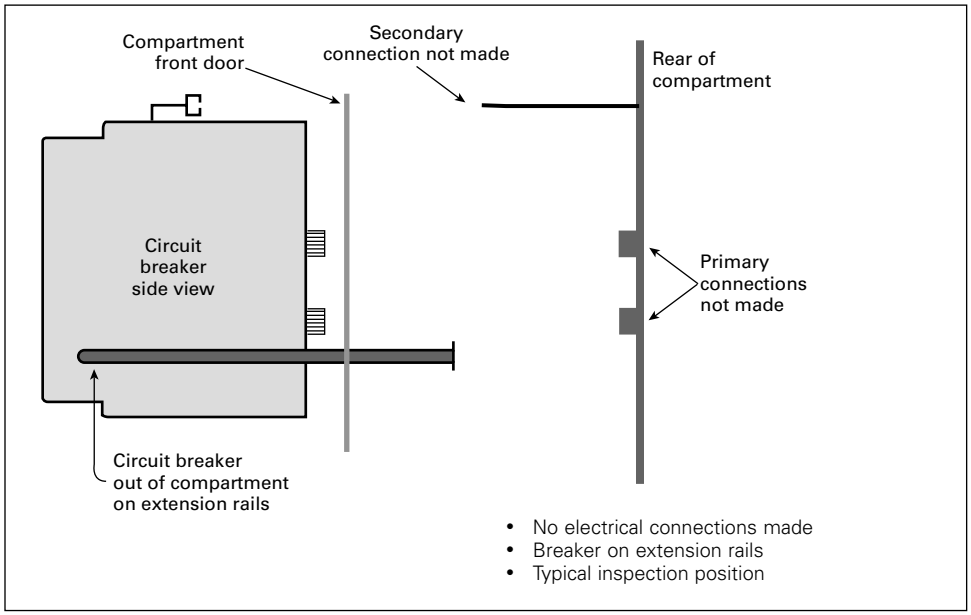


Figure 8. REMOVE position

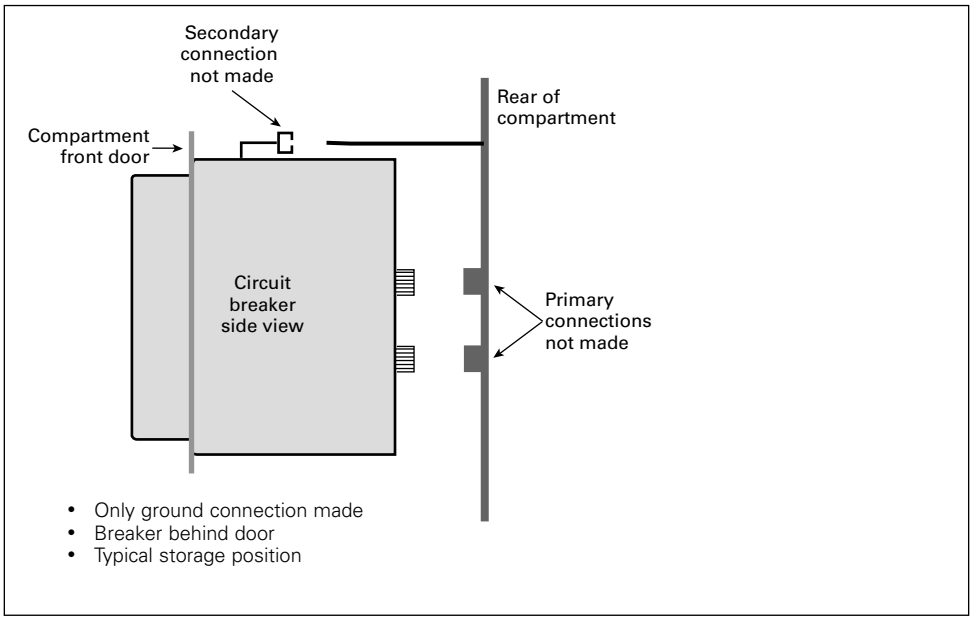


Figure 9. DISCONNECT position

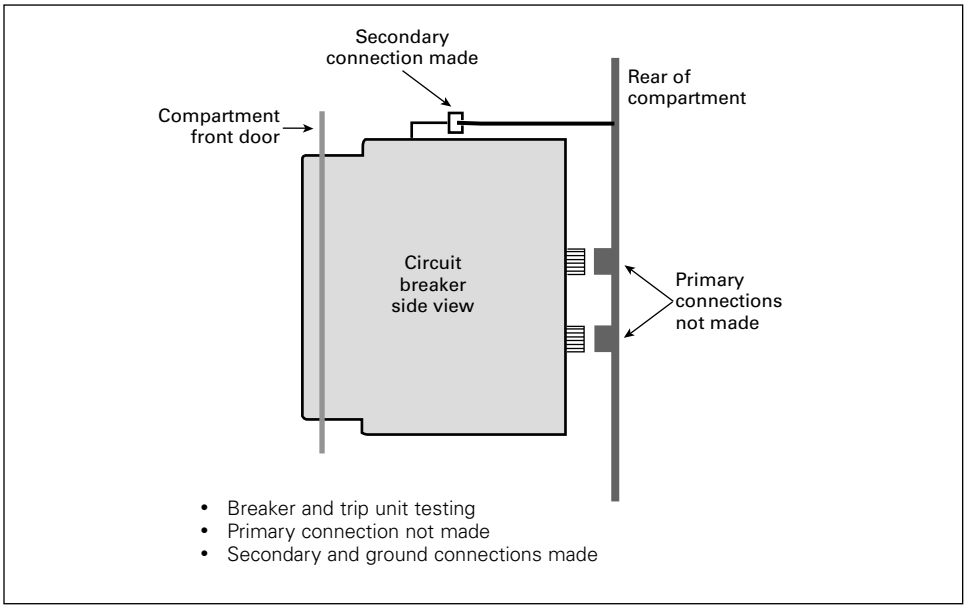


Figure 10. TEST position

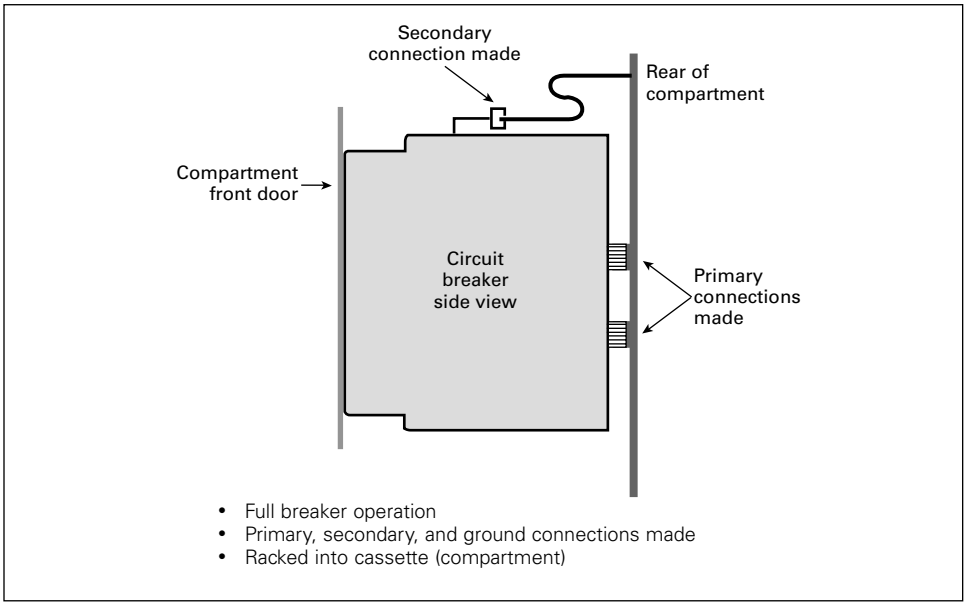


Figure 11. CONNECT position

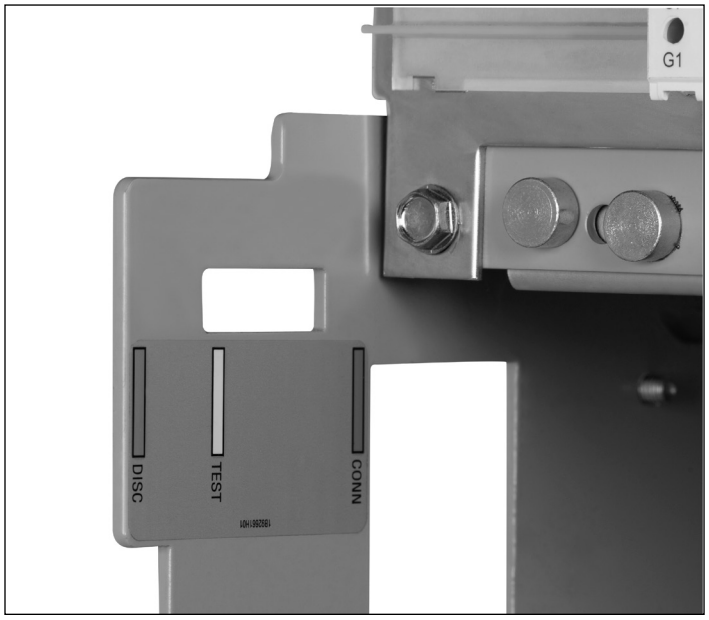


Figure 12. Cassette label showing DISCONNECTED, TEST, and CONNECTED position of recessed cover

Levering circuit breaker

⚠ CAUTION

MAKE CERTAIN THAT THE CIRCUIT BREAKER IS FULLY INSERTED INTO ITS COMPARTMENT BEFORE ANY ATTEMPT IS MADE TO LEVER THE CIRCUIT BREAKER. ATTEMPTING TO LEVER THE CIRCUIT BREAKER IN BEFORE IT IS FULLY POSITIONED INSIDE ITS COMPARTMENT CAN RESULT IN DAMAGE TO BOTH THE CIRCUIT BREAKER AND THE COMPARTMENT.

The circuit breaker is now ready to be levered. With the circuit breaker OPEN, the levering device access door can be raised. The levering device is hand operated using a standard 3/8-inch square drive and ratchet, which is not provided (**Figure 13**). As long as the access door is raised, the circuit breaker is held trip-free. Begin by rotating the levering-in screw to the full counterclockwise (DISCONNECT) position.

Close the compartment door and begin levering the breaker into its different positions using a clockwise ratcheting motion. When the circuit breaker is levered fully to the DISCONNECT or the CONNECT position, the levering shaft hits a hard stop; do not exceed 25 ft-lb of torque or the levering mechanism may be damaged. **The circuit breaker can be levered with the compartment door open or closed, but it is advisable to close the door prior to levering.** The position of the circuit breaker within its compartment is indicated by color-coded position indicators (Red = Connect, Yellow = Test, Green = Disconnect) (**Figure 13** and **Figure 19**). To remove the circuit breaker from its compartment, follow the procedure just described using a counterclockwise ratcheting motion.

Figure 13. Levering position indication

⚠ NOTICE

THE CIRCUIT BREAKER MECHANISM IS INTERLOCKED SUCH THAT CHARGED CLOSING SPRINGS ARE AUTOMATICALLY DISCHARGED IF THE CIRCUIT BREAKER IS LEVERED INTO OR OUT OF THE CELL. DISCHARGE TAKES PLACE BETWEEN THE DISCONNECT AND THE TEST POSITION.

Fixed circuit breaker

The Magnum PXR and PD-SB fixed type circuit breaker differs from the drawout version in that it has no levering device, primary disconnects, or secondary disconnects (**Figure 14**). In addition, a fixed circuit breaker does not have a standard feature to hold the breaker in a trip-free position. To ensure the proper sequence of operation between two or more circuit breakers, an optional key interlock is mounted through the front panel (**Figure 45)**.

Figure 14. Typical fixed Magnum PXR circuit breaker

Circuit breaker terminals have holes for making bolted horizontal primary bus connections. Adapters are available for making vertical primary bus connections. Secondary connections can be made through standard terminal blocks or a special connector compatible with the drawout circuit breaker's type secondary connector. Both secondary connection devices are mounted at the top front of the circuit breaker.

The fixed circuit breaker frame has two mounting feet, one on each side, to permit the fixed circuit breaker to be securely mounted. Each mounting foot has two slotted mounting holes that are used to bolt the circuit breaker securely in place. Use either M10 or 3/8-inch bolts for this purpose. Refer to the dimensional drawings referred to in Section 6 (Fixed circuit breakers) for circuit breaker and bus stab dimensions.

Circuit breaker operation

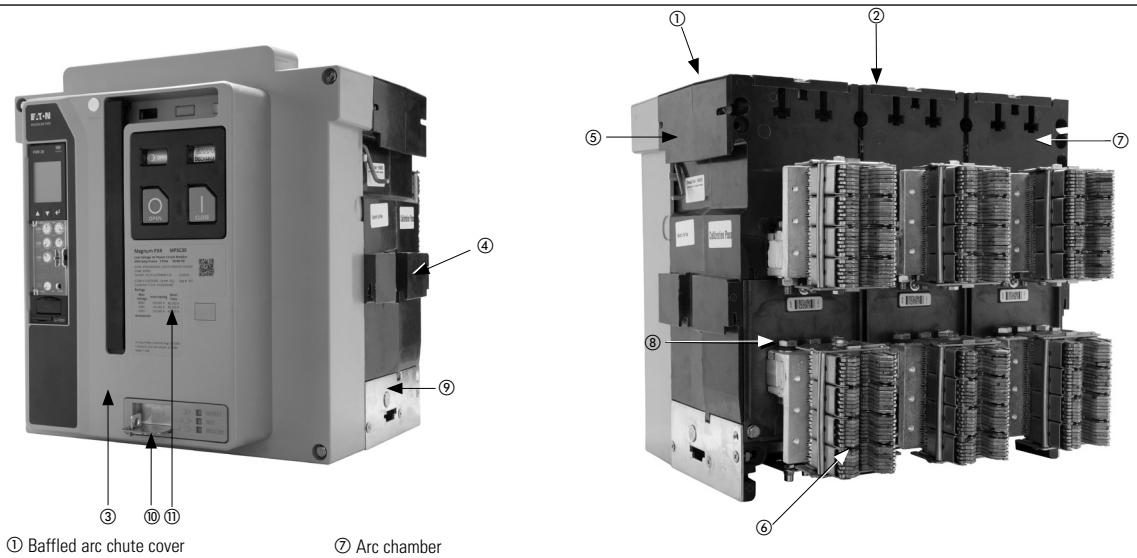
Circuit breakers should be operated manually and/or electrically before they are put into service. This can be done during the installation process or some later date prior to startup. To check circuit breaker operation, follow the operational procedures outlined in Section 3 for both manually operated and electrically operated circuit breakers.

Section 3: Circuit breaker description and operation

Introduction

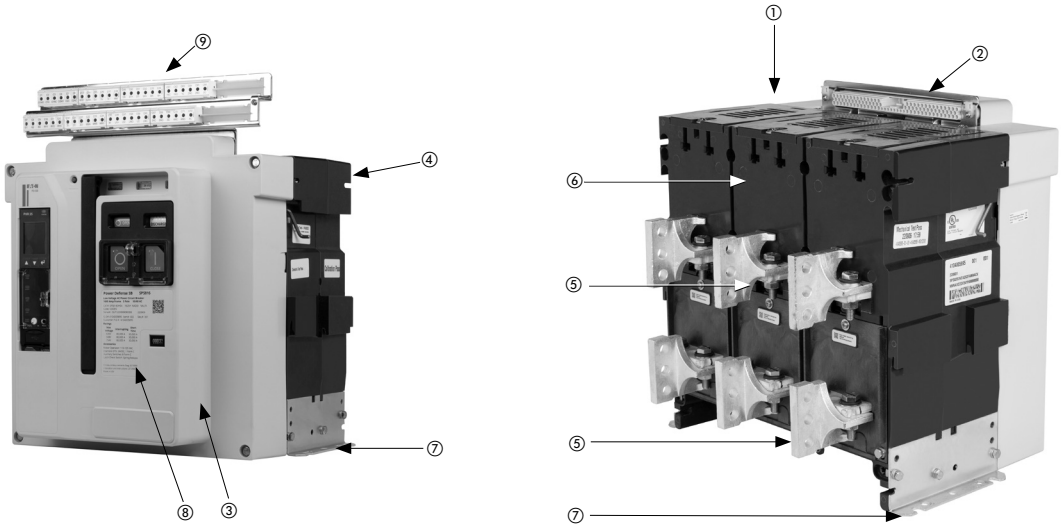
Magnum PXR and PD-SB circuit breakers are available in both drawout and fixed mounting configurations (**Figure 15** and **Figure 16**). A majority of features are common to all configurations, and will be discussed in this section. The mounting features unique to the drawout and fixed configurations will be covered individually in Sections 5 and 6 respectively.

Controls and indicators for both drawout and fixed circuit breakers are functionally grouped on the front of the circuit breaker. The front escutcheon (faceplate) is common for all frame sizes up to 6000A (up to 5000A for PD-SB). Double frame circuit breakers use six (or eight) sets of rear primary connections; these circuit breakers are available from the factory with several different phase sequences, distinguishable by the sixth character in the model number. The phase sequence is also labeled on the rear of the circuit breaker (**Figure 18**). For these drawout breakers, phase sequence labels are also supplied with the cassette and must be applied by the switchgear builder. Circuit breakers with different phase sequences are not interchangeable. Drawout breakers with differing phase sequence are prevented from insertion into the cassette by properly assembled rejection key plates (see Section 2).



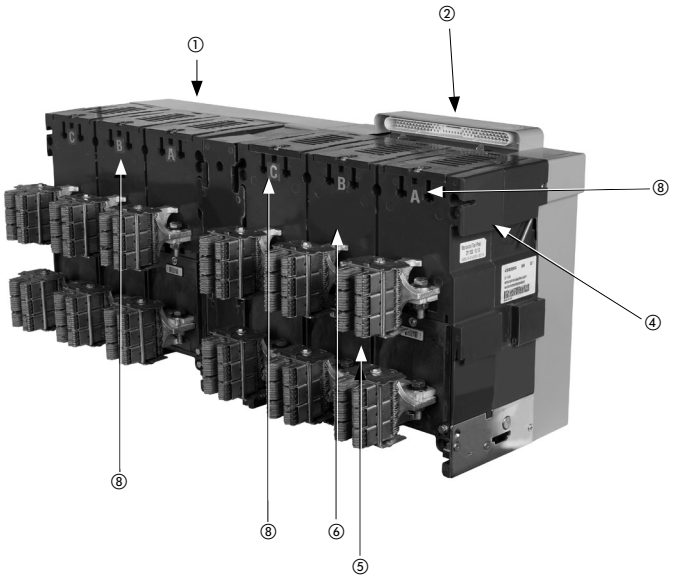
① Baffled arc chute cover
② Secondary disconnects (contacts)
③ Front cover
④ Drawout rail supports
⑤ Integral lifting handle
⑥ Primary disconnect finger cluster
⑦ Arc chamber
⑧ Primary vertical adapter
⑨ Levering device bearing plate
⑩ Padlockable levering device access door
⑪ Circuit breaker nameplate

Figure 15. Typical drawout circuit breaker features (front and rear views)



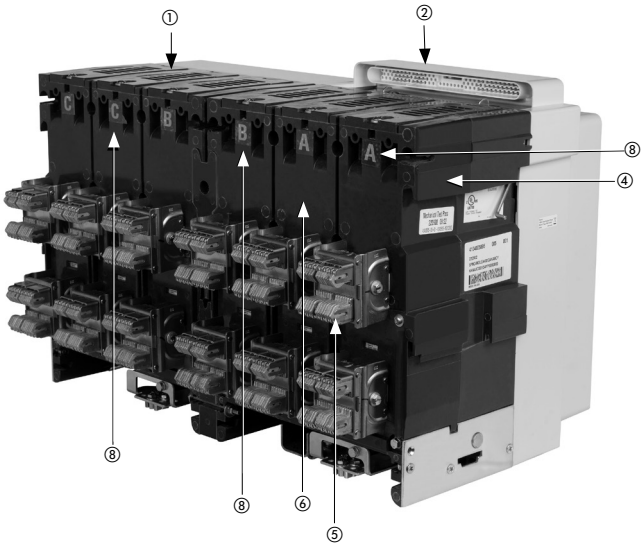
① Baffled arc chute cover
② Secondary disconnect (contacts)
③ Front cover
④ Integral lifting handle
⑤ Fixed primary terminal (with optional vertical adapter)
⑥ Arc chamber
⑦ Mounting foot
⑧ Circuit breaker nameplate
⑨ Secondary terminal blocks (optional)

Figure 16. Typical fixed circuit breaker features (front and rear views)



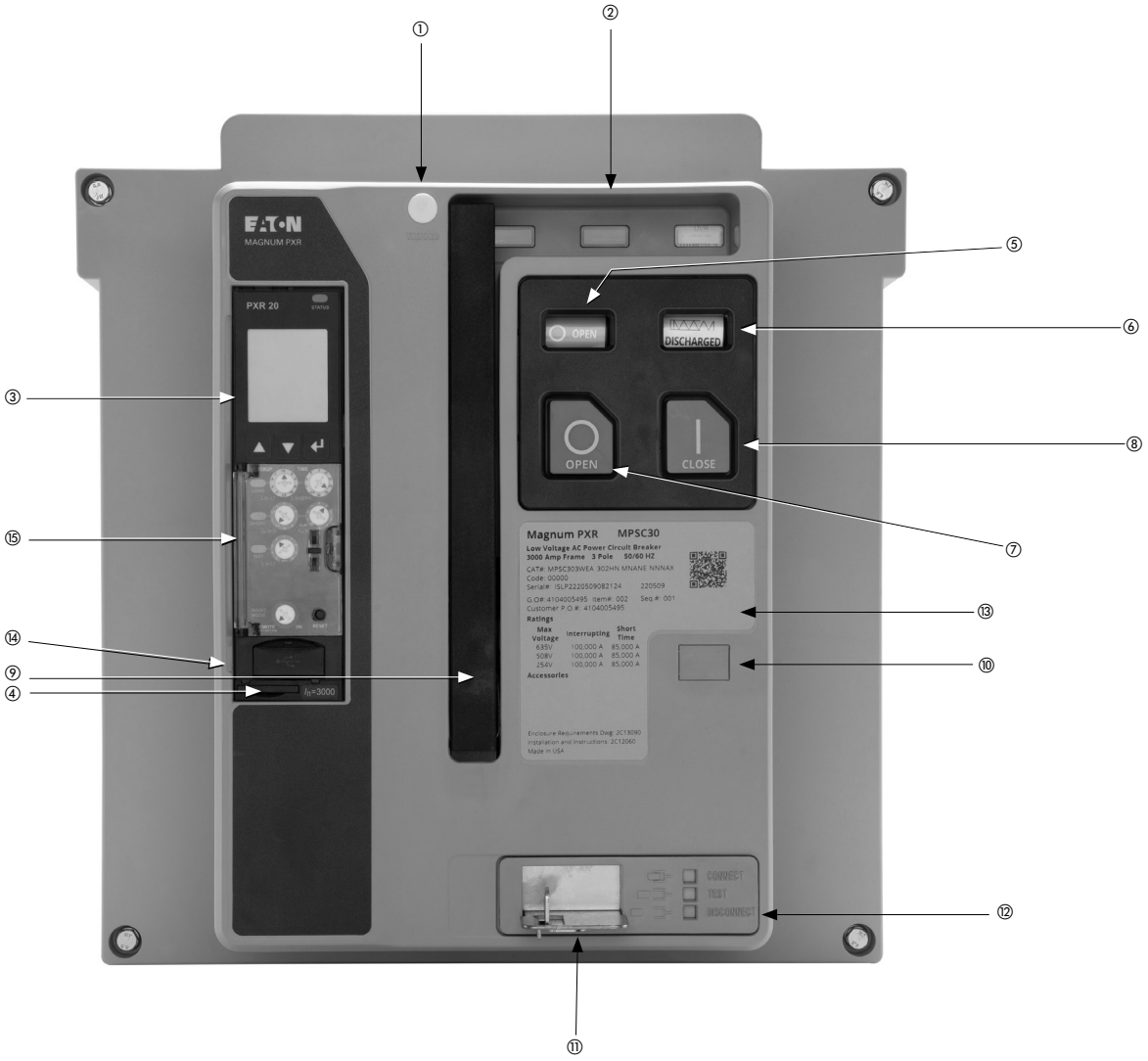
① Baffled arc chute cover
② Secondary disconnect (contacts)
③ Front cover
④ Integral lifting handle
⑤ Primary disconnect finger clusters
⑥ Arc chamber
⑦ Circuit breaker nameplate
⑧ Phase identification labels

Figure 17. Typical double-wide frame circuit breaker features (front and rear view)



① Baffled arc chute cover
② Secondary disconnect (contacts)
③ Front cover
④ Integral lifting handle
⑤ Primary disconnect finger clusters
⑥ Arc chamber
⑦ Circuit breaker nameplate
⑧ Phase identification labels

Figure 18. Typical double narrow frame circuit breaker features (front and rear view, drawout shown)



① Trip flag (pop-out indicator)
② Three accessory windows
③ Trip unit
④ Battery cover and I_n rating label
⑤ Contact status (open-close)
⑥ Spring status (charged-discharged)
⑦ Manual OPEN button
⑧ Manual CLOSE button
⑨ Manual charge handle
⑩ Optional operation counter (not shown)
⑪ Padlockable levering device access door for drawout breaker
⑫ Color-coded breaker position indicator
⑬ Nameplate
⑭ Trip unit USB door
⑮ Lockable trip unit door

Figure 19. Magnum PXR and PD-SB drawout circuit breaker front cover (Magnum PXR shown)

Basic circuit breaker assembly

All Magnum PXR and PD-SB circuit breakers use a rigid frame housing construction of engineered thermoset composite resins. This construction
provides high-strength structural properties, excellent dielectric characteristics, and resistance to arc tracking.

The three-piece construction approach provides support while isolating and insulating power conductors (**Figure 20**).

