Behavioral Health Building

Operation and Maintenance Manual

Factory Order #: 31751120

12-17-2013

Kansas City, KS

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Schneider Electric

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Schneider Electric Conditions of Sale
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Note
The following Conditions of Sale are subject to change. All transactions for all products sold by Schneider Electric USA ("Schneider Electric"), including all Schneider Electric brand products, are subject to the latest published Conditions of Sale of Schneider Electric and to any Special Conditions of Sale which may be contained in applicable Schneider Electric quotations and acknowledgments.

Schneider Electric Standard conditions of Sale will apply in all transactions between customers and Schneider Electric, unless the Proposal-based Project Conditions of Sale, apply as defined in the following paragraph.

Proposal-based Projects Definitions

Transactions that exhibit some or all of the following attributes: Unique customer requirements that are typically negotiated and quoted, requires approval drawings and project management by Schneider Electric, and for which there is a specific direct-ship address.

Governing Provisions and Acceptance

All quotations are subject to these conditions of sale. Acceptance of an order by Schneider Electric shall be expressly conditioned on Purchaser's assent to these conditions. Purchaser's direction to proceed with engineering, manufacture or shipment by Schneider Electric shall be deemed evidence of this assent. No modified or other conditions will be applicable unless those conditions are so stated in Schneider Electric's proposal or are specifically agreed to in writing and signed by an authorized official of Schneider Electric. Failure to object to provisions contained in any Purchase Order or other communication from the Purchaser (including, without limitation, penalty clauses of any kind) shall not be construed as a waiver of these Conditions nor an acceptance of any other provisions. These terms are a complete statement of the parties' agreement and may only be modified in writing signed by both parties. These terms may not be modified by course of dealing, course of performance or usage of trade. These terms supersede all previous written or oral quotations, statements or agreements. Any contract for sale by and between the parties shall be governed by and construed according to the laws of the State of Illinois without regard to its rules on the conflict of laws. The Convention on the International Sale of Goods is expressly excluded.

Quotations

Quotations shall be valid for no more than thirty (30) days from the date quotation is communicated from seller to purchaser, unless otherwise stated in the quotation. All quotations are subject to change by Schneider Electric Company at any time upon notice to Purchaser. Quotations are made based on Schneider Electric's interpretation of the plans and specifications submitted to Schneider Electric by the Purchaser. It is Purchaser's obligation to review the quotation carefully and to immediately advise Schneider Electric of any differing interpretation Purchaser has so any necessary change can be made.

Order Entry

A complete, signed purchase order must be received before entry of an order into Schneider Electric's system. Considerable detail is involved in the manufacture of power equipment. To facilitate timely shipment, complete details and information, including Purchaser's requested on-site dates must be provided at the time of order entry. Shipment dates are approximate and are based upon timely receipt of all necessary information from the Purchaser. Lack of complete information may result in delays of drawings or manufacture. Such delays shall relieve Schneider Electric from compliance with the quoted delivery dates and may lead to price escalation. Failure to provide a complete signed purchase order within twenty (20) days of notification of award may result in renegotiation of price or shipment dates.

Approval Drawings

When required by a specific Purchase Order, drawings will be submitted for approval per agreed upon schedules, and price policy, below, to assure Schneider Electric has designed the equipment as described in Purchaser's specifications, as modified by Schneider Electric's quotation. If at time of drawing approval Schneider Electric has not designed the equipment to meet the specifications, as modified by Schneider Electric's quotation, Schneider Electric will make the appropriate changes at no charge to Purchaser. Where the Purchaser's specification is not definitive, Schneider Electric shall have the right to design the product in line with good commercial practice, without further obligation to Purchaser. If at drawing approval, Purchaser makes changes outside the design as stated in the specifications, such changes shall be treated as a change order as provided below.

Price Policy

Quoted prices are firm provided: A) The order is received with complete engineering details and is released for manufacture within sixty (60) calendar days from the originally anticipated release date. B) All required approval drawings are returned and equipment released by Purchaser no later than sixty (60) calendar days from the original date of issuance of approval drawings by Schneider Electric. The returned drawings must be released for manufacture for shipment on the agreed date. Drawing re-submittals which are required for any reason other than to correct Schneider Electric errors will not extend the sixty (60) day deadline. If the Purchaser causes delay of shipment in any way or returns approval drawings beyond the time stated above, Purchaser may be subject to charges which shall not exceed 2% of the purchase order price for each full month or fraction thereof that shipment is delayed, as compensation to Schneider Electric for expenses created by such delay and not as a penalty. In addition to the 2% charge per month, if shipment is delayed through the fault of Purchaser for more than 180 days from the original date of issuance of approval drawings, the price may be subject to revision.

Pricing-Purchaser Changes

All prices cover a bill of material as described in Schneider Electric specifications or quotations to be designed and manufactured to Schneider Electric standard designs, unless otherwise agreed in writing between the parties. Purchaser may make minor changes not affecting the time or cost of performance without charge prior to the start of manufacture. If any changes are requested by the Purchaser after submission of the original Purchase Order which affect the cost or time of performance, additional billing will be made with the amount of price adder dependent on the change and status of the order when the change is made. Changes may also result in an extension of time for shipment. All changes will be agreed to by the parties, in writing, prior to implementation. Purchaser's rescheduling shipment will be considered a change. All expenses incurred by Schneider Electric in connection with the storage of equipment, including demurrage, packing, storage charges, insurance and handling charges by Schneider Electric will be paid by the Purchaser upon submission of invoices by Schneider Electric. Schneider Electric will issue price changes for any change requested by the Purchaser that affects modification of equipment, changes the bills of material, engineering or drawings or delivery schedule as follows: A) If Purchaser makes a change to an order prior to being released to engineering, the net price will be adjusted by re-pricing the equipment with prices in effect at the time of the change. A commensurate delay in the shipping date will be based on the changes involved. B) For changes made after the order is released to engineering, the net price and ship date will be adjusted as described in paragraph A above. An additional charge based on Schneider Electric standard engineering billing charges and cost of parts ($250 minimum) will be made to cover any extra engineering and drafting, scrap or rework of parts, or cost of modification. C) If during the drawing approval process, the Purchaser makes changes outside the design covered by the specifications, Schneider Electric will be reimbursed as described in paragraph A and B above, plus any additional charges for any extra cost incurred as a direct result of the changes and allowed a commensurate delay in shipping date based on the changes involved. Changes to the order can not be processed until a formal signed change order is received from the Purchaser.

Substitutions

Schneider Electric may furnish suitable substitutes for material unobtainable because of priorities or regulations established by governmental authority or non-availability of materials from suppliers, provided such substitutions do not adversely affect the technical soundness of the equipment. Schneider Electric assumes no liability for deviation from published dimensions and descriptive information not essential to proper performance of the product.

Taxes

Any manufacturer's tax, retailer's tax, occupation tax, use tax, sales tax, excise tax, (except federal excise tax on vehicles), duty, customs, inspecting or testing fee, or other tax, fee or charge of any nature whatsoever, imposed by any governmental authority or measured by any transaction between Schneider Electric and Purchaser, shall be paid by the Purchaser in addition to the prices quoted or invoiced, and such charges will appear as a separate line item on the invoice. In the event Schneider Electric will be required to pay any such tax, fee, or charge, Purchaser shall reimburse Schneider Electric or, in lieu of such payment, Purchaser shall supply Schneider Electric at the time the order is submitted with an exemption certificate or other document acceptable to the tax authority. Purchase Orders must state the existence and amount of any such tax, fee or charge for which Purchaser claims an exemption.

Terms of Payment

Acceptance of all Purchase Orders is subject to Purchaser meeting Schneider Electric credit standards. Terms are subject to change for failure to meet such standards. Terms are net thirty (30) days from date of invoice of each shipment, unless otherwise stated in Schneider Electric's quotation. For an authorized distributor or authorized reseller order, applicable terms of payment are stated in the quotation or applicable discount schedule. Schneider Electric reserves the right at any time to demand full or partial payment before proceeding with a contract of sale if, in its sole judgment, as a result of changes in the financial condition of the Purchaser the terms of payment originally specified are no longer justified.

Progress Payments/ Payment Term

All proposal-based projects are Net 30 days from date of invoice of each shipment. On projects exceeding $1,000,000 Net, progress payments are payable according to the following milestones:

- 30% Release to manufacturing
- 70% (balance) due at shipment

Payments

If delivery is delayed or deferred by the Purchaser beyond the scheduled date, payment shall be due in full when Schneider Electric is prepared to ship. The equipment may be stored at the risk and expense of the Purchaser. If the Purchaser defaults when any payment is due, then the whole contract price shall become due and payable upon demand, or Schneider Electric at its option, without prejudice to other lawful remedies, may defer delivery or cancel the contract for sale. If Purchaser become insolvent, or bankrupt or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily under the bankruptcy or any insolvency law, Schneider Electric may cancel any order then outstanding at any time and recover its proper cancellation charges from the Purchaser or the Purchaser's estate.

Delivery

F.O.B. Point of Shipment

When the Schneider Electric quotation is based on delivery F.O.B. point of shipment, freight prepaid and allowed for delivery within the continental United States, Product is sold F.O.B. point of shipment, freight prepaid and allowed for orders over $2000 net. Delivery by Schneider Electric to the point of shipment constitutes delivery to the Purchaser; and title and all risk of loss or damage in transit shall pass to the Purchaser at time of delivery at the F.O.B. point. Schneider Electric is not responsible for breakage or delays by carrier after having received "in good order" receipts from the carrier. Purchaser is responsible for pursuing any damage claims with the carrier. For orders under $2000 net the above terms apply except freight is prepaid not allowed. No allowance will be made in lieu of transportation if the Purchaser accepts shipment at factory, warehouse or freight station or otherwise supplies its own transportation. Freight prepaid is defined as: a) Shipments to destinations within the continental United States to the accessible common carrier point nearest the first destination. b) Shipments to U.S. destinations outside the continental United States shall be to the common carrier free delivery point in the United States nearest the original port of embarkation. All charges associated with F.A.S., C.I.F., or other charges such as pier transfer, lift, ocean freight, and marine or war insurance shall be paid by the Purchaser, unless otherwise specifically agreed in a specific Purchase Order. In no event will Schneider Electric be responsible for demurrage or detention charges.

Delivery: F.O.B. Destination

When the Schneider Electric quotation is based on delivery F.O.B. Destination, for shipments for delivery within the continental United States, Schneider Electric will retain title and all risk of loss or damage in transit to the common carrier free delivery point in the United States nearest the first destination for a price addition of 2% of the net price. If the Purchaser elects this Option, Purchaser's obligations shall be as follows: a) Purchaser shall have the responsibility of inspecting the equipment for apparent loss or damage immediately upon its arrival at the free delivery point. b) In the event of apparent shipping loss or damage, Purchaser shall make written notation of the loss on the carrier's delivery receipt and, within 72 hours of delivery shall notify the Schneider Electric Customer Information Center. Purchaser shall not remove product from the point of examination and shall retain the shipping container and packing

material. Purchaser shall request the carrier to make an inspection and send Schneider Electric a copy of the carrier's inspection report. c) In the event of concealed damage which occurred during transit and is discovered by the Purchaser after delivery, Purchaser shall report such damage immediately, but in no event later than 15 days after delivery, to the delivering carrier, and within 72 hours of discovery, shall notify the local Schneider Electric field office. If such notification is not made, Schneider Electric shall not be liable for loss or damage in transit.

Shipment and Routing
Schneider Electric shall select the point of origin of shipment, the method of transportation and the routing of the shipment. Purchasers that request expedited or special modes of transportation or routing involving air, premium or any other non-standard Schneider Electric shipping shall be assessed additional charges for shipping, handling, freight and expediting. Any rebates, allowances, discounts, or incentives received by Schneider Electric from its carriers shall be retained by Schneider Electric. All prices include domestic packaging only. When other than domestic packaging is required, contact your local Schneider Electric field office. Purchaser specified packaging and marking may be subject to additional charges.

Shortages

Claims for shortages or errors must be submitted to Schneider Electric within 30 days after invoice date, and failure to give such notice shall constitute unqualified acceptance and a waiver of all such claims by the Purchaser.

Installments

Schneider Electric reserves the right to make shipments in installments, unless otherwise expressly stipulated in a specific Purchase Order; and all such installments when separately invoiced shall be paid for when due per invoice without regard to subsequent shipments. Delay in shipment of any installment shall not relieve Purchaser of its obligation to accept remaining shipments.

Force Majeure

Schneider Electric shall not be liable for any damages as a result of any delays due to any causes beyond Schneider Electric's control, including, without limitation, an act of God; act of Purchaser or Schneider Electric supplier; embargo or other governmental act, regulation or request; fire; accident; strike; slowdown; flood; fuel or energy shortage; sabotage; war; riot; delay in transportation and inability to obtain necessary labor, materials or manufacturing facilities from usual sources. In the event of any such delay, the date of delivery shall be extended for a period of time reasonably necessary to overcome the effect of such delay.

Standard Warranty

Schneider Electric warrants equipment manufactured by it and sold through authorized sales channels to be free from defects in materials and workmanship for 12 months from the issuance of the customer provisional acceptance letter or 18 months from the invoice date of the last component of the order whichever occurs first. If within such period, any such equipment shall be proved to Schneider Electric's satisfaction to be non-conforming, such equipment shall be repaired or replaced at Schneider Electric's option. This warranty shall not apply (a) to equipment not manufactured by Schneider Electric, (b) to equipment that has been repaired or altered by other than Schneider Electric so as, in its judgment, to affect the same adversely, or (c) to equipment that has been subjected to negligence, accident, or damage by circumstances beyond Schneider Electric's control, or improper operation, maintenance or storage, or to other than normal use or service. With respect to equipment not manufactured by Schneider Electric, the warranty obligations of Schneider Electric shall in all respects conform and be limited to the warranty actually extended to Schneider Electric by its supplier. Non-conforming products must be returned at Schneider Electric's expense for evaluation unless this is waived in writing. Replacement products may be new or reconditioned. The foregoing warranties do not cover reimbursement for labor, transportation, removal, installation, temporary power, or any other expenses that may be incurred in connection with repair or replacement. Any part or component changed or repaired in the context of the contractual warranty will itself benefit of a 3 month warranty but shall not cause the warranty duration of the overall System / Solution to be extended.

Optional Warranties

(Only available on equipment to be located in the U.S.)
Option 1—Extended: 2 to 5 years from Shipment. If requested by the Purchaser, and specifically accepted in writing by Schneider Electric, the standard warranty will be extended to two (2) years from date of invoice for a price addition of 1% of the net face value of the Purchase Order, will be extended to three (3) years from date of invoice for a price addition of 3% of the net face value of the Purchase Order, will be extended to four (4) years from date of invoice for a price addition of 5% of the net face value of the Purchase Order, or will be extended to five (5) years from date of invoice for a price addition of 7% of the net face value of the Purchase Order.
Option 2—Special Warranty: If requested by the Purchaser, and specifically accepted in writing by

Schneider Electric, the standard warranty will be extended, for a price addition of 3% of the net face value of the Purchase Order, to cover reimbursement of the direct costs of: a) Removal of non-conforming equipment or part thereof; b) Transporting equipment or parts to and from the place of repair; c) Off-loading of truck and reinstallation at the original site. Such special warranty, which may be chosen to cover a period not exceeding that of the standard or extended warranty (see above) selected, will not include the cost of providing temporary power or removing or replacing other apparatus or structures, or costs of transportation beyond a common carrier free delivery point in the continental United States. Further, the obligation of Schneider Electric for expenses and costs arising under this special warranty coverage will not exceed 50% of the net invoice price on the equipment being repaired. This warranty does not change or affect the allocation of risk or loss during shipment.
Option 3—Extended Warranty: Preventative Maintenance Agreements. If requested by the Purchaser, and specifically accepted by Schneider Electric, a Preventative Maintenance Agreement is available to provide preventative maintenance on equipment covered by the agreement. Terms of the preventative maintenance agreement shall be as defined in a separate Services Agreement agreed to by the parties.

Software

Any software or computer information, in whatever form, provided with equipment manufactured by Schneider Electric is licensed to Purchaser solely pursuant to standard licenses of Schneider Electric or its supplier of such software or computer information, which licenses are, hereby incorporated by reference. Schneider Electric does not warrant that such software or computer information will operate error free or without interruption, and warrants only that during the warranty period applicable to the equipment that the software will perform its essential functions. If such software or computer information fails to conform to such warranty, Schneider Electric will, at its option, provide an update to correct the non-conformance or replace the software or computer information with the latest available version containing a correction. Schneider Electric shall have no other obligation to provide updates or revisions.

Limitations

These disclaimers and limitations of remedies apply to all warranties offered to Purchaser and to all Purchase Orders. **The warranties set forth above are exclusive and in lieu of all other expressed or implied warranties (except warranties of title), including, but not limited to implied warranties of merchantability and fitness for a particular purpose.** Except as may be expressly provided in an authorized writing by Schneider Electric, Schneider Electric shall not be subject to any other obligations or liabilities whatsoever other than as stated above with respect to equipment sold or services rendered by Schneider Electric. Notwithstanding anything to the contrary herein contained **Schneider Electric Company, its contractors and suppliers of any tier, shall not be liable in contract, in tort (including negligence or strict liability) or otherwise for lost time, lost profits, or special, indirect, incidental or consequential damages of any kind whatsoever.** The remedies of the Purchaser are exclusive and the total cumulative liability of Schneider Electric, its contractors and suppliers of any tier, with respect to this contract or anything done in connection therewith, such as the use of any product covered by or furnished under the contract, whether in contract, in tort (including negligence or strict liability) or otherwise, shall not exceed the price of the product, part, or service on which such liability is based.

Intellectual Property

As to equipment proposed and furnished by Schneider Electric, Schneider Electric shall defend any suit or proceeding brought against Purchaser so far as based on a claim that such equipment constitutes an infringement of any copyright, trademark or patent of the United States.

This obligation shall be effective only if Purchaser shall have made all payments then due hereunder and if Schneider Electric is notified promptly in writing and given authority, information, and assistance at Schneider Electric's expense for the defense of the same. In the event the use of such equipment by Purchaser is enjoined in such a suit, Schneider Electric shall, at its expense, and at its sole option, either (a) procure for the Purchaser the right to continue using such equipment (b) modify such equipment to render it non-infringing (c) replace such equipment with non-infringing equipment, or (d) refund the purchase price (less depreciation) and the transportation and installation costs of such equipment. Schneider Electric will not be responsible for any compromise or settlement made without its written consent. The foregoing states the entire liability of Schneider Electric for patent, trademark or copyright infringement, and in no event shall Schneider Electric be liable if any infringement charge is based on the use of Schneider Electric equipment for a purpose other than that for which it was sold by Schneider Electric. As to any equipment furnished by Schneider Electric to Purchaser and manufactured in accordance with designs proposed by Purchaser, the Purchaser shall indemnify Schneider Electric against any award made against Schneider Electric for patent, trademark, or copyright infringements.

Witness of Tests and Factory Inspections

Normal production schedules do not provide the opportunity for Purchaser to witness routine factory tests on equipment or make factory inspections. Witnessing of tests or factory inspections by the Purchaser may result in delays of production for which Schneider Electric will not be responsible. Witness testing and factory inspections must be requested at time of quotation and confirmed at order entry. Standard Schneider Electric factory testing and inspection will apply. Schneider Electric will notify Purchaser fourteen (14) calendar days prior to scheduled witness testing or inspection. In the event Purchaser is unable to attend, the Parties may mutually agree on a rescheduled date. However, Schneider Electric, at its sole option, may consider the witness tests and/or inspection waived, and ship and invoice the Products. Purchaser will be responsible for paying for all scheduled witness testing, whether or not Purchaser attends.

Return of Equipment

No equipment may be returned without first obtaining Schneider Electric's written permission and a returned material identification tag. Returned equipment must be of current manufacture, in the original packaging, unused, undamaged and in saleable condition, securely packed to reach Schneider Electric without damage and labeled with the return authorization number. Any cost incurred by Schneider Electric to put equipment in first class condition will be charged to the Purchaser. Returns will be credited at price invoiced by Schneider Electric less a restocking fee of 25% invoice price. Special Order and Custom equipment is not returnable. Schneider Electric shall bear the cost of returns resulting from Schneider Electric error, and method and route of return will be at the discretion of Schneider Electric. Costs incurred by failure to follow Schneider Electric direction will be borne by the Purchaser.

Nuclear Applications Terms and Conditions

Unless otherwise agreed in writing by a duly authorized representative of Schneider Electric, products sold hereunder are not intended for use in or in connection with any nuclear facility or activity. If so used, Schneider Electric disclaims all liability for any damage, injury or contamination; and Purchaser shall indemnify Schneider Electric against any such liability, whether arising as a result of breach of contract, warranty or tort (including negligence) or otherwise.

Patterns and Tools

Notice will be given if special patterns or tools are required to complete any order. Charges for such patterns or tools do not convey title thereto or the right to remove them from Schneider Electric's plant. If patterns or tools are not used for a period of two years, Schneider Electric shall have the right to scrap them without notice.

Product Notices

Purchaser shall promptly supply the user (including its employees) of the product with all Schneider Electric supplied product notices, warnings, instructions, recommendations and similar materials.

Errors

Schneider Electric reserves the right to correct errors or omissions in quotations, acknowledgments, invoices, or other documents.

OSHA Compliance

Compliance with OSHA or similar federal, state or local laws during the operation or use of the product(s) is the sole responsibility of the Purchaser.