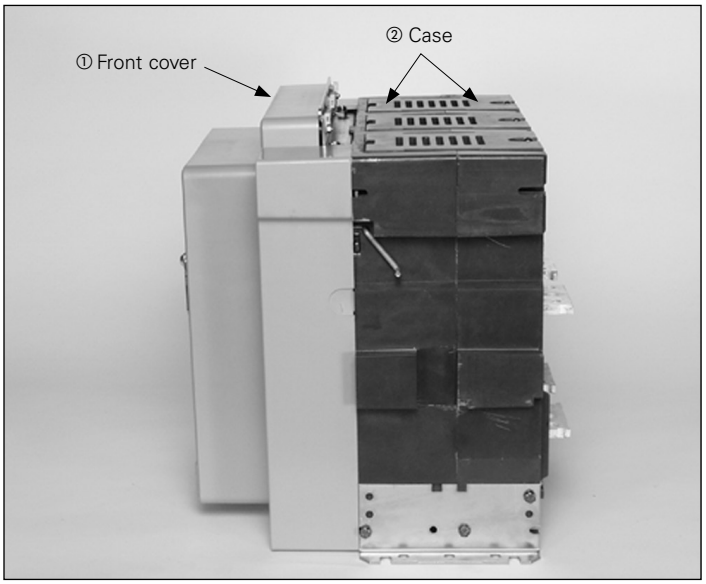


Figure 20. Typical construction (right side view)

① A two-piece engineered thermoset composite resin case encloses current paths and arc chambers. The chambers act to channel arc gases up and out of the circuit breaker during interruption.

② The operating mechanism sits on the front of the case and is electrically isolated and insulated from current contact structures. It is covered by an insulating front cover.

Pole units

A current-carrying pole unit is individually enclosed and rigidly supported by the case. The individual chambers provide for pole unit isolation and insulation from one another. Each pole unit has one primary contact assembly, which consists of a moving portion and a fixed portion. The exact design configuration depends upon the breaker's frame size. Double frame circuit breakers use two pole units and arc chute assemblies connected mechanically and electrically in parallel to form one phase.

Primary moving contacts

Depending upon the frame size, each primary moving contact assembly is comprised of multiple individual copper contact fingers connected to the load conductor through flexible braided connectors (**Figure 22**). Two flexible connectors are used to connect each finger to the load conductor. The number of fingers used depends upon the circuit breaker's continuous and short-circuit current ratings (**Figure 22** and **Figure 23**). On some ratings, fingers are removed and replaced with spacers.

The single contact finger performs both the main and arcing contact functions on different parts of the same finger (**Figure 21**). A highly conductive alloy pad is part of the contact finger and functions as the moving main contact, and is called the "heel." The tip of the same contact finger functions as the moving arcing contact, and is called the "toe."

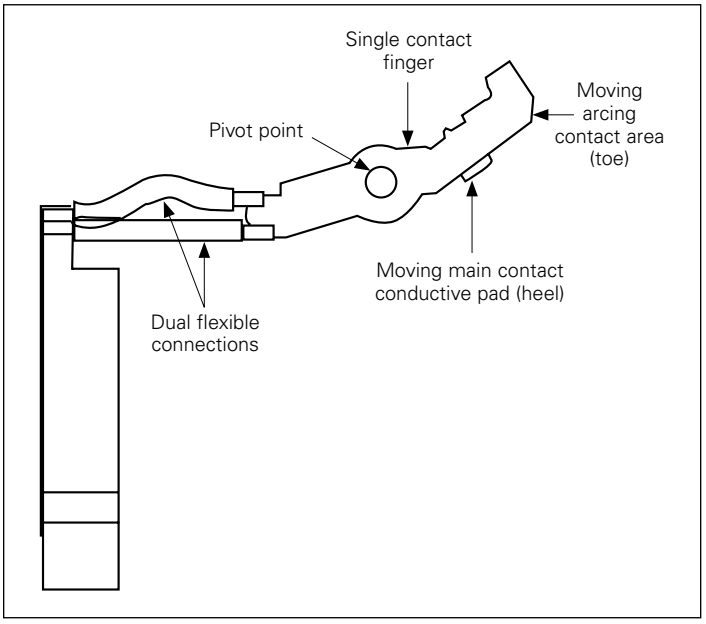


Figure 21. Features of moving conductor assembly

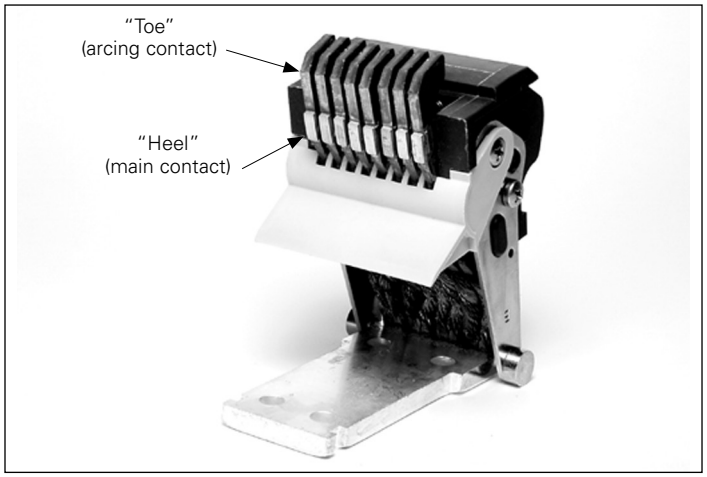


Figure 22. Narrow frame (8-finger) moving conductor assembly

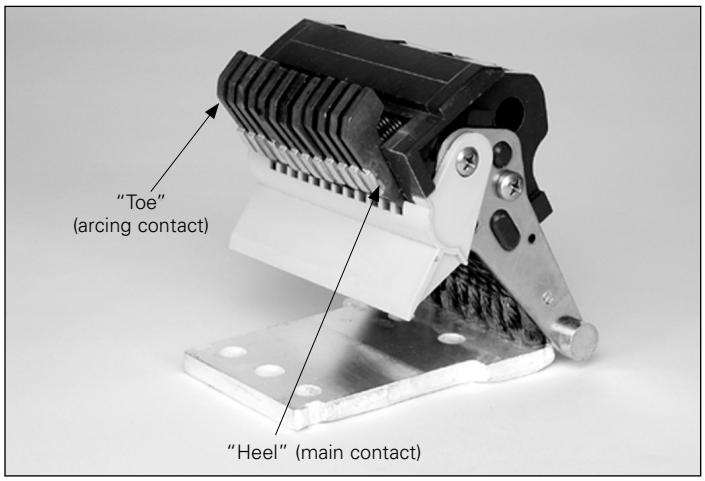


Figure 23. Standard frame (12-finger) moving conductor assembly

Primary stationary contacts

The primary stationary contact is a combination of two items (**Figure 24**). One is a conductive pad mounted on the line conductor that functions as the stationary main contact. The other is an arc runner, also connected to the line conductor. The integral arc runner serves a dual purpose:

- Fixed arcing contact
- Part of the arc chute

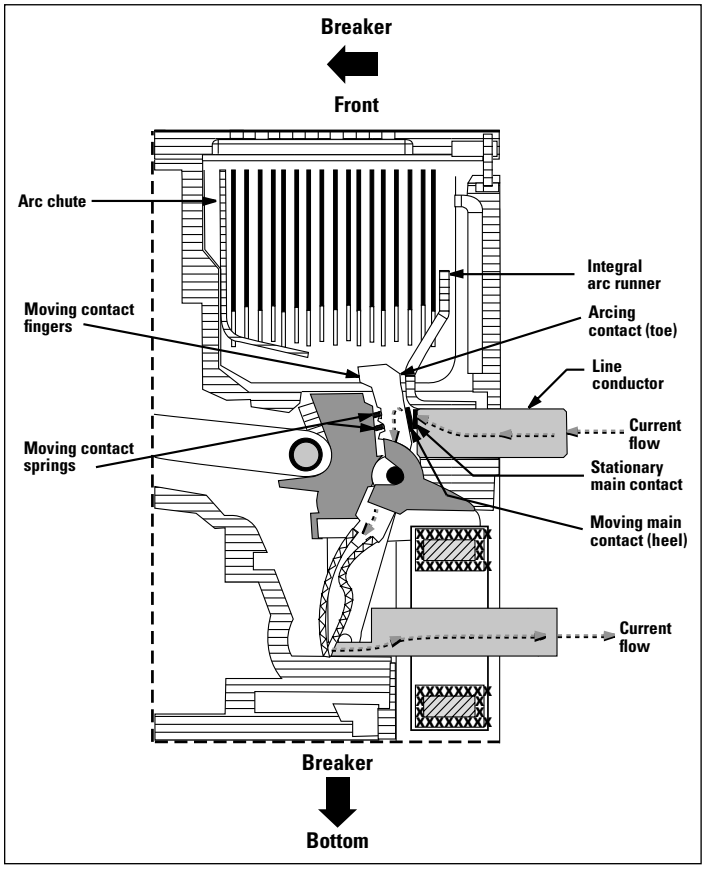


Figure 24. General partial cross-sectional view (shown in closed position) (not specific to any family/frame)

Operating mechanism

The Magnum PXR and PD-SB operating mechanism is based on the proven cam and spring design of the Magnum DS power circuit breaker. It is easily accessed by removing four cover screws and the front cover (**Figure 25**). The mechanism is a two-step stored energy mechanism. Potential energy is stored to close the circuit breaker. Sufficient energy to open the circuit breaker remains available after a closing operation.

Manual operation

On manually operated circuit breakers, the closing spring can only be charged manually. To manually charge the spring, insert one finger in the recess behind the charging handle and pull out. This permits a gloved hand to grasp the handle and begin charging (**Figure 26**). It takes from 5 to 7 downward strokes on the charging handle to complete the manual charging process. It is possible to manually recharge the spring immediately after closing the circuit breaker and before it has been tripped open.

Standard manually operated circuit breakers are closed and opened by hand using the Manual CLOSE and Manual OPEN buttons respectively located on the front of the circuit breaker (**Figure 19**). Performing either operation is accomplished by pressing and releasing the appropriate button. Access to these pushbuttons can be limited by the use of an optional, padlockable cover. In addition, complete access to the CLOSE button can be prevented with an optional prevent close cover. The status of the springs and the primary contacts are always indicated in an indicator window just above the pushbuttons.

Electrically operated optional devices are available to automatically close or trip a manually operated circuit breaker. An electrical spring release is available to close a manually operated circuit breaker. Two optional devices, a shunt trip, and an undervoltage release, are available to automatically trip (open) a manually operated circuit breaker. All of these UL Listed optional devices can be installed easily in the field. For more details on these devices, refer to **page 26**, "Accessory devices" in this manual.

An electrical operator, which is used to charge the closing spring automatically, can be added to a manually operated circuit breaker in the field (**Figure 27**).

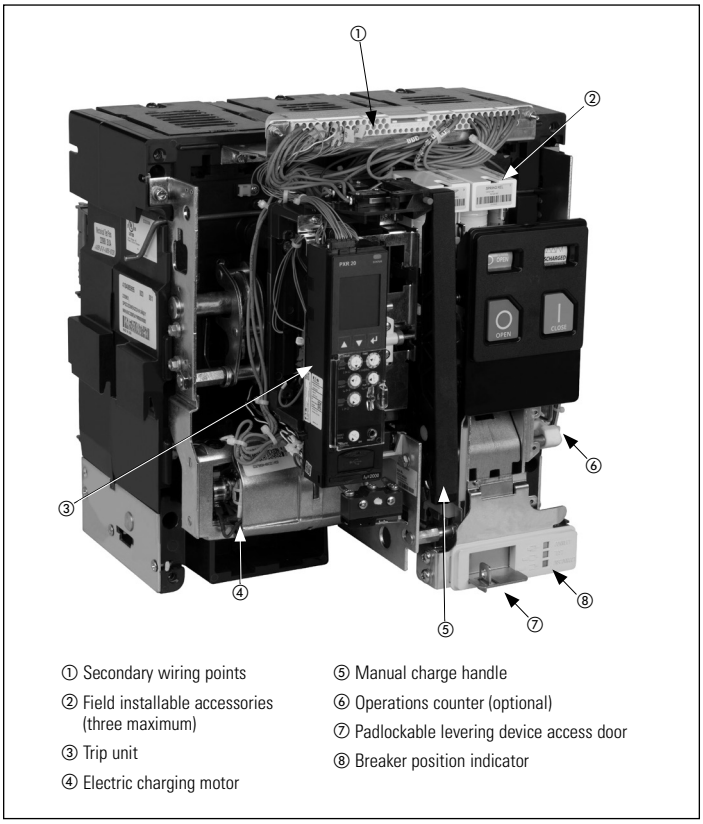


Figure 25. Typical electrically operated drawout circuit breaker with front cover removed

Figure 26. Circuit breaker closing springs being manually charged (Magnum DS shown)

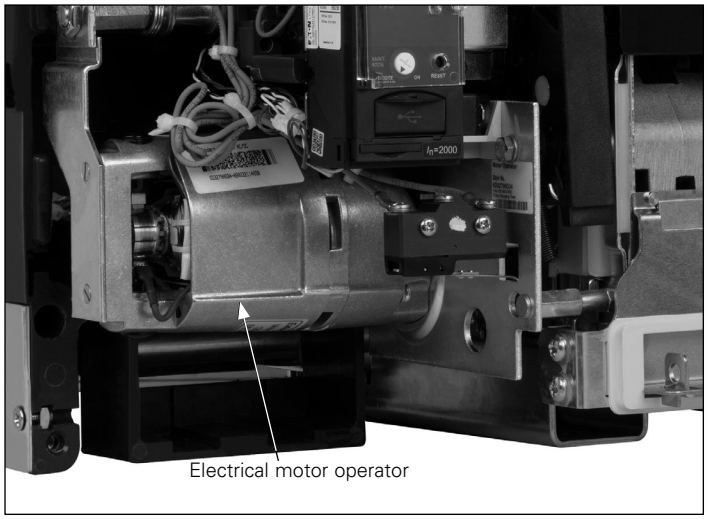


Figure 27. Electrical motor operator to charge closing spring

Electrical operation

For electrically operated circuit breakers, the springs are normally charged through the use of an electrical operator (**Figure 27**). The springs can, however, be charged manually as just described in the previous paragraph (**Figure 26**).

Like the manually operated circuit breaker in the previous paragraph, electrically operated circuit breakers can also be manually closed and opened through the use of the front-mounted Manual OPEN and Manual CLOSE buttons.

An electrically operated circuit breaker from the factory is also equipped as standard with a spring release to close the circuit breaker electrically. An optional shunt trip and undervoltage release are also available to trip (open) an electrically operated circuit breaker.
Refer to **page 26**, "Accessory devices" for more details on both standard and optional devices.

Anti-pump feature

The Magnum PXR and PD-SB circuit breaker has both mechanical and electrical anti-pump features. If the circuit breaker is closed on a fault condition and trips open while the CLOSE signal is maintained, (using the mechanical pushbutton, the spring release, or the trip unit), it will not make subsequent attempt to close until the CLOSE command is removed and reapplied.

Note: If the close signal is applied prematurely (before the breaker is completely charged and latched), the CLOSE command will be ignored until it is removed and reapplied.

For electrical closing, a Latch Check Switch (LCS) option is available (see **page 27**), which will block the application of the electrical CLOSE command until the breaker is ready to close.

Arc chambers

The Magnum PXR and PD-SB circuit breakers use arc chambers to insulate and isolate individual poles from one another, from the rest of the circuit breaker, and from operating personnel (**Figure 15**). Arc chambers are molded and integral parts of the circuit breaker frame. Enclosed within each arc chamber is an arc chute that mounts over each set of primary contacts.

After the main contacts part, any remaining current is driven to the arcing contacts (**Figure 28**). Magnetic action draws the arc to the arc chute. As the arcing contacts separate, the moving arcing contacts discharge into the arc chute plates while the integral arc runner also helps to draw the arc into the arc chute (**Figure 29**).

Arc chute

The Magnum PXR and PD-SB arc chutes mount down over the arcing contact. V-shaped arc chute plates attract the arc and interrupts it. The top arc plate, which is a part of the arc chute itself, also helps to attract the arc away from the moving arcing contact and up into the arc chute's V-shaped plates (**Figure 30** and **Figure 31**).

Arc chute components are assembled in an insulating jacket, which is removable from the top of the circuit breaker. Each arc chute has a baffled top cover.

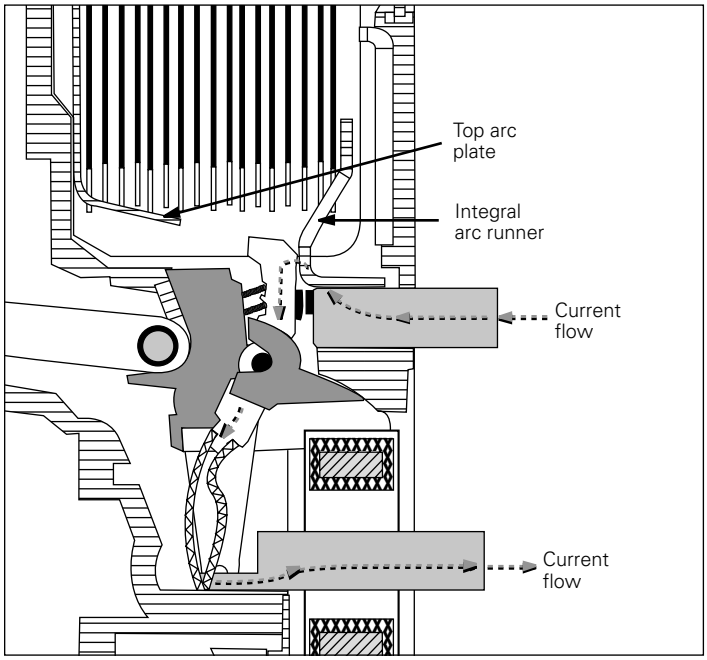


Figure 28. Cross section of conductor and arc control system

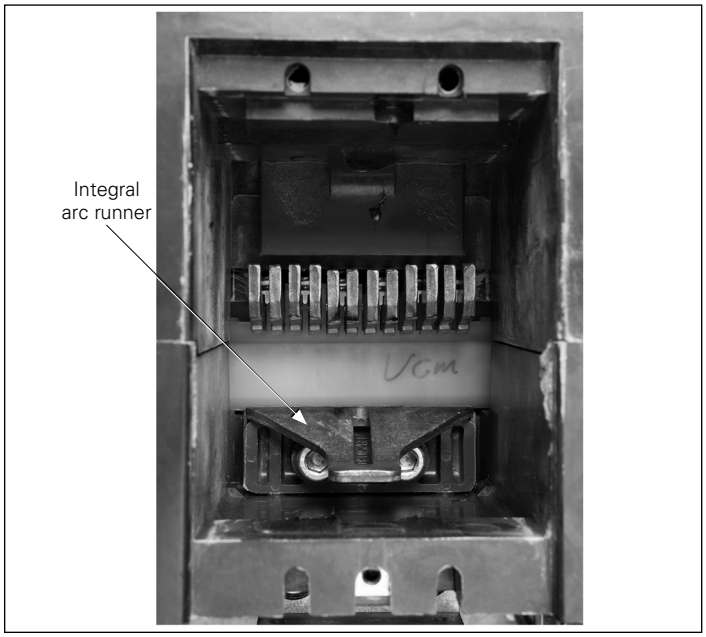


Figure 29. Integral arc runner viewed from top of arc chamber (arc chute removed, circuit breaker open)

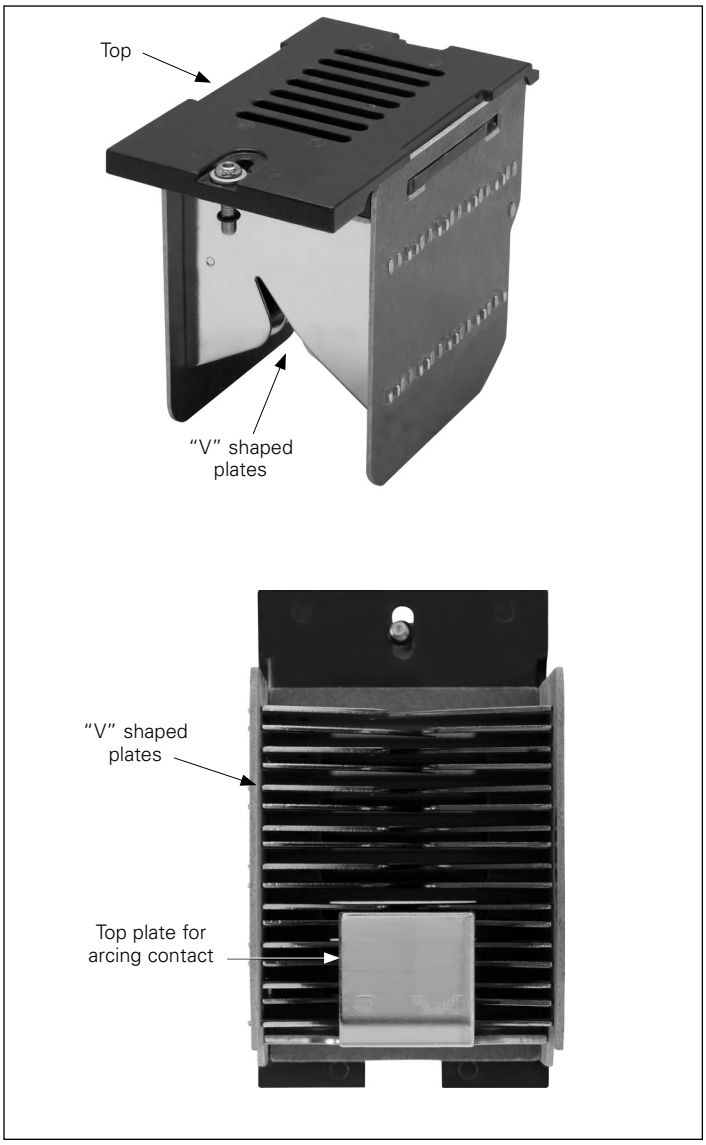


Figure 30. Arc plate assembly

Electronic tripping system

The Magnum PXR and PD-SB circuit breaker uses the Power Xpert Release (PXR) trip unit. The trip unit is available in multiple styles with advanced features. For details pertaining to the trip units available and how to configure them for your application, please refer to the User Manual, publication MN013015EN.

There are 5 parts to the tripping system

- Current sensors
- Frame module
- Trip unit
- Trip actuator
- Voltage divider board (VDB) 1 (PXR 25 and PXR 35)
- Voltage divider board (VDB) 2 (PXR 35 only)

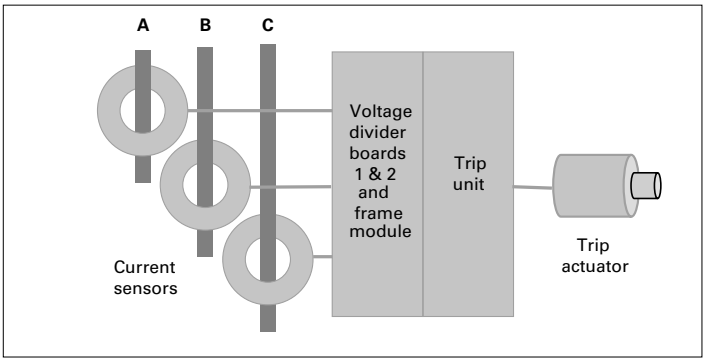


Figure 31. Pictorial diagram of typical current sensing, processing, and tripping system

Microprocessor-based trip unit

The PXR trip unit has features and flexibility that allow configuration for a wide variety of protection applications. The PXR trip unit is available in multiple models for the Magnum PXR and PD-SB circuit breaker family. The models range from simple current protection devices through more complex protection, metering and communication functionality. Communication options support integration into a variety of systems to monitor performance. Advanced metering of currents, voltages, power and energy allows evaluation of real-time energy use.

Table 4. Magnum PXR and PD-SB trip units

Trip unit	Trip unit catalog number	Breaker catalog digit 13,14	Protection	ARMS	Communication	Metering
PXR 20	PXR20VN30LNNC	2A	LSI	N	Adapter module (CAM)	Current
	PXR20VN30LGNC	2C	LSIG	N	Adapter module (CAM)	Current
	PXR20VN30LNAM	2H	LSI	Y	Modbus RTU & CAM	Current
	PXR20VN30LGAM	2F	LSIG	Y	Modbus RTU & CAM	Current
PXR 25	PXR25VN30LNAM	2Q	LSI	Y	Modbus RTU & CAM	Current, voltage, power, energy
	PXR25VN30LGAM	2S	LSIG	Y	Modbus RTU & CAM	Current, voltage, power, energy
PXR 35	PXR35VN30LDAE	3A	LSI	Y	Modbus RTU & Ethernet	Current, voltage, power, energy
	PXR35VN30LGAE	3B	LSIG	Y	Modbus RTU & Ethernet	Current, voltage, power, energy
	PXR35VN30LDAB	3C	LSI	Y	Modbus RTU, Ethernet & Bluetooth	Current, voltage, power, energy
	PXR35VN30LGAB	3D	LSIG	Y	Modbus RTU, Ethernet & Bluetooth	Current, voltage, power, energy

Notes
LSI = Long, short and instantaneous protection are available
LSIG = Long, short, instantaneous, and ground protection are available
CAM = Communication adapter module, see Section 4.4 Communications adapter modules (CAMs).

The Trip Unit contains the electronics which support the protection functions, metering capability, user interface and communication features. It can be replaced in the field for the same style unit or to a different style. Note that upgrading may require the installation of other sub-system components and wiring to enable full feature support.

The Frame Module is mounted permanently to the circuit breaker frame, it should not be removed or replaced. It holds factory configured frame information regarding the circuit breaker rating, sensor calibration, and operation. The interface circuit for the sensors as well as the configurable relays are mounted in the frame module.

The Voltage Divider Board (VDB) converts the line voltage from the top or bottom breaker terminals for sensing by the trip unit electronics. It is included with PXR 25 and PXR 35 trip unit styles. With the PXR 35 trip unit, this is VDB1 and is connected to the top terminals. Additionally, the PXR 35 utilizes a second VDB (VDB2) that is connected to the bottom terminals.

The electronic trip units are self-powered. When the circuit breaker is closed, no external power is required to operate their current protection systems. Current signal levels and the control power are derived from the current sensors integrally mounted in the circuit breaker.

The test functions are integrated into the trip unit and do not require a separate test kit. Secondary injection is accomplished using an on-board circuit to provide the input to the trip unit. Tests are initiated using the trip unit's front panel and by using the configuration software, Power Xpert Protection Manager (PXPM).

Four built-in test modes are available for use: functional test using secondary injection, functional test using simulated current, current sensor continuity test, and open breaker functional test. Complete testing of the trip unit system can be accomplished when a current sensor test is used in conjunction with secondary injection test.

When the circuit breaker is shipped from the factory, the trip unit's protective functions are normally set at minimum values. For specific overload tripping characteristics and time/current curves to coordinate with a load or system, refer to the trip unit instruction book.

Figure 32. PXR 25 programmable trip unit installed in Magnum PXR circuit breaker

Current sensors

The internal Current Sensors are permanently installed in the lower rear of the circuit breaker. They consist of two coils; as current begins to flow through the circuit breaker, an iron core coil generates the energy which powers the trip unit. At the same time, an air core coil provides signals which are processed to determine the magnitude of current the breaker is carrying. Auxiliary control power is not required for current protection functions.

Figure 33. Narrow frame current sensors shown with cover plate removed

Trip actuator

The trip actuator is a small cylindrically shaped electromagnetic device that acts mechanically to trip the circuit breaker (**Figure 31**). In general, it is composed of a permanent magnet, a spring-loaded rod to produce the mechanical tripping, and a lever for resetting the actuator after tripping occurs. The electronic trip unit provides a pulse that counteracts the effect of the permanent magnet, allowing the spring-loaded rod to act mechanically. The device is reset when the circuit breaker opens.

Mechanical trip flag

A red, pop-out mechanical trip indicator is an optional feature. It is located above the trip unit on the breaker's front faceplate (**Figure 32**). It operates by releasing and popping out any time the circuit breaker trips due to an overcurrent condition.

An optional overcurrent trip switch (OTS) that operates off the position of the mechanical trip indicator is also available. The switch is reset when the trip indicator is reset.

The pop-out mechanical trip indicator is available in two versions:

Interlocking trip indicator—When activated via a tripping event, the interlocked version of the trip indicator acts to provide local visual indication that the breaker has tripped, change the OTS contact position, and interlock the breaker such that the breaker cannot be reclosed until the mechanical trip indicator is reset.

Non-interlocking trip indicator—This version acts only to provide visual local indication of a tripping event and change the OTS contact position.

When using an interlocking trip indicator, a remote trip reset option is available to electrically reset the trip indicator by applying the proper rated control voltage. The remote trip reset feature is very useful in applications where direct access to the circuit breaker is limited, for example a wind turbine. The remote trip reset will act to reset the trip indicator and OTS but will not reset the trip unit status LEDs; those can be reset via communications (if included).

The PXR trip unit shows the cause of trip via LEDs on the face of the trip unit. These indicators should be cleared by pushing the reset button after the cause of the fault has been diagnosed. This will preserve the battery and eliminate confusion when the breaker is put back in service.

Making current release

All Magnum PXR and PD-SB circuit breaker trip units have a making current release function. This safety feature prevents the circuit breaker from being closed and latched on a faulted circuit. The non-adjustable release is preset at a peak instantaneous current of 22.5 x I_n; this corresponds to an rms current of 11 x I_n with maximum asymmetry.

The making current release is enabled only for the first two cycles following a circuit breaker closing operation. The making current release will trip the circuit breaker instantaneously, release the mechanical (pop-out) indicator, and flash the instantaneous LED trip indicator, if so equipped.

Voltage taps

Voltage taps are pre-installed for monitoring the three phase voltages (**Figure 34)**. One set (red wires) connects to the line (upper) terminals and the other set (black wires) connects to the load (lower) terminals (black tubing does not extend to the connection at the terminals). For the PXR 25 trip unit either can be then connected to the VDB which converts line voltage for input to the trip unit. For the PXR 35 trip unit there is a VDB connected to each one.

The voltage tap connectors at the front of the breaker are equipped with a protective insulating cap. Be sure to leave the cap in place over the unused connectors.

Breakers are able to be converted from upper terminal voltage monitoring to lower terminal voltage monitoring by switching the connections with the voltage divider board connector. If the connection is switched, replace the cap over the unused connector and contact Eaton for a Lower Terminal Voltage Metering Label.

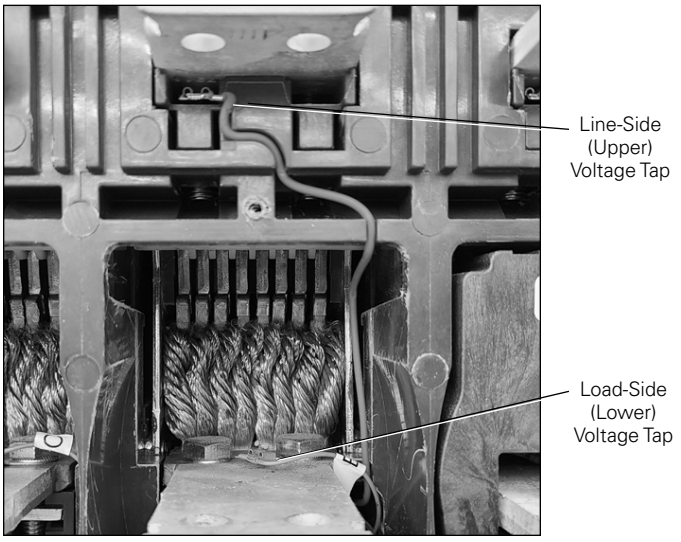


Figure 34. Line and load-side voltage taps for circuit breakers with PXR 25 or PXR 35 trip units

Accessory devices

A variety of accessory devices are available for use with Magnum PXR or PD-SB circuit breakers. Unless otherwise stated, they are all considered optional devices in the sense that they are not provided as standard on a manually operated circuit breaker. Available accessories are identified here and discussed in general terms. For more detailed information and/or installation instructions, refer to individual instructional leaflets dedicated to the accessories.

Magnum PXR and PD-SB circuit breaker accessories are designed to fit all frame sizes. The accessories fall into one of three categories:

- Plug-in electrical
- Internal electrical
- Mechanical

Plug-in electrical accessories

There are four plug-in electrical accessories for use with Magnum PXR and PD-SB circuit breakers. Three can be viewed for identification by name and rating through viewing windows located in the right front of the circuit breaker (**Figure 35**). All four are plug-in type and can be factory installed or field installed using a UL Listed kit.

The four plug-in accessories are:

- Shunt trip (ST)
- Spring release (SR)
- Undervoltage release (UVR)
- Auxiliary switch

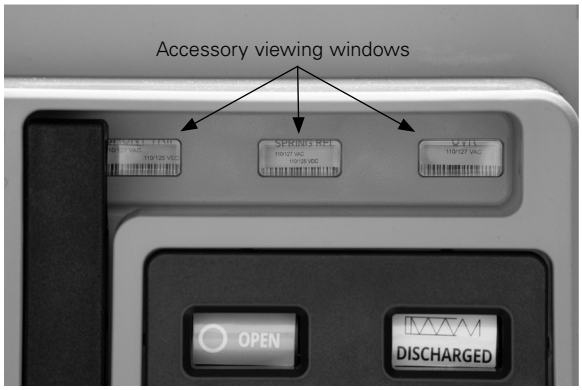


Figure 35. Through-the-window electrical accessories

Shunt trip—The shunt trip is an optional device on circuit breakers (**Figure 36** and **Figure 37**). It opens the circuit breaker instantaneously when its coil is energized by a voltage input (**Table 5**). A total of two shunt trips can be mounted on a Magnum PXR and PD-SB circuit breakers. Shunt trips are available with a continuous duty coil or a cutoff switch. A continuous duty (or 100% rated) shunt trip can be continuously energized and is useful in applications where it is desired to keep the breaker tripped open. Shunt trips that have a cutoff switch remove voltage from the coil once the breaker contacts are opened.

Table 5. Shunt trip ratings

Control voltages	Operational voltage range 70–110%	Inrush power consumption ①	Opening time (ms)
24 Vdc	17–26 Vdc	250 W	35
48 Vdc	34–53 Vdc	250 W	35
60 Vdc	42–66 Vdc	300 W	35
110–125 Vdc	77–138 Vdc	450 W	35
220–250 Vdc	154–275 Vdc	450 W	35
110–127 Vac	77–140 Vac	450 VA	35
208–240 Vac	146–264 Vac	450 VA	35

① Required for less than 35 ms.

Table 6. Continuous duty shunt trip

Control voltages	Operational voltage range 70–110%	Inrush/continuous power consumption	Opening time
24 Vdc	17–26	250 W / 18 W	35
48 Vdc	34–53	275 W / 18 W	35
60 Vdc	42–66	275 W / 18 W	35
110–125 Vdc	77–138	450 W /1 0 W	35
220–250 Vdc	154–275	450 W / 10 W	35
110–127 Vac	77–140	450 VA / 10 VA	35
208–240 Vac	146–264	400 VA / 10 VA	35

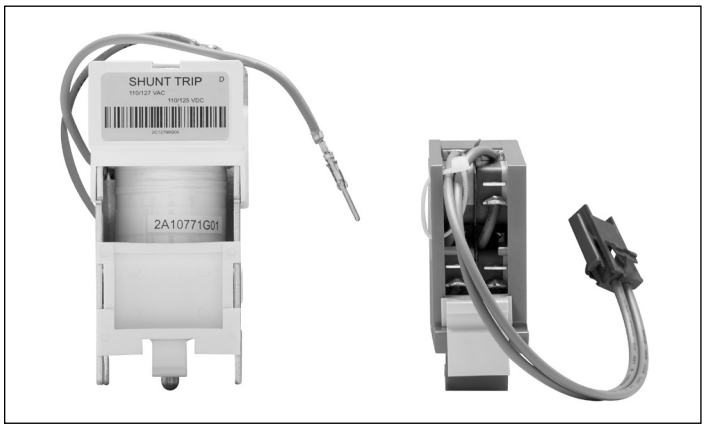


Figure 36. Shunt trip with cutoff switch

Figure 37. Shunt trip switch installed

Spring release—The spring release is an optional device (**Figure 38**). It remotely closes the circuit breaker when the coil is energized by a voltage input (**Table 7**). The closing spring must be fully charged and the trip latch reset (not held in the tripped position) for the spring release to operate. If these two conditions are not met, the close signal will be ignored until it is removed and re-applied.

Table 7. Spring release ratings

Control voltages	Operational voltage range 85–110%	Inrush power consumption	Closing time (ms)
24 Vdc	20–26 Vdc	250 W	40
48 Vdc	41–53 Vdc	250 W	40
60 Vdc	51–66 Vdc	300 W	40
110–125 Vdc	93–138 Vdc	450 W	40
220–250 Vdc	187–275 Vdc	450 W	40
110–127 Vac	93–140 Vac	450 VA	40
208–240 Vac	177–264 Vac	450 VA	40

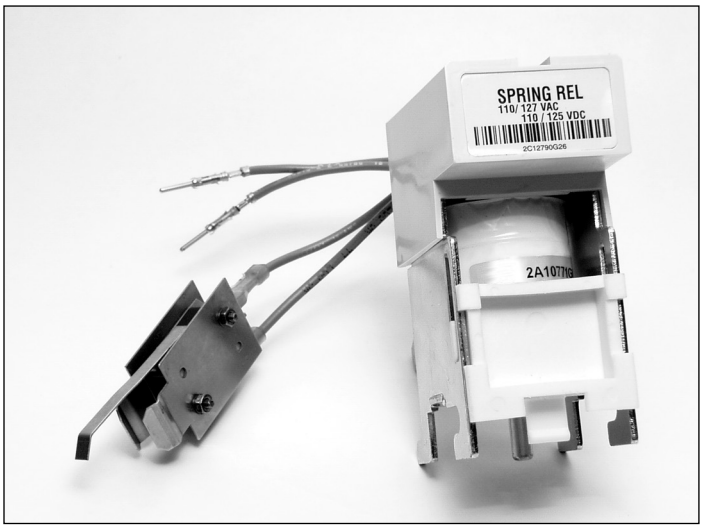


Figure 38. Spring release with optional latch switch

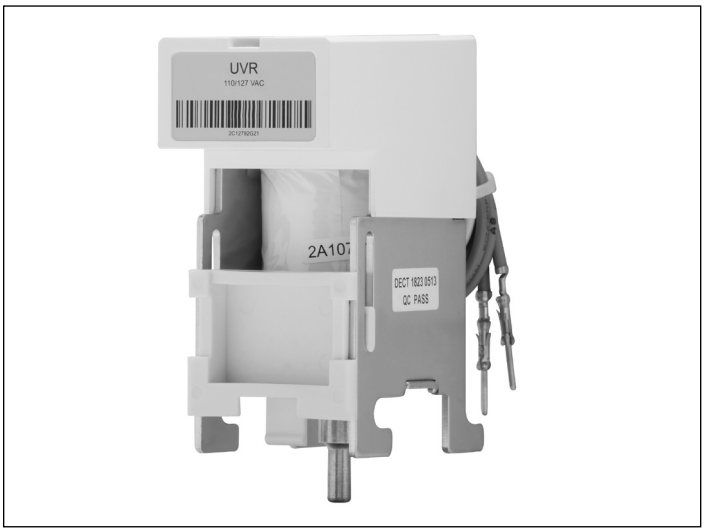


Figure 39. Undervoltage release

An optional Latch Check Switch (LCS) can be installed to indicate when the circuit breaker is "ready to close." Two versions of the LCS are available.

The LCS wired to the spring release will not permit activation of the spring release until the circuit breaker is fully charged and the trip latch is reset (**Figure 38**). If power is applied and maintained to the spring release, an activation will occur when the circuit breaker is "ready to close."

The LCS for remote indication consists of one Form C contact wired to the circuit breaker secondary contacts for integration into external control schemes.

Note: Wiring the LCS for remote indication directly in series with the SR accessory is not recommended as this will override the "anti-pump" feature of the electrical charging/closing system.

Undervoltage release—The undervoltage release is an optional device on both manually and electrically operated circuit breakers (**Figure 36**). It opens the circuit breaker when its supply voltage falls to between or below 35–60% of rated voltage. If the release is not
energized to 85% of its supply voltage, the circuit breaker cannot be closed electrically or manually (**Table 8**).

Table 8. Undervoltage release

Control voltages	Operational voltage range 85–110%	Dropout voltage 30–60%	Inrush/ continuous power consumption	Opening time (ms)
24 Vdc	20–26 Vdc	7–14 Vdc	250 W ① / 18 W	70
32 Vdc	27–35 Vdc	10–19 Vdc	275 W ① / 15 W	70
48 Vdc	41–53 Vdc	14–29 Vdc	275 W ① / 18 W	70
60 Vdc	51–66 Vdc	18–42 Vdc	275 W ① / 18 W	70
110–125 Vdc	94–138 Vdc	33–75 Vdc	450 W ① / 10 W	70
220–250 Vdc	187–275 Vdc	66–150 Vdc	450 W ① / 10 W	70
110–127 Vac	94–140 Vac	33–76 Vac	450 VA ② / 10 VA	70
208–240 Vac	177–264 Vac	62–144 Vac	400 VA ② / 10 VA	70
380–415 Vac	323–457 Vac	114–249 Vac	480 VA ② / 10 VA	70
480 Vac	408–528 Vac	144–288 Vac	400 VA ② / 10 VA	70
600 Vac	510–660 Vac	180–360 Vac	400 VA ② / 10 VA	70

① Required for 200 ms.

② Required for 400 ms.

Figure 40. Shunt trip, spring release, and undervoltage release installed

Auxiliary switch—An auxiliary switch is an optional device providing remote electrical indication if the circuit breaker is open or closed (**Figure 41**). Up to three auxiliary switches can be mounted in the circuit breaker. Each switch has four Form C contacts for a total of 12 normally open and 12 normally closed contacts (**Table 9**).

Table 9. Auxiliary switch, overcurrent trip switch, and cell switch contact ratings

Control voltages	Contact rating inductive load (amperes)
250 Vac	10
125 Vdc	0.5
250 Vdc	0.25

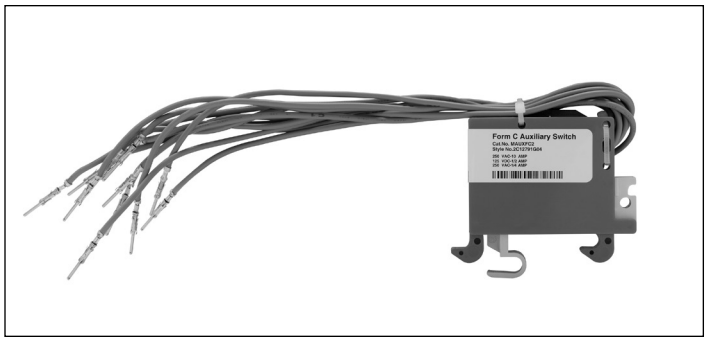


Figure 41. Auxiliary switch (Form C)

Internal electrical accessories

Other electrical accessories are mounted inside the circuit breaker. They can be factory or site installed. There are two different internally mounted accessories:

- Overcurrent trip switch (bell alarm)
- Motor operator

Overcurrent trip switch (bell alarm)—An overcurrent trip switch (bell alarm) is an optional device (**Figure 42**). It provides an electrical indication when a circuit breaker trips as a result of the trip unit reacting to an overcurrent condition. Opening as a result of a circuit breaker's manual open button, shunt trip, or undervoltage release does not cause the overcurrent trip switch to operate.

The overcurrent trip switch has 2 Form C contacts (**Table 9**). The status of the contacts changes when the trip indicator pops out. This permits the switch to be used as an alarm or in conjunction with a spring release to block a subsequent remote electrical closing signal.

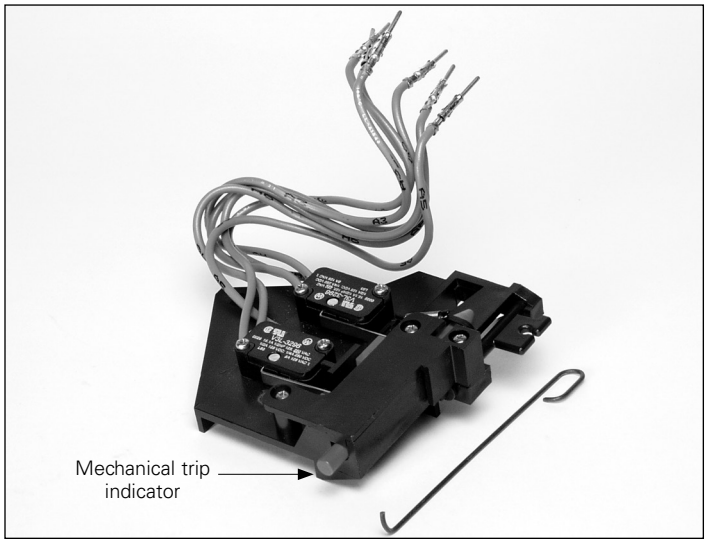


Figure 42. Mechanical trip indicator with associated overcurrent trip switch

Motor operator—A motor operator is an electric motor assembly internally mounted in the circuit breaker (**Figure 43** and **Figure 44**). It charges the closing springs electrically for remote or local operation. The motor operator can be factory or site installed (**Table 10**).

To convert a manually operated circuit breaker to an electrically operated circuit breaker, a UL Listed motor operator kit is available.

Table 10. Motor operator

Control voltages ①	Operational voltage range 85–110%	Running current (A. avg.)	Typical inrush current	Power consumption (W or VA)	Maximum charging time (seconds)②
24 Vdc	20–26	12	300% of running	300	5
48 Vdc	41–53	5	500% of running	250	5
60 Vdc	51–66	3	600% of running	250	5
110–125 Vdc	94–138	2	600% of running	250	5
220–250 Vdc	187–275	1	600% of running	250	5
110–127 Vac	94–140	2	600% of running	250	5
208–277 Vac	177–305	1	600% of running	250	5
24 Vdc	20–26	12	300% of running	300	3
48 Vdc	41–53	5	500% of running	250	3
110–125 Vac/Vdc	94–138	2	600% of running	250	3
220–250 Vav/Vdc	187–275	1	600% of running	250	3

① AC voltages are 50/60 Hz

② 5 second motors are considered compact size and 3 second motors are considered standard size.

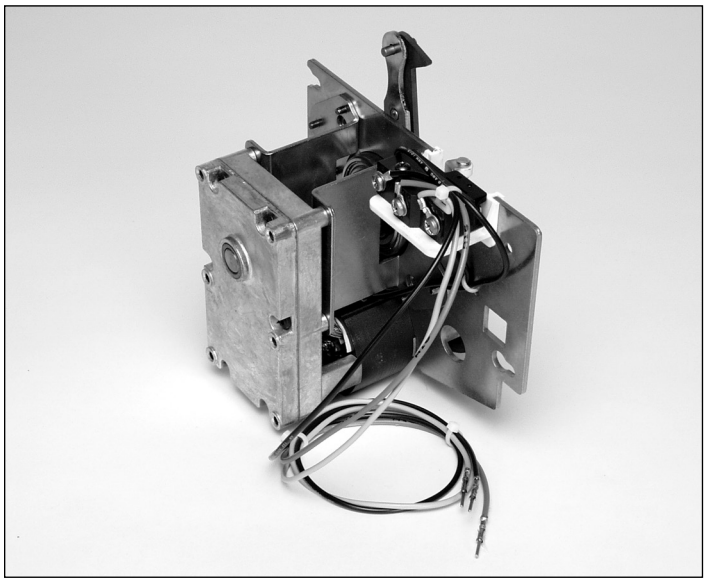


Figure 43. Motor operator kit

Figure 44. Motor operator installed in a standard frame circuit breaker

Mechanical accessories

There are 10 optional mechanical type accessories:

- Operations counter
- Off key lock
- Cassette lock
- Pushbutton cover
- Prevent close cover
- Lockout cover
- Cassette safety shutters
- Cassette cell switch
- Terminal Block Extension Bracket
- Door escutcheon
- Waterproof cover
- Mechanical interlock

Operations counter—The operations counter is a mechanical device used to provide a record of the number of circuit operations. It is mounted in the lower right portion of the circuit breaker and can be viewed through the front cover (**Figure 45**).

Figure 45. Cover mounted key lock and operations counter

Off key lock—The off key lock secures the circuit breaker in the OFF position. It is mounted in the lower right portion of the circuit breaker and can be viewed through the front cover (**Figure 45**). The customer supplies the key lock. The provisions available are for Kirk, Castell, Ronis, or CES.

Cassette lock—A cassette-mounted lock can be used in conjunction with different interlocking schemes (such as main-tie-main) (**Figure 46**). The lock holds the circuit breaker trip-free in the CONNECTED position, preventing it from being closed.

Up to three lock cylinders can be installed on one cassette. Eaton supplies the lock provisions only. The customer is responsible for the locks, which can be Kirk or Castell.

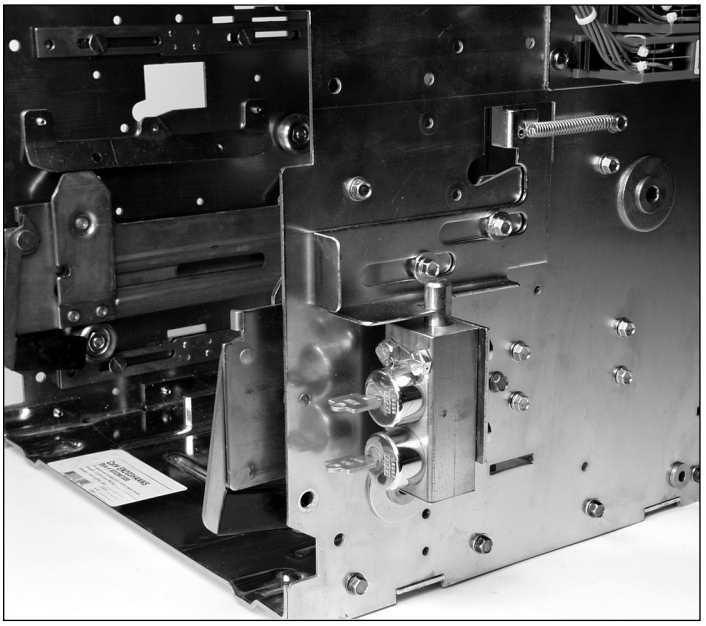


Figure 46. Cassette-mounted key lock

Pushbutton cover—Padlockable covers are available to limit access to the OPEN and CLOSE pushbuttons (**Figure 47**). They can be installed with either or both pushbutton covers in place.

Figure 47. OPEN–CLOSE pushbutton lockable cover plate (Magnum DS shown)

Prevent close cover—All access to the CLOSE pushbutton can be prevented by adding the fixed Prevent Close Cover to the pushbutton cover.

Lockout cover—When padlocked, it maintains the OPEN button in the ACTUATED position, which prevents closure of the breaker.

Cassette safety shutters—Automatically operated insulating type safety shutters are available for use with the drawout cassette. When the drawout circuit breaker is levered from the CONNECT position, the shutters automatically close to cover the fixed primary contacts (**Figure 35**). When the circuit breaker is levered into the cassette, the shutters automatically open, permitting primary connections to be made (**Figure 49**).

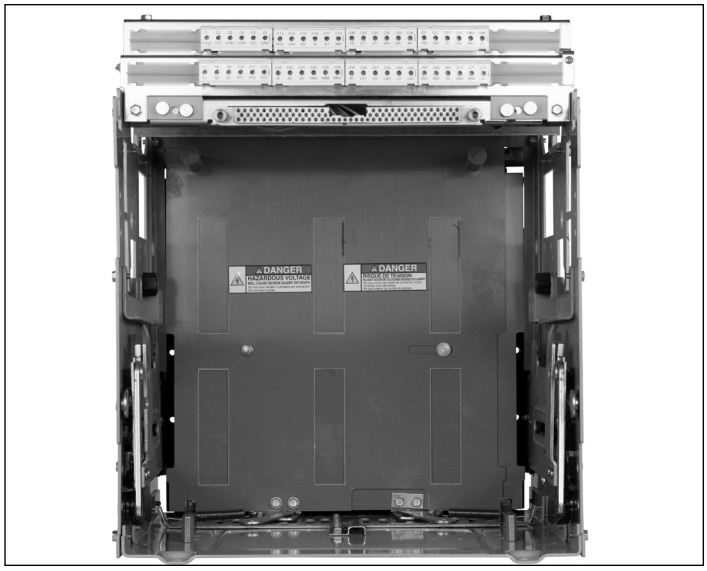


Figure 48. Typical safety shutters in CLOSED position

Figure 49. Typical safety shutters in OPEN position

Cassette cell switch—The cassette cell switch is a compartment position switch for drawout circuit breakers. It is available in a 4 Form C or 8 Form C contact configuration, and mounts on the right side of the cassette (**Figure 50** and **Figure 51**). Refer to the ratings in **Table 9** for cell switch contact information. The cell switch changes status between the TEST and CONNECT positions.