Termination

Any order may be terminated by the Purchaser only upon written notice to Schneider Electric will be subject the following cancellation schedule:

- 20% after issuance of approval drawings
- 50% at release to manufacturing
- 100% at start of fabrication

Cancellation

Schneider Electric shall have the right to cancel any order or contract at any time by written notice for any material breach of the contract by the Purchaser, including material delays in releasing equipment for manufacture or approval drawings and excessive changes to specifications or drawings.

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SURGELOGIC™
Surge Protective Device

Square D Warranty
Surgelogic TVSS Protection Systems

Warranty to customers purchasing through authorized Square D distributors and customers purchasing directly from Square D.

Protection Limits

With regard to any Square D Surgelogic TVSS protection system that has been properly installed in compliance with all applicable electrical code requirements, Square D warrants the Surgelogic TVSS device to be free from defects in materials and workmanship for a period of ten (10) years from date of invoice from Square D or its authorized sales channel. If within the applicable warranty period purchaser discovers such item was not as warranted and promptly notifies Square D in writing, Square D shall repair or replace the items or refund the purchase price, at Square D's option. This warranty shall not apply (a) to electrical equipment in which the TVSS is installed, i.e. panelboards, motor control centers, busway, switchboards, switchgear, etc.. (b) to equipment not manufactured by Square D, (c) to equipment which shall have been repaired or altered by others than Square D, (d) to equipment which shall have been subjected to negligence, accident, or damage by circumstances beyond Square D's control, or to improper operation, maintenance or storage, or to other than normal use or service.

The foregoing warranty does not cover reimbursement for labor, transportation, removal, installation, or other expenses which may be incurred in connection with repair or replacement.

Except as may be expressly provided in an authorized writing by Square D, Square D shall not be subject to any other obligations or liabilities whatsoever with respect to equipment manufactured by Square D or services rendered by Square D.

The foregoing warranties are exclusive and in lieu of all other express and implied warranties except warranties of title, including but not limited to implied warranties of merchantability and fitness for a particular purpose.

Limitation of Liability

Anything to the contrary herein contained notwithstanding, Square D Company, its contractors and suppliers of any tier shall not be liable in contract, in tort (including negligence or strict liability) or otherwise for any special, indirect, incidental or consequential damages whatsoever. The remedies of the purchaser set forth herein are exclusive where so stated and the total cumulative liability of Square D, its contractors and suppliers of any tier, whether in contract, in tort (including negligence or strict liability) or otherwise, shall not exceed the price of the product or part on which such is based.

Item No.	Qty.	Catalog Number / Details

BILL OF MATERIALS

001-00 1

Designation: MSB
SQUARE D CUSTOM QED SWITCHBOARD
QED Switchboard

Square D Power Style Custom Switchboard
Designed and Tested in accordance with:
UL 891/NATIONAL ELECTRIC CODE/NEMA PB-2
System Voltage - 208Y/120V 3Ph 4W 60Hz
Source Description - Single Main
System Ampacity - 1600A
Bussing - Copper Plated with Silver
Neutral Bus - 100%
Max Available Fault Current (RMS) - 65kA
Enclosure - Type 3R Non-Walk-in
Accessibility: Front Only
Rodent Barrier
Exterior Paint Color - ANSI 49
Mimic Nameplate - Power Flow Plastic
Ground Lug provided for each device
Optional Copper Ground Bus
Lineup 1 BTU: 10448

Dimensions
---
3 - 36" Wide Section(s)
1 - Dimensions: 108.00" W X 35.5" D X 91.5"H
3 - 35.5" Deep Enclosure(s)
Approximate Weight: 2553.00

Incoming Requirements

Suitable for Use As Service Entrance
Entry Point: Left of Lineup, Through the Bottom
Connection Type: Cable
Surge Arrestor
Power Meter - PM-820RD
3 CTs Power Meter - 3 phase 4 wire wye 208Y/120

Mains
---
1 - 1600AS/1600AT 208V 80% Rated 65 kA 3 Pole UL, Fixed Mounted Micrologic Circuit Breaker: Type RG
Standard Trip Unit, Long Time, Short Time, Instantaneous
Nameplate - White Surface / Black Letters

Feeders
---
1 - 1200AS/1200AT 208V 80% Rated 65 kA 3 Pole UL, Fixed Mounted Micrologic Circuit Breaker: Type RG
Standard Trip Unit, Long Time, Short Time, Instantaneous
Specials: 9-500MCM/PH&N
Special 9-500MCM/PH&N #: 5673538
2 - 200AT 208V 80% Rated 65 kA 3 Pole UL, Group Mounted Thermal Magnetic Circuit Breaker: Type QG

Item No.	Qty.	Catalog Number / Details
		1 - 1000AS/1000AT 208V 80% Rated 65 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type PG Standard Trip Unit, Long Time, Short Time, Instantaneous 1 - 600AS/600AT 208V 80% Rated 65 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type LG Standard Trip Unit, Long Time, Short Time, Instantaneous Common Feeder Features: Nameplate - White Surface / Black Letters
002-00	1	**Designation:** MDPA SQUARE D CUSTOM QED SWITCHBOARD QED Switchboard --- Square D Power Style Custom Switchboard Designed and Tested in accordance with: UL 891/NATIONAL ELECTRIC CODE/NEMA PB-2 System Voltage - 208Y/120V 3Ph 4W 60Hz Source Description - Single Main System Ampacity - 1200A Bussing - Copper Plated with Silver Neutral Bus - 100% Max Available Fault Current (RMS) - 50kA Enclosure - Type 1 Accessibility: Front Only Exterior Paint Color - ANSI 49 Ground Lug provided for each device Optional Copper Ground Bus Lineup 1 BTU: 7485 Dimensions --- 2 - 36" Wide Section(s) 2 - 24" Deep Enclosure(s) Dimensions: 72.00" W X 24" Max D X 91.5" H Approximate Weight: 1502.00 Incoming Requirements --- Suitable for Use As Service Entrance Entry Point: Left of Lineup, Through the Bottom Connection Type: Cable Surge Arrestor SPD with Surge Rating 160kA SPD Dry Contacts Includes Surge Counter Power Meter - PM-820RD 3 CTs Power Meter - 3 phase 4 wire wye 208Y/120 Mains --- 1 - 1200AS/1200AT 208V 80% Rated 65 kA 3 Pole UL, Fixed Mounted Micrologic Circuit Breaker: Type RG Standard Trip Unit, Long Time, Short Time, Instantaneous Nameplate - White Surface / Black Letters Specials: 9-500MCM/PH&N

Item No.	Qty.	Catalog Number / Details
		Special 9-500MCM/PH&N #: 5673538 Feeders --- 2 - 200AT 208V 80% Rated 65 kA 3 Pole UL, Group Mounted Thermal Magnetic Circuit Breaker: Type QG 3 - 250AS/225AT 208V 80% Rated 65 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type JG Standard Trip Unit, Long Time, Short Time, Instantaneous 1 - 250AT 208V 80% Rated 3 Pole UL, Group Mounted Thermal Magnetic Prepared Space: Type JG 1 - 400AS/350AT 208V 80% Rated 65 kA 3 Pole UL, Group Mounted Electronic Trip Circuit Breaker: Type LG Standard Trip Unit, Long Time, Short Time, Instantaneous Common Feeder Features: Nameplate - White Surface / Black Letters
002-01	4	80247-553-64 right splice assembly, 1.5" bus
005-00	1	**Designation:** PANEL L1A NQ ML PNLB (INT,BOX,TRIM) - A NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 42kA Series Rated w/ JG Circuit Breaker TVSS 160kA per Phase/80kA per Mode SPD line to grd protect w/TVSS Surge Counter w/TVSS Dry Contacts Main Lug Only: 225A Main Acc: Sub-Feed Lugs Incoming Conductors: 1 - (2) 1/0 - 350 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 42 Circuit Interior Type 1Box: 62H x 20W x 5.75D Incoming: Top Trim: Surface - Hinged Box Cat No: MH62 Front Cat No: NC62SHR Ref. Drawing: PBA701T Feeders: 35 - 20A/1P QOB 3 - 20A/1P QOB HPL 4 - 20A/1P QOB-GFI Optional Features: Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L1A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
018-00	1	**Designation:** PANEL L1A NQ ML PNLB (INT,BOX,TRIM) - B

Item No.	Qty.	Catalog Number / Details
		NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 42kA Series Rated w/ JG Circuit Breaker Main Lug Only: 225A Incoming Conductors: 1 - (2) 1/0 - 350 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 42 Circuit Interior Type 1Box: 38H x 20W x 5.75D Incoming: Top Trim: Surface - Hinged Box Cat No: MH38 Front Cat No: NC38SHR Ref. Drawing: PBA701T Feeders: 3 - 20A/1P QOB HPL 36 - 20A/1P QOB 1 - 50A/3P QOB Optional Features: Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L1A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
006-00	1	**Designation:** PANEL L2A NQ ML PNLB (INT,BOX,TRIM) - A NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 42kA Series Rated w/ JG Circuit Breaker TVSS 160kA per Phase/80kA per Mode SPD line to grd protect w/TVSS Surge Counter w/TVSS Dry Contacts Main Lug Only: 225A Main Acc: Sub-Feed Lugs Incoming Conductors: 1 - (2) 1/0 - 350 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 42 Circuit Interior Type 1Box: 62H x 20W x 5.75D Incoming: Top Trim: Surface - Hinged Box Cat No: MH62 Front Cat No: NC62SHR Ref. Drawing: PBA701T Feeders: 38 - 20A/1P QOB 4 - 20A/1P QOB-GFI Optional Features: Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L2A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on

Item No.	Qty.	Catalog Number / Details
019-00	1	**Designation:** PANEL L2A NQ ML PNLB (INT,BOX,TRIM) - B NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 42kA Series Rated w/ JG Circuit Breaker Main Lug Only: 225A Incoming Conductors: 1 - (2) 1/0 - 350 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 42 Circuit Interior Type 1Box: 38H x 20W x 5.75D Incoming: Top Trim: Surface - Hinged Box Cat No: MH38 Front Cat No: NC38SHR Ref. Drawing: PBA701T Feeders: 42 - 20A/1P QOB Optional Features: Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L2A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
007-00	1	**Designation:** PANEL L3A NQ ML PNLB (INT,BOX,TRIM) - A NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 42kA Series Rated w/ JG Circuit Breaker TVSS 160kA per Phase/80kA per Mode SPD line to grd protect w/TVSS Surge Counter w/TVSS Dry Contacts Main Lug Only: 225A Main Acc: Sub-Feed Lugs Incoming Conductors: 1 - (2) 1/0 - 350 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 42 Circuit Interior Type 1Box: 62H x 20W x 5.75D Incoming: Top Trim: Surface - Hinged Box Cat No: MH62 Front Cat No: NC62SHR Ref. Drawing: PBA701T Feeders: 38 - 20A/1P QOB 4 - 20A/1P QOB-GFI Optional Features: Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L3A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on

Item No.	Qty.	Catalog Number / Details
020-00	1	**Designation:** PANEL L3A NQ ML PNLB (INT,BOX,TRIM) - B NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 42kA Series Rated w/ JG Circuit Breaker Main Lug Only: 225A Incoming Conductors: 1 - (2) 1/0 - 350 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 42 Circuit Interior Type 1Box: 38H x 20W x 5.75D Incoming: Top Trim: Surface - Hinged Box Cat No: MH38 Front Cat No: NC38SHR Ref. Drawing: PBA701T Feeders: 40 - 20A/1P QOB 1 - 35A/2P QOB Optional Features: Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L3A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
008-00	1	**Designation:** SPARE TVSS MODULE MA1IMA16 IMA MA Module, 120V, 160kA
009-00	1	**Designation:** 5-RTU-1 D325NR SWITCH FUSIBLE GD 240V 400A 3P NEMA3R
010-00	2	**Designation:** 5-RTU-1 PKOGTA2 EQUIP GRD ASSY 240V + 600V 100-200
011-00	6	**Designation:** 5-RTU-1 PLUS SPARES FRNR350 Class RK5 350A 250V Fuse (25413-00530)
012-00	1	**Designation:** ERV-1 D222NRB SWITCH FUSIBLE GD 240V 60A 2P NEMA3R
014-00	1	**Designation:** ERV-1 GTK03 KIT EQUIPMENT GROUND CU/AL
013-00	4	**Designation:** ERV-1 PLUS SPARES FRNR30 Class RK5 30A 250V Fuse (25413-00350)
015-00	1	**Designation:** WH-2 D322N SWITCH FUSIBLE GD 240V 60A 3P NEMA1
017-00	1	**Designation:** WH-2 GTK03 KIT EQUIPMENT GROUND CU/AL

Item No.	Qty.	Catalog Number / Details
016-00	6	**Designation:** WH-2 PLUS SPARES FRNR45 Class RK5 45A 250V Fuse (25413-00380)
021-00	2	**Designation:** CBS FOR EXT PANEL LB QOB360VH MINIATURE CIRCUIT BREAKER 240V 60A
022-00	1	**Designation:** TRAINING SQDSERVICE. Startup Services - Straight Time CONSISTING OF Square D will perform the Scope of Work per Square D document number 0180IB0001 R5/01 "Square D Services Procedures for Startup and Commissioning of Electrical Equipment". Work will be performed during Straight Time (any scheduled 8 hour period between 06:00 and 18:00 hours Monday thru Friday) It is estimated that the service will be performed using one technician with all equipment and tests performed in immediate succession, unless otherwise specified. If equipment is not available or prepared to be tested in the number of days specified, additional travel and expense charges may apply. For each hour that SDS is delayed at the job site due to the unavailability of the equipment for any reason, a charge at the applicable T&M rates will be added to the invoice. Startup scope of work includes Square D technician supervision during energization of equipment. Quoted price is based on energization during final day of inspection and testing. If additional trip is required in order to provide energization supervision, additional travel, expense and labor charges will apply. To schedule date for start of work, call: 1-888-SQUARED Square D services must be contacted prior to 2 weeks from required date of service to avoid additional charges. Rev: 051207 Jobsite Distance under 50 miles Services will make up to 1 Trip to the Job Site General Info Additional Services Description:TRAINING Quantity:8 Number of Students: 1 to 5 Training On Switchboard Other Equipment Number of Students: 1 to 5

Item No.	Qty.	Catalog Number / Details
		Markings: If you have any questions about this invoice please contact Christina Grimm at 636-257-8200 X 16 or email her at Christina.grimm@schneider-electric.com.
023-00	1	SCB00000012684 GROUND_BUS_W/LUGS
024-00	3	2506504902
025-00	15	2506504902 GROUND LUGS
026-00	1	SCB-00000-12684 GROUND BUS - 36" SECTION
037-00	1	**Designation:** PANEL EL1 NQ MB Panel (Interior) NQ Panelboard Consisting of 208Y/120V 3Ph 4W 60Hz SCCR: 10kA Fully Rated Single Main: 150A/3P QB Circuit Breaker Incoming Conductors: 1 - #4 - 300 kcmil AL Ground Bar Bus: Aluminum: Tin Plated 30 Circuit Interior Type 1,Box: 44H x 20W x 5.75D Incoming: Bottom Trim: Surface - Hinged Box Cat No: MH44 Front Cat No: NC44SHR Ref. Drawing: PBA707HR Feeders: 30 - 20A/1P QOB Optional Features: Standard Panel (Box Ahead),Standard Solid Neutral,Standard Ground Bar Standard Nameplate: Engraved as Follows Line 1: PANEL EL1 Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
038-00	1	**Designation:** PANEL EL1 MH44 (Box) NQ Standard TYPE 1 Box 44 H
039-00	1	**Designation:** PANEL EL1 NC44SHR (Trim) Trim Surface Hinged 44"H
040-00	1	DU324 SWITCH NOT FUSIBLE GD 240V 200A 3P NEMA1 Enclosure Type: Type 1 Interrupting Rating (AIR): 10kA Fuse Capability: Non Fusible Max System Voltage: 240 VAC Switch Current Rating: 200 Amp Number of Switching Poles: 3 Pole No Neutral Ground Lug: AL/CU

Item No.	Qty.	Catalog Number / Details
		Ground Lug: Field or Factory Installed: Field Processed by ACE 2.0 - 030513
041-00	1	PKOGTA2 EQUIP GRD ASSY 240V + 600V 100-200

SQUARE D
by Schneider Electric

Job Name:	BEHAVIORAL HEALTH BUILDING	Square D Quotation #:	31751120
Job Location:	WICHITA, KS	Quotation Revision #:	
		Sales Contact:	Q4P
		Sales Contact Location:	439
Purchaser:	STANION WHOLESALE ELECTRIC CO	Customer:	TORGESON ELECTRIC CO
Purchaser PO #:		Customer PO #:	
User:	VA MEDICAL CTR HOSPITAL	Architect:	PROFESSIONAL ENGINEERING
User Location:		Cons. Engineer:	
Drawing Status:	RECORD		

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SQUARE D FACTORY ORDER NUMBER: 31751120–001

These products are manufactured in a facility which is quality systems registered by Underwriters Laboratories to ISO 9000

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--	–	----	--	--/--/--
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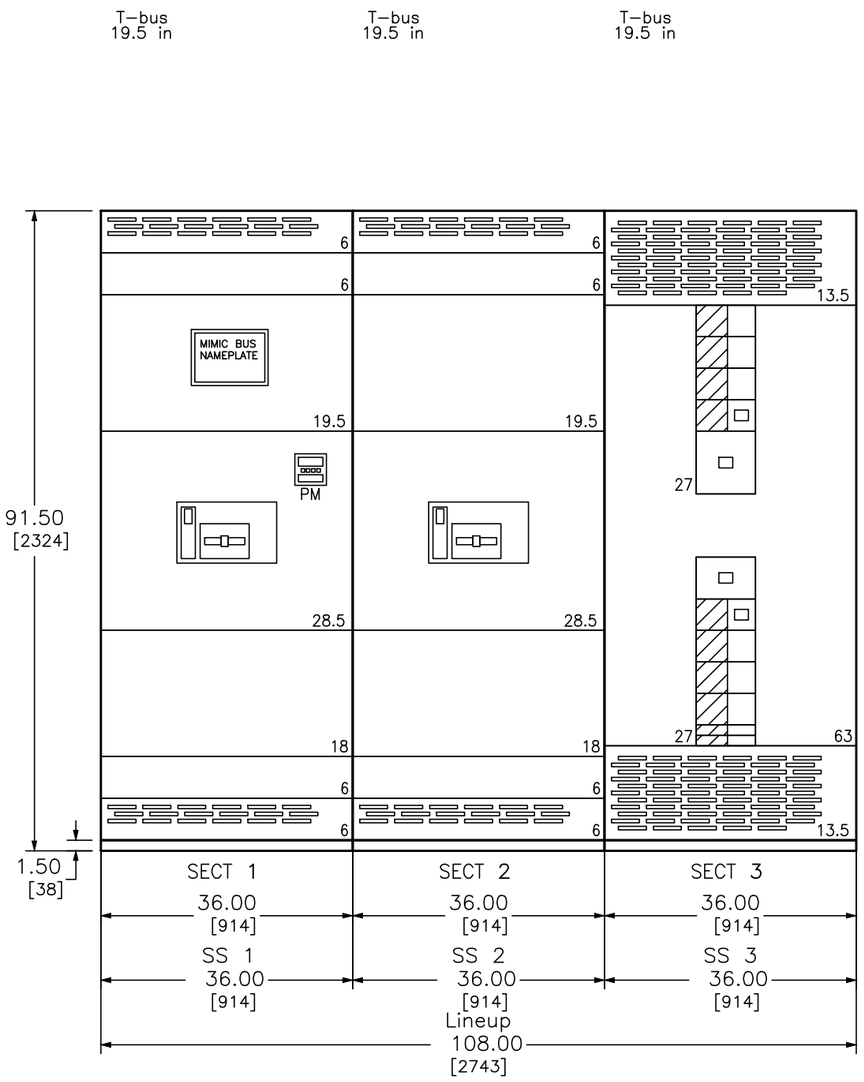

SWITCHBOARD GENERAL NOTES

PRODUCT DESCRIPTION & RATINGS

Power System Data

208Y/120V 3Ph 4W 60Hz / 3 Phase Wye
Solidly Grounded
System Short Circuit Current Rating: 65kA RMS
Incoming Section 1 Cable Through the Bottom Left of Lineup

Bus System Data

1600A Silver Plated Copper Main Bus
(2) .25x2.00 IN/6x51 mm Cu Bus Bar Per Phase/Neutral
(1) .25x.875 IN/6x22 mm Cu Ground Bus

Enclosure Data

Type 3R Free Standing
Exterior Paint Color: ANSI 49
Front Accessibility Only Required
Rodent barriers
Mimic Bus: Power Flow Plastic Nameplate
1.5H Corrosion Resist Base Channels
Equipment Nameplate: White Surface/Black Letters
Device Nameplate: White Surface / Black Letters

Estimated Shipping Weight

Shipping Split 1 814.00 lbs / 369.23 kgs
Shipping Split 2 814.00 lbs / 369.23 kgs
Shipping Split 3 925.00 lbs / 419.58 kgs
Complete Lineup 2553.00 lbs / 1158.04 kgs

Code Standards

U.L. Deadfront and suitable for use as Service Entrance when not more than six (6) disconnecting means are provided.

Rating Nameplates

ST1– Service Entrance – Section Bus 1600A
ST2– Deadfront– Section Bus 1200A
ST3– Deadfront– Section Bus 1600A

PRODUCT INFORMATION

Wiring

All wiring to be Machine Tool Wire type

Instruction Bulletins

Reference 80043–055 For Handling, Installation, Anchoring, Inspection And Maintenance Information

Product Accessories/Options

DUAL DIMENSIONS: INCHES
MILLIMETERS

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	MSB
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	GENERAL NOTES
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# F31751120–001–01	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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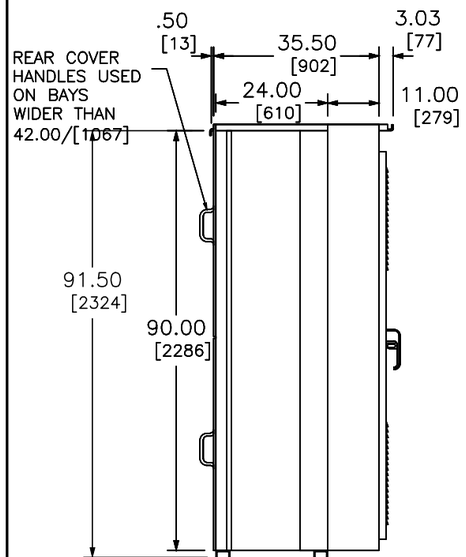
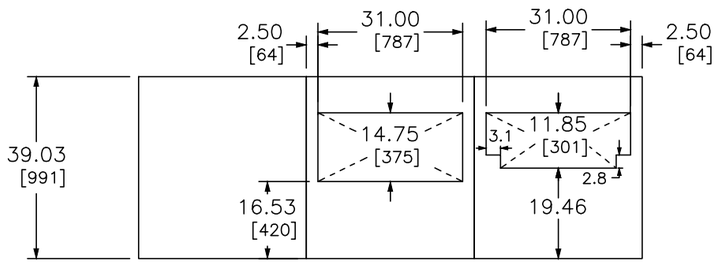
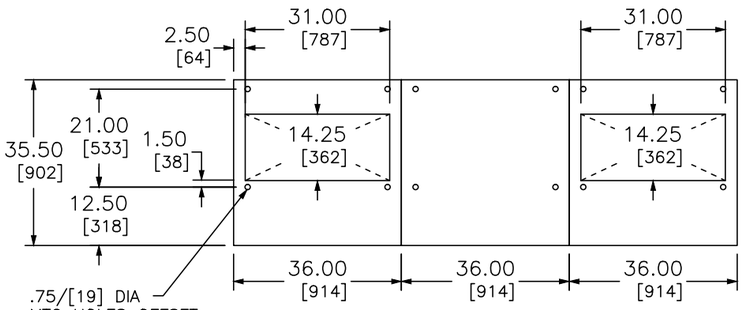


LEFT SIDE VIEW



TOP VIEW – FRONT



FLOOR PLAN – FRONT

NOTE:
A MINIMUM OF 2.00/[51] CLEARANCE BEHIND THE SWITCHBOARD IS REQUIRED FOR TOP COVER OVERHANG.

DUAL DIMENSIONS: INCHES
MILLIMETERS

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MSB**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	SIDE, TOP VIEW & FLOOR PLAN
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG#	F31751120-001-01

PG 2 OF 2 | REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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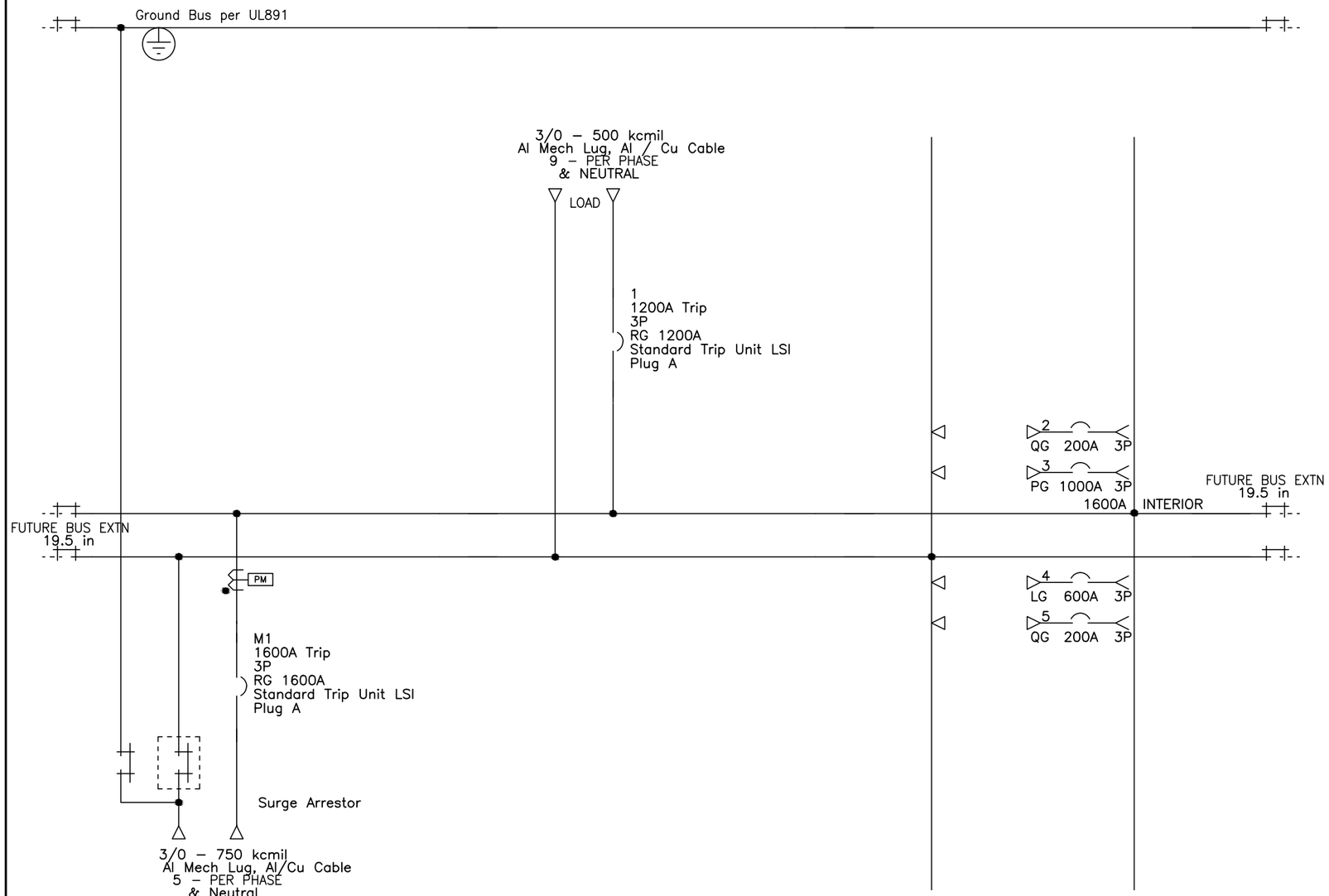

SECTION 1

SECTION 2

SECTION 3

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MSB**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	ONE LINE
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **031751120-001-01**	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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POWER STYLE QED–2 SWITCHBOARD

SECT NO	CKT NO	GMD HEIGHT	DEVICE/FRAME RATING	TRIP AMP	FUSE/ TRIP	#P	DESIGNATION	N/P	LUG INFORMATION				ACCESSORIES
									QTY	PHASE WIRE RANGE	QTY	NEUT. WIRE RANGE	
1	M1	–	RG 1600A Plug A	1600A	S–LSI	3P	MAIN BREAKER	Yes	5	3/0 – 750 kcmil	5	3/0 – 750 kcmil	SDSA,PM
2	1	–	RG 1200A Plug A	1200A	S–LSI	3P	MDPA	Yes	9	3/0 – 500 kcmil	9	3/0 – 500 kcmil	
3	2	4.5 in	QG	200A	–	3P		Yes	1	#4 – 300 kcmil	1	#6 – 350 kcmil	
3	3	9 in	PG 1000A Plug A	1000A	S–LSI	3P	BLDG 5	Yes	4	3/0 – 500 kcmil	4	3/0 – 500kcmil	
3	4	6 in	LG 600A	600A	S–LSI	3P	EXISTING LOAD	Yes	2	3/0 – 500 kcmil	2	4/0 – 500kcmil	
3	5	4.5 in	QG	200A	–	3P		Yes	1	#4 – 300 kcmil	1	#6 – 350 kcmil	

LEGEND	
PM	Power Meter, PM820
SDSA	Secondary Surge Arrester

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MSB**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	SCHEDULE
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# 031751120–001–01	PG 2 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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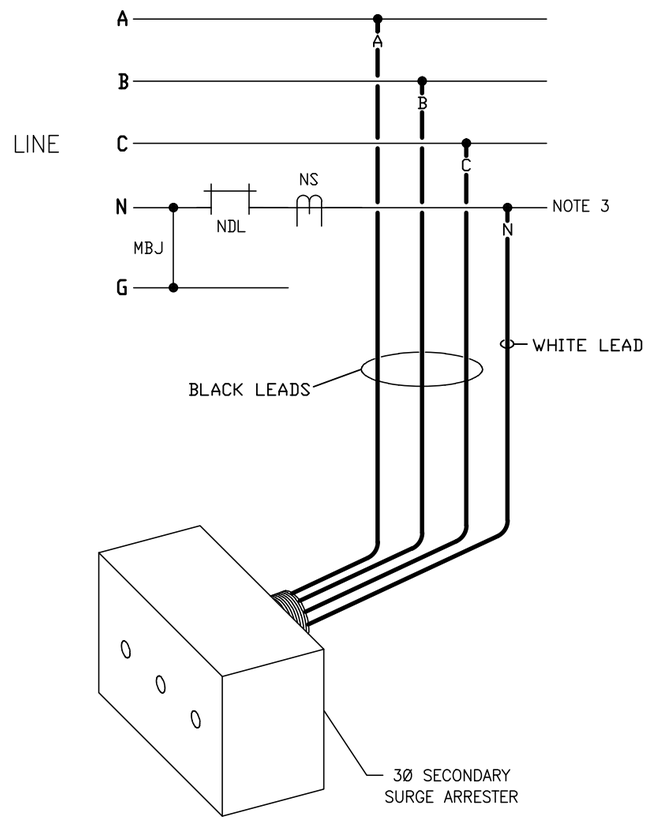
3 PHASE, 4 WIRE SYSTEMS



NOTES:

1. THE SECONDARY SURGE ARRESTER'S 18 INCH LEADS SHOULD NOT BE LENGTHENED.
2. SECONDARY SURGE ARRESTERS SHALL NOT BE APPLIED IN UNGROUNDED OR IN HIGH RESISTANCE GROUNDED SYSTEMS.
3. WHEN SECONDARY SURGE ARRESTER IS INSTALLED IN 3 PHASE,3 WIRE SOLIDLY GROUNDED SYSTEMS, THE WHITE LEAD MUST BE CONNECTED TO THE GROUND BUS.

SSA3PH 08/22/01
80360 012 R1 REV.A

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MSB**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	WIRING DIAGRAM
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **W31751120-001-01**	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--	–	----	--	--/--/--
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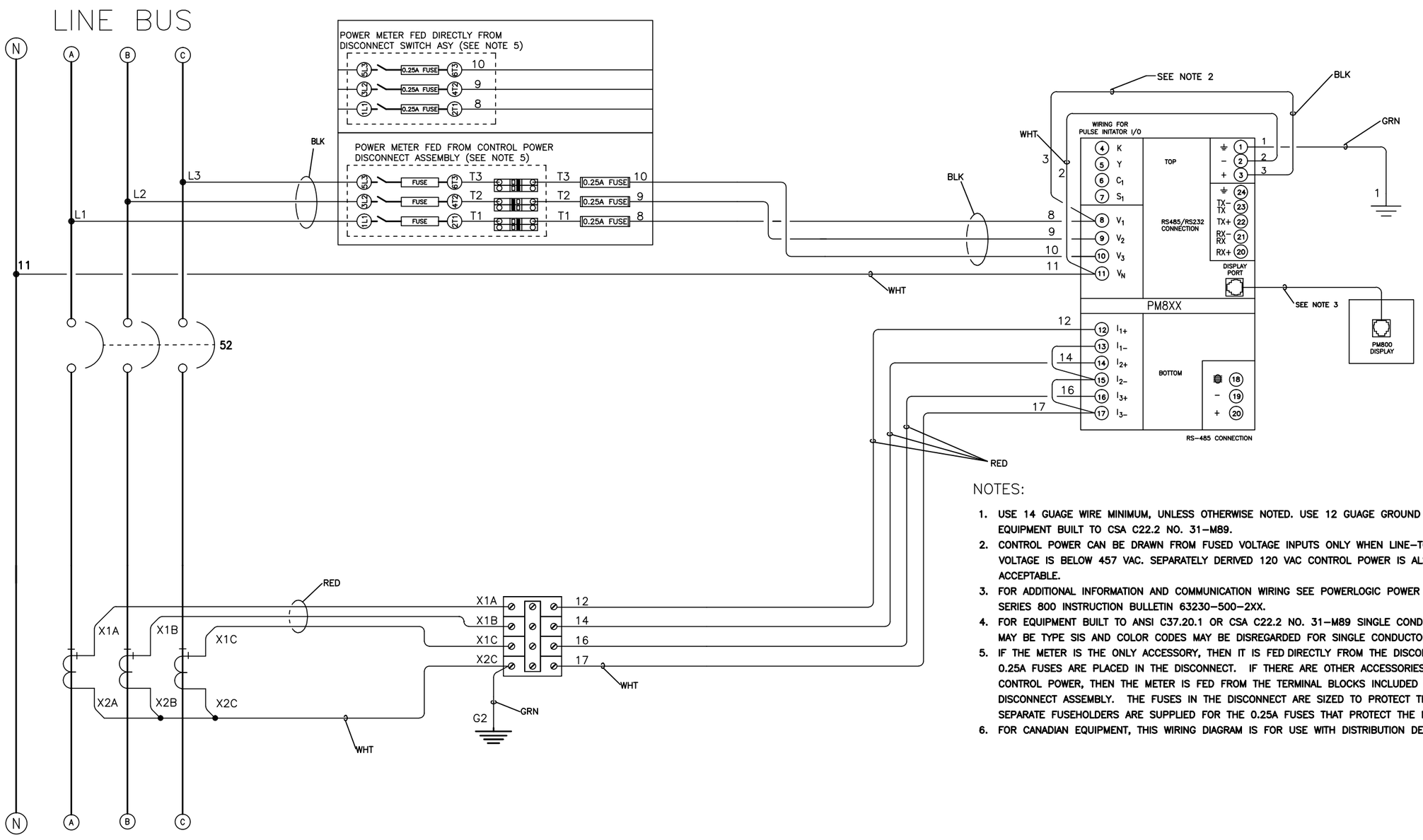

NOTES:

1. USE 14 GUAGE WIRE MINIMUM, UNLESS OTHERWISE NOTED. USE 12 GUAGE GROUND WIRE FOR EQUIPMENT BUILT TO CSA C22.2 NO. 31–M89.
2. CONTROL POWER CAN BE DRAWN FROM FUSED VOLTAGE INPUTS ONLY WHEN LINE–TO–NEUTRAL VOLTAGE IS BELOW 457 VAC. SEPARATELY DERIVED 120 VAC CONTROL POWER IS ALSO ACCEPTABLE.
3. FOR ADDITIONAL INFORMATION AND COMMUNICATION WIRING SEE POWERLOGIC POWER METER SERIES 800 INSTRUCTION BULLETIN 63230–500–2XX.
4. FOR EQUIPMENT BUILT TO ANSI C37.20.1 OR CSA C22.2 NO. 31–M89 SINGLE CONDUCTOR CABLE MAY BE TYPE SIS AND COLOR CODES MAY BE DISREGARDED FOR SINGLE CONDUCTORS.
5. IF THE METER IS THE ONLY ACCESSORY, THEN IT IS FED DIRECTLY FROM THE DISCONNECT AND 0.25A FUSES ARE PLACED IN THE DISCONNECT. IF THERE ARE OTHER ACCESSORIES REQUIRING CONTROL POWER, THEN THE METER IS FED FROM THE TERMINAL BLOCKS INCLUDED IN THE DISCONNECT ASSEMBLY. THE FUSES IN THE DISCONNECT ARE SIZED TO PROTECT THE XFMR AND SEPARATE FUSEHOLDERS ARE SUPPLIED FOR THE 0.25A FUSES THAT PROTECT THE METER.
6. FOR CANADIAN EQUIPMENT, THIS WIRING DIAGRAM IS FOR USE WITH DISTRIBUTION DEVICES ONLY.

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MSB**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	WIRING DIAGRAM
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **W31751120–001–01**	PG 2 OF 2 REV –

SQUARE D
by Schneider Electric

Job Name:	BEHAVIORAL HEALTH BUILDING	Square D Quotation #:	31751120
Job Location:	WICHITA, KS	Quotation Revision #:	
		Sales Contact:	Q4P
		Sales Contact Location:	439
Purchaser:	STANION WHOLESALE ELECTRIC CO	Customer:	TORGESON ELECTRIC CO
Purchaser PO #:		Customer PO #:	
User:	VA MEDICAL CTR HOSPITAL	Architect:	PROFESSIONAL ENGINEERING
User Location:		Cons. Engineer:	
Drawing Status:	RECORD		

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SQUARE D FACTORY ORDER NUMBER: 31751120–002

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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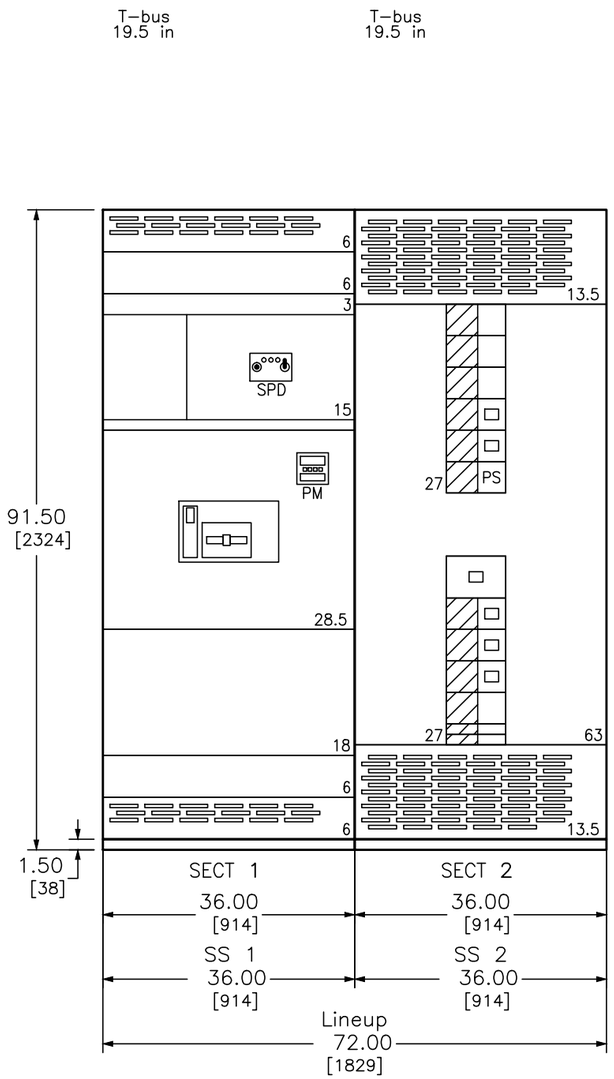

SWITCHBOARD GENERAL NOTES

PRODUCT DESCRIPTION & RATINGS

Power System Data

208Y/120V 3Ph 4W 60Hz / 3 Phase Wye
Solidly Grounded
System Short Circuit Current Rating: 50kA RMS
Incoming Section 1 Cable Through the Bottom Left of Lineup

Bus System Data

1200A Silver Plated Copper Main Bus
(2) .25x1.50 IN/6x38 mm Cu Bus Bar Per Phase/Neutral
(1) .25x.875 IN/6x22 mm Cu Ground Bus

Enclosure Data

Type 1 Free Standing
Exterior Paint Color: ANSI 49
Front Accessibility Only Required
Handling: Rollers & Lifting Assemblies
Equipment Nameplate: White Surface/Black Letters
Device Nameplate: White Surface / Black Letters

Estimated Shipping Weight

Shipping Split 1 717.00 lbs / 325.23 kgs
Shipping Split 2 785.00 lbs / 356.08 kgs
Complete Lineup 1502.00 lbs / 681.31 kgs

Code Standards

U.L. Deadfront and suitable for use as Service Entrance
when not more than six (6) disconnecting means are provided.