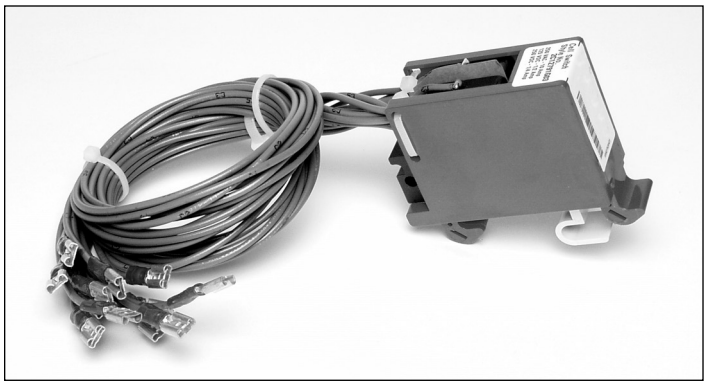


Figure 50. Cell switch (drawout position indicator) unmounted

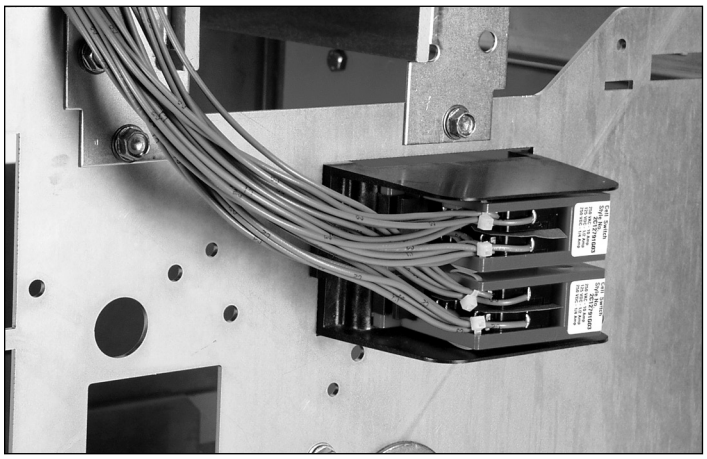


Figure 51. Cell switches mounted on cassette

Terminal block extension bracket —Terminal block extension bracket is attached to either side of the cassette or elsewhere within switchgear and provides attachment points for up to three additional secondary terminal blocks. This accessory is meant to be used when the number of secondary circuits exceeds the space available at the top of the cassette or fixed mount breaker. If the bracket is attached to the side of the cassette, it may interfere with other accessories.

Door escutcheon—The door escutcheon is a molded frame used to seal the space between the circuit breaker and the compartment door cutout. It is supplied with a mounting gasket (**Figure 52**). The door escutcheon and gasket have an IP41 rating.

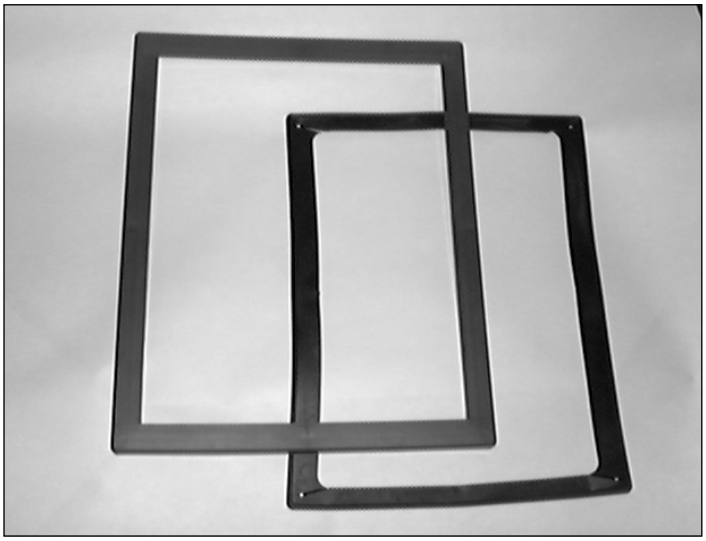


Figure 52. Door escutcheon and gasket

IP55 waterproof cover—A hinged dome-shaped waterproof cover attaches to the metal compartment door to provide waterproof protection for the circuit breaker (**Figure 53**).

Figure 53. IP55 waterproof cover (Magnum DS shown)

Mechanical interlock—A family of mechanical interlocks are available to interlock the closing of two or three Magnum PXR or PD-SB circuit breakers. The mechanical interlock holds one or more circuit breakers tripped (prevents closure) when others are closed. A lever assembly is mounted on each breaker, which interfaces with the pole shaft and the tripper bar. The lever assemblies are interconnected with either cables or rods, depending upon the relative orientation of the breakers. Rods can be used only when the circuit breakers to be interlocked are vertically stacked. Cables can be used for any orientation of the breakers. Mechanical interlocks are available for both fixed and drawout circuit breakers, and in both two-way and three-way versions. An illustration of a two-way cable interlock mounted on two drawout circuit breakers is shown in **Figure 54**.

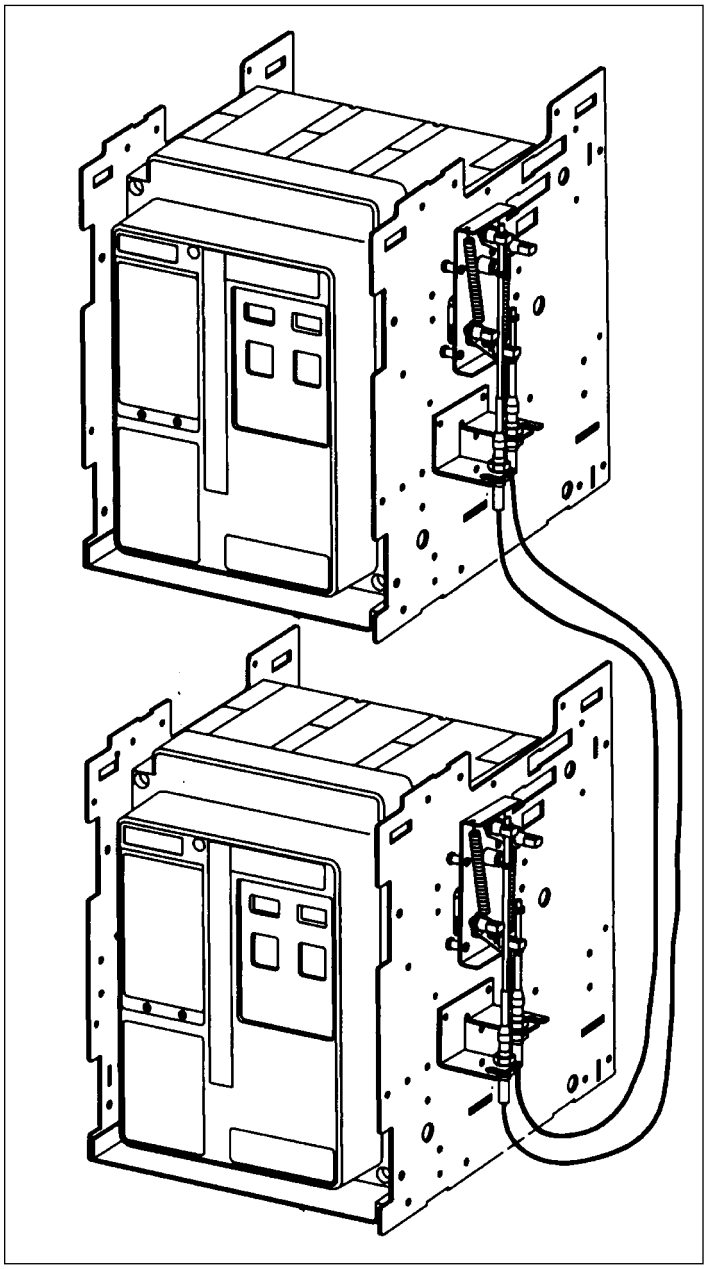


Figure 54. Cassette-mounted two-way cable interlock (Magnum DS shown)

Section 4: Master connection diagrams

Secondary contacts and connection diagrams

A maximum of 84 secondary wiring connection points are available on the Magnum PXR and PD-SB circuit breaker, each dedicated to a specific function (**Figure 56**).

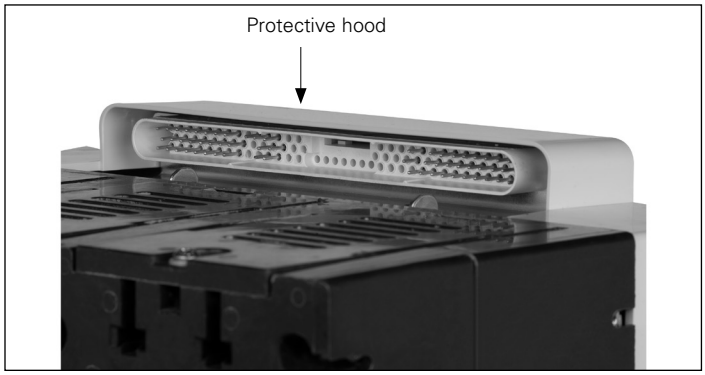
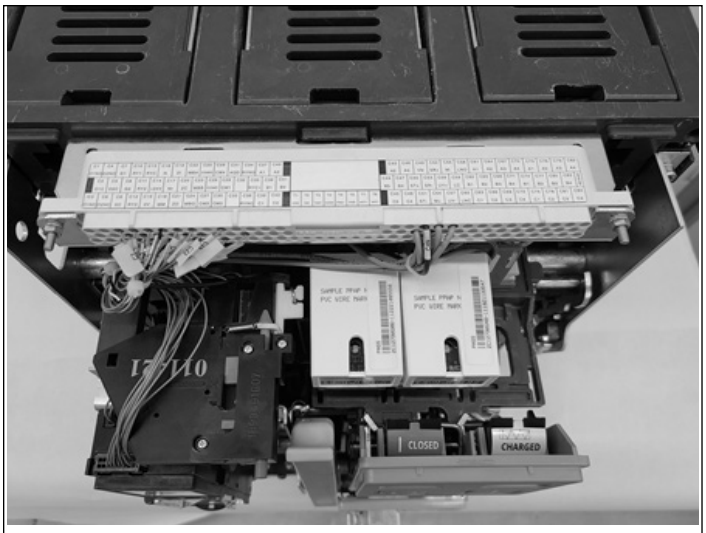


Figure 55. Secondary connector protective hood

A proprietary secondary contact connector with 84 plug-in contact points is mounted on the top rear portion of the circuit breaker. The plug-in connector is protected by a molded hood (**Figure 55**). When the front cover of the circuit breaker is removed, the top of each plug-in connector is exposed. A label on the connector identifies the wiring points.



Labels Legend

OTS	Overcurrent trip switch
G	Source ground input
RY	Trip unit programmable relay
+24V/0V	External trip unit power
N	External neutral current input
MM	Maintenance Mode (ARMS)
Z	Zone selective interlocking
MB B+/A-	MODBUS communications
CM	CAMCOM communications
VN	External neutral voltage input
ST	Shunt trip
SR	Spring release
M/SC	Charging motor
A/B/C	Auxiliary switches

Figure 56. Top view secondary connectors

Drawout type circuit breakers: A mating secondary plug-in connector is mounted on the top front portion of the drawout cassette (**Figure 57**). This connector matches and plugs into the circuit breaker mounted connector. Contact points are wired from the cassette's plug-in connectors to cassette-mounted terminal blocks. The terminal blocks are also mounted on the top front portion of the cassette. The secondary terminals have finger-proof hinged covers with small holes for probe testing.

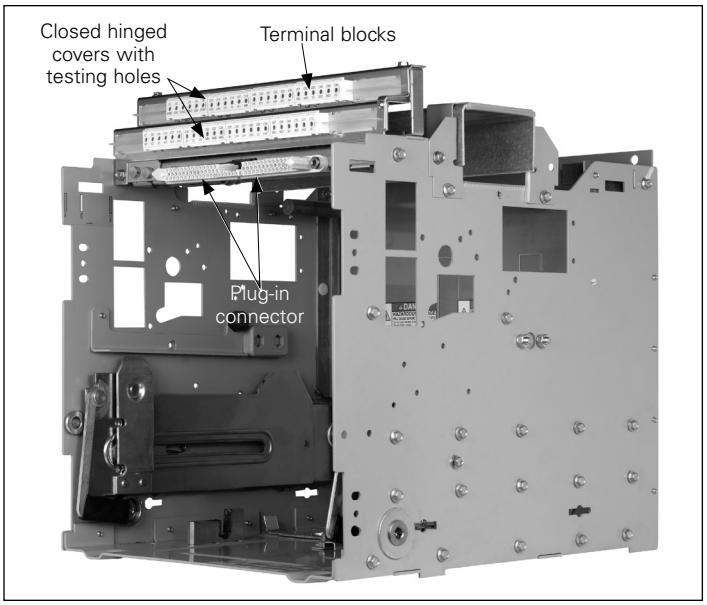


Figure 57. Typical cassette-mounted secondary wiring

Fixed type circuit breakers: There are two secondary connection options:

1. Without terminal block: If a terminal block for customer use is not required, the circuit breaker is supplied with the plug-in connector (male and female) just described in the two previous paragraphs. The plug-in connectors are joined and attached to the top portion of the circuit breaker. The customer can plug secondary wiring with crimp-on connectors into the back of the plug-in connector; subsequently the connections to the circuit breaker can be quickly joined or separated as required.
2. With terminal block: For those customers preferring to wire to a terminal block, terminal blocks with finger-proof hinged covers are added to the secondary configuration just described for a fixed circuit breaker "without a terminal block." The terminal blocks are wired to the plug-in connectors and also permanently attached to the upper rear portion of the circuit breaker (**Figure 16** and **Figure 18**).

A standard tool is available from the plug-in connector manufacturer (AMP) to facilitate the removal of secondary wiring from a plug-in connector, or contact Eaton for assistance (**Figure 58**). The connector halves must be separated to use this tool.

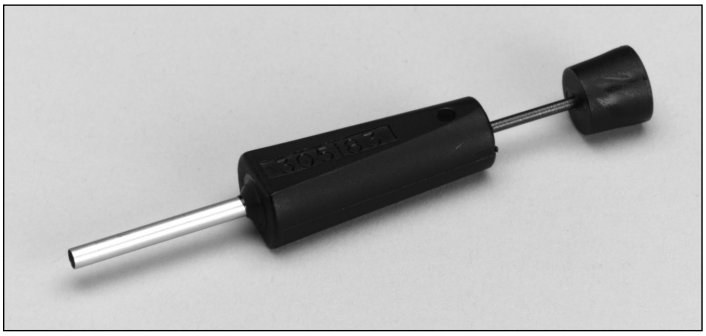


Figure 58. AMP secondary wiring removal tool

Connection diagrams

The connection diagrams for all Magnum PXR and PD-SB circuit breakers using PXR trip units are shown in **Figure 59** through **Figure 70**.

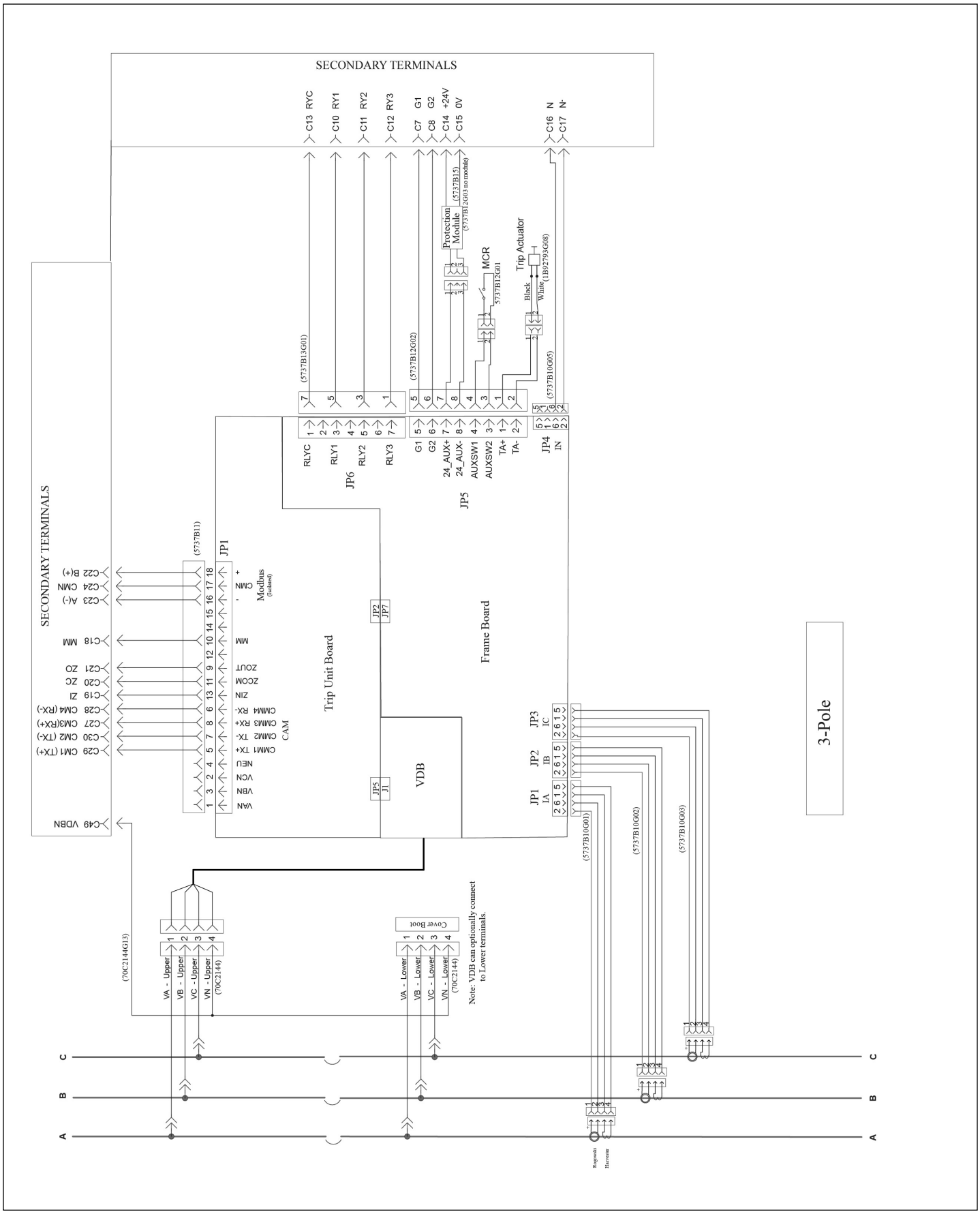


Figure 59. Magnum PXR and PD-SB 3-pole wiring diagram (PXR 20/25)

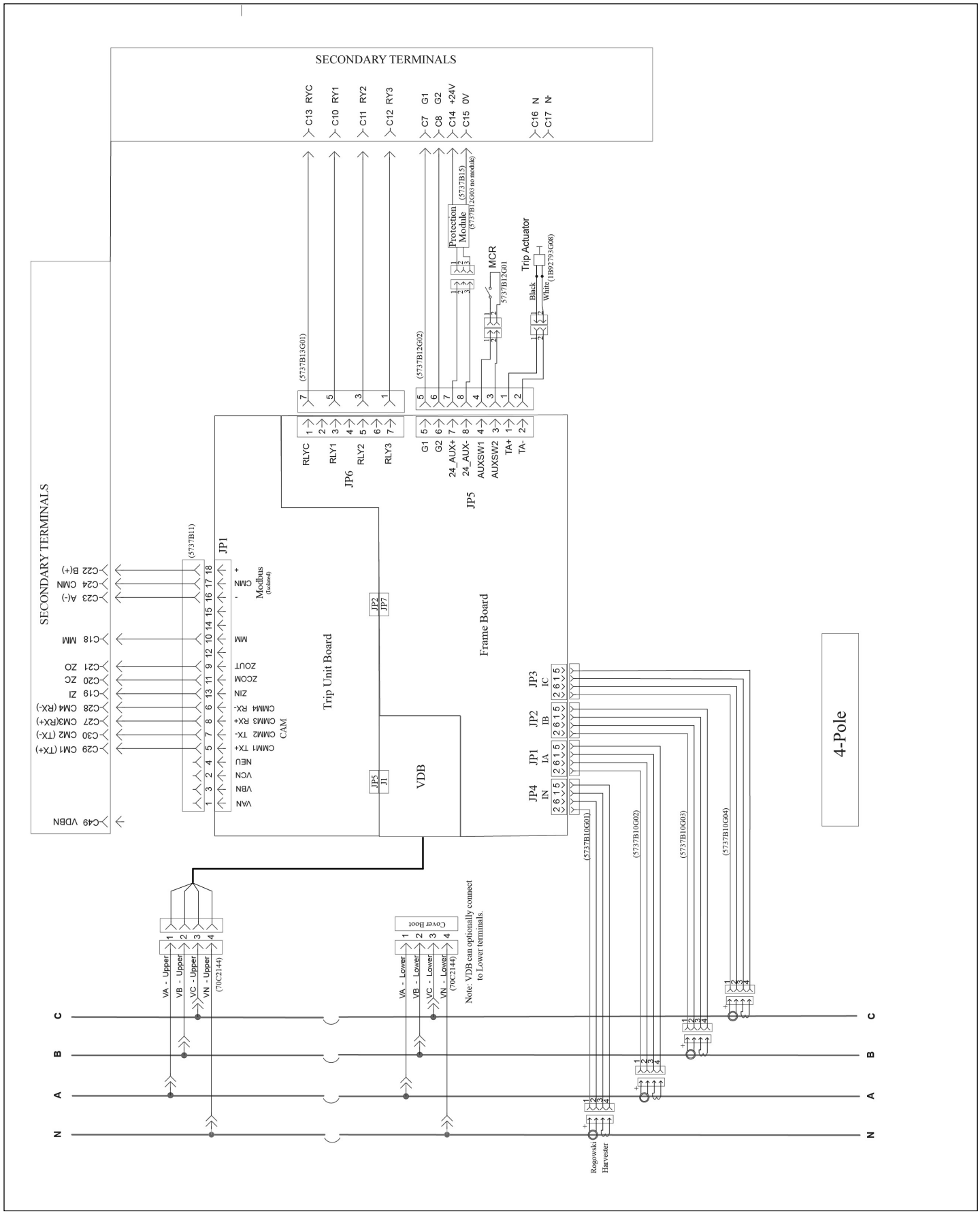


Figure 60. Magnum PXR and PD-SB 4-pole wiring diagram (PXR 20/25)

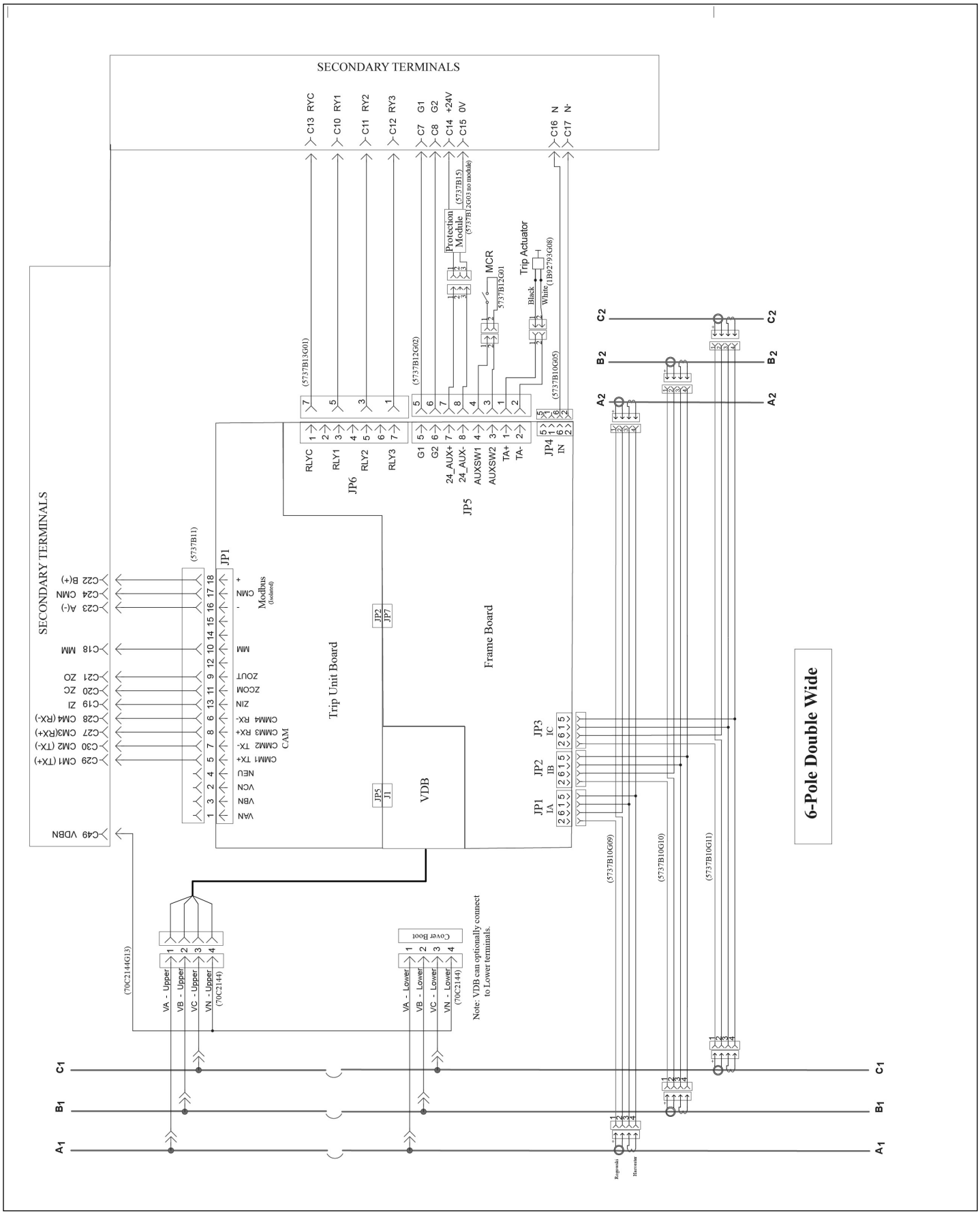


Figure 61. Magnum PXR and PD-SB 6-pole ABCABC wiring diagram (PXR 20/25)

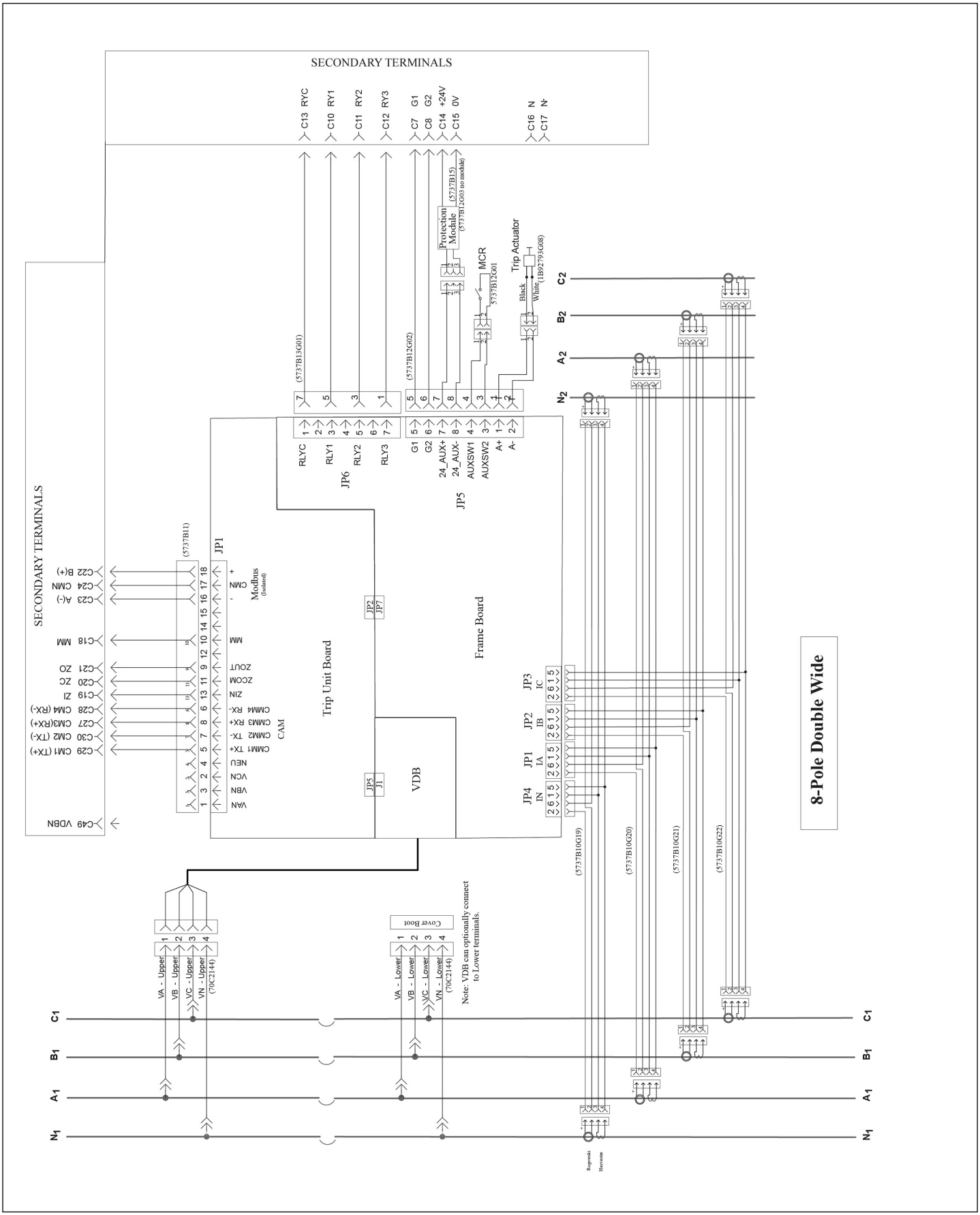


Figure 62. Magnum PXR and PD-SB 8-pole NABCNABC wiring diagram (PXR 20/25)

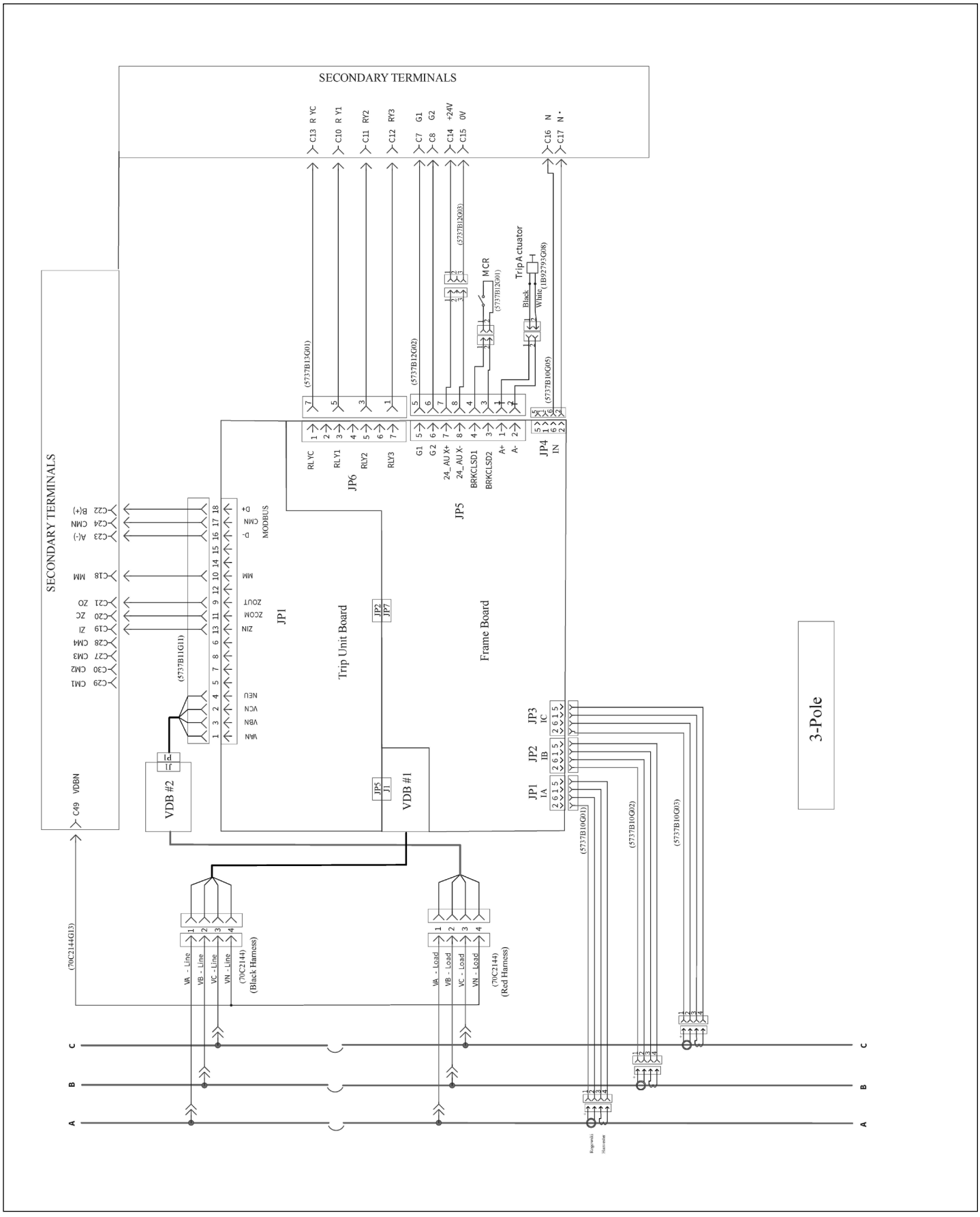


Figure 63. Magnum PXR and PD-SB 3-pole wiring diagram (PXR35)

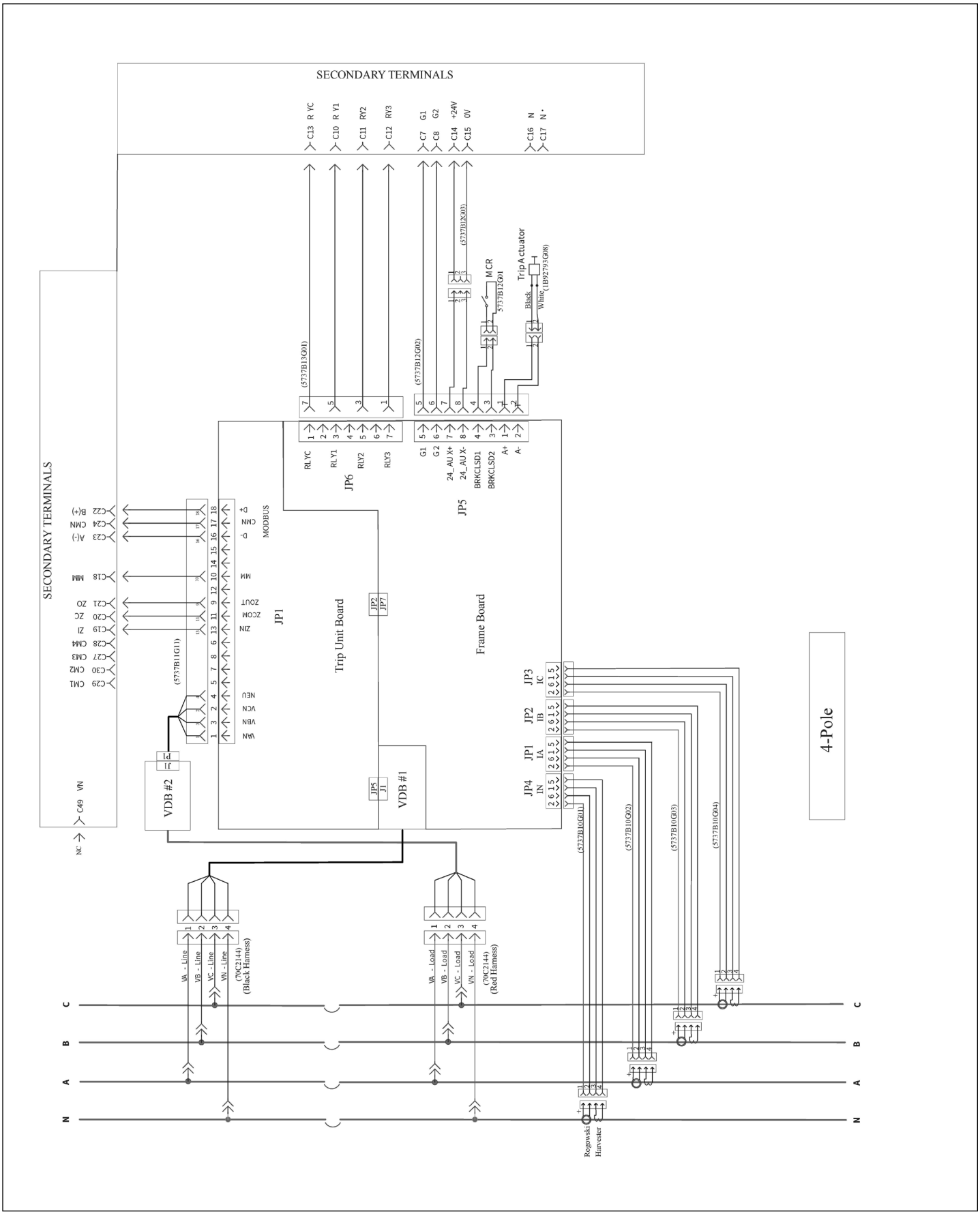


Figure 64. Magnum PXR and PD-SB 4-pole wiring diagram (PXR35)

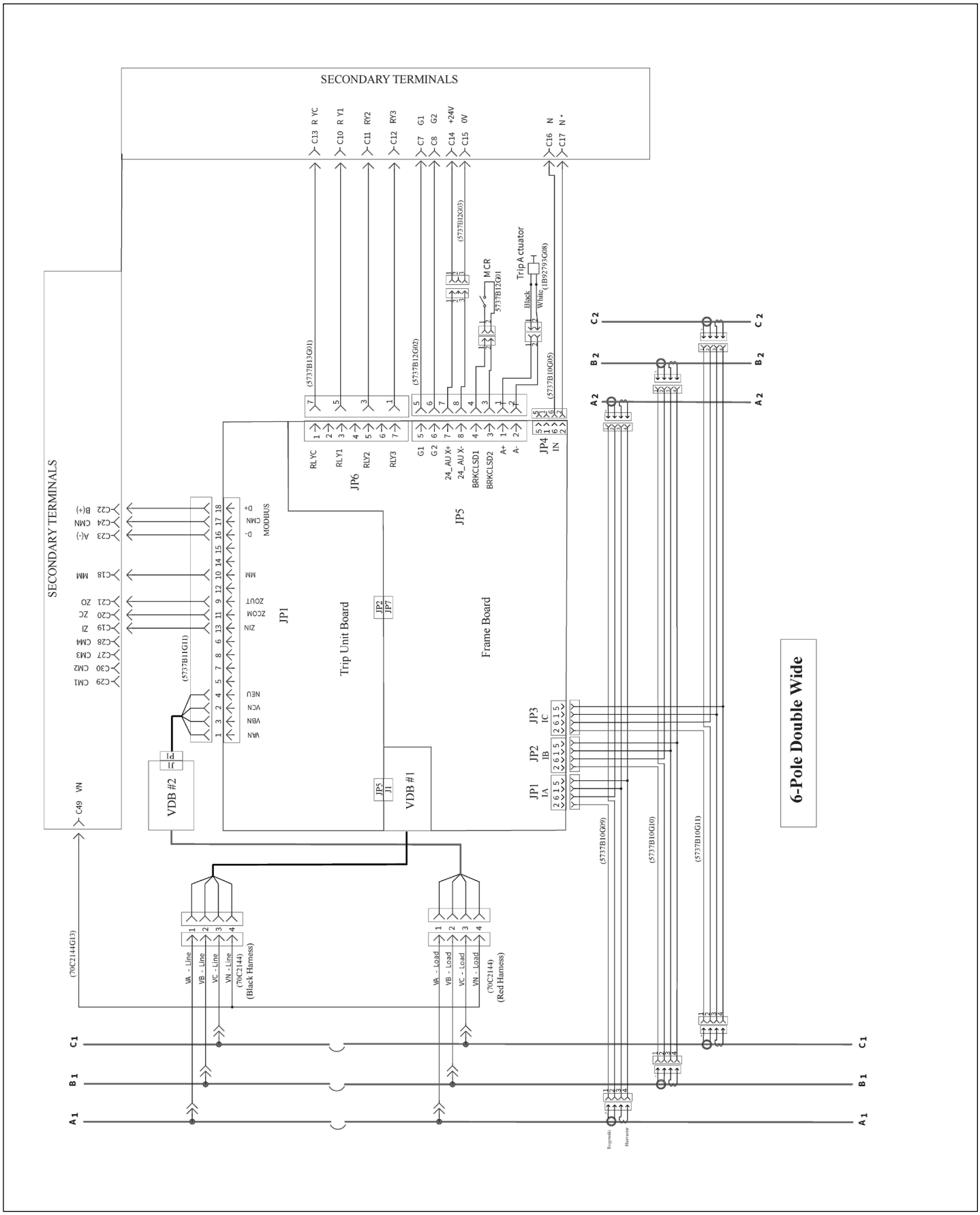


Figure 65. Magnum PXR and PD-SB 6-pole wiring diagram (PXR35)

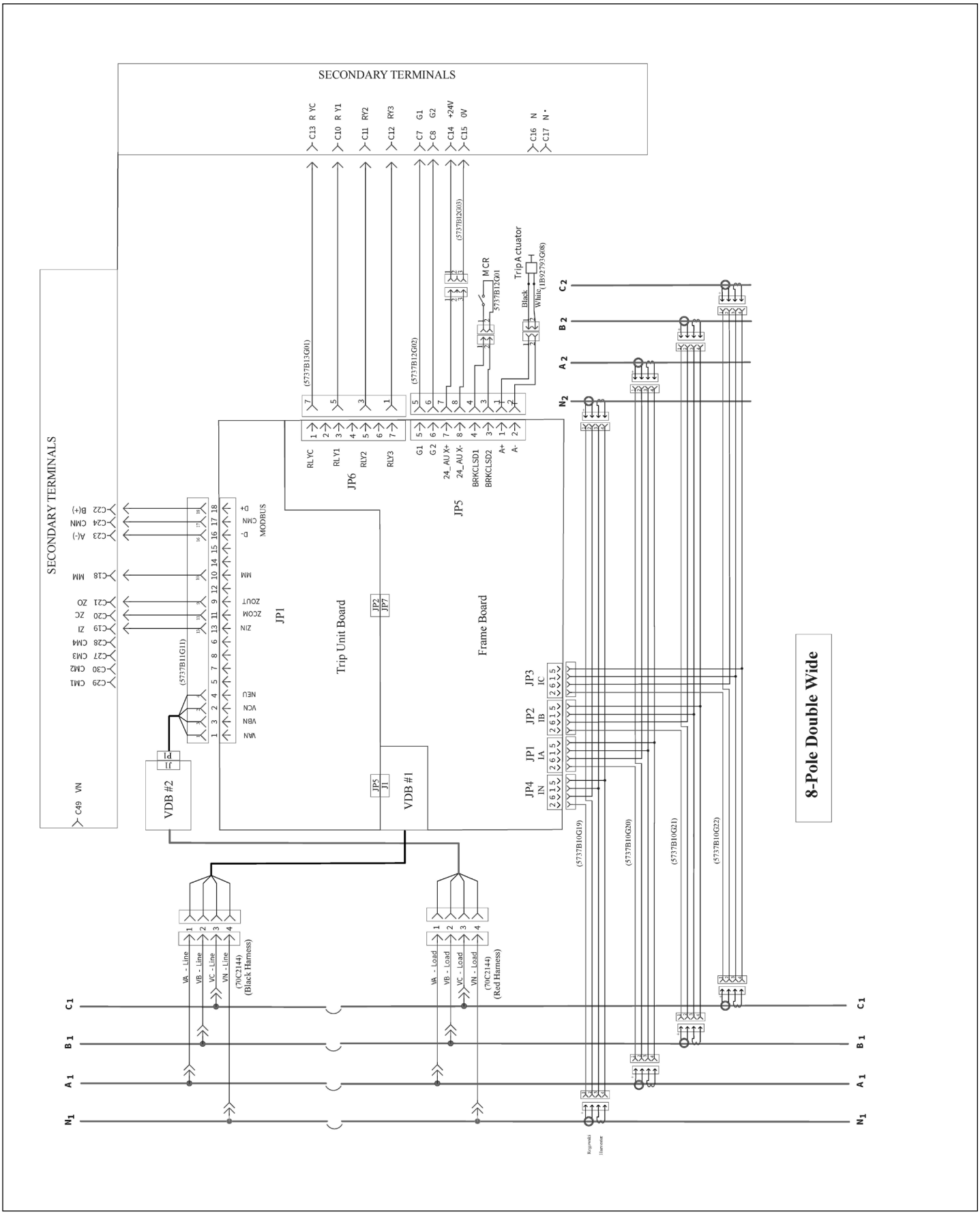


Figure 66. Magnum PXR and PD-SB 8-pole wiring diagram (PXR35)

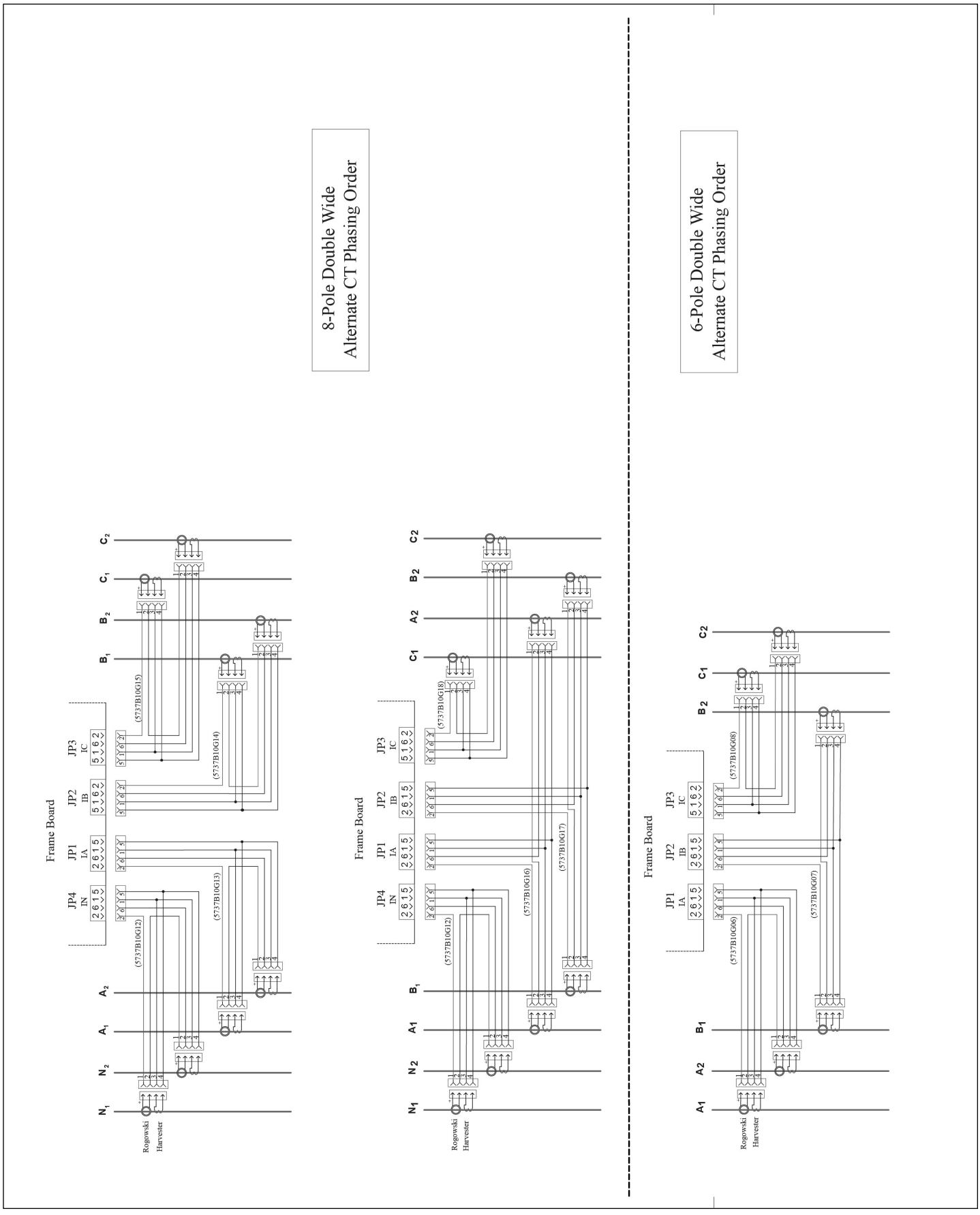


Figure 67. Magnum PXR and PD-SB 6/8 pole wiring diagram (PXR 20/25/35) for alternate phasing configurations

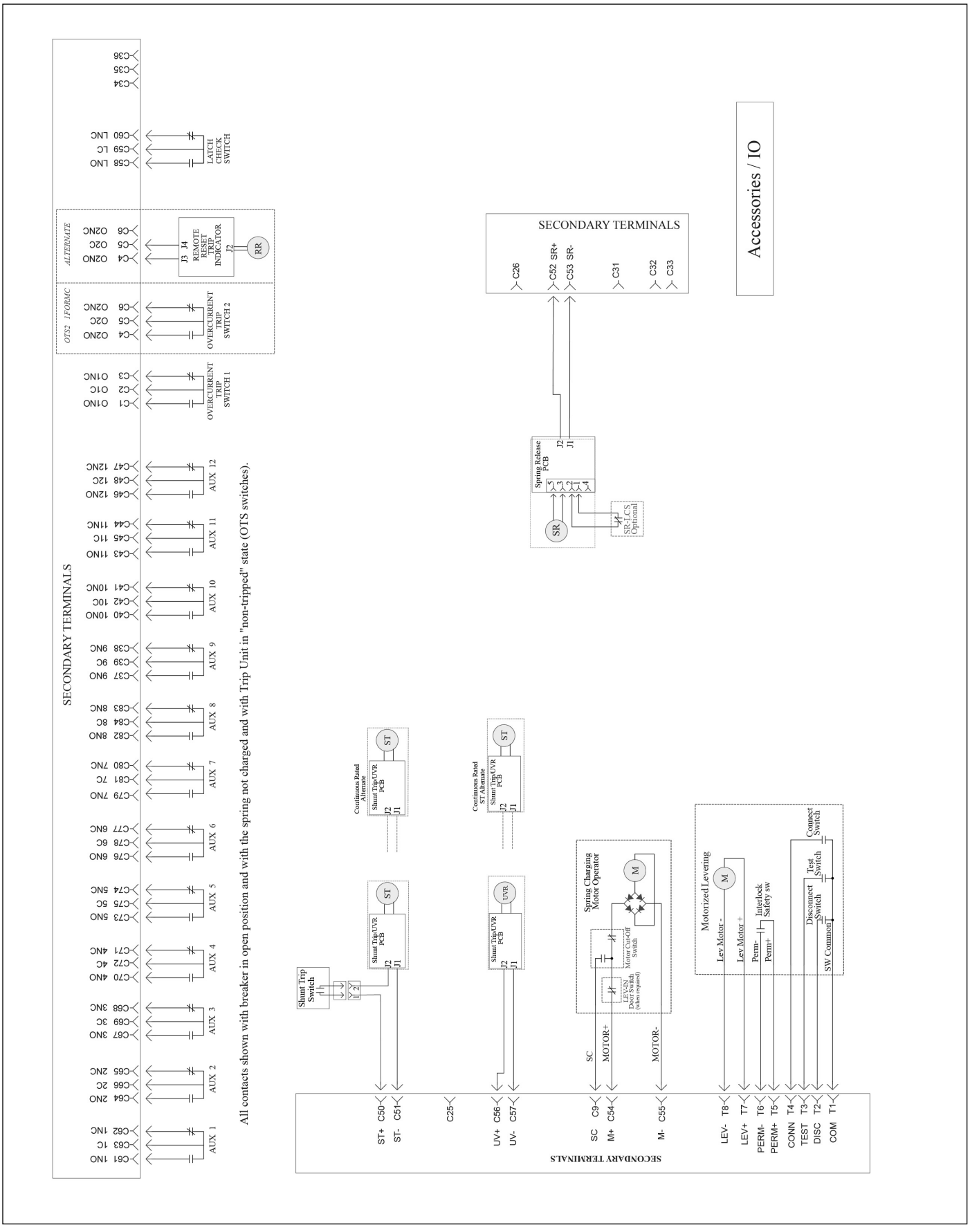


Figure 68. Magnum PXR and PD-SB accessory wiring diagrams (PXR 20/25/35)