Rating Nameplates

ST1– Service Entrance – Section Bus 1200A
ST2– Deadfront– Section Bus 1200A

PRODUCT INFORMATION

Wiring

All wiring to be Machine Tool Wire type

Instruction Bulletins

Reference 80043–055 For Handling, Installation,
Anchoring, Inspection And Maintenance Information

Product Accessories/Options

DUAL DIMENSIONS: INCHES
MILLIMETERS

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MDPA**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	GENERAL NOTES
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **F31751120–002–01**	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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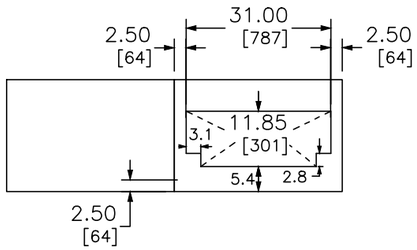
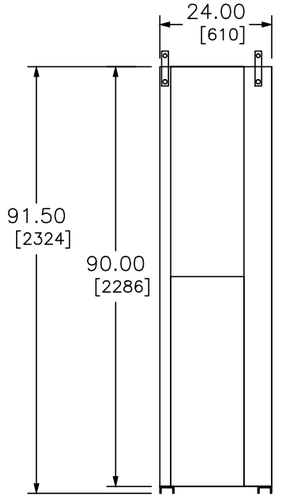
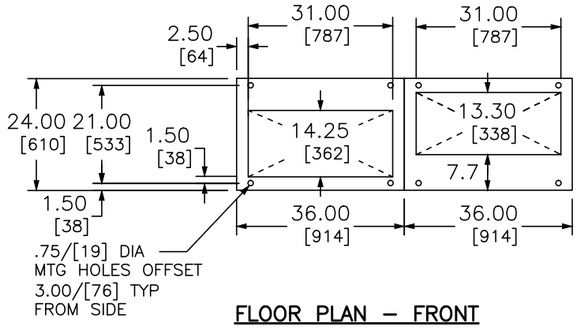


TOP VIEW – FRONT



LEFT SIDE VIEW



FLOOR PLAN – FRONT

DUAL DIMENSIONS: INCHES
MILLIMETERS

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MDPA**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	SIDE, TOP VIEW & FLOOR PLAN
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **F31751120-002-01**	PG 2 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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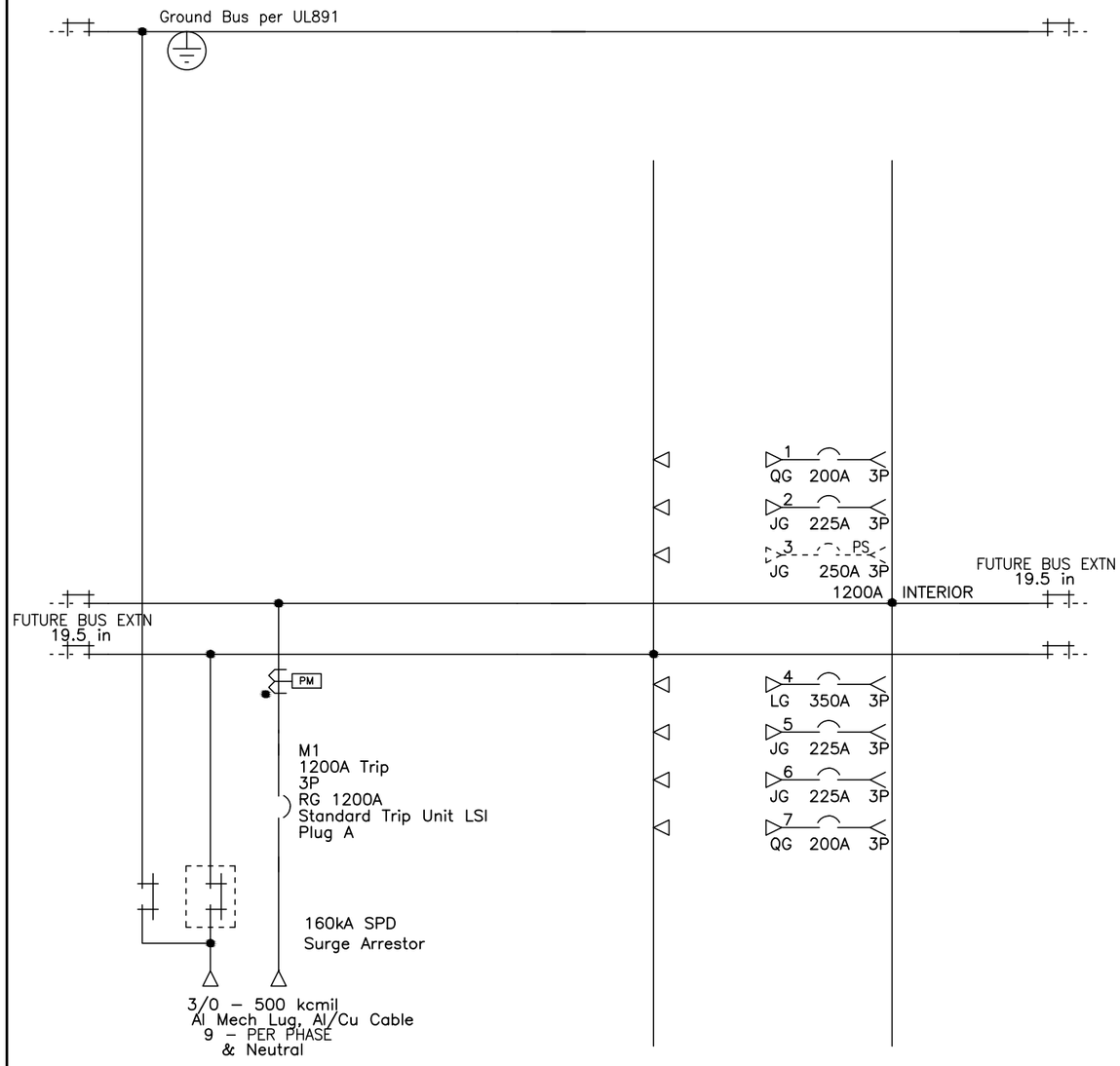

SECTION 1

SECTION 2

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	MDPA
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	ONE LINE
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# 031751120-002-01	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
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POWER STYLE QED–2 SWITCHBOARD

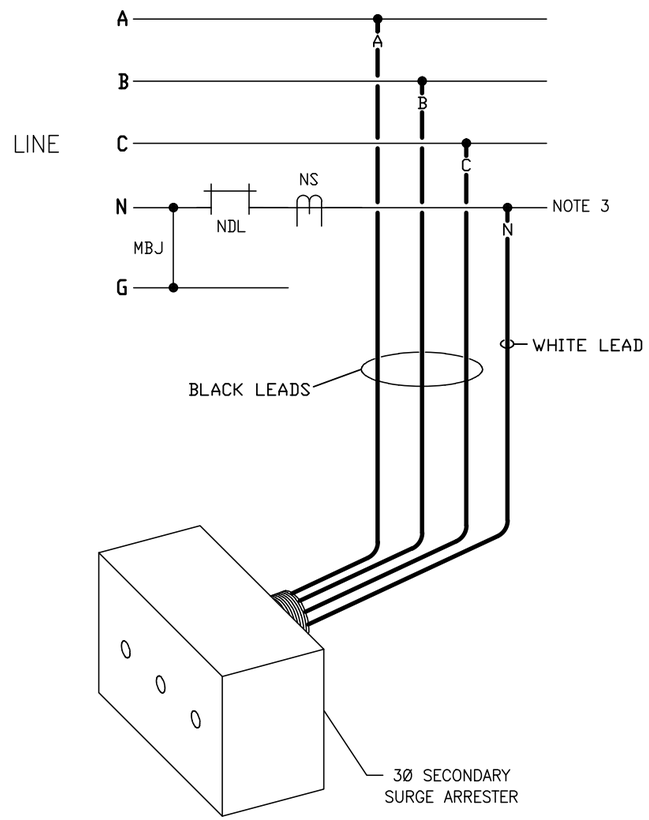
SECT NO	CKT NO	GMD HEIGHT	DEVICE/FRAME RATING	TRIP AMP	FUSE/ TRIP	#P	DESIGNATION	N/P	LUG INFORMATION				ACCESSORIES
									QTY	PHASE WIRE RANGE	QTY	NEUT. WIRE RANGE	
1	–	–	160kA SPD	–	–	–	–	–	–	–	–	–	SPD
1	M1	–	RG 1200A Plug A	1200A	S–LSI	3P	MAIN BREAKER	Yes	9	3/0 – 500 kcmil	9	3/0 – 500 kcmil	SDSA,PM
2	1	4.5 in	QG	200A	–	3P	ELEVATOR 1	Yes	1	#4 – 300 kcmil	1	#6 – 350 kcmil	
2	2	4.5 in	JG 250A	225A	S–LSI	3P	PANEL L2A	Yes	1	3/0 – 350 kcmil	1	#6 – 350 kcmil	
2	3	4.5 in	JG (PS)	(250A)	–	3P	SPACE	Yes	1	3/0 – 350 kcmil	1	#6 – 350 kcmil	
2	4	6 in	LG 400A	350A	S–LSI	3P	RTU–1	Yes	2	3/0 – 500 kcmil	1	#4 – 600 kcmil	
2	5	4.5 in	JG 250A	225A	S–LSI	3P	PANEL L3A	Yes	1	3/0 – 350 kcmil	1	#6 – 350 kcmil	
2	6	4.5 in	JG 250A	225A	S–LSI	3P	PANEL L1A	Yes	1	3/0 – 350 kcmil	1	#6 – 350 kcmil	
2	7	4.5 in	QG	200A	–	3P	ELEVATOR 1	Yes	1	#4 – 300 kcmil	1	#6 – 350 kcmil	

LEGEND	
PM	Power Meter, PM820
SDSA	Secondary Surge Arrester
SPD	Surge Protection Device

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MDPA**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	SCHEDULE
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# 031751120–002–01	PG 2 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--	–	----	--	--/--/--

3 PHASE, 4 WIRE SYSTEMS



NOTES:

1. THE SECONDARY SURGE ARRESTER'S 18 INCH LEADS SHOULD NOT BE LENGTHENED.
2. SECONDARY SURGE ARRESTERS SHALL NOT BE APPLIED IN UNGROUNDED OR IN HIGH RESISTANCE GROUNDED SYSTEMS.
3. WHEN SECONDARY SURGE ARRESTER IS INSTALLED IN 3 PHASE,3 WIRE SOLIDLY GROUNDED SYSTEMS, THE WHITE LEAD MUST BE CONNECTED TO THE GROUND BUS.

SSA3PH 08/22/01
80360 012 R1 REV.A

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MDPA**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	WIRING DIAGRAM
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **W31751120-002-01**	PG 1 OF 3 REV –

REV	DESCRIPTION	BY	DATE
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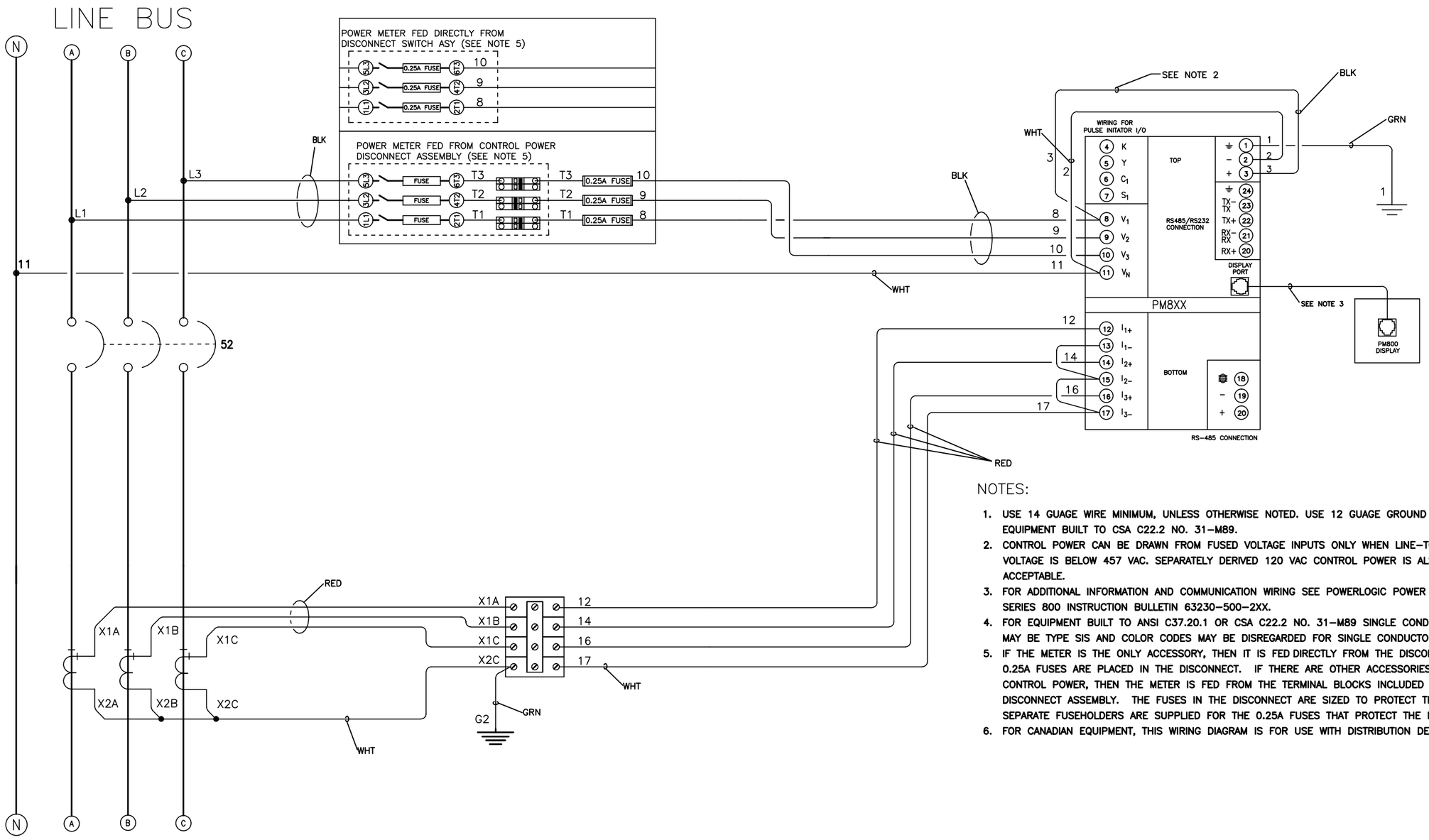
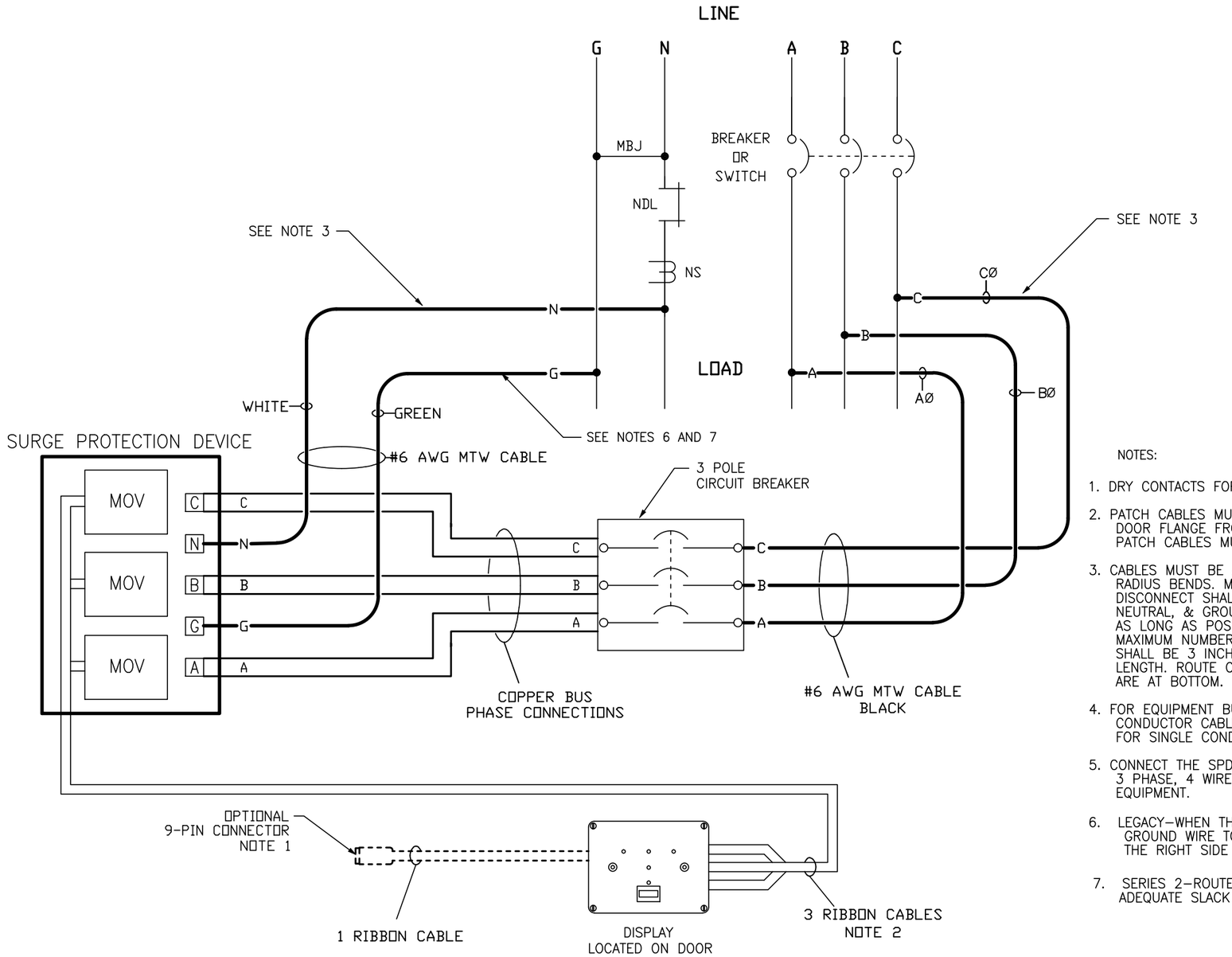


NOTES:

1. USE 14 GUAGE WIRE MINIMUM, UNLESS OTHERWISE NOTED. USE 12 GUAGE GROUND WIRE FOR EQUIPMENT BUILT TO CSA C22.2 NO. 31–M89.
2. CONTROL POWER CAN BE DRAWN FROM FUSED VOLTAGE INPUTS ONLY WHEN LINE–TO–NEUTRAL VOLTAGE IS BELOW 457 VAC. SEPARATELY DERIVED 120 VAC CONTROL POWER IS ALSO ACCEPTABLE.
3. FOR ADDITIONAL INFORMATION AND COMMUNICATION WIRING SEE POWERLOGIC POWER METER SERIES 800 INSTRUCTION BULLETIN 63230–500–2XX.
4. FOR EQUIPMENT BUILT TO ANSI C37.20.1 OR CSA C22.2 NO. 31–M89 SINGLE CONDUCTOR CABLE MAY BE TYPE SIS AND COLOR CODES MAY BE DISREGARDED FOR SINGLE CONDUCTORS.
5. IF THE METER IS THE ONLY ACCESSORY, THEN IT IS FED DIRECTLY FROM THE DISCONNECT AND 0.25A FUSES ARE PLACED IN THE DISCONNECT. IF THERE ARE OTHER ACCESSORIES REQUIRING CONTROL POWER, THEN THE METER IS FED FROM THE TERMINAL BLOCKS INCLUDED IN THE DISCONNECT ASSEMBLY. THE FUSES IN THE DISCONNECT ARE SIZED TO PROTECT THE XFMR AND SEPARATE FUSEHOLDERS ARE SUPPLIED FOR THE 0.25A FUSES THAT PROTECT THE METER.
6. FOR CANADIAN EQUIPMENT, THIS WIRING DIAGRAM IS FOR USE WITH DISTRIBUTION DEVICES ONLY.

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	MDPA
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	WIRING DIAGRAM
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# W31751120–002–01	PG 2 OF 3 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--	–	----	--	--/--/--



NOTES:

1. DRY CONTACTS FOR REMOTE MONITOR, ETC. LOCATED ON REAR OF DISPLAY.
2. PATCH CABLES MUST BE PROTECTED WHERE THEY CROSS THE HINGE SIDE DOOR FLANGE FROM THE DISPLAY DOOR TO INSTRUMENT COMPARTMENT. PATCH CABLES MUST BE KEPT SEPARATED FROM POWER WIRING.
3. CABLES MUST BE AS SHORT AS POSSIBLE WITH A MINIMUM NUMBER OF LARGE RADIUS BENDS. MAXIMUM LENGTH OF CABLE FROM THE BUS TAPS TO THE DISCONNECT SHALL NOT EXCEED 8 FEET. ALL CONDUCTORS INCLUDING PHASES, NEUTRAL, & GROUND MUST BE TWISTED TOGETHER 1 TIME EVERY 2 FEET FOR AS LONG AS POSSIBLE ALONG THEIR ROUTING WITHIN THE SWITCHBOARD. MAXIMUM NUMBER OF BENDS SHALL NOT EXCEED 4 AND MINIMUM BEND RADIUS SHALL BE 3 INCHES. CABLES MUST BE SECURELY FASTENED THROUGHOUT THEIR LENGTH. ROUTE CABLES OUT HOLE IN INSTRUMENT COMPARTMENT IF BUS TAPS ARE AT BOTTOM.
4. FOR EQUIPMENT BUILT TO ANSI C37.20.1 OR CSA C22.2 No. 31–M89, SINGLE CONDUCTOR CABLE MAY BE TYPE SIS AND COLOR CODES MAY BE DISREGARDED FOR SINGLE CONDUCTORS.
5. CONNECT THE SPD NEUTRAL LUG TO THE GROUND BUS WHEN THE SYSTEM IS 3 PHASE, 4 WIRE AND THE NEUTRAL BUS IS NOT PRESENT WITHIN THE EQUIPMENT.
6. LEGACY–WHEN THE SPD IS MOUNTED IN A 19.5" METERING COMPARTMENT, CONNECT THE GROUND WIRE TO THE GROUND BUS EXTENSION ASSEMBLY THAT IS MOUNTED ON THE RIGHT SIDE OF THE SECTION.
7. SERIES 2–ROUTE NEUTRAL AND GROUND CABLE OUT THE CLOSEST GROMMET. LEAVE ADEQUATE SLACK IN THE WIRING TO ALLOW THE TVSS UNIT TO PULL FORWARD.

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**MDPA**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	QED SWITCHBOARD
DRAWN BY:	ABIMAEL SOSA	DRAWING TYPE:	WIRING DIAGRAM
ENGR:	AS		
DATE:	MARCH 28, 2013		
DRAWING STATUS:	RECORD	DWG# **W31751120–002–01**	PG 3 OF 3 REV –

Power-Style™
QED-2 Switchboards
Class 2700

ENGLISH

Instruction Bulletin

80043-055-10
12/2011

Retain for future use.

SQUARE D™
by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Table of Contents

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List of Figures

List of Tables

Section 1—Introduction

This manual contains instructions for the proper installation, operation, and maintenance of Power-Style™ QED-2 switchboard equipment manufactured by Schneider Electric. Engineering, installation, and operating staff supervisors should familiarize themselves with this manual and become acquainted with the appearance and characteristics of each piece of equipment mounted or contained in the switchboard.

These instructions and procedures apply to Power-Style QED-2 switchboard installations by Schneider Electric. When special features or non-standard components are incorporated in the switchboard, detailed instructions for these components are included in the instruction material holder.

NOTE: There are references to Series 2 switchboards in several places in this instruction bulletin. To determine if the QED-2 switchboard is a Series 2 model, check the rating nameplate located on the front cover. If the switchboard is a Series 2 model, the nameplate indicates that. If it is not a Series 2 model, there is not a Series designation.

Inspection and Packaging

Every Power-Style QED-2 switchboard is carefully inspected and packaged at the assembly plant. Construction of the switchboard is checked, both structurally and electrically, for compliance with all specifications, codes, and standards. After a complete inspection, the switchboard is prepared for shipment. Each section is shipped separately for easier handling before installation. The factory order number, an identification number, and the shipping weights are plainly marked on each shipping section.

Document Replacement

Contact your local Schneider Electric representative to replace lost or damaged wiring diagrams and instruction sheets. Use the factory order number as a reference.

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Section 2—Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm power is off.
- Practice lock-out/tag-out procedures according to OSHA requirements.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to equipment or other property.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual assume that the customer has taken these measures before performing maintenance or testing.

Failure to follow these instructions will result in death or serious injury

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Section 3—Receiving, Handling, and Storing

Receiving

Upon receipt, check the packing list against the equipment received to ensure the order and shipment are complete. Also upon receipt, immediately inspect switchboard sections for any damage that occurred in transit. If damage is found or suspected, file a claim with the carrier immediately and notify the nearest Schneider Electric representative.

Handling

⚠ WARNING

SPECIAL HANDLING REQUIREMENTS

- Do not lay the equipment on its front or sides.
- Lay equipment only on its back when special handling is required.
- Do not ship the equipment lying down.

Failure to follow these instructions can result in serious injury or equipment damage.

Ensure that proper equipment, such as an overhead crane, is available at the installation site to handle the switchboard. This equipment helps avoid injury to personnel and damage to the switchboard.

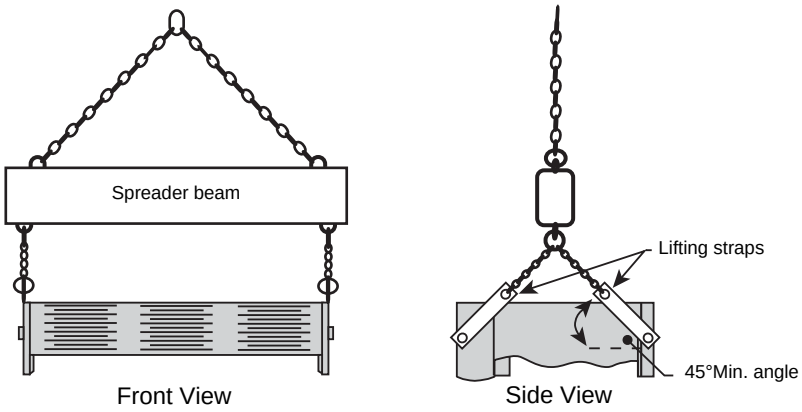
The shipping weight of each shipping section is marked on the packing list. Verify the lifting capacity of the equipment being used to handle the switchboard in accordance with the shipping weight of each shipping section. Keep the switchboard upright during handling.

Schneider Electric recommends using an overhead crane, lifting straps, and cables or chains to handle the switchboard. This method and alternative handling methods are discussed in this section.

Handling with Lifting Straps

Schneider Electric provides lifting straps as standard equipment for NEMA Type 1 switchboard shipping sections rated 3,000 A or less. Instruction labels on each shipping section include drawings and written instructions outlining the proper use of the lifting straps (Figure 1). Use rigid spreaders or a spanner bar to provide vertical lift on the lifting straps. This helps avoid damage to the frame or finish.

Figure 1: Lifting with an Overhead Crane, Lifting Straps, and Cables or Chains



Follow these instructions to handle the switchboard:

1. Use load-rated cables or chains with safety hooks or shackles. Do not pass cables or chains through holes in lifting straps.
2. Use a load-rated spreader beam to prevent structure damage. Rig so that the minimum angle between the lifting cables or chains and equipment top is 45 degrees.

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Follow these instructions for laying equipment on its back:

1. Remove shipping skid and equipment back covers.
2. Use overhead cranes, lifting straps, and cables or chains for laying equipment on its back.
3. Rate of drop or pickup for laying equipment on its back is four feet per minute or less.
4. Reverse the procedure to stand the equipment in its upright position.
5. Reinstall back covers.

The warning label (Figure 2) is attached to both the front and rear of the switchboard.

Figure 2: Warning Label, Rainproof Switchboards

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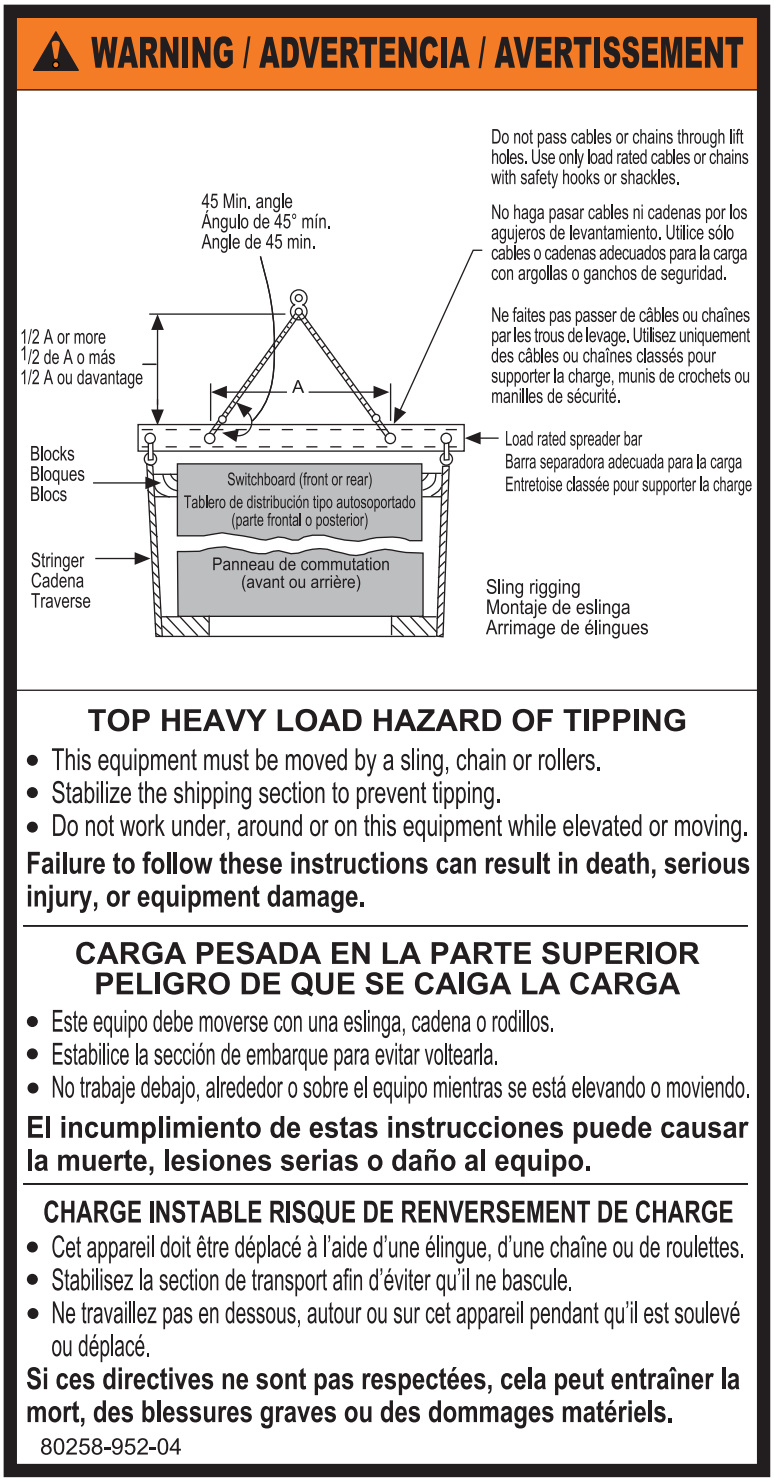
Handling without Lifting Straps

Lifting straps are not furnished on shipping sections rated more than 3,000 A, or on rainproof switchboards. Use rollers, slings, or other means to handle the shipping sections. The handling label (Figure 3) is affixed to each of these sections.

Figure 3: Handling Instruction Label, Switchboards without Lifting Straps



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⚠ WARNING

TOP HEAVY LOAD—HAZARD OF TIPPING

Stabilize the shipping section to reduce the possibility of tipping.

Failure to follow these instructions can result in death or serious injury.

When elevating a shipping section not equipped with lifting straps, use an overhead crane equipped with either of the following:

- A chain coupled to a sling rigging
- A wire cable with safety hooks and shackles

Wrap the sling completely around the switchboard and shipping stringers.

NOTE: A forklift is an alternative method of handling the switchboard.

Always check the fork lengths to ensure that the forks extend under the entire switchboard. Carefully balance the load, and always use a safety strap when handling or moving a switchboard with a forklift (Figure 4 on page 11).

Storing

When storing the switchboard before installation, cover the top and openings of the equipment during the construction period to protect the switchboard from dust and debris.

If a switchboard is not installed and energized immediately, store it in a clean, dry space with a consistent temperature to prevent condensation. Store the switchboard indoors, if possible. Preferably, store it in a heated building with adequate air circulation and protect it from dirt, fumes, water, and physical damage. Storing the switchboard outdoors can cause harmful condensation inside the switchboard.

NOTE: Install portable electric heaters of approximately 250 watts per vertical section in both indoor-type and rainproof-type switchboard enclosures for adequate protection during storage.

Before energizing the space heaters, remove all loose packing or flammable materials inside the switchboard. Outdoor switchboards are not weather-resistant until completely and properly installed; treat them the same as indoor switchboards until after installation.

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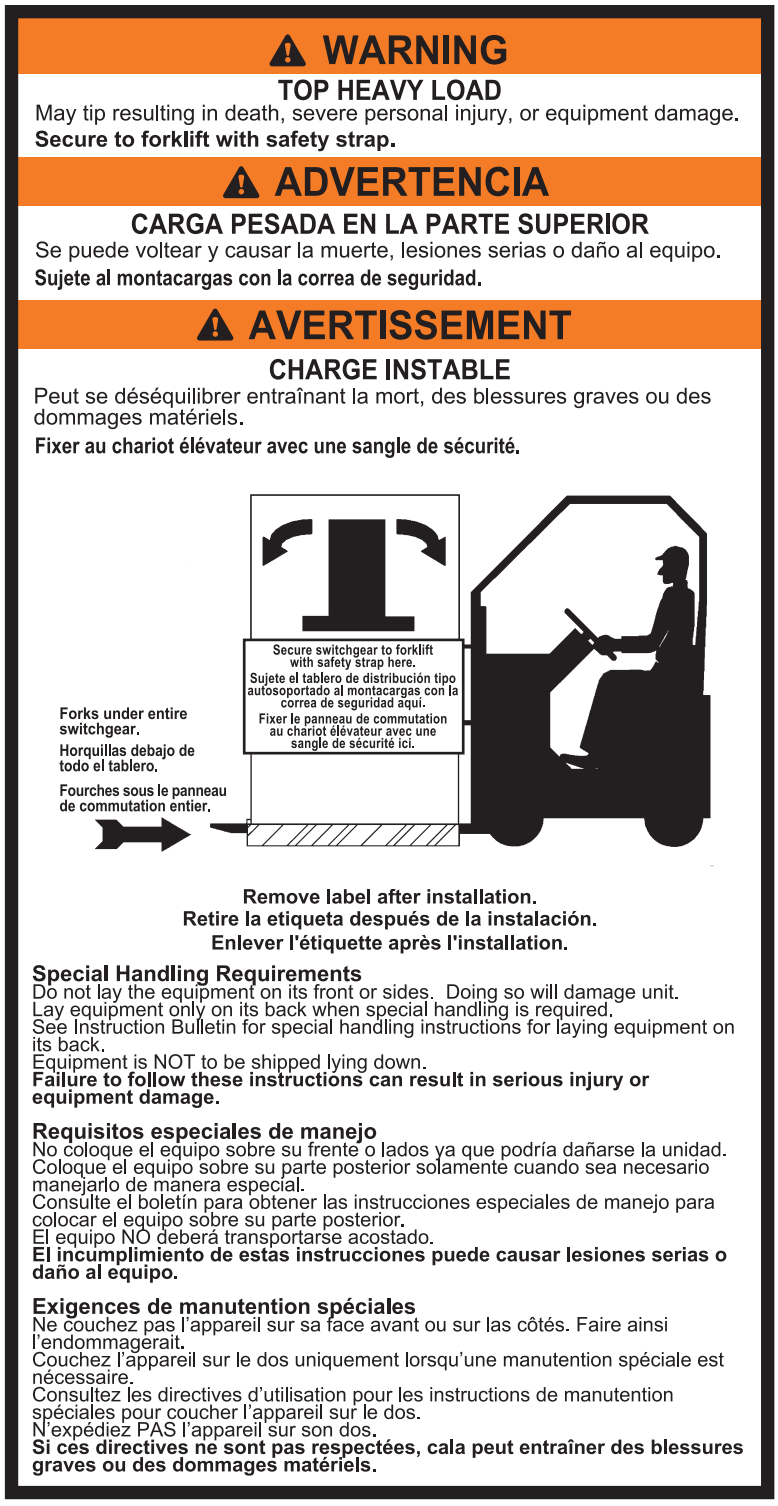
Figure 4: Forklift Safety Label



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Section 4—Installation

Correct installation of Power-Style QED-2 switchboards is essential for proper operation of all switchboard components. Study the associated instruction books and all drawings carefully. In most cases, all drawings are sent to the purchaser before a switchboard is shipped to enable adequate planning.

NOTE: While installing switchboards, do not use the top of the switchboard as a support for the weight of the installer.

Location

Find the designated area on the building floor plan where the switchboard will be installed. The location chosen for installation should provide working clearances complying with Section 110-26 of the National Electrical Code® (NEC®) or Section 2-308 of the Canadian Electrical Code (CEC) Part 1. Front-accessible switchboards require field connections, including mains, branches, ground bus, and neutral bus, to be accessible and maintainable from the front. For switchboards having rear ventilation, allow a minimum 1/2-inch (13 mm) clearance between the rear of the switchboard and the wall for proper ventilation. Equipment drawings identify switchboards requiring rear or side access.

If in a wet location or outside of the building, enclose the switchboard in an outdoor enclosure or equipment to prevent moisture or water from entering and accumulating within the enclosure. Outdoor switchboards drain to the rear, so there must be at least 1/2-inch (13 mm) clearance between the rear of the switchboard and a wall or other obstruction for proper drainage.

Foundation Preparation

The floor or foundation must be strong enough to support the weight of the switchboard without sagging. The surrounding floor area should gently slope toward a drain.

NOTE: For seismic qualifications, read the section “Anchoring for Seismic Qualifications” on page 15 before pouring the floor or foundation.

Power-Style QED-2 switchboards are assembled on true and level floors at the assembly plant. To ensure correct bus bar alignment, the mounting pad or final installation site must be smooth and level. If parallel steel floor channels are imbedded for mounting the switchboard, take extra care to ensure the floor channels are level over their entire length to avoid distortion of the switchboard structure. Each channel should be level with the finished floor.

When pouring the foundation, make provisions for conduits entering the switchboard from below and carrying the incoming and/or outgoing cables, control wiring, and ground cable. The bottom view in the equipment drawing shows the available conduit area for correct layout.

Conduits should project above the finished floor by about 2 in. (51 mm). However, to simplify moving the shipping sections into place, install the conduits flush with the concrete and, after the sections are in their final position, add the appropriate extension sleeves. Otherwise, raising the shipping section on timbers or lifting it by a crane to clear the conduit hubs will be necessary. Before pouring the foundation, consider installing additional conduits for future circuits.

Switchboard Preparation

Remove dirt and debris from the foundation and surrounding area before moving the switchboard into final position.

After the switchboard has been moved to its final installation site, take each shipping section off its shipping stringers. For switchboards greater than 24 in. (610 mm) deep, the center base channel can be removed.

Remove all packing materials. If the switchboard is equipped with a bottom closure plate in each vertical section, remove and retain the plates for reuse. When bottom closure plates are furnished, the customer must make any holes necessary for conduit entering the bottom of the switchboard. After making the holes, reinstall the closure plate.

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General Installation

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Level and align adjacent shipping sections with one another. Ensure proper alignment of horizontal main through bus and proper splice bus connections.

Failure to follow this instruction can result in equipment damage.

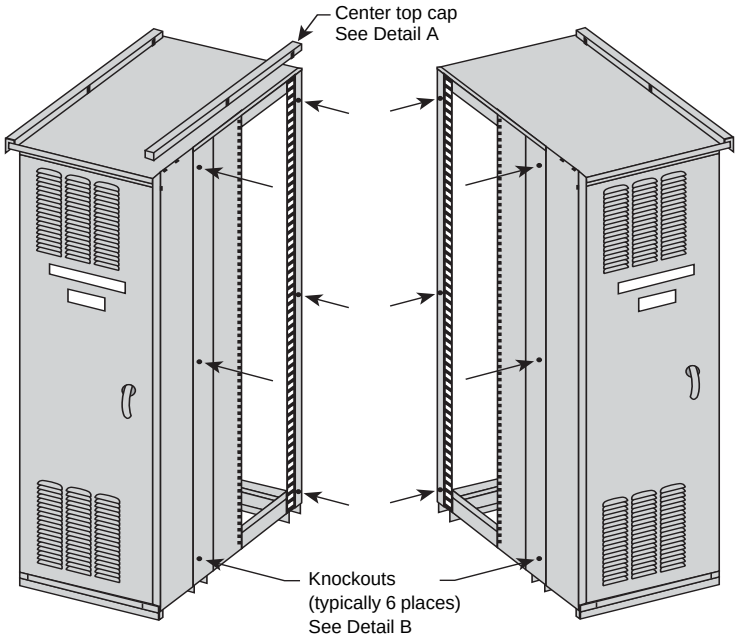
Install the switchboard into its final position by leveling progressively each section and bolting the frames together, if separated. Position shipping sections as follows:

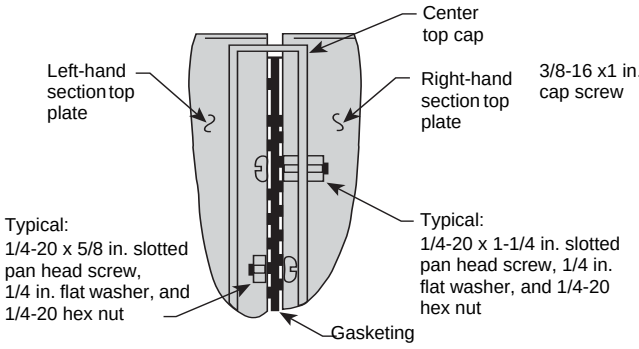
1. Maneuver each shipping section into the desired position using the procedures under “Handling” on page 7.
2. Carefully lower the section over the conduit stubs to comply with the “available conduit area” as shown in the bottom view of the equipment drawings. Otherwise, there might not be sufficient cable bending space.
3. Level the shipping section.
4. After installation of each section is complete, make the through bus splice connection to the preceding section before installing the next section.

Joining Shipping Sections—Outdoor Switchboards

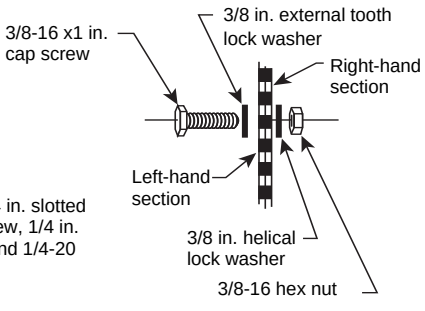
1. Remove the center top cap (Figure 5) from the left-hand section, and retain all hardware for reuse.

Figure 5: Joining Adjacent Sections—Outdoor Switchboards





Detail A



Detail B

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2. When possible, open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Remove three 0.5-in. (13 mm) diameter knockouts from the front vertical corner channel and three from the rear vertical corner channel (a total of six per frame side) as indicated by the arrows in Figure 5.
4. Position each adjacent section, carefully leveling it and aligning it with the previous section. If lifting straps are provided, completely remove them from the sides being bolted together so the sections can be joined flush.