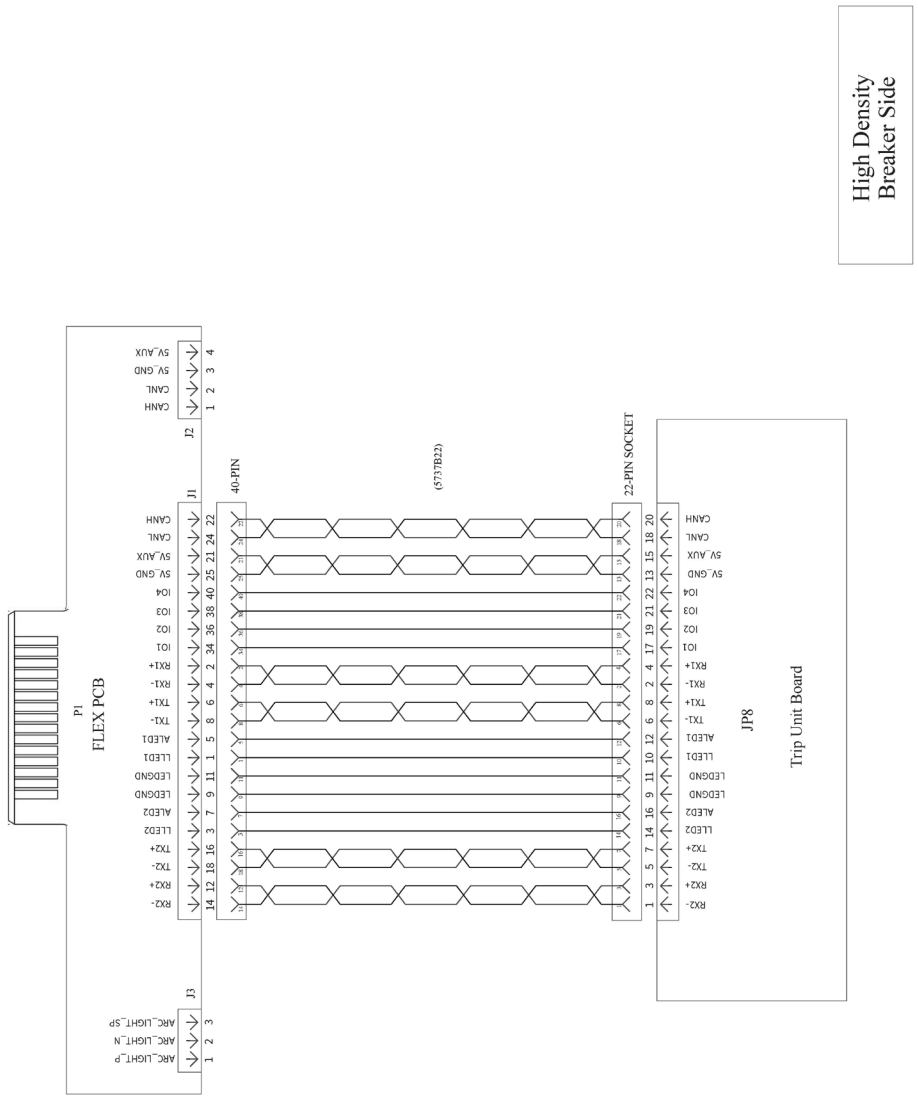


Figure 69. Magnum PXR and PD-SB breaker side high density wiring diagram (PXR35)

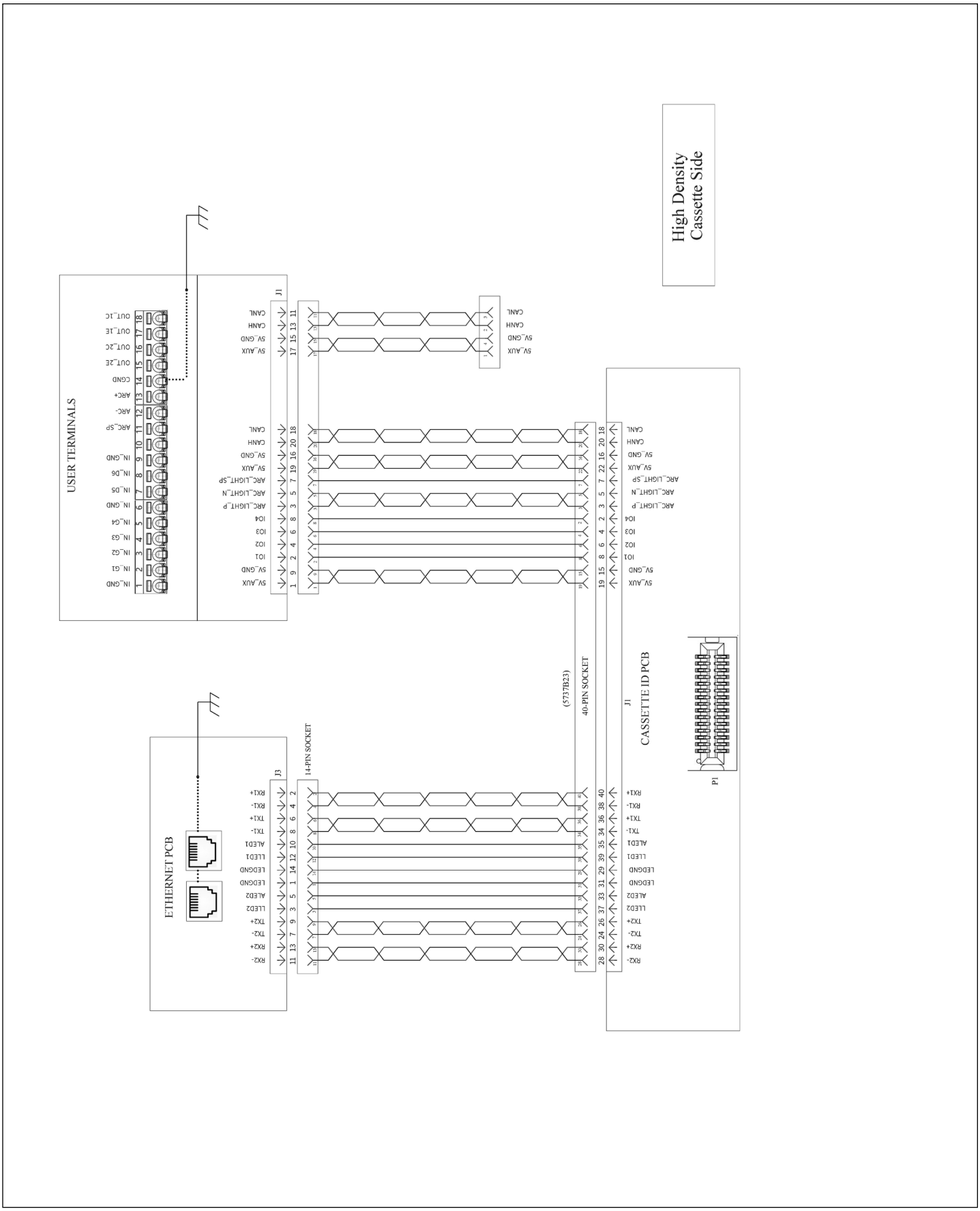


Figure 70. Magnum PXR and PD-SB cassette side high density wiring diagram (PXR35)

Section 5: Drawout circuit breaker and cassette

General

Section 3 discussed topics and features common to all Magnum PXR and PD-SB circuit breakers, no matter what the mounting configuration or type (drawout or fixed). In this section, features unique to the drawout type circuit breaker and drawout cassette, not covered elsewhere, are discussed. Section 6 covers features unique to fixed type circuit breakers only. Drawings and dimensions associated with all circuit breakers, drawout cassettes, and any appropriate primary bus connections can be found in the technical product guide (PA013006EN), available on the website at www.eaton.com/magnumpxr The installation and the levering of a drawout circuit breaker were discussed in Section 2. If necessary, review that information, because it will not be repeated here.

Drawout cassette

A drawout circuit breaker is used in combination with a fixed drawout cassette (**Figure 71** and **Figure 73**); the drawout circuit breaker is equipped with automatic primary disconnects **Figure 72**. The cassette provides all of the necessary interfaces to the drawout circuit breaker, including automatic primary and secondary connections. For the narrow frame circuit breaker, a single cassette style using horizontal stabs and horizontal customer busbar terminals is available (**Figure 74**). The 4000A and 5000A double narrow cassettes utilize an interleaved style connection on the back of the cassette to make it easier to install standard bus bar thicknesses. For the MPS standard and double-wide circuit breakers, two cassette types, are available: basic, and universal. The basic cassette supplies vertical stab/terminals only (**Figure 75**). The basic cassette is available without the copper stab/terminals so that these pieces can be integrated with vertical busbars provided by the switchgear builder (**Figure 76**). The universal cassette provides a set of flat pad terminals on the rear of the cassette that can be adapted to vertical, horizontal, or front connection (**Figure 77**). Mounting locations for cell (TOC) switches, safety shutters, mechanical interlocks, terminal block extension bracket, and key interlocks are provided on the cassette.

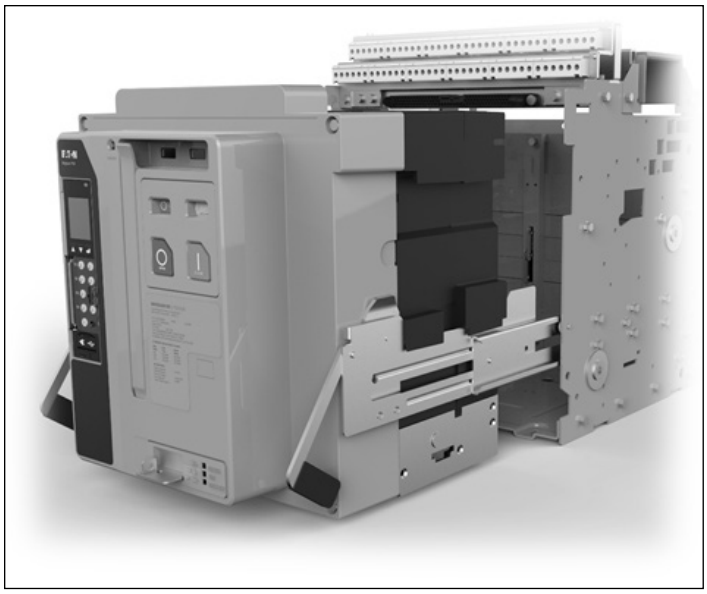
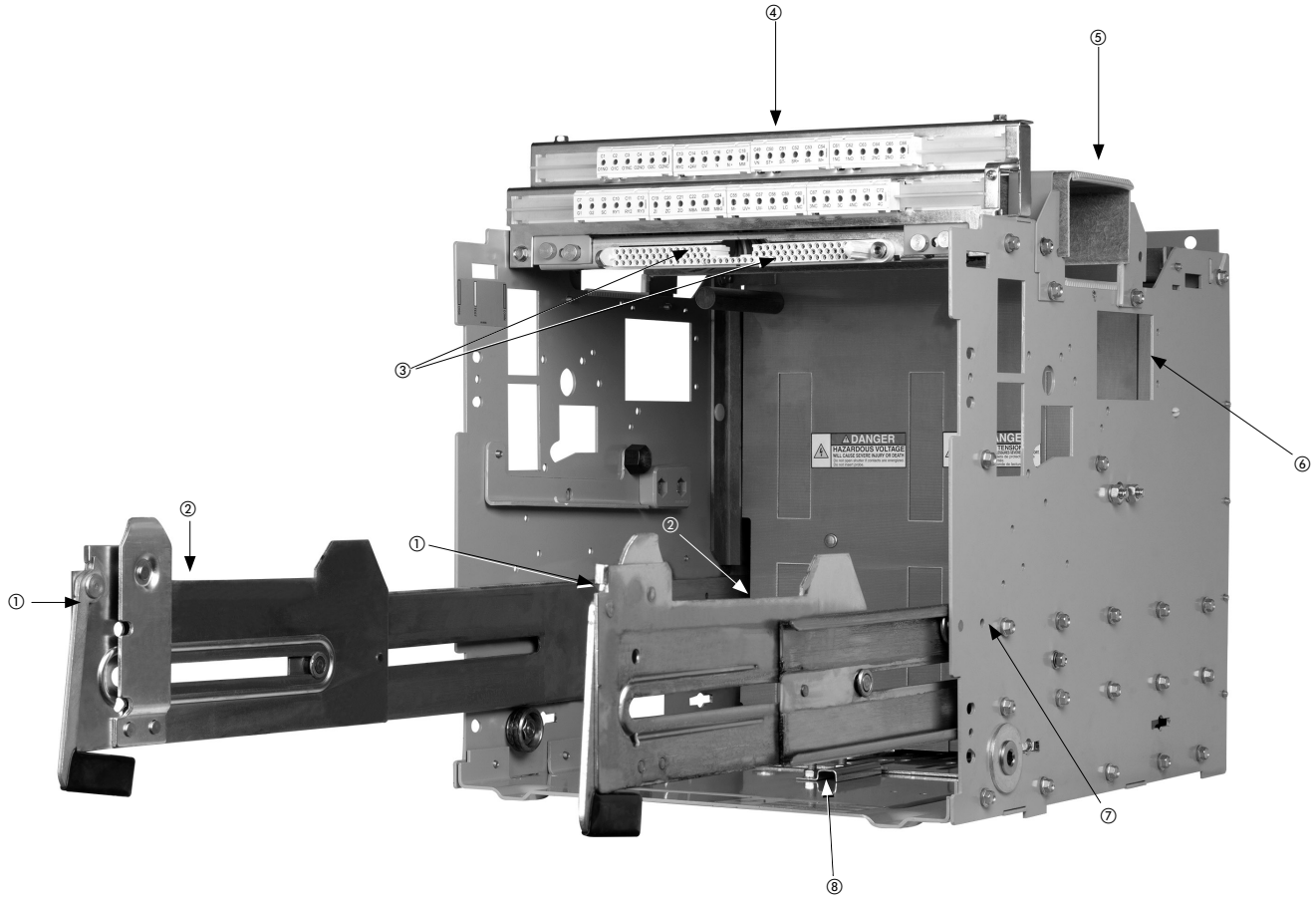


Figure 71. MPS/SPS drawout circuit breaker in cassette

Figure 72. MPS/SPS drawout circuit breaker with automatic primary disconnects



① Extension rails
② Extension rail cutout
③ Secondary plug-in connector
④ Secondary terminal blocks
⑤ Arc hood
⑥ Optional cell (TOC) switch mounting location
⑦ Optional key interlock mounting location
⑧ Grounding bar

Figure 73. Typical drawout cassette features

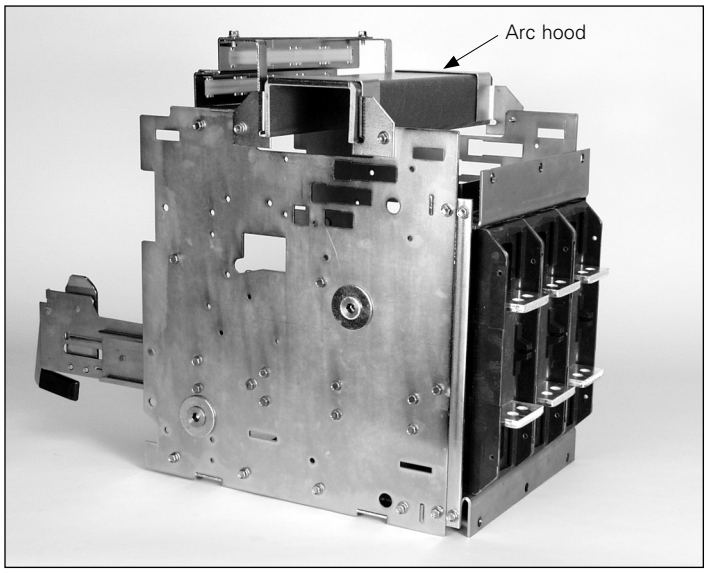


Figure 74. Typical narrow frame cassette (horizontal terminals)

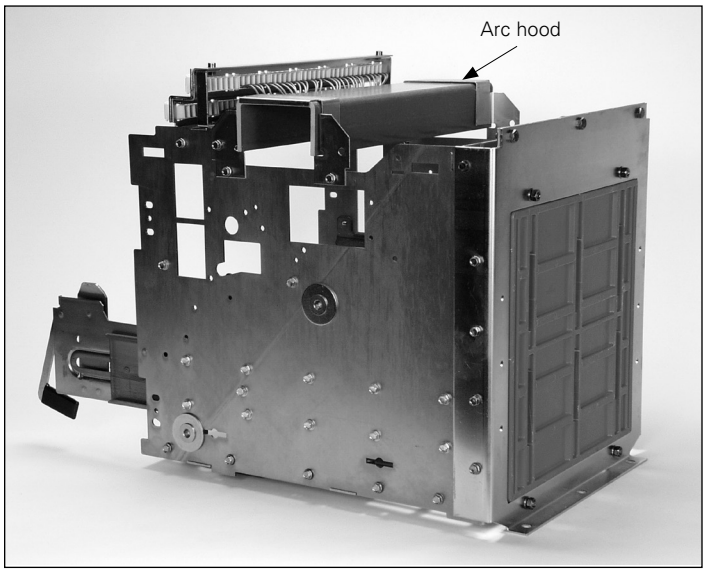


Figure 76. Typical basic cassette (without stabs)

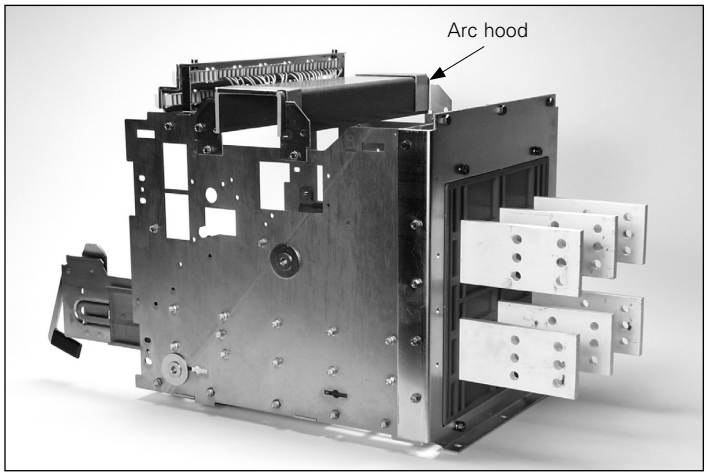


Figure 75. Typical basic cassette (vertical terminals)

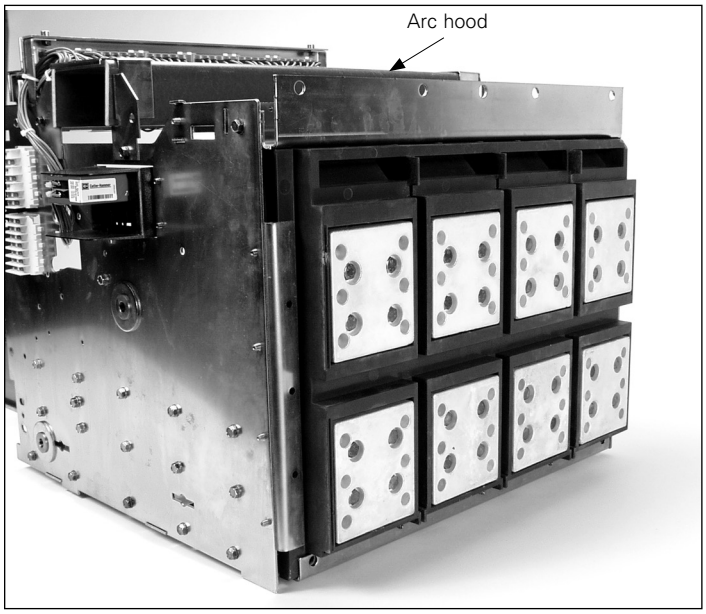


Figure 77. Typical universal cassette, four-pole (flat terminal pads)

Section 6: Fixed circuit breaker

General

Section 3 discussed topics and features common to all Magnum PXR and PD-SB circuit breakers, no matter what the mounting configuration or type. In this section, features unique to the fixed configuration not covered elsewhere are covered. The installation of a fixed circuit breaker was discussed in Section 2. If necessary, review that information, because it will not be repeated here.

The standard fixed circuit breaker is supplied with horizontally mounted primary connections (**Figure 78**). Optional vertical primary adapters are available for different bus configurations.

Figure 78. Fixed Magnum PXR circuit breaker with available vertical adapter shown

Section 7: Importance of maintenance

General

Magnum PXR and PD-SB circuit breakers are manufactured under a high degree of quality control, with the best available materials, and with a high degree of tooling for accuracy and part interchangeability. Design tests and actual experience show them to have durability well beyond minimum standards requirements. However, because of the variability of application conditions and the great dependence placed upon these circuit breakers for protection and the assurance of service continuity, Eaton recommends that inspection and maintenance activities take place on a regularly scheduled basis.

This section explains what Magnum PXR and PD-SB components need to be maintained, when they should be inspected, and step-by-step procedures for completing required inspections and tests. The following maintenance recommendations apply to all families of Magnum PXR and PD-SB breakers.

Eaton's history of producing high-quality electrical components has made Eaton a leader in the industry and a contributing member of many governing standards agencies. The basis for the information provided in this guide comes from the National Electrical Manufacturers Association (NEMA) standard, NEMA AB4, and the National Fire Protection Association (NFPA) standard, NFPA 70B. If further assistance or information is required, please contact Eaton Electrical Services and Systems at 1-877-386-2273 (1-877-ETN-CARE).

It is recommended that maintenance record sheets be completed each time maintenance is performed on the circuit breaker. Careful and accurate documentation of all maintenance activities provides a valuable historical reference on equipment over time. Examples are provided on **page 62** and **page 63**.

This document cannot, and is not intended to, ensure proper electrical performance of a Magnum PXR and PD-SB breaker that has been modified in any way that is not authorized by Eaton.

Safety precautions

⚠ WARNING

FAILURE TO INSPECT, CLEAN, AND MAINTAIN CIRCUIT BREAKERS CAN REDUCE EQUIPMENT LIFE OR CAUSE THE EQUIPMENT NOT TO OPERATE PROPERLY UNDER FAULT CONDITIONS. THIS COULD RESULT IN EQUIPMENT DAMAGE, BODILY HARM, OR EVEN DEATH.

Only workers with electrical training and familiarity with power circuit breakers and their associated hazards should perform work on Magnum PXR and PD-SB circuit breakers. Workers should also become familiar with the specifics associated with Magnum PXR and PD-SB circuit breakers as presented in this maintenance section. Be sure to follow all safety guidelines and wear proper personal protective equipment when performing maintenance on a circuit breaker.

Unless otherwise specified in this guide, inspection, preventative maintenance, and testing must always be performed on equipment that is in an electrically-safe working condition (as defined in Article 120 of NFPA 70E-2015) and at a distance beyond the arc flash boundary of energized electrical conductors. Verify that there is no voltage present on incoming terminals (or on control power terminals, if present) and between these terminals and ground to positively ascertain that the equipment is totally in an electrically safe working condition. The disconnecting or isolating means on the line side of the isolation devices being checked or tested should be in the open state to assure that the equipment will remain in an electrically safe working condition during these procedures by exercising approved Lock-Out-Tag-Out procedures. Refer to the Hazardous Energy Control procedures as described in OSHA and NFPA 70C-2015, Article 120.2 (D) for clarification.

Low voltage AC power circuit breakers should be installed, operated, and maintained by qualified personnel as defined by OSHA

29CFR1910 subpart 5.

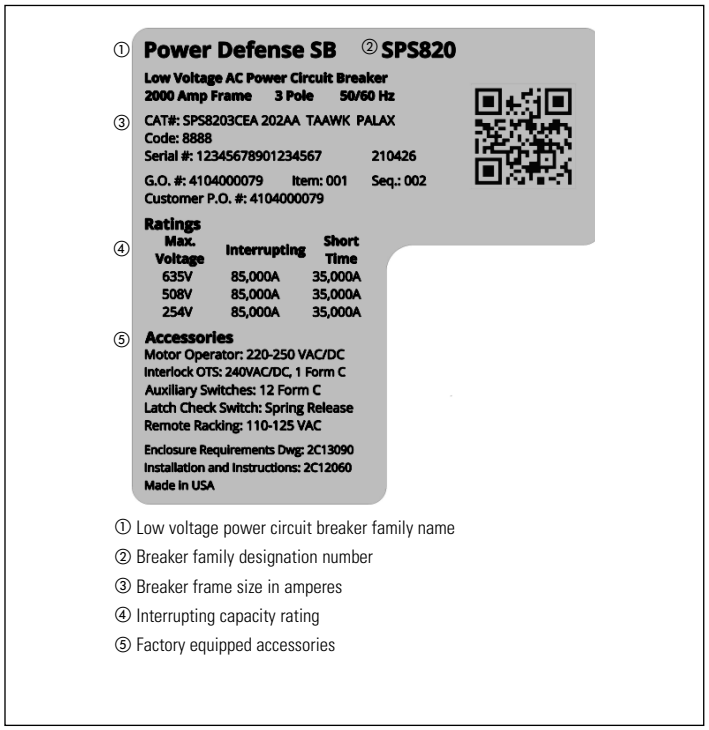
General cleaning recommendations

Circuit breaker cleaning activities should be part of an overall activity that includes the assembly in which the circuit breaker is installed. Loose dust and dirt can be removed from external surfaces using an industrial quality vacuum cleaner and/or lint-free cloth. Unless otherwise indicated, never use high-pressure air because dirt or foreign products can be driven into areas such as the breaker mechanism, where additional friction sources could create problems. Never use a wire brush to clean any part of the circuit breaker.