NOTE: If lifting strap removal is not required to join sections, leave the lifting strap on the switchboard. Verify that the bolt is tight to maintain NEMA Type 3R integrity.

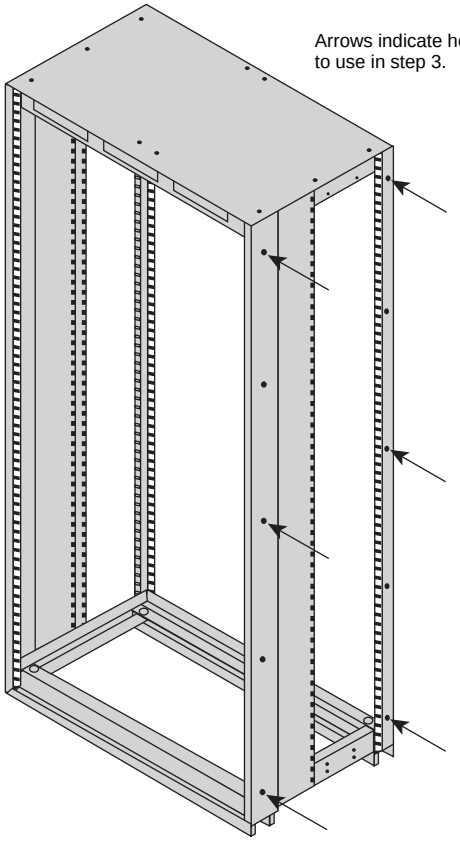
5. Six bolts (3/8-16 x 1 in.) are provided. Place them through the holes created in step 3 to join adjacent sections.
6. Make the through bus splice connections to the preceding section.
7. Replace the center top cap removed in step 1.
8. Replace and secure the front and rear doors and panels removed in step 2.

Joining Shipping Sections—Indoor Switchboards

1. Position each adjacent section, carefully leveling and aligning it with the previous section. If lifting straps are provided, completely remove them from the sides being bolted together so the sections can be joined flush.

   NOTE: Leave the other lifting straps on the switchboard if their removal is not required to join adjacent sections flush.

Figure 6: Indoor Switchboards



2. Open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Six bolts (3/8-16 x 1 in.) are provided. Place the bolts through the existing holes in the front and rear vertical corner channels to join adjacent sections (Figure 6).
4. Make the through bus splice connections to the preceding section.
5. Replace and secure all front and rear doors and panels removed in step 2.

Anchoring for Seismic Qualifications

QED-2 equipment that is seismically certified has been qualified to the site-specific seismic requirements of the listed model building codes and/or standards. Optional construction features may be required, depending on the location of the installation and the particular code and/or standard of interest. Seismic certificates of compliance are provided with all seismically certified QED-2 equipment. To maintain the validity of this certification, the installation instructions provided in this bulletin must be followed.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, QED-2 equipment are considered nonstructural building components. Equipment capacity was determined from triaxial seismic shake table test results as defined in the International Code Counsel Evaluation Service (ICCES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156). Unless otherwise indicated, an equipment importance factor of 1.5 (Ip = 1.5) was used, indicating that equipment functionality was verified before and after shaker table seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority. The Building Seismic Safety Council (BSSC) recognizes AC 156 as an appropriate methodology in the 2003 National Earthquake Hazard Reduction Program (NEHRP) Commentary (FEMA 450 Part 2). The National Institute of Building Sciences established the BSSC in 1979 to develop and promote regulatory provisions for earthquake risk mitigation at the national level.

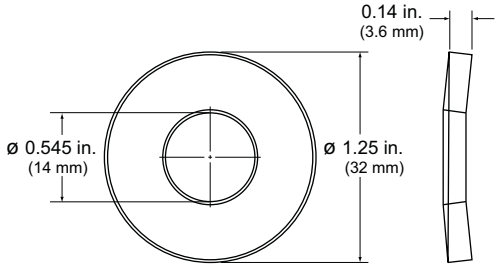
Incoming and outgoing cable and conduit must also be considered as related but independent systems. They must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, bottom entry and/or exit of cable and conduit is preferred. This system must be able to transfer the loads created by a seismic event to the load-bearing path of the building structural system.

Maintaining Seismic Certification

Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event, the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system. The structural civil engineer or design engineer of record is responsible for detailing the equipment connection and anchorage requirements for the given installation. The installer and manufacturers of the anchorage restraint system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of these systems.

Anchoring QED-2 Equipment for Seismic Applications

Figure 7: Belleville Washer



Formed base channels run the width of the section. The channels and connecting braces provide a minimum 0.75-in. (19 mm) diameter hole for fastening the section to the floor. To anchor the QED-2 switchboard to the floor properly, use all four mounting locations for NEMA Type 1 enclosures less than 36 in. deep, all six mounting locations for 36–70 in. deep enclosures, and six of the eight mounting locations for enclosures greater than 70-in. deep (see Figure 8 on page 17).

Use 0.5 in. (13 mm) diameter anchor bolts (Grade 5 minimum, provided by others) for the installation of equipment. Use one 1.25 in. (32 mm) outer diameter Grade 5 Belleville washer (provided by others; see Figure 7) under the head of each bolt or anchor nut. To develop the full strength of the anchor, torque the hardware to the value specified by the anchor manufacturer, or as recommended in the seismic restraint detailing supplied by the Structural Civil Engineer of record for the project (see Figure 9 on page 18).

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Additionally, each NEMA Type 1 enclosed section includes four rear top-located hard points for attaching two upper lateral braces (braces and hardware supplied by others) to the QED-2 structure for top structural restraint (see Figures 10 and 11 on page 19).

Top structural restraint is required for all QED-2 equipment installed:

- where the site-specific 0.2 second spectral ground motion exceeds 2.67 g (as determined from the code-referenced ground motion maps or the site-specific seismic hazard engineering study), or
- when displacement at the top of the equipment cannot be tolerated, or
- for all QED-2 corner sections used for seismic applications.

To develop the full strength of the upper structural anchor, install and torque the hardware as specified by the anchor manufacturer or the seismic restraint detailing supplied by the Structural Civil Engineer of record for the project.

NOTE: Anchoring hardware is not furnished with the QED-2 equipment.

After the QED-2 switchboard and adjacent equipment are properly joined and the entire structure is bolted to the floor, install the incoming service conductors and load side cables. During an earthquake, the top of the QED-2 switchboard can move in any direction. Any top incoming cables must accommodate this motion. Do not use the QED-2 enclosure (particularly the top) to mount exterior equipment.

Base Anchoring

1. To anchor the switchboard to the floor properly, use all of the designated 0.75 in. (19 mm) diameter mounting hole locations as illustrated in Figure 8 on page 17. The enclosure dimensions corresponding to Figure 8 are listed in Table 1.

Table 1: Enclosure X,Y,Z Dimensions in Inches (mm)

Enclosure Width → / Enclosure Depth ↓	12 in.	24 in.	30 in.	36 in.	42 in.	48 in.	54 in.
24 in.	X = 6 (152) Y = 21 (533)	X = 18 (457) Y = 21 (533)	X = 24 (610) Y = 21 (533)	X = 30 (762) Y = 21 (533)	X = 36 (914) Y = 21 (533)	X = 42 (1067) Y = 21 (533)	X = 48 (1219) Y = 21 (533)
36 in.	X = 6 (152) Z = 16.5 (419) Y = 33 (838)	X = 18 (457) Z = 16.5 (419) Y = 33 (838)	X = 24 (610) Z = 16.5 (419) Y = 33 (838)	X = 30 (762) Z = 16.5 (419) Y = 33 (838)	X = 36 (914) Z = 16.5 (419) Y = 33 (838)	X = 42 (1067) Z = 16.5 (419) Y = 33 (838)	X = 48 (1219) Z = 16.5 (419) Y = 33 (838)
48 in.	X = 6 (152) Z = 22.5 (572) Y = 45 (1143)	X = 18 (457) Z = 22.5 (572) Y = 45 (1143)	X = 24 (610) Z = 22.5 (572) Y = 45 (1143)	X = 30 (762) Z = 22.5 (572) Y = 45 (1143)	X = 36 (914) Z = 22.5 (572) Y = 45 (1143)	X = 42 (1067) Z = 22.5 (572) Y = 45 (1143)	X = 48 (1219) Z = 22.5 (572) Y = 45 (1143)
54 in.	X = 6 (152) Z = 25.5 (648) Y = 51 (1295)	X = 18 (457) Z = 25.5 (648) Y = 51 (1295)	X = 24 (610) Z = 25.5 (648) Y = 51 (1295)	X = 30 (762) Z = 25.5 (648) Y = 51 (1295)	X = 36 (914) Z = 25.5 (648) Y = 51 (1295)	X = 42 (1067) Z = 25.5 (648) Y = 51 (1295)	X = 48 (1219) Z = 25.5 (648) Y = 51 (1295)
60 in.	X = 6 (152) Z = 28.5 (724) Y = 57 (1448)	X = 18 (457) Z = 28.5 (724) Y = 57 (1448)	X = 24 (610) Z = 28.5 (724) Y = 57 (1448)	X = 30 (762) Z = 28.5 (724) Y = 57 (1448)	X = 36 (914) Z = 28.5 (724) Y = 57 (1448)	X = 42 (1067) Z = 28.5 (724) Y = 57 (1448)	X = 48 (1219) Z = 28.5 (724) Y = 57 (1448)
72 in.	X = 6 (152) Z_1 = 28.5 Z_2 = 40.5 (1029) Y = 69 (1753)	X = 18 (457) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 24 (610) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 30 (762) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 36 (914) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 42 (1067) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 48 (1219) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)

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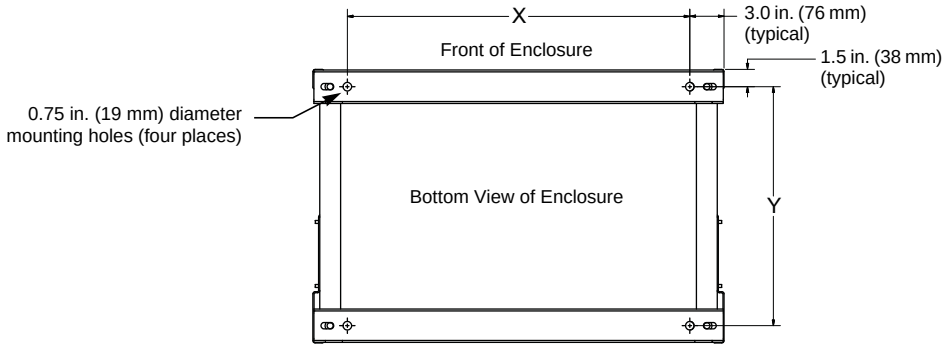
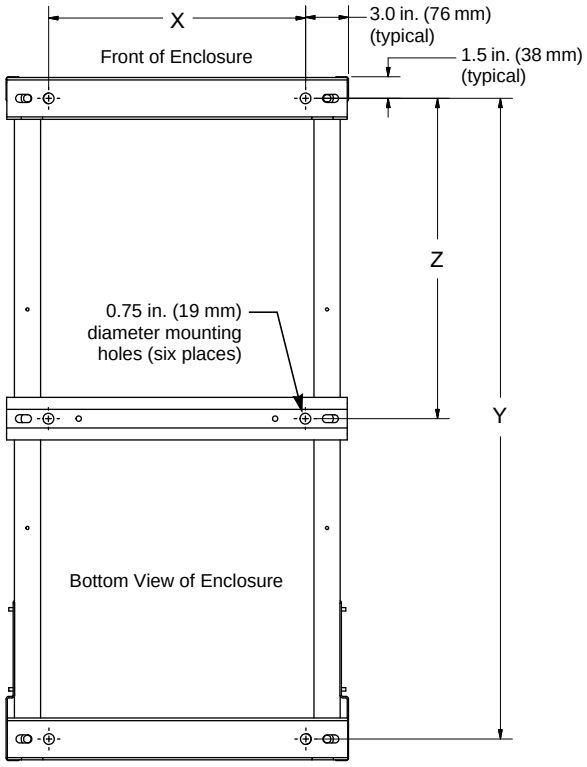
Figure 8: Base Channel Floor Anchor Bolt Locations

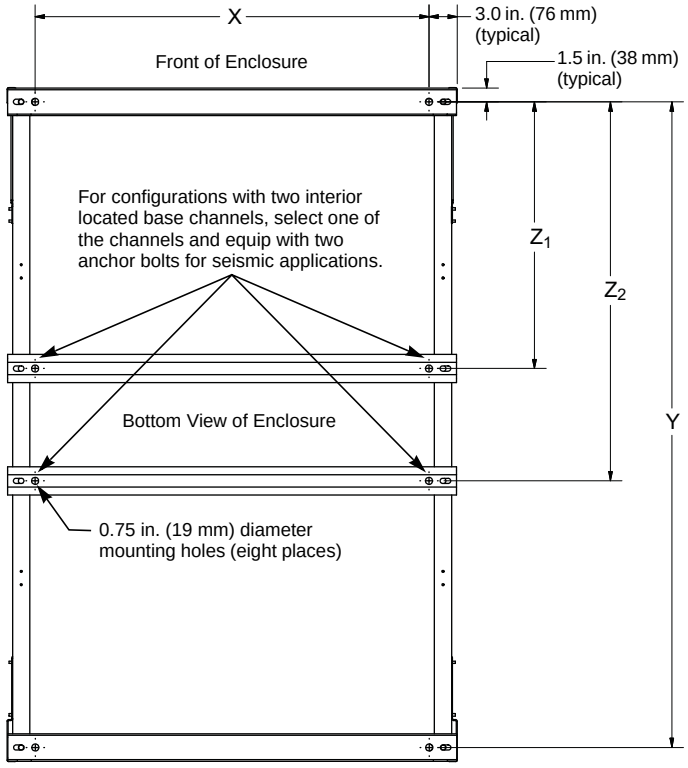


Enclosures < 36 in. Deep

NOTE: See Table 1 on page 16 for X, Y, Z dimensional values.



Enclosures 36–70 in. Deep



Enclosures > 70 in. Deep

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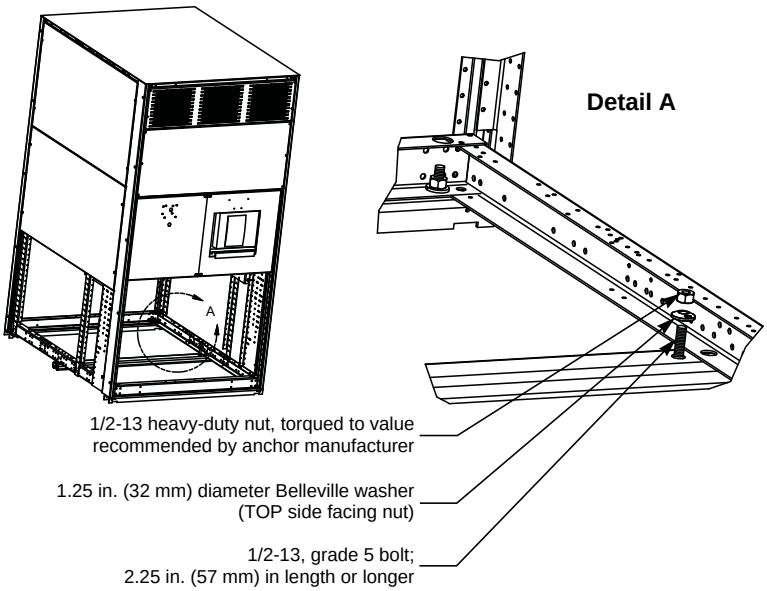
2. Depending on the frame size (see Figure 8 on page 17), use either four or six 1/2-13 Grade 5 bolts in the locations shown in Figure 9.

Figure 9: Base Channel Mounting Hardware



NOTE: Base channel mounting hardware detail shown for reference purposes only. Anchoring hardware is not furnished with the switchboard. Covers and internal hardware shown removed for illustration purposes.

3. Once the switchboard is in place, secure the base channels to each bolt using a 1.25 in. (32 mm) diameter Belleville washer between a 1/2-13 hardened nut and the switchboard frame as illustrated in Figure 9.

   NOTE: The “TOP” side of the Belleville washer must be facing the nut.

4. Torque each nut to the value recommended by the anchor manufacturer to develop the full strength of the anchor.

Top Anchoring/Restraint

For installation at locations with an Ss greater than 2.67 g (as determined from the current version of the International Building Code), or where displacement cannot be tolerated at the top of the switchboard during a seismic event, use top restraints attached to the equipment hard points.

NOTE: Anchoring hardware is not furnished with the switchboard.

1. The four 0.88-in. (22 mm) diameter mechanical knock-outs shown in Figure 10 on page 19 serve as hard points for application of a top restraint system.

   NOTE: By code, it is the responsibility of the Building Design Professional to determine the top restraint methodology for the intended building application.

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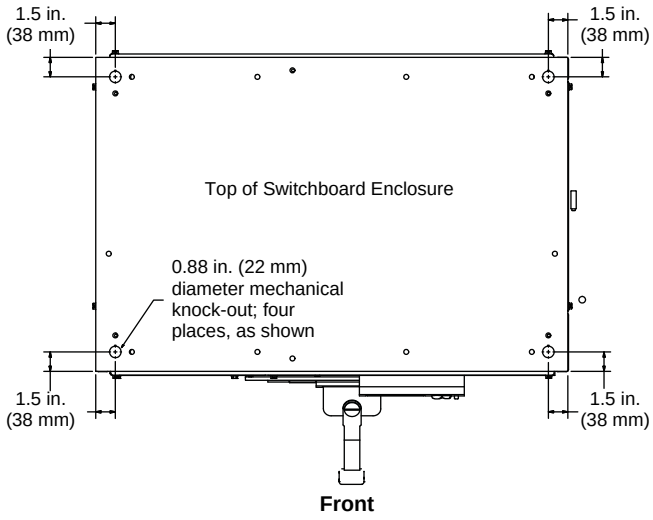
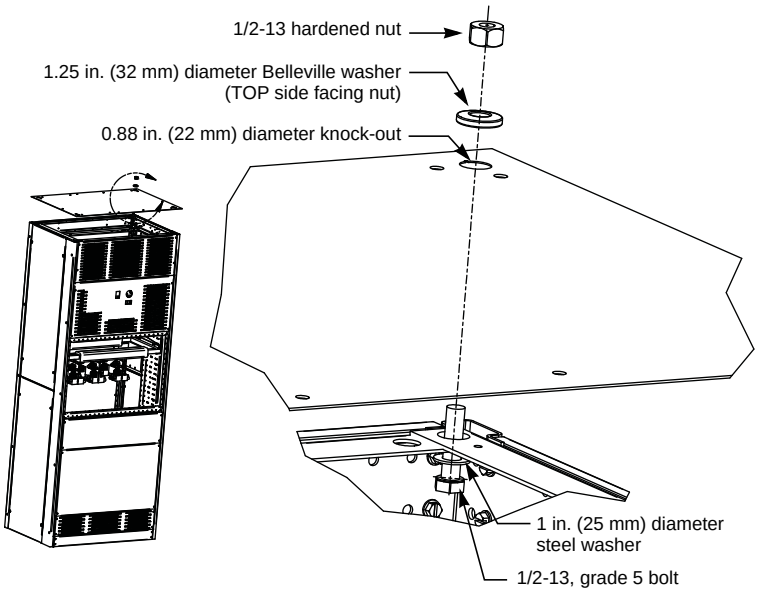
Figure 10: Top Anchor Hard-Point Locations



2. Detach the top plate from the main switchboard enclosure. Retain the screws.
3. Remove the four 0.88 in. (22 mm) diameter mechanical knock-outs as directed by the Building Design Professional.
4. With the knock-outs removed, reattach and resecure the top plate to the enclosure using the screws removed in Step 2.
5. Attach the top restraint system using a 1/2-13, Grade 5 bolt, a 1 in. (25 mm) diameter steel washer, a 1.25 in. (32 mm) diameter Belleville washer, and a hardened 1/2-13 nut as shown in Figure 11.

Figure 11: Top Anchor Mounting Hardware



6. After all switchboard sections are properly joined and the entire structure is properly anchored, install the incoming service conductors and load side cables.

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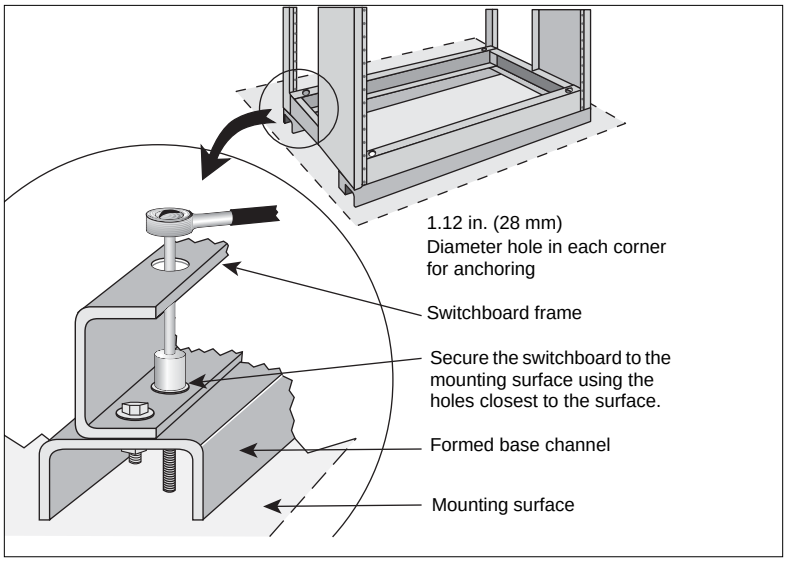
7. Do not use the switchboard enclosure (particularly the top) to mount exterior equipment, except for conduit.