Functional tests

Eaton recommends that the following functional tests be performed on Magnum PXR and PD-SB circuit breakers as part of any maintenance procedure. These tests are meant to check the basic functionality of the breaker components. The circuit breaker should be removed from service and Eaton should be notified if the circuit breaker fails to perform any of these tests successfully. Please be prepared to provide the estimated number of operations the circuit breaker has to date, (or exact number, if equipped with an operations counter) as well as the following nameplate information if possible.

Magnum nameplate information



Before doing any work on drawout type circuit breakers, confirm that the breaker is levered out to the TEST or DISCONNECT position. To test the electrical operations of the circuit breaker accessories, the breaker must be levered out to the TEST position. For breaker control wiring information, refer to **Figure 59** through **Figure 68**. During the levering process, be aware of any signs that would indicate that the levering process is not working properly.

If working on a fixed circuit breaker, bus systems must be in an electrically safe working condition for convenience and safety. The circuit breaker should be switched to the OPEN state and the mechanism springs discharged.

For functional testing of the trip unit, refer to the separate detailed instruction book dedicated to the trip unit.

Manual operation functional test

Procedure

1. Charge the breaker mechanism springs either using the charging handle or the motor operator.
2. Press the CLOSE pushbutton to close the breaker manually and verify closing by noting the state of the indicating flag (**Figure 79**).
3. Charge the breaker mechanism springs either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging.
4. Press the OPEN pushbutton to manually open the breaker.
5. Press the CLOSE pushbutton to manually close the breaker. Is the breaker closed?
6. Press the OPEN pushbutton to manually open the breaker. Is the breaker open?

Note: Repeat this entire described test procedure three times.

Figure 79. CLOSED and OPEN indicators

Electrical operation functional test

Note: Breaker accessory voltages can vary within the same breaker. Be sure to review the accessory voltage rating before energizing as damage may occur.

This test procedure is based on the assumption that the breaker is equipped with optional shunt trip (ST), undervoltage release (UVR), and/or spring release (SR) accessories (**Figure 80**). If one accessory is missing, substitute the manual button or manual charge handle to replace the accessory's function. If equipped with a motor operator, the voltage is listed on the breaker nameplate.

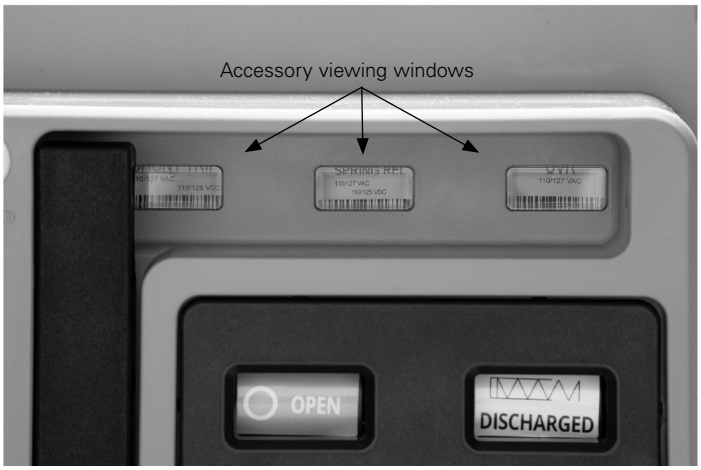


Figure 80. Accessory viewing windows

Procedure

1. Charge the breaker mechanism springs using the motor operator, then if equipped with a UVR, energize the UVR with the rated voltage.
2. Close the breaker by applying rated voltage to the spring release accessory and verify closing by noting the state of the indicating flag.
3. Charge the breaker mechanism springs using the motor operator. If using the motor operator, after charging, remove power to the motor operator to prevent automatic recharging.
4. Open the breaker by applying rated voltage to the shunt trip accessory.

Note: If UVR is not installed, proceed to step 7.

5. With UVR energized, close the breaker using the spring release accessory. The breaker should now be closed.
6. Open the breaker by removing power from the UVR. The breaker should now be open.
7. Repeat this entire described test procedure three times.

Trip unit overload functional test

An overload simulation for trip unit testing can be achieved by using the Power Xpert Protection Manager (PXPM) software. Testing prior to startup should always be done with the circuit breaker either in a de-energized system, or in TEST or DISCONNECTED cassette position, or WITHDRAWN from cell. Note that the circuit breaker must be carrying less than 5% of In prior to the test.

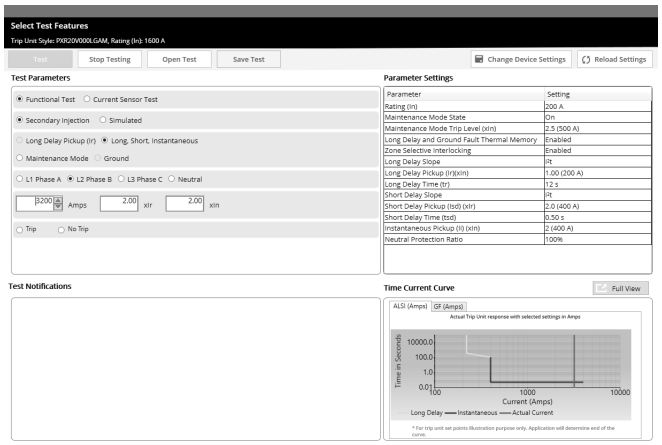


Figure 81. Power Xpert Protection Manager (PXPM) software.

Procedure

1. Charge the breaker mechanism springs either using the charging handle or the motor operator.
2. Close the breaker by applying rated voltage to the spring release accessory and verify closing by noting the state of the indicating flag.
3. Charge the breaker mechanism springs either by using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging.
4. Check the state of the pop-out trip indicator (if so equipped) is "out" and then reset it.
5. Press the CLOSE pushbutton to manually close the breaker. If the indicator is "out", then reset it.
6. PXPM initiates the functional testing using secondary injection. Navigate using the "Test Mode" icon to the test screen and select the appropriate test conditions. Enter the requested current and initiate the test by clicking on the "Test" button (note that the password will be required). Secondary injection will start, and the trip unit will open the breaker based on the configured settings. Results will be shown within the PXPM software.

   Verify that the trip indicator pop-out button (if so equipped) is "out" and then reset it by pressing the pop-out button. The trip unit then needs to be reset by the Reset pushbutton on the front of the trip unit

Maintenance schedule

Normal operating conditions

When determining how often a Magnum PXR and PD-SB breaker should be inspected, the environmental and operating conditions must be taken into consideration.

Table 11. Normal operating conditions

Normal operating conditions	
Temperature	Ambient temperature between 15 °C to 30 °C (59 °F to 86 °F)
Percent load	<80% of I_n (sensor rating)
Relative humidity	40–70% in a noncondensing environment
Corrosive atmosphere	Clean, dry, noncorrosive atmosphere
Salt environment	No salt mist
Dust	Protected by switchboard or switchgear assembly with proper ventilation
Vibration	Continuous vibration <0.2 g

Table 12 serves as a baseline for developing a maintenance schedule. Under these conditions, the recommended maintenance frequencies should be followed as written below.

Table 12. Normal maintenance frequency

Test/inspection	Frequency
Arc chute inspection	1 year
Primary contact inspection	1 year or after a short circuit interruption
Internal mechanism inspection	Every 250 operations or 3 years
Primary disconnect inspection (drawout applications only)	Every time breaker is racked out
Secondary connection inspection	Every time breaker is racked out
Interlocks inspection	Every 250 operations or 3 years
Trip unit testing (primary injection)	5 years
Trip unit testing (secondary injection)	2–3 years

Adjusting maintenance frequency

Although Magnum PXR and PD-SB breakers are designed and manufactured to operate in a wide variety of applications and environments, there are some conditions that may require inspection frequency to be increased.

Table 13. Increased frequency conditions

Factor	Condition limits	Recommended action
Operating conditions		
High cycling	Greater than one operation every 2 minutes	Inspect every 1500 operations
Low cycling	Less than one operation per year	Double the normal inspection frequency
Repeated interruptions or overloads	Three interruptions or 50 overloads (28 overloads for >2000 A breakers)	Double the normal inspection frequency
Capacitive switching	>135% of the capacitive bank load	Double the normal inspection frequency
Environmental conditions		
Temperature	Ambient temperature is above or below 15 °C to 30 °C (59° F to 86° F)	Double the normal inspection frequency
Temperature	Breaker is placed in an area with a strong solar influence	Double the normal inspection frequency
Dirt and contaminants	Visible dirt or contaminants	Remove contaminants from the breaker and double the normal inspection frequency
Corrosive atmospheres	Breaker is used in water or wastewater, pulp and paper, petrochemical, or other harsh industrial atmospheres	Double the normal inspection frequency
Altitude	>2000 m (6562 ft)	Use appropriate voltage and current correction factors. See **Table 14** for rating factors. Short circuit current is not affected as long as the voltage is rated in accordance with the table.
Humidity	Breaker is placed in a condensing environment	Double the normal inspection frequency and inspect for rust

Use this table for ratings factor.

Table 14. Altitude rating factors

Altitude (meters)	Voltage correction	Current correction
2000	1.000	1.000
2100	0.989	0.998
2300	0.976	0.995
2450	0.963	0.993
2600	0.950	0.990
2750	0.933	0.987
2900	0.917	0.983
3050	0.900	0.980
3200	0.883	0.977
3350	0.867	0.973
3500	0.850	0.970
3650	0.833	0.967
3800	0.817	0.963
3950	0.800	0.960
5000	0.700	0.940

Inspection procedures

Arc chute inspection

Table 15. Pre-inspection conditions

Device	Position of poles		Mechanism		Device position in cassette			
Fixed	**Open**	*Closed*	*Charged*	**Discharged**	—	—	—	—
Drawout	**Open**	*Closed*	*Charged*	**Discharged**	*Connected*	*Test*	*Disconnected*	**Removed**

When a circuit breaker experiences a high level fault or during regularly scheduled maintenance periods, the circuit breaker's arc chutes and arc chambers should be inspected for any kind of damage or dirt. Be especially alert for signs of significant erosion of the V-shaped plated inside the arc chute.
Arc chutes fit inside the arc chambers and down over the primary contacts. Each arc chute is held in place by one top inserted screw.

Procedure

1. Remove arc chute screws and all arc chutes from the arc chamber.
2. Turn each arc chute upside down and visually inspect the inside.
3. Be sure to look for erosion and sooty discoloration on the splitter plates and insulating jacket. If arc chutes show severe signs of erosion or discoloration, replace with a new arc chute.

Note: Because the arc chutes are removed, this is an ideal time to inspect the primary contacts for wear (See Primary Contact Inspection procedure on **page 54**)

4. When the inspections are complete, position each arc chute over its respective set of primary contacts, and secure in place with the screw(s) removed earlier. Be sure to torque arc chute screws to 35 to 45 in-lb.

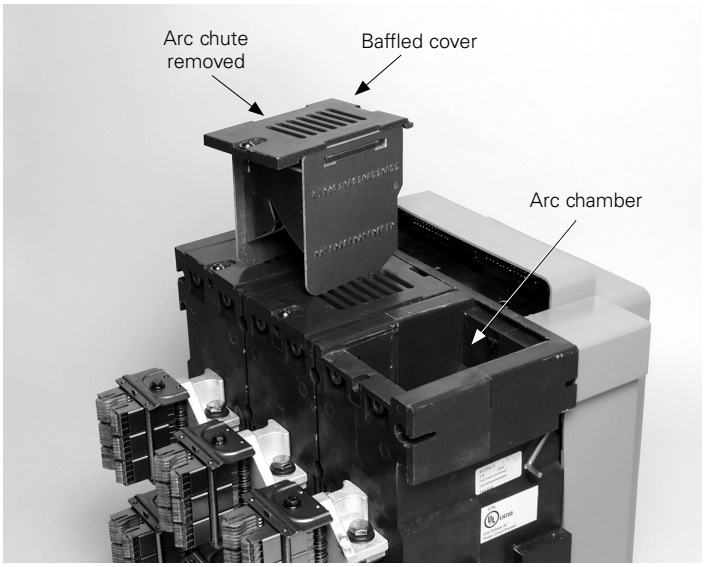


Figure 82. Top rear view of circuit breaker with one arc chute removed

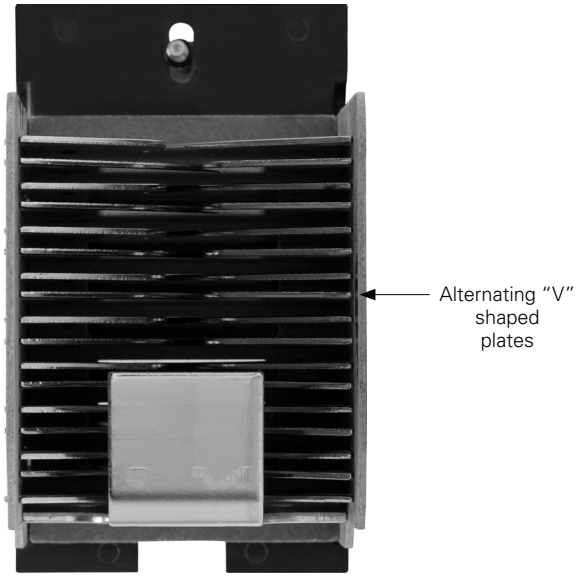


Figure 83. Bottom view of arc chute

Primary contact inspection

Table 16. Pre-inspection conditions

Device	Position of poles		Mechanism		Device position in cassette			
Fixed	**Open**	*Closed*	*Charged*	**Discharged**	—	—	—	—
Drawout	**Open**	*Closed*	*Charged*	**Discharged**	*Connected*	*Test*	*Disconnected*	**Removed**

Procedure

Note: Using the mating line of the housing halves as a reference guide will assist in this visual inspection.

1. With the arc chutes removed, look directly down into the arc chamber (**Figure 84**), and visually inspect each primary contact structure for signs of wear and/or damage.
2. Use the contact wear indicator to inspect each contact. The contact wear indicator is the relative position of the individual contact fingers to a narrow, side-to-side ledge inside the arc chamber. The ledge is actually part of the arc chamber. When the circuit breaker is closed and the contacts are in good condition, the narrow ledge is covered by the back end of each of the contact fingers (**Figure 85**). If the back end of any of the contacts are below the ledge, the contact assembly should be replaced.
3. Once the inspection is complete, be sure to verify the arc chutes are properly replaced as previously described in the Arc Chute Inspection procedure.

⚠ WARNING

ARC CHUTES MUST BE SECURED PROPERLY IN PLACE BEFORE A CIRCUIT BREAKER IS INSTALLED IN A CIRCUIT BREAKER COMPARTMENT. FAILURE TO DO THIS COULD RESULTS IN EQUIPMENT DAMAGE, BODILY INJURY, OR EVEN DEATH.

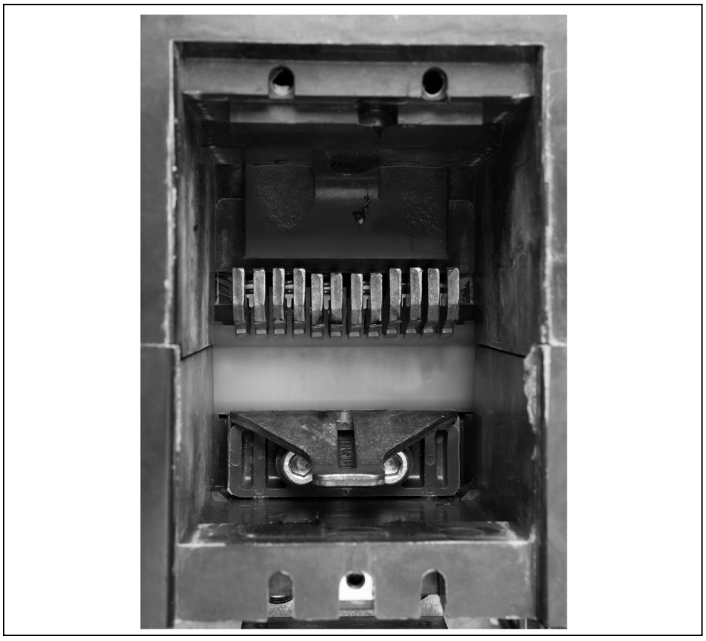


Figure 84. Primary contacts with circuit breaker open (not used for contact wear inspection)

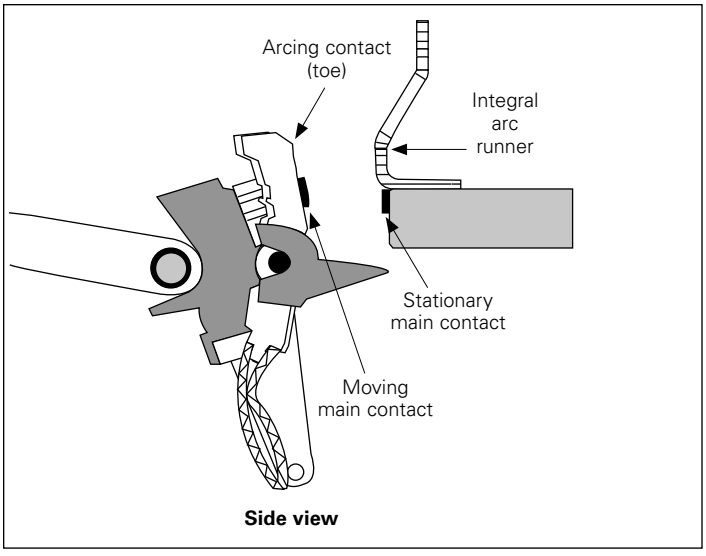


Figure 85. Contact inspection area with circuit breaker open

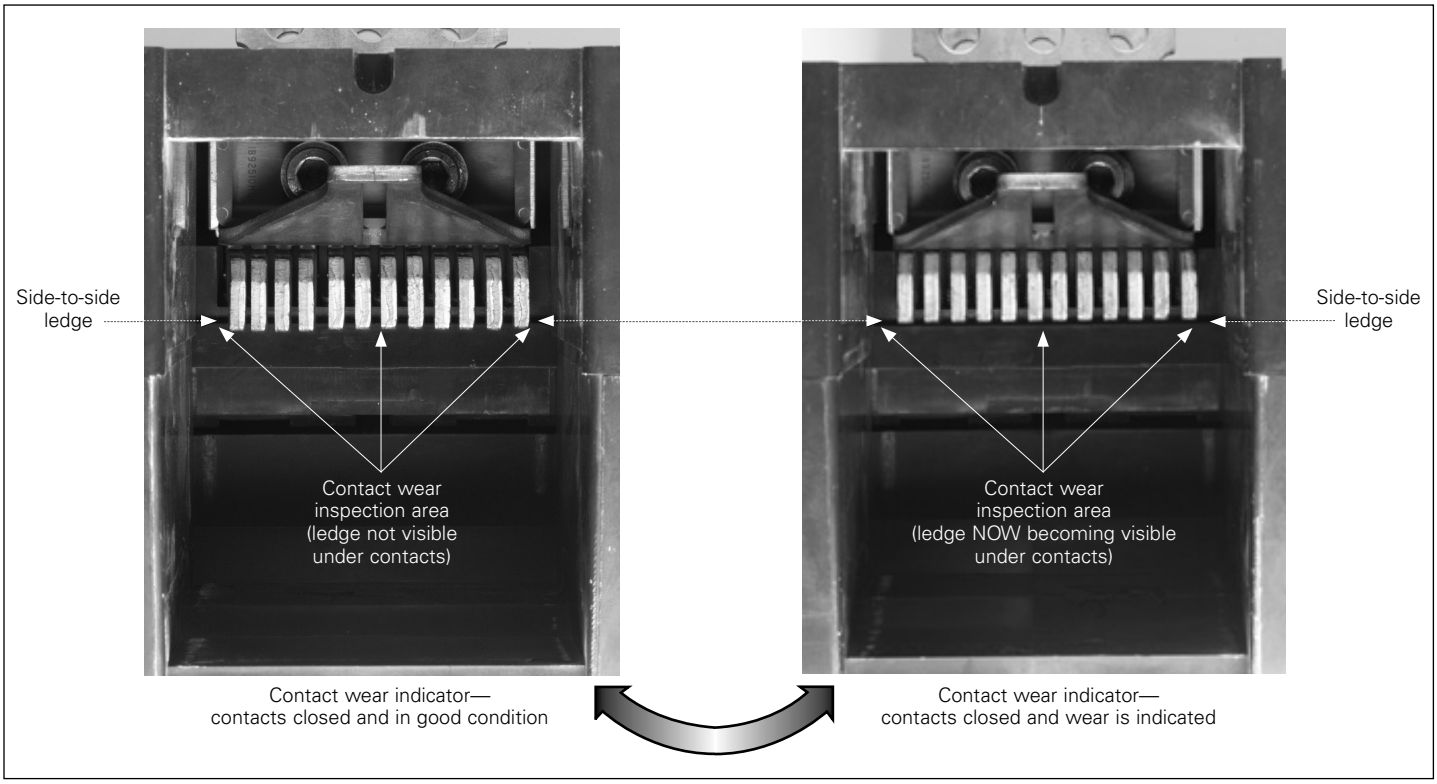


Figure 86. Use of contact wear indicator with circuit breaker closed

Internal mechanism inspection

Table 17. Pre-inspection conditions

Device	Position of poles		Mechanism		Device position in cassette			
Fixed	**Open**	*Closed*	*Charged*	**Discharged**	—	—	—	—
Drawout	**Open**	*Closed*	*Charged*	**Discharged**	*Connected*	*Test*	*Disconnected*	**Removed**

Procedure

1. Inspect the breaker for nicked wires, cracks in plastic parts, and loose screws. Screws or bolts should be tightened to levels outlined in **Table 18**. Loose screws inserted into plastic parts will require thread-locking compound (such as Loctite 242). All nicked wiring should be replaced or repaired in accordance with accepted industry practices.
2. Ensure that the torque values of the operating mechanism and motor mounting hardware are within the recommended values in **Table 14**.
3. Inspect all sliding or rolling parts for cleanliness and adequate lubrication. Refer to **Table 19** and **Figure 87**—**Figure 92**.