Anchoring the Switchboard

Although sections are freestanding, a hard bump or shifting movement can result in damage to the splice joints between sections and conduit hubs connected to the sections. Therefore, each vertical section must be anchored to the floor.

Formed base channels run the width of the shipping section. The channels have 1.12-in. (28 mm) diameter holes for fastening the section to the floor (Figure 12). Anchor each section to the floor with 1/2-in. (Grade 2 minimum) bolts with flat washers and anchors suitable for installation of electrical equipment (not furnished).

Figure 12: Switchboard Base Channels



After all switchboard sections are properly joined and the entire structure is bolted to the floor, install the incoming service conductors and load side cables.

NOTE: If the switchboard consists of only one shipping section, proceed to “Grounding and Bonding” on page 22.

Through Bus Splice Connections

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not install through bus splice connectors with the switchboard energized.

Failure to follow this instruction will result in death or serious injury.

Through bus splice connectors and/or hardware, along with installation instructions, are provided with each shipping split. Follow the installation instructions, and torque splice bolts to the value given in “Section 9—Torque Values for Electrical Connections” on page 39.

If through bus bars are wrapped with an insulative material, cover the splice connections with the material provided.

For splice connections with bus on the front and rear of an insulating tube, ensure the U-shaped, copper connector is centered around the tube. Figure 13 on page 21 shows the proper orientation of the connector.

NOTE: The U-shaped connector will fit snugly against the insulating tube when installed correctly. It is pulled away from the insulating tube in Figure 13 to show the orientation of the connector slot.

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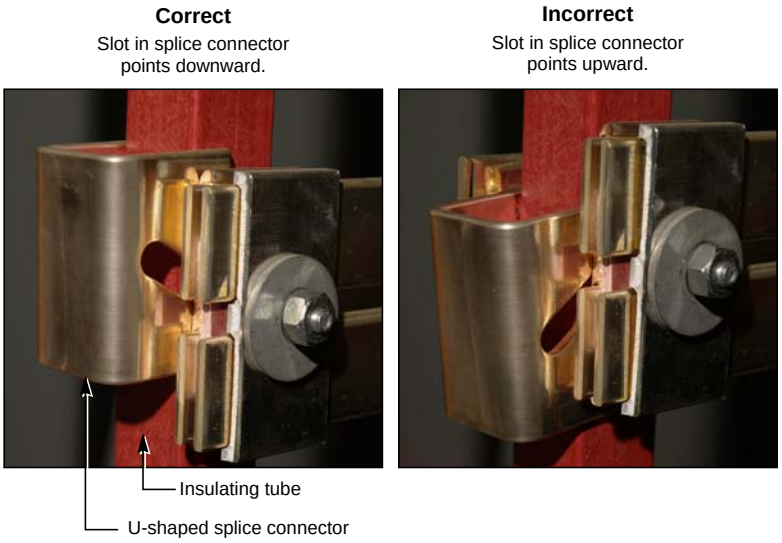
Figure 13: Proper Orientation of U-shaped Splice Connector



Ground Bus Splice Connections

Align and secure the ground bus splice connection between shipping sections. Torque connections to 100 lb-in (11 N•m) (Figure 14 or 15).

NOTE: Proper installation is essential for equipment ground-fault systems.

Figure 14: Ground Bus Splice Connection

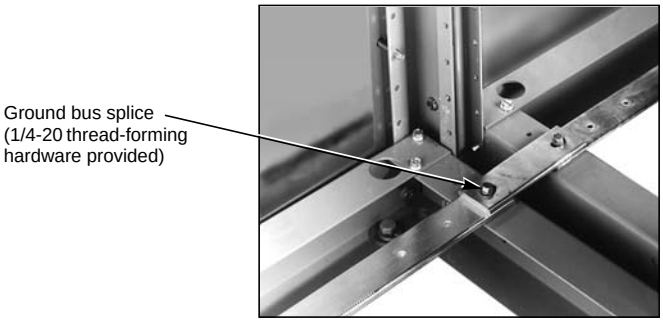


Figure 15: Series 2 Ground Bus Splice Connection

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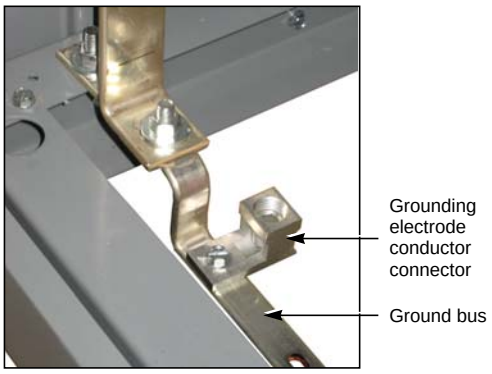
Grounding and Bonding

Service Equipment—Grounded System

Figure 16: Grounding Electrode Connector



NOTE: A system is “grounded” if it is grounded at any point ahead of the switchboard, whether the grounded conductor (neutral) is carried through to the loads, or not.

For solidly *grounded* systems used as either service equipment or as a main switchboard on a separately derived system:

1. Run a grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchboard ground bus (or on the neutral bus, if so indicated on the equipment drawing) (Figure 16). Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC or Sections 10-204 and 10-206 of the 1998 CEC, and install it as specified in Section 250-64 of the NEC or Section 10-908 of the 1998 CEC.
2. Install the main bonding jumper between the neutral bus and the ground bus (Figure 17 or 18 on page 22). For torque values, refer to “Section 9—Torque Values for Electrical Connections” on page 39.

   NOTE: If the switchboard is fed from multiple sources (for example, double-ended systems), there may be two or more main bonding jumpers to install.

Figure 17: Main Bonding Jumper

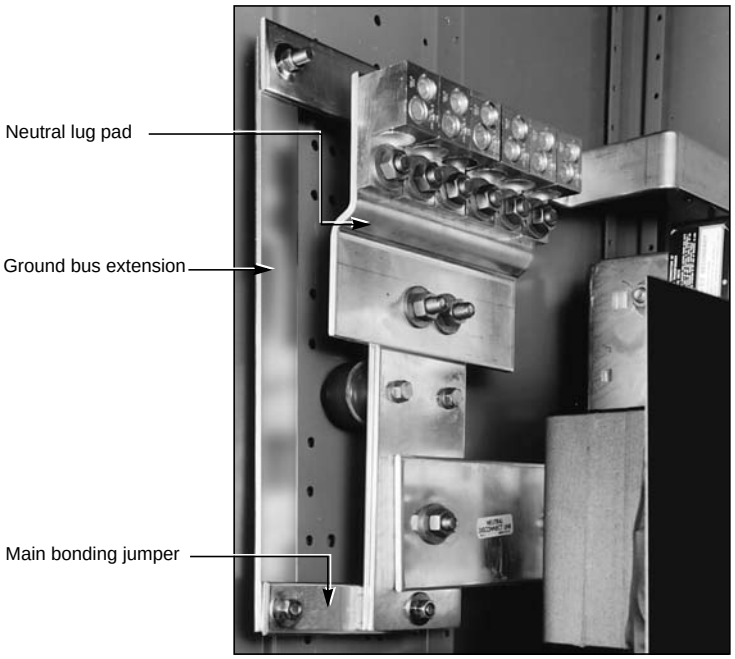


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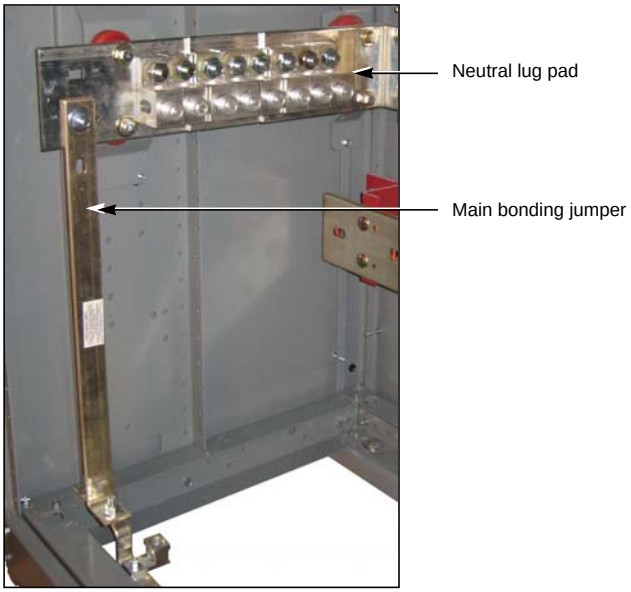
Figure 18: Series 2 Main Bonding Jumper



In Canada, a main bonding jumper bus or cable is provided between the neutral bus and ground bus. When the bonding jumper must be disconnected (for example, for a Megger® test), remove the main bonding jumper bus or cable lug with cable from the neutral bus. This is normally located near the line neutral lugs. Secure the main bonding jumper bus or cable and lug to maintain the required distance from phases and neutral.

NOTE: If the switchboard is fed from multiple sources (for example, a double-ended system like a main-tie-main), there may be two or more main bonding jumpers installed.

Service Equipment—Ungrounded System

For *ungrounded* systems used as either service equipment, or as a main switchboard on a separately derived system:

1. Run a grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchboard ground bus (Figure 16).
2. Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC or Sections 10-700 and 10-702 of the 1998 CEC, and install it as specified in Section 250-64 of the NEC or Section 10-204 of the 1998 CEC.

Not Service Equipment

For either *grounded or ungrounded* systems, when a switchboard is not used as service equipment nor as a main switchboard on a separately derived system:

Use equipment grounding conductors sized according to Section 250-122 of the NEC or Section 10-206 of the 1998 CEC to connect the switchboard frame and ground bus to the service ground.

High-Impedance Grounded Neutral Systems

For high-impedance grounded neutral systems:

Ground the system following the instructions provided with the system grounding equipment and in compliance with Section 250-36 of the NEC. Confirm that the switchboard frame and ground bus are bonded in accordance with Section 250-102 of the NEC.

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Busway Connections

Schneider Electric switchboards are manufactured with two different styles of busway connections. Qwik Flange™ is used on indoor switchboards only.

The other type of busway connection is the “dummy” flanged end. This type is used on some indoor switchboards, but primarily on outdoor units. The dummy flanged end must be removed to allow actual busway flanged end installation. Either the dummy or actual busway flanged end must be in place before energizing the switchboard.

NOTE: Do not use the switchboard to support the weight of the busway connection. Support busway independently.

Busway Connection—NEMA Type 1 (Indoor) Only (Qwik Flange™)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying the switchboard and busway before installing connections.

Failure to follow this instruction will result in death or serious injury

Follow the instructions in this section to make Qwik Flange busway connections (see Figures 19 and 20):

1. Remove any protective covering from the opening in the switchboard.
2. Slip the busway joint into the switchboard connectors.
3. Check the joint bolt alignment; the center line (C/L) of the joint bolt to the switchboard surface should be 0.95 in. (24 mm) (Figure 19).
4. Attach the side closing plates using two 5/16-in. bolts (provided). When installed properly, the holes in the side closing plates align with the holes in both the switchboard and busway.

Figure 19: Qwik Flange Installation

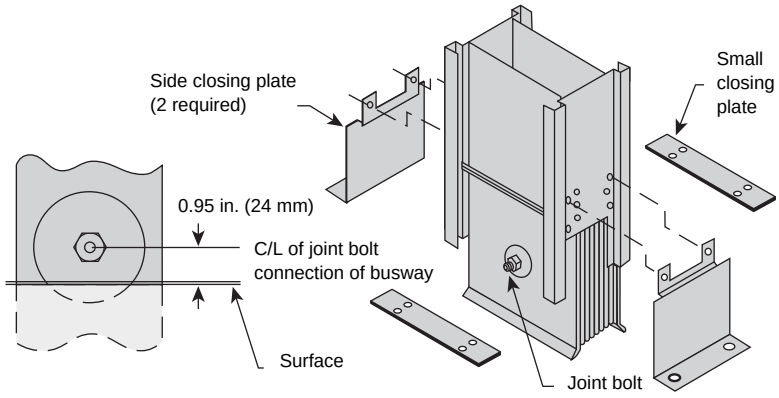
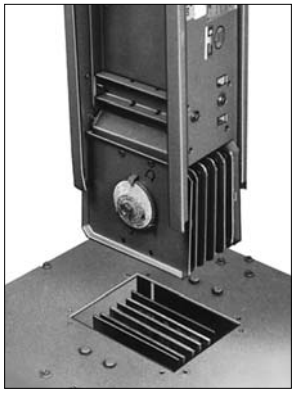
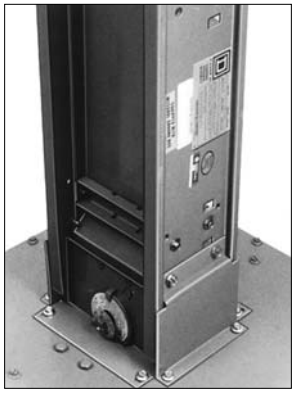


Figure 20: Qwik Flange





5. Use an 18-in. (457 mm) or longer wrench to torque the joint bolt until the outer break-away head twists off. Do not allow the break-away bolt head or red warning disc to drop into the switchboard.
6. Slip the remaining two small closing plates into position by aligning with the holes in the switchboard. Use the four 1/4-20 screws provided to secure the equipment.
7. Confirm proper phasing of the installed busway before energizing.

Busway Connections—NEMA Type 1 (Non-Qwik Flange) and NEMA Type 3R

If this style of connection for busway is furnished, the busway "dummy" flanged end must be removed before installing busway (Figure 21 on page 25).

⚠ DANGER

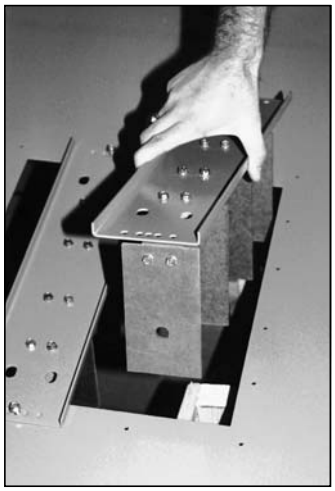
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying the switchboard and busway before installing connections.

Failure to follow this instruction will result in death or serious injury.

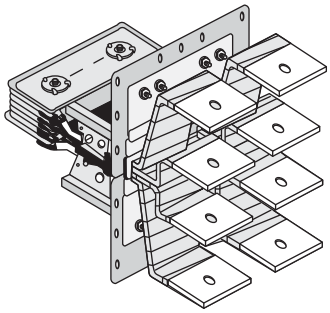
1. From inside the switchboard, remove the 1/2-in. bolts that fasten the switchboard bus to the busway dummy nonmetallic flanges. Retain all hardware for reuse.
2. Remove all screws securing the busway dummy flanged end to the switchboard enclosure.
3. Remove the busway dummy flanged end (Figure 21).

Figure 21: Removing the Busway Dummy Flanged End



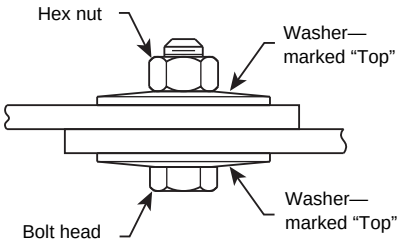
4. Install the actual busway flanged end to the switchboard bus connectors provided in the switchboard (Figure 22). Insert the flanges between the switchboard bus connectors so that the mounting holes in the collar of the flanged end align with the pre-drilled holes in the switchboard enclosure.

Figure 22: Flanged-End Connections



5. Line up the holes in the bus bar flanges, and reinstall the 1/2-in. (13 mm) hardware that was removed in step 1 on page 25 and as shown in Figure 23.

Figure 23: Reinstalling the 1/2-In. (13 mm) Hardware



NOTE: The convex side (marked “Top”) of one conical washer should be against the bolt head, and the convex side of the second conical washer should be against the hex nut.

6. Torque the bolts inserted in step 5 as indicated in “Section 9—Torque Values for Electrical Connections” on page 39.
7. Assemble the busway collar to the switchboard enclosure with the screws provided.
8. Ensure that the busway integral ground is connected to the switchboard ground bus.
9. Confirm busway phasing before energizing.

Conduit Area

1. Locate and terminate all conduit in the switchboard enclosure in the “available conduit area” designated on the equipment drawing.

   NOTE: On switchboards greater than 24 in. (610 mm) deep, the center base channel can be removed for additional conduit area. **Exception:** Do not remove any base channels when seismic restraint is required.

2. Install the conduit properly. Use hubs, locknuts, and bushings to protect the cables and prevent condensation on the conduit from entering the switchboard.

   NOTE: If top entry, do not use the top of the switchboard to support the weight of the conduit. Support the conduit independently.

   If bottom closure plates are furnished, the customer must remove the plates, make holes in them for any conduit entering the bottom of the switchboard, and then reinstall the plates.

   Under seismic conditions, consider using top restraints if movement of the top of the switchboard is an issue.

3. Bond all conduit hubs to the switchboard enclosure with approved electrical connections.

Cable Pulling

Power-Style QED-2 switchboards are constructed to customer specifications for the cable entrance arrangement (for example, top or bottom feed). Switchboard components are arranged to give proper cable clearance and bending space for cables entering or exiting the switchboard as specified on the equipment drawing.

1. Use only cable sizes suitable for a proper fit with the corresponding lugs.
2. Pull the proper number of line side and load side cables according to the load served and the NEC or CEC.
3. Position the cables inside the switchboard so that they are not subject to physical damage.
4. Maintain the largest possible bending radii and proper clearance to bus bars and grounded parts. If any cables are lying or bearing on structural members, support them to relieve this condition or place suitable protective material at the bearing point to protect the cable insulation.

5. Be certain to run all phase conductors, including the neutral, through the same opening where cables enter or leave the switchboard, or pass through any metal that has magnetic properties. Otherwise, overheating can result. See Section 300-20(a) of NEC.
6. When instructed, brace or cable-lace the conductors.

Cable Terminations

1. Use a proper insulation stripping tool to strip a length of insulation from the end of the cable sufficient to fit into the full length of the lug barrel. Be careful not to nick or ring the strands.
2. Thoroughly clean aluminum cable contact surfaces with a wire brush, or scrub them with an abrasive cloth to remove oxides and foreign matter.
3. Immediately apply an acceptable joint compound to the bare aluminum surfaces.
4. If compression-type lugs are furnished on any switch or circuit breaker, or as the main incoming power lugs, unbolt and remove them to create sufficient room for crimping the lugs to the cables with the crimping tool.
   a. Insert the cable into the lug barrel and, using the crimping tool, make the specified number of crimps per the recommendations of the manufacturer.
   b. Wipe excess joint compound from the connector and insulation.
   c. With the cables connected, remount the lugs onto the bus bars, switches, or circuit breakers. Torque the bolts to the values given in “Section 9—Torque Values for Electrical Connections” on page 39.
5. Set screw-type lugs may be furnished as main incoming lugs and are standard on molded case circuit breakers and QMB/QMJ/QMQB[1] fusible switches. Torque these lugs to, **but do not exceed**, the specified values. Torque values for circuit breaker and switch lugs are marked on these units. Torque values for other switchboard lugs are marked on the switchboard (Table 6 on page 39).

[1] QMQB switches are available in Canada only.

ENGLISH

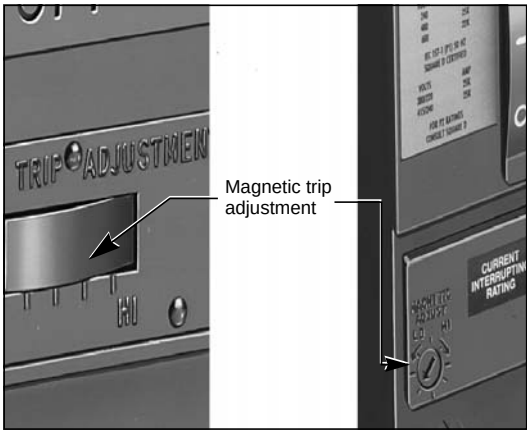
Section 5—Pre-energizing Checkout Procedure

Conduct a complete inspection **before** the switchboard is energized to ensure that all components function and operate properly. **Complete every step of the checkout procedure listed before energizing the switchboard.**

1. Check all field-installed bus bar connections. Torque values are listed in “Section 9—Torque Values for Electrical Connections” on page 39.
2. Check all accessible connections for tightness.
3. Check all factory- and field-installed lug terminations for tightness.
4. Check the rigidity of all bus bar supports.
5. Check the switchboard enclosure for dents or other damage that reduces electrical clearances inside the switchboard.
6. Remove all foam blocks, or other temporary cushioning or retaining material, from the electrical devices.
7. Manually open and close all switches, circuit breakers, and other operating mechanisms, checking for correct alignment and free operation.
8. Operate all electrically operated switches, circuit breakers, and other devices equipped with remote operators (not under load). An auxiliary source of control power may be necessary to accomplish this.
9. Check all relays, meters, and instrumentation to verify that all field- installed wiring connections are made properly and that the devices function properly.
10. Current transformers (CTs) supplied for customer use require connection to a metering device load before energizing. Verify that the metering device load is properly connected, including main switchboard connections to remote equipment.
11. All CT circuits supplied by Schneider Electric for customer metering use are shorted for shipment. Remove shorting terminal screws on shorting terminal blocks or jumpers and store in the block.
12. Factory installed molded case circuit breakers, 250 A frames or larger, may have an adjustable magnetic trip, which is shipped on the “LO” setting. The markings between “LO” and “HI” settings represent a range of instantaneous magnetic trip values of 5–10 times the continuous current rating of the circuit breaker. To provide coordinated operation during a fault, adjust the magnetic trip as outlined in the respective instruction manual. All poles are adjusted simultaneously, using a screwdriver, by the single setting (Figure 24).
13. On switchboards containing an electronic trip circuit breaker, set the tripping characteristic curve of the adjustable electronic trip unit per the job requirements, or as outlined in the respective instruction manual.
14. If ground-fault protection is furnished on type BP switch, adjust the relay to the desired ground current pickup setting. The relay is shipped from the factory at the lowest setting of 120 A for the Type GC relay. Relay pickup range is from 120–1,200 A for the Type GC relay.

    NOTE: For molded case circuit breakers, refer to “Section 11—Reference Publications” on page 42 for circuit breaker information.
15. Check the torque on all bolts of the fuses mounted in Bolt-Loc™ switches, 21–30 lb-ft (28–41 N•m), and in QMB/QMJ/QMQB[1] switches (as marked on the device).

Figure 24: Instantaneous Trip Setting



[1] QMQB switches are available in Canada only.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not pry open or spread the fuse mounting clips. Doing so can cause a loose connection, resulting in overheating.

Failure to follow this instruction can result in equipment damage.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE OR INJURY

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating “Warning: Disconnect Plug Before Dielectric Test”.
- Some Micrologic™ trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

Failure to follow these instructions can result in injury or equipment damage.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not use an air hose to blow out the switchboard. Dust can settle inside relays and overcurrent devices, causing overheating and improper operation.

Failure to follow this instruction can result in equipment damage.

16. Examine fuse clip contact pressure and contact means (QMB/QMJ/QMQB[1] fusible switches). If there is any sign of looseness, contact Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada). Loose fuse clips can result in overheating.
17. Check all QMB/QMJ/QMQB[1] fusible switches, verifying that the proper fuses with the required interrupting rating and continuous current rating are installed. Do not use renewable link fuses in Square D™ brand fusible switches.
18. Verify that all grounding connections are correctly made. If the switchboard is used as a service entrance, double check to see that the main bonding jumper is connected (Figure 17 on page 22).
19. Conduct an electrical insulation resistance (Megger®) test to ensure that the switchboard is free from short circuits and undesirable grounds. Open all control power and metering disconnects or remove the fuses from the control circuits. Disconnect the neutral connection at any surge protective device or other electronic device before performing the electrical insulation resistance test; reconnect to the device after the test. With the neutral isolated from the ground and the power switches and circuit breakers open, conduct electrical insulation tests from phase-to-phase, phase-to-ground, phase-to-neutral, and neutral-to-ground. If the resistance reads less than one megohm while testing with the branch circuit devices in the open position, the system may be unsafe and should be investigated. Consult Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada) to help correct any problems.
20. After completing the electrical insulation resistance test, replace all control power fuses that were removed and close power disconnects that were opened.
21. Check all field-installed wiring. Make certain it is clear of all live parts, and when instructed, secured to withstand fault currents.
22. Verify that all control wiring between sections is connected.
23. Vacuum to remove any dust, scrap wire, or other debris.
24. Replace all covers and barriers; check for any pinched wires, and close doors. Make certain all enclosure parts are aligned properly and securely fastened.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Correct short-circuit conditions detected during the checkout procedures described in “Section 5—Pre-energizing Checkout Procedure”, beginning on page 28.
- Qualified electrical personnel must be present when energizing this equipment for the first time.
- Follow the instructions in this section to energize the switchboard properly.

Failure to follow these instructions will result in death or serious injury.

ENGLISH

Ground Fault Protection Systems

Paragraph 230-95(c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed. If the circuit breaker has equipment ground-fault protection installed, test it at this time.

1. Make sure the trip unit is powered. The trip unit is powered if:
   - — The circuit breaker is closed or bottom fed and has more than 100 V of load voltage on two phases (P or H trip unit only).
   - — The full-function or hand-held test kit is connected and on.
   - — The 24 Vdc external power supply is connected.
   - — An external voltage tap is installed and voltage of more than 100 V is present on two phases (P or H trip unit only).
2. If the system is a radial (single-ended) system, press the ground-fault Push-to-Test button. The circuit breaker trips, and the trip unit ground-fault indicator light comes on.
3. Record results on the ground fault system test log.

NOTE: If a complete check of the ground-fault system is necessary, use primary injection testing. If the system is multiple source and/or requires field connections at the job site, use primary injection testing.

NOTE: Some ground fault systems require field connections at the job site. Consult the switchboard interconnection wiring drawing for details.

Section 6—
Energizing the Switchboard

1. Make sure there is not a load on the switchboard when it is energized. Turn off all downstream loads.
2. Energize the switchboard in the following sequence:
   a. Turn on all control power disconnects before energizing the switchboard. Refer to the record drawings supplied with equipment to see if control power disconnects are supplied.
   b. Close any open doors and/or covers.
   c. Close all main devices.
   d. Close each branch circuit breaker or branch fusible switch.
   e. Proceed to each panelboard and other downstream load.
3. After all overcurrent protective devices are closed, turn on all loads (for example, lighting circuits, contactors, heaters, and motors).

ENGLISH

Section 7—
Maintaining the Switchboard

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Inspect and perform preventive maintenance only on switchboards and equipment that has been de-energized and electrically isolated (unless otherwise specified). This helps ensure that accidental contact cannot be made with energized parts.
- Follow safety-related work practices as described in NFPA 70E, Part II at all times.

Failure to follow these instructions will result in death or serious injury.

Periodic maintenance of the switchboard includes cleaning, lubrication, and exercising component parts. The interval between maintenance checks can vary depending upon the amount of usage and environmental conditions of each installation. The maximum recommended inspection interval is one year. This definition for periodic maintenance applies throughout this manual, unless otherwise noted.

Always inspect the switchboard after a fault. (Refer to “Section 8—Adverse Circumstances”, beginning on page 37). Service bulletins for the various disconnecting and overcurrent devices mounted in the switchboard are available through your local Schneider Electric representative.

General Inspection and Cleaning

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Do not use an air hose to blow out the switchboard. Dust can settle inside relays and overcurrent devices, causing overheating and improper operation.
- Do not allow paint, chemicals, or petroleum-based solvents to contact plastics or insulating materials.

Failure to follow these instructions can result in equipment damage.

1. Vacuum the switchboard interior to remove any dirt or dust deposits. Wipe all bus bars, insulators, cables, etc., with a clean, dry, lint-free cloth.
2. Check the switchboard interior carefully for moisture, condensation build-up, or signs of any previous wetness. Moisture can cause insulation failures and rapid oxidation of current-carrying parts. Inspect all conduit entrances and cracks between the enclosure panels for dripping leaks. Condensation in conduits can be a source of moisture and must not be allowed to drip onto live parts or insulating material. Take the necessary steps to eliminate the moisture and seal off all leaks.
3. Inspect the switchboard for any signs of overheating. Discoloration and flaking of insulation or metal parts are indications of overheating.

   NOTE: If overheating occurs, be sure that all conditions that caused the overheating have been corrected. Loose or contaminated connections can cause overheating.
4. Check for signs of rodent nesting in the switchboard. If required, use a good exterminating technique in the general area of the switchboard.

   NOTE: Do not place or use exterminating substances and chemicals inside the switchboard. Some products attract rodents.
5. Carefully inspect all devices for any visibly worn-out, cracked, or missing parts.
6. Manually open and close switches and circuit breakers several times to verify they are working properly.
7. Verify that all key interlocks and door interlocking provisions are working properly.

ENGLISH

Bus Bar Joints, Lug Terminations, and Insulating Materials

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Do not sand or remove plating on any bus bar, splice bar, or terminal lug.
- Damage to plating can result in overheating. Replace damaged part. Contact Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada).

Failure to follow these instructions can result in equipment damage.

1. Bus bar joints are maintenance-free. Do not retighten them after the pre-energizing checkout procedure is complete.
2. Check all bus bar joints and terminal lugs for any pitting, corrosion, or discoloration resulting from high temperatures or subjection to high fault conditions. If any damage has occurred, replace the bus bars or lugs. If cleaning is required, use Lectra-Clean®, made by CRC.
3. Inspect all insulating materials. Before re-energizing the switchboard, replace insulators with any visible damage (such as cracks).

General Lubrication Information

For field maintenance relubrication of blade/jaw components in switches 600 V and below, use BG20 High Performance Synthetic Grease from Dow Corning (Schneider Electric catalog number SWLUB). This grease is applicable for the following switches:

- Bolt-Loc
- QMB Main and Branch
- QMJ Branch
- QMQB[1] Main and Branch

For bus/plug-on connections, use electric joint compound, Schneider Electric catalog number PJC7201.

For SED and NED circuit breaker drawout connections, Schneider Electric catalog number PJC8311 Electric Joint Compound **must** be used.

For Masterpact™ NW drawout connections, use only Schneider Electric catalog number S48899 Electric Joint Compound.

Automatic Transfer Switches

Consult the documentation provided by the manufacturer for all installation, operation, and maintenance instructions for these devices.

Bolt-Loc Bolted Pressure Contact Switch Maintenance (800–4,000 A)

Refer to the Bolt-Loc switch installation and maintenance manual for complete information (manual is shipped with the switchboard). If the manual is not available, refer to “Section 11—Reference Publications” on page 42, and contact your local Schneider Electric representative to obtain the appropriate manuals.

1. Exercise the operating mechanism at least once a year to ensure proper operation.
2. The Bolt-Loc switch is shipped from the factory properly lubricated. Periodic cleaning and lubrication of the switch is required. The maintenance interval between lubrications depends on factors such as usage and ambient conditions. The maximum recommended maintenance interval is one year for current-carrying parts and five years for operating mechanisms.

[1] QMQB switches are available in Canada only.

⚠ DANGER

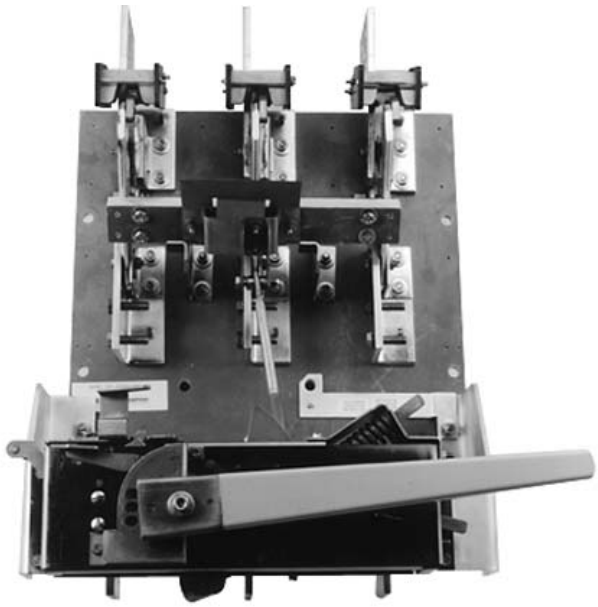
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Always check line and load ends of the fuses for voltage before starting the replacement procedure. The Bolt-Loc switch can be part of a multiple source system in which the fuses can be energized when the Bolt-Loc switch is in the "open" position.

Failure to follow this instruction will result in death or serious injury.

3. To replace the fuse:
   a. Open the switch before opening the fuse door.

Figure 25: Type BP Bolt-Loc Fusible Switch



   b. Open the fuse door, releasing the interlock as described in the instructions on the door.
   c. Observe the switch blades to confirm the switch is "open."
   d. Check the line and load ends of fuses for voltage using a properly rated voltage sensing device. No voltage should be present.
   e. Remove all fuses. Retain the hardware for reuse.
   f. Using a non-abrasive cleaner such as Lectra-Clean, made by CRC, wipe clean the fuse mounting pads on the switch and the terminals of each new fuse. Check the alignment of fuse terminals before installing new fuses.
   g. Install new fuses using the same hardware removed in Step e. Tighten to 21–30 lb-ft (28–41 N•m).
4. Close the fuse door, and check the fuse door interlock with the switch in the ON position. The fuse doors should not open using normal hand force.

ENGLISH

Circuit Breakers

Schneider Electric circuit breakers are designed and manufactured as sealed units requiring minimal periodic maintenance.

Exercise circuit breakers at least once a year to ensure proper operation. For general maintenance:

1. Trip the circuit breaker by pushing the Push-To-Trip or “Open” button located on the face of the circuit breaker. Refer to the appropriate circuit breaker manual for the specific location of this button.
2. Manually open and close the circuit breaker two to three times.

Figure 26: PowerPact™ R-Frame Circuit Breaker

NOTE: Schneider Electric instruction bulletin 48049-900-0x, *Field Testing and Maintenance Guide for Thermal-Magnetic and Micrologic™ Electronic Trip Molded Case Circuit Breakers*, provides more in-depth information.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- If adjusting circuit breaker settings, do not set the long-time trip rating at a higher ampacity than the rating of the bus bar or load cables it supplies; overheating can occur.
- Before energizing the switchboard, fill all unused I-Line circuit breaker mounting spaces with blank fillers and/or extensions as listed in Table 2.

Failure to follow these instructions will result in death or serious injury.

Refer to individual circuit breaker instruction manuals shipped with the switchboard for additional maintenance information, such as changing rating plugs, sensor plugs, or adjustable settings and removing circuit breakers. If the instruction manual is not available, refer to “Section 11—Reference Publications” on page 42 for the appropriate number, or contact your local Schneider Electric representative.

Table 2: I-Line™ Blank Fillers and Extensions

Item	Height	Catalog No.	Branch Circuit Side	Circuit Breaker Frame
Blank Fillers	1.50 in. (38 mm)	HNM1BL	Both Sides	Not applicable
	4.50 in. (114 mm)	HNM4BL	Both Sides	
Blank Extensions	1.50 in. (38 mm)	HLW1BL	Wide Side	All applications except PowerPact H/J circuit breakers with Micrologic trip unit 5/6.
	4.50 in. (114 mm)	HLW4BL	Wide Side	
	1.50 in. (38 mm)	HLN1BL	Narrow Side	
	4.50 in. (114 mm)	HLN4BL	Narrow Side	
	4.50 in. (114 mm)	HLN4EBL	Narrow Side	Only PowerPact H/J circuit breakers with Micrologic trip unit 5/6.
	4.50 in. (114 mm)	HLW4EBL	Wide Side	

ENGLISH

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Do not remove the protective lubricant on the plug-on connectors.
- If additional lubrication is required, apply a coating of electrical joint compound, catalog number PJC7201, to the contact surfaces of the plug-on connector.

Failure to follow these instructions can result in equipment damage.

3. The universal test set, catalog number UTS3, is available to test Schneider Electric Powerpact P and R circuit breakers equipped with Micrologic trip units. It runs trip unit tests automatically, with prompts to the user for initial information. Test modules for each circuit breaker frame are used to store data necessary for automatic tests. Series B Micrologic trip units require test module CBTMB, which is included in UTS3.

   A pocket tester, catalog number S434206, or UTA tester, catalog number STRV00910, are available for Schneider Electric Powerpact H, J, and L circuit breakers with Micrologic trip units. These testers supply power to the Micrologic trip units and allow for settings to be adjusted through the keypad located on the circuit breaker or through a PC using the USB interface.

   Masterpact NW trip units require the full-function test set, catalog number S33595, or the hand-held test set, catalog number S33594.

NOTE: Tests can be conducted with a circuit breaker installed in the switchboard; circuit breaker removal is not required. **The switchboard must be de-energized.**

QMB/QMJ/QMQB[1] Fusible Switches

Refer to the QMB/QMJ/QMQB[1] instruction manual for complete maintenance information. If the instruction manual is not available, refer to “Section 11—Reference Publications” on page 42 of this manual for the appropriate number. Contact your local Schneider Electric representative to obtain the manual.

Switch Maintenance

1. Periodically exercise the switch to ensure proper operation. This period should not exceed one year.
2. Check the cover interlock with the switch in the ON position. The cover should not open using normal hand force.
3. Inspect the switch interior for any damaged or cracked parts, and replace as necessary.
4. For fusible switch units, check the fuse mounting clips or bolted contact area for corrosion or discoloration (indicating overheating). Replace them if necessary.
5. For additional maintenance instructions, see the label on the inside of the door.

Fuse Replacement (Fusible Switches Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Always check line and load ends of the fuses for voltage before starting the fuse replacement procedure with a properly rated voltage sensing device.

Failure to follow this instruction will result in death or serious injury.

1. Turn the switch to the OFF position before opening the door.
2. Observe the switch blades to confirm that the switch is in the OFF position.
3. Using a properly rated voltage sensing device, verify that line and load ends of the fuse are not energized.
4. Observe all warning labels specifying the type of fuse to use. Do not substitute a non-current limiting fuse, or attempt in any way to defeat the rejection feature of the fuse clips furnished with the switch. Do not use renewable link fuses in Schneider Electric fusible switches.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not pry open or spread the fuse mounting clips. Doing so can cause a loose connection, resulting in overheating and nuisance fuse blowing.

Failure to follow this instruction can result in equipment damage.

[1] QMQB switches are available in Canada only.

ENGLISH

Installing QMB/QMJ/QMQB[1] Fusible Switches

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Remove power for these sections before installing or removing QMB/QMJ/QMQB[1] switches.
- Do not use a main as a branch unit or a branch as a main.
- All unused spaces must be filled with blank fillers before energizing the switchboard. Refer to Tables 3 and 4 for sizes and catalog numbers.

Failure to follow these instructions will result in death or serious injury.

Table 3: QMB/QMJ Fusible Switch Blank Fillers

Height	Catalog No.
1.50 in. (38 mm)	QMB1BLW
3.00 in. (76 mm)	QMB3BLW
6.00 in. (152 mm)	QMB6BLW
15.00 in. (381 mm)	QMB15BLW

Table 4: QMQB[1] Fusible Switch Blank Fillers

Height	Catalog No.
2x: 1.375 in. (35 mm)	QFS1
8x: 5.50 in. (140 mm)	QFS5
10x: 6.875 in. (175 mm)	QFS6
14x: 9.625 in. (244 mm)	QFS9
24x: 16.50 in. (419 mm)	QFS16

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not remove the protective lubricant on the plug-on connectors.

Failure to follow this instruction can result in equipment damage.

1. Turn off the main power.
2. Turn the switch handle(s) to the OFF position. Align switch plug-on connectors with QMB panel vertical bus, and plug switch onto panel.
3. Place and partially tighten all unit mounting screws that mount to the QMB panel mounting rails.
4. Tighten all screws evenly. The unit mounting flange and plug-on connectors must be seated securely.

Removing QMB/QMJ/QMQB[1] Fusible Switches

1. Turn off the main power.
2. Turn switch handle(s) to the OFF position.
3. Disconnect the load wires.
4. For QMB and QMJ switches, remove mounting screws holding the switch to the mounting rail. For QMQB[1] switches, remove the bolts holding the switch to the line terminal.
5. Unplug the switch.

Ground-Fault Protection Systems

Check the terminal connections on the ground-fault protection system at least once a year for tightness and corrosion. If the system can be tested without tripping the main or branch device, directions for testing the system are in the device manual. Otherwise, testing the ground-fault protection system will trip the main or branch device to which it is connected. If the ground-fault sensor or relay is physically or electrically damaged, replace it.

If the ground-fault protection system does not operate properly and additional equipment has been connected to the installation since the last maintenance test/check, de-energize the entire system, and check for grounds on the neutral downstream from the main bonding jumper. If no downstream grounds are detected and the ground fault system is not operating properly, contact Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada).

If no additions have been made to the installation and the ground-fault protection system does not operate properly, contact Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada).

[1] QMQB switches are available in Canada only.

Refer to the ground-fault field test instruction manual for additional testing information. If the manual is not available, refer to “Section 11—Reference Publications” on page 42 of this manual to obtain the appropriate number. Contact your local Schneider Electric representative to obtain this manual.

Section 8—Adverse Circumstances

This section includes, but is not limited to, all electrical components of the switchboard.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power supplying the switchboard before cleaning.
- Always use a properly rated voltage sensing device to confirm all power is off.
- Before energizing the switchboard, all unused circuit breaker mounting spaces must be filled.

Failure to follow these instructions will result in death or serious injury.

NOTE: Before attempting to re-energize the switchboard following adverse circumstances, contact Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada) for special instructions.

Inspection Following a Short Circuit

If a short circuit occurs, make a thorough inspection of the entire system, and verify that no damage to conductors or insulation has occurred. High mechanical and thermal stresses developed by short-circuit currents can damage conductors and insulation. Check the overcurrent-protection device that interrupted the short-circuit current for possible arcing damage.

Do not open sealed devices, such as molded case circuit breakers. Replace these devices if they are damaged. Before energizing the switchboard, all unused circuit breaker mounting spaces must be filled. For more information about these devices, refer to the appropriate instruction manual listed in “Section 11—Reference Publications” on page 42.

Clean-up Following a Short Circuit

The insulating properties of some organic insulating materials can deteriorate during an electrical arc. If so:

1. Remove any soot or debris.
2. Replace carbon-tracked insulation.

Water-Soaked Switchboards

Do not clean or repair a switchboard that has been exposed to large volumes of water or submerged at any time. Current-carrying parts, insulation systems, and electrical components may be damaged beyond repair. **Do not energize the switchboard.** Contact Square D Services.

ENGLISH

Water-Sprayed or Splashed Switchboards (Clean Water Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on it.

Failure to follow this instruction will result in death or serious injury.

If the switchboard has been sprayed or splashed with small amounts of clean water, make