Table 18. Magnum PXR and PD-SB breaker torque list

Subassembly	lb-in	Nm
Arc chute	35–45	3.95–5.08
Front cover	25–35	2.82–3.95
Rear housing	75–85	8.47–9.60
Motor operator	75–85	8.47–9.60
Current sensor cover screws	18–22	2.03–2.49
Fixed mount feet bolts	75–85	8.47–9.60
Primary disconnect	75–85	8.47–9.60

Table 19. Greases used on Magnum PXR and PD-SB

Grease type	Description
Magnalube®-G	
Eaton standards	#53701AI
Color	Green
Manufactured by	Saunders Enterprises inc. 11-51 44th Road, Long Island City, New York 11101 Phone (718) 729-1000 Fax (718) 729-2690 www.magnalube.com
Molykote®	
Eaton standards	#53701QB
Color	Black
Manufactured by	Dow Corning Company Midland, Michigan 48686-0994 (989) 636-1000 www.dupont.com/molykote.html

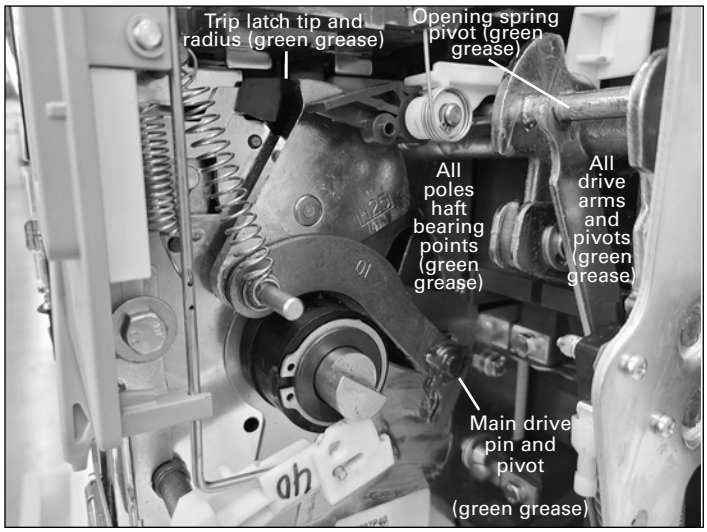


Figure 87. Breaker mechanism lubrication

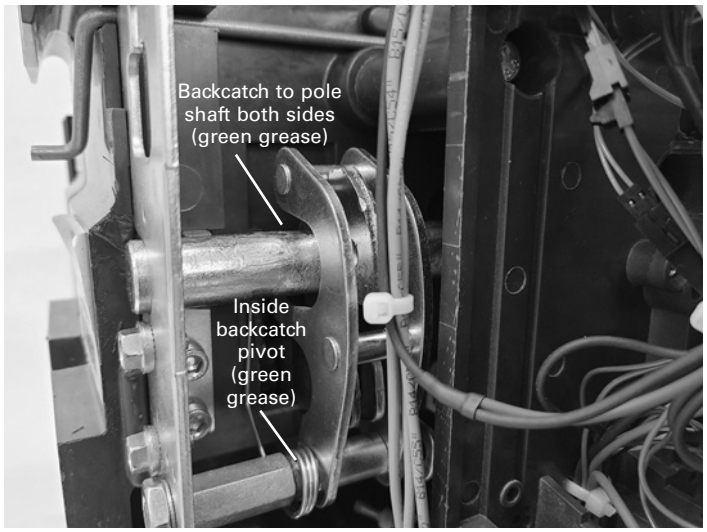


Figure 88. Pole shaft lubrication

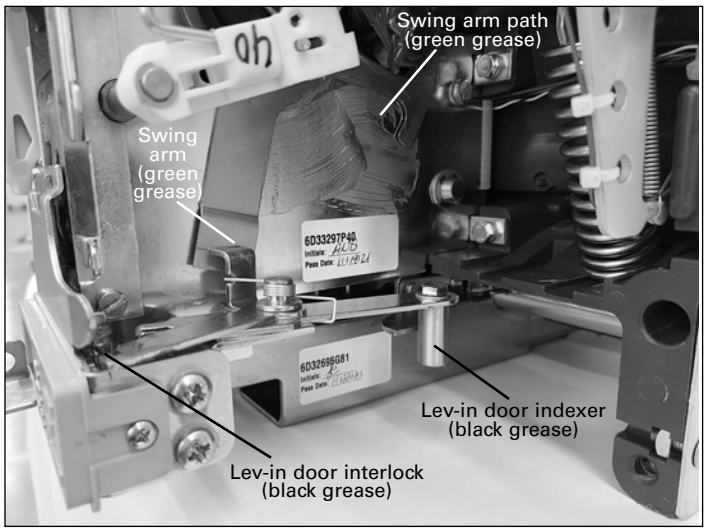


Figure 89. Drawout system lubrication (not applicable to fixed-mount breakers)

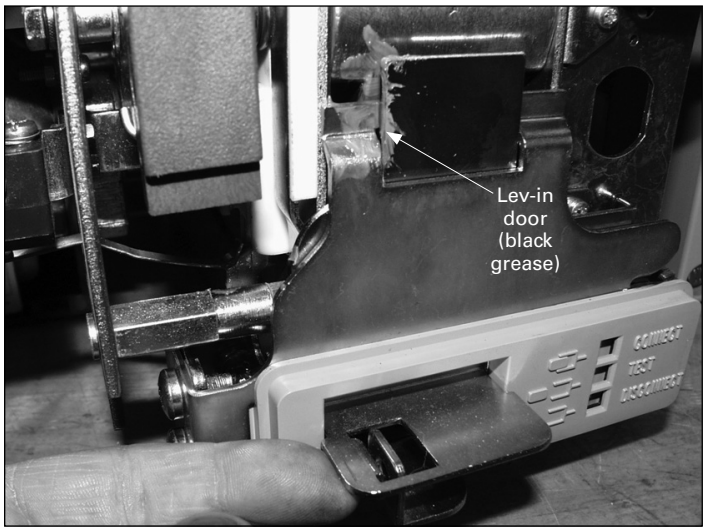


Figure 90. Drawout system lubrication

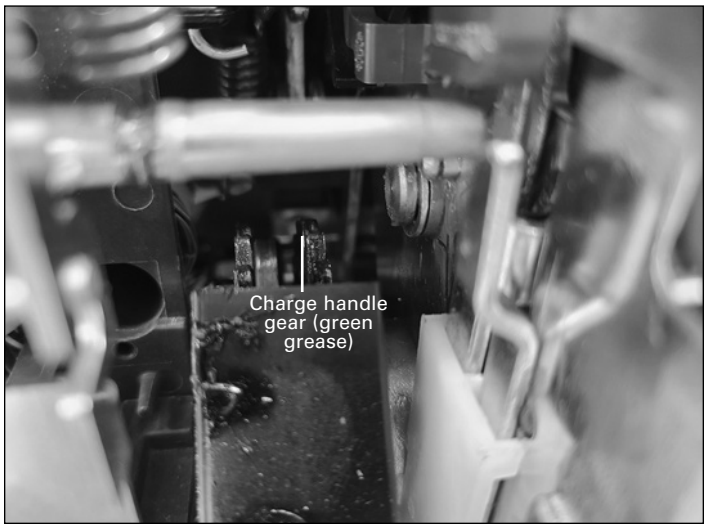


Figure 91. Charging handle and gear lubrication

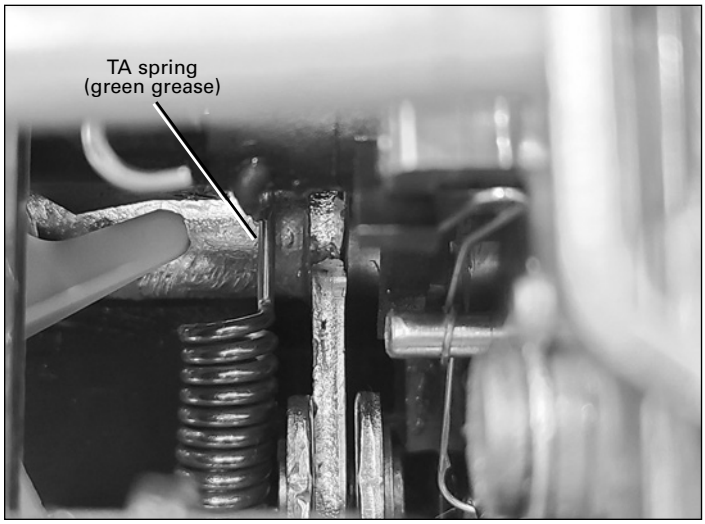


Figure 92. Pole shaft and TA spring lubrication

Primary disconnect inspection

Table 20. Pre-inspection conditions

Device	Position of poles		Mechanism		Device position in cassette			
Fixed	**Open**	*Closed*	*Charged*	**Discharged**	—	—	—	—
Drawout	**Open**	*Closed*	*Charged*	**Discharged**	*Connected*	*Test*	*Disconnected*	**Removed**

Procedure

For Magnum PXR and PD-SB breakers with vertically mounted primary disconnects:

1. With breaker removed from cell, verify that vertical adapter nuts and bolts are torqued to 37–43 lb-ft.

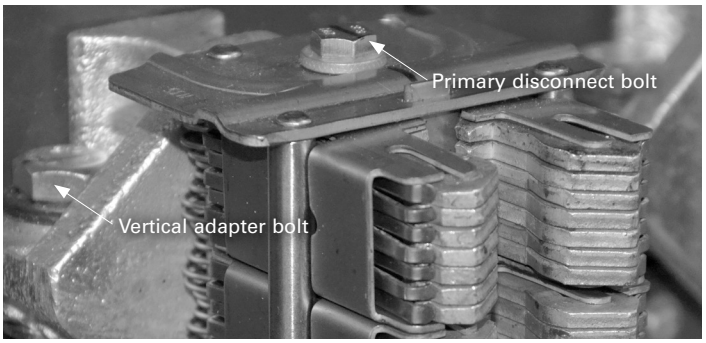


Figure 93. Primary disconnects

For all Magnum PXR and PD-SB breakers primary disconnects:

1. Remove the primary disconnect.
2. Inspect primary disconnect contact surfaces for indications of plating wear, corrosion, or arcing and pitting. Replace primary disconnect if there is evidence of any exposed copper.
3. Inspect finger springs for broken, cracked, or misalignment with fingers.
4. Remove loose contaminates.
5. Reinstall and tighten the M6 screw (refer back to **Table 18**) to retain the primary disconnect. Verify that the primary disconnect is free to rotate about the screw, and return to the home position.
6. Be certain that the retaining screw is in the proper position and does not deform the end plates on the primary disconnects.

Secondary disconnect inspection

Table 21. Pre-inspection conditions

Device	Position of poles		Mechanism		Device position in cassette			
Fixed	**Open**	*Closed*	*Charged*	**Discharged**	—	—	—	—
Drawout	**Open**	*Closed*	*Charged*	**Discharged**	*Connected*	*Test*	*Disconnected*	**Removed**

Procedure

Breaker:

1. Remove the breaker front cover.
2. With breaker removed from cell, verify that the breaker secondary disconnect pins are fully seated and locked into position by lightly pulling on each wire individually.

Note: Do not exceed 1 lb of force or damage to pin or housing may occur.

3. Ensure all pins are straight without bends, corrosion, and do not show evidence of arcing.
4. Damaged pins are to be replaced. Refer to renewal parts catalog.

⚠ WARNING

REMOVE ALL POWER TO THE CASSETTE SECONDARY PINS.

Cassette:

1. On the cassette side of the secondary disconnect, ensure all sockets are fully seated and locked into position by lightly pressing on each socket.
2. Visually inspect each socket for evidence of arcing, corrosion, or foreign objects.
3. Damaged sockets are to be replaced. Refer to renewal parts catalog
4. Ensure that socket housings are free to move to allow self-aligning with the breaker side secondary housing.

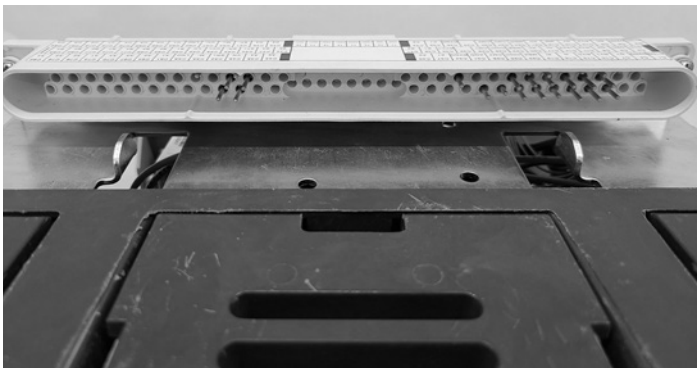


Figure 94. Breaker secondary

Figure 95. Cassette secondary

Interlocks inspection

Table 22. Pre-inspection conditions

Device	Position of poles		Mechanism		Device position in cassette			
Fixed	**Open**	*Closed*	*Charged*	**Discharged**	—	—	—	—
Drawout	**Open**	*Closed*	*Charged*	**Discharged**	*Connected*	*Test*	*Disconnected*	**Removed**

⚠ WARNING

REMOVE THE DRAWOUT CIRCUIT BREAKERS FROM THE CASSETTE FOR THE FOLLOWING TESTS. FOR FIXED MOUNTED CIRCUIT BREAKERS, ALL PRIMARY AND SECONDARY POWER IS TO BE REMOVED.

Procedure

Note: The circuit breaker will be required to be charged, closed, and opened during this inspection procedure.

1. Remove the breaker front cover.
2. Verify that the breaker is in working order by charging the breaker, close the breaker, recharge the breaker, and open the breaker.

Note: The breaker will need to be charged and opened for this inspection procedure.

3. Verify that the circuit breaker will not close if any of the following mechanical conditions exist:
   a. If the breaker is equipped with an Undervoltage Release that is NOT energized, and the breaker is charged and opened, depress the CLOSE pushbutton. The breaker should not close.

Note: Remove the Undervoltage Release for the remainder of the interlock testing if installed.

   b. For drawout breakers, lift the levering-in screw access door. With door open or not fully closed depress the CLOSE button. The breaker should not close.
   c. Rotate the levering-in screw and verify that the door does not close in intermediate positions. The door should only close in the full disconnect, test, and connect positions.
   d. Return the drawout levering in screw to the disconnected position.
   e. Depress and hold the breakers OPEN pushbutton and then depress the CLOSE pushbutton. The breaker should not close.
4. If the breaker is equipped with an internal key lock, engage the lock and remove the key. Depress the CLOSE button. The breaker should not close. Reinsert the key and disengage the key lock. Close the breaker. Attempt to engage the key lock; the key should rotate 90 degrees and the breaker should open. Remove the key and ensure the breaker is open, but do not recharge.
5. Depress and hold the CLOSE pushbutton while charging the breaker. The breaker should not close when the breaker is fully charged. Release and re-press the CLOSE button. The breaker should close. Do not open the breaker until instructed to do so.

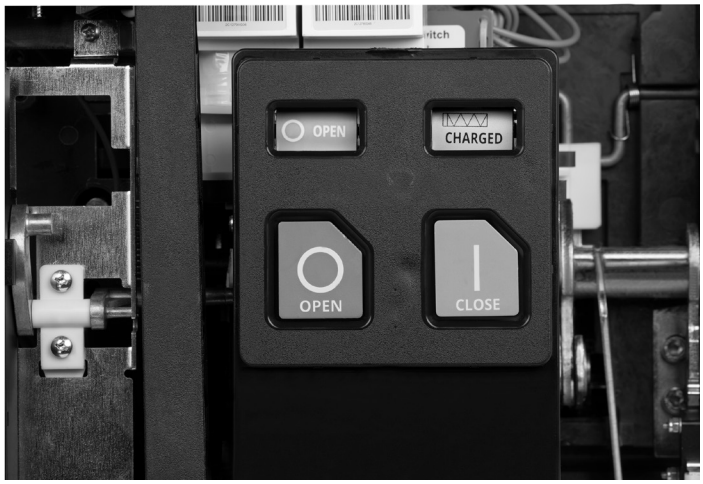


Figure 96. Charged and opened

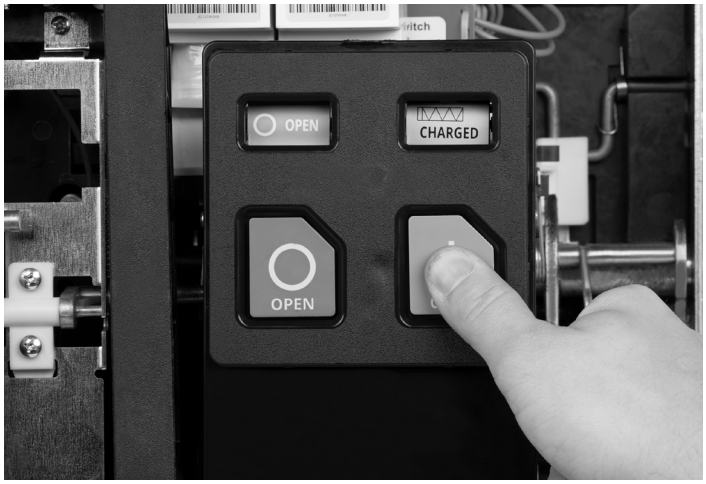


Figure 97. Push to close

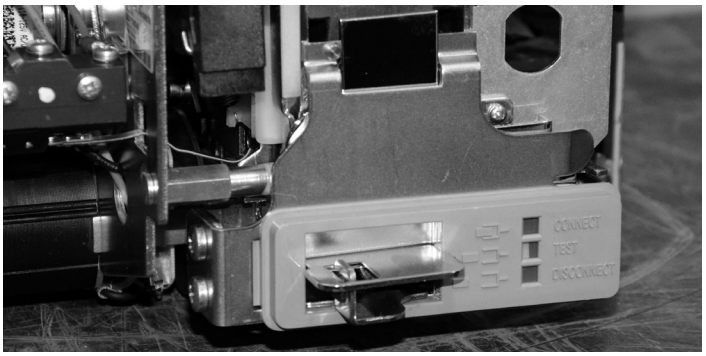


Figure 98. Levering-in door in position between disconnect and test

There are NO impediments to tripping/opening. The circuit breaker will always be permitted to open on command of the following:

- OPEN pushbutton is depressed
- Shunt trip (electrical)
- External trip interlock (cassette)
- UVR being de-energized (electrical)
- Trip unit signal (overcurrent etc.)
- Rotating the interlock wire form
- For breakers used in multi-way interlocks with other breakers, testing should be performed as described in the appropriate instruction manual

Note: Drawout breakers must be installed in their cassette. To verify proper operation of multi-way interlocks, the breaker will be required to close and open while installed in the switchgear.

Troubleshooting

Table 23. Spring charging

Problem	Possible root cause	Actions
Breaker won't charge mechanically	Charge handle broken	Install replacement handle kit
	Manual charge handle unable to be pulled	Verify breaker is not charged. Higher current breakers require more force to charge. Apply more force to charging handle but do not exceed 120 lb. If problem persists, a possible mechanism issue may be present, contact Eaton Electrical Services & Systems
	Manual charging handle not engaging	Check to see if breaker is already charged
	Possible worn parts will not allow manual charge to engage	Install replacement handle kit
	Manual charge handle engages, but cannot reach full charge	Apply force to manual charging not to exceed 120 lb
	Manual arm not consistently engaging	Install replacement handle kit
	Charging mechanism jamming	Contact Eaton Electrical Services & Systems
Breaker won't charge electrically	Motor operator skips during charging cycle due to gear teeth being out of alignment	Contact Eaton Electrical Services & Systems
	Improper motor operator mounting	Tighten motor mounting hardware
	Incorrect motor mounting	Verify proper orientation of motor operator standoffs to mechanism, verify motor operator mounting
	Insufficient voltage/current to load or leads	Verify supply to motor
	Levering device door switch out of adjustment	Adjust switch to pick mating surface on lev in door
	Secondary breaker contacts not engaged	Adjust switch lever and check secondary contact terminal condition. Ensure that breaker is fully in test or connect position.
	Loose terminal screws on cutoff switches	Tighten all terminal screws
	Motor continuously runs	Contact Eaton Electrical Services & Systems

Table 24. Contact closing

Problem	Possible root cause	Actions
Breaker will not close	Breaker is already closed with flag indication error	Contact Eaton Electrical Services & Systems
	An external interlock such as a key or cable	Clear all external interlocks
	Closing spring not charged.	Charge the closing spring using the handle or motor operator.
	Insufficient voltage/current to spring release.	Verify supply to spring release.
	Pushbutton cover and/or prevent close cover blocking access to CLOSE pushbutton	Remove cover.
	Lev in door is open (drawout breakers only)	Ensure breaker is fully in connect, test, or disconnect position and lev in door fully closes.
	Continuous shunt trip energized	De-energize continuous duty shunt trip
	Undervoltage release (UVR) de-energized	Energize UVR
	Mechanical obstructions	Remove arc chutes and remove obstructions
	Broken trip actuator (TA) resetter or reset spring	Contact Eaton Electrical Services & Systems
	Accessory connections not correct	Verify and correct accessory connections
	Trip indicator (also known as overcurrent trip switch) not reset	Reset trip indicator
	Close signal sent too quickly after breaker opens	Add a delay before sending the close signal or install the latch check switch internally wired to the spring release
	Trip unit is removed or installed incorrectly	Verify that trip unit is installed correctly and the prevent close interlock is engaged appropriately. Refer to MN013015EN for instructions on installing the trip unit
	Other unidentified issues	Contact Eaton Electrical Services & Systems
Breaker will not stay closed (opens immediately)	Lev in door slightly opened and acting upon interlock	Ensure lev in door is completely closed
	Voltage present at the shunt trip terminals	Verify and remove remote open signal
	OPEN pushbutton not full returned	Clear obstruction
	Loose key interlock linkage assembly or interference with key interlock cable	Tighten mounting hardware or clear cable obstruction
	Breaker attempts to close on overload or fault currents	Investigate and clear cause of fault
	Neutral sensor polarity incorrect (ground fault)	Reverse polarity
	Neutral sensor secondary is grounded	Remove ground connection from neutral sensory secondary
	Neutral sensor installed does not match the selected option	Make sure that neutral sensor selection is set for Rogowski or iron-core CT to match what is connected
	Shunt trip coil is burned causing armature to remain extended	Replace shunt trip
	Other unidentified issues	Contact Eaton Electrical Services & Systems

Table 25. Contact opening

Problem	Possible root cause	Actions
Breaker will not open on expected trip unit settings	Pinched or damaged wires	Repair damage
	Damaged trip actuator (TA)	Contact Eaton Electrical Services & Systems
	Broken TA tripper	Contact Eaton Electrical Services & Systems
	Trip unit settings not as desired	Reset trip unit to proper settings
	Trip unit not communicating correctly	Check communication devices and wiring
Breaker will not open by way of accessories	Voltage at shunt trip too low	Excessive voltage drop in control wiring
	Mis-wired open accessories	Correct secondary wire connections
	Accessory not fully seated	Fully seat and lock accessory
	Shunt trip cutoff switch not connected, present, or damaged (instantaneous shunt trip only)	Connect, install, or replace shunt trip cutoff switch
	Accessory deck broken or not locked down	Replace or lock down accessory deck
	Other unidentified causes	Contact Eaton Electrical Services & Systems
Breaker will not open mechanically	Obstruction behind off pushbutton	Remove obstruction
	Pushbutton cover blocking access to OPEN pushbutton	Remove cover.
	Other unidentified causes	Contact Eaton Electrical Services & Systems

Table 26. Levering-in/-out (drawout applications only)

Problem	Possible root cause	Actions
Breaker will not rack in	Breaker does not push to stops evenly	Ensure breaker is square against stops by pushing evenly on both sides of the breaker
	Breaker/Cassette are equipped with mismatching rejection bracket assemblies.	Ensure that rated current on the breaker matches the rated current of the cassette. Check that cassette rejection bracket pin scheme matches the cassette catalog number.
	Attempting to rack in a breaker with PXR into a Digitrip cassette.	Replace cassette
	Cassette floor pan mounting bolts in wrong location or not low profile	Remove bolt and replace with low profile
	Arc hood displaced and interfering with breaker movement	Replace arc hood
	Cassette secondary sliding bracket not free to move with breaker	Remove wire obstruction or lubricate slide bushings and pin
	Lev in device require re-lubrication	Lubricate lev in device
	Excessive drive screw torque causing stripping or bending of key components	Contact Eaton Electrical Services & Systems
	Racking screw not in full retracted position before pushing breaker into cell	Rotate to full counterclockwise stop
Breaker will not rack out	Other unidentified causes	Contact Eaton Electrical Services & Systems

MAGNUM PXR and PD-SB AIR CIRCUIT BREAKER INSPECTION RECORD

Location _____ Date _____

Position_____ Serial No. _____

Switchgear Mfr. _____ Cat # _____

As Found Condition:

Cleanliness _____ Arc Chute Wear _____ Contact Wear _____ Lubrication _____

Broken or missing parts _____ Wiring Condition _____

Functional Checks - Manual Operation

Manual Charging _____ CLOSE Push Button _____ OPEN Push Button _____

Levering In Device _____ Counter advancing on Charge _____

OPEN/CLOSED Flag operation_____ CHARGED/DISCHARGED Flag operation _____

Functional Checks - Electrical (at reduced nominal if possible)

Motor operator @ 85% Voltage _____ Spring Release @ 85% _____ Undervoltage Release Dropout @ 35% < 60% _____

Power Relay Module @ 85% _____ Shunt Trip @ 70% _____ Undervoltage Release Pickup @ 85% _____

Trip Indicator Electrical Reset @ 85% _____

Trip Unit Functional Check with Hand-Held Test Kit _____

Trip Unit Primary Injection Test (see MAGNUM PXR and PD-SB AIR CIRCUIT BREAKER TRIP UNIT FIELD TEST FORM)

_____

Interlock Checks

Wire Form Interlock _____ Trip Free Interlock _____ Levering In Door Interlock _____

Interlocking Trip Indicator _____ Key Interlock _____ Cable/Rod Interlock _____

Remarks (Report action/repairs made):

_____

_____

_____

Other repairs recommended:

_____

_____

_____

Magnum PXR and PD-SB air circuit breaker inspection record

MAGNUM PXR and PD-SB AIR CIRCUIT BREAKER TRIP UNIT FIELD TEST FORM

Reference Documents MN013015EN

Location _____ Date_____

Position _____ Switchgear Mfr_____ Load Reading _____

Breaker GO# _____ Item # _____ Seq # _____

Breaker Data

Breaker Catalog Number. _____ Trip Unit Cat Number_____

Rating Plug/Sensor _____Amperes

Trip unit settings as found Long Delay Setting (LDS) _____ Long Delay Time (LDT) _____ Short Delay Setting (SDPU) _____

Short Delay Time (SDT) _____ Instantaneous (INST) _____

Ground Fault Settin (GFPU) _____ Ground Fault Time (GFT) _____

Long Delay Memory Jumper (LD Mem)(In/Out) _____ Maintenance Mode (ON/Off) _____

Trip unit test settings **LDS - 0.5 LDT - 4 SDPU - 2.5 SDT - 0.5 INST - 2 GFPU - 0.4 GFT - 0.5**

LD Mem - On Zone Interlock C19-21 On Ground Fault (if equipped with GF) OFF

Maintenance Mode setting (if equpped) - R5 (2.5x) Maintenance Mode Off

Test Data

Date of Test Inspector's Initials			**Left Pole (A phase)**	**Center Pole (B phase)**	**Right Pole (C phase)**	**Observations**	**Time Range from Curve in seconds**
Long Delay Test A phase Test Current% of In Rating 100%	Amperes _____					Long Delay LED Blink during test	Trip 26-36
Long Delay Memory Test A phase (immediately following previous test) Test Current% of In Rating 100%	Amperes _____					Long Delay LED Blink after test	Trip <10
Instantaneous Test B phase No trip Test Current% of In Rating 180%	Amperes _____					Long Delay LED Blink during test	No Trip
Instantaneous Test B phase Trip Test Current% of In Rating 220%	Amperes _____					Instantaneous LED blink after test	Trip <0 .065
Short Delay Test C phase No trip Test Current% of In Rating 120%	Amperes _____					Long Delay LED Blink during test	No Trip
Short Delay test C phase Trip Test Current% of In Rating 131%	Amperes _____					Short Delay LED blink after test	Trip 0.4 to 0.555
Maintenance Mode Test C phase (if equipped) No Trip Test Current% of In Rating 150%	Amperes _____	Set Maintenance Mode to ON Set Instantaneous to OFF				Blue LED on	No Trip < 0.4
Maintenance Mode Test C phase (if equipped) Trip Set Test Current% of In Rating 287%	Amperes _____	Maintenance Mode to ON Set Instantaneous to OFF				Blue LED on Instantaneous LED blink after test	Trip < 0.06
Ground Fault C phase or N if 4 Pole No Trip (if equipped) Test Current% of In Rating 36%	Amperes _____	GF = ON GFPU = .0.4					No Trip
Ground Fault C phase or N if 4 Pole Trip (if equipped) Test Current% of In Rating 44%	Amperes _____	GF = ON GFPU = .0.4				Ground Fault LED blink after test	Trip 0.4 to 0.555

Reset all trip unit settings back to as found positions

Remarks (record unusual conditions, corrections, needed repairs, etc; use separate form to record annual breaker inspection details):

_____

_____

_____

_____

_____

Magnum PXR and PD-SB air circuit breaker trip unit field test form

Section 8: Renewal parts

General

All renewal parts and/or spare parts recommendations for type Magnum PXR and PD-SB circuit breakers are supplied in separate renewal parts documentation, not this instruction manual. Refer to the most recent version of this documentation for specific assistance.

When ordering parts, always specify, if known, the part name and style number. If the style number is not known, it would help to refer to a pictorial and/or graphic reference. Also include the circuit breaker type, general order number and other information as shown on the nameplate on the front cover of the circuit breaker (**Figure 2** and **Figure 19**).

Some detailed parts shown in the figures in this manual may only be available as a part of a sub-assembly. Certain parts may not be available at all for field installation. Some parts in the figures are illustrated just to show their function and location in the assembly. The renewal parts documentation indicates which parts are available and in what form. For additional information, visit www.eaton.com/magnumpxr.

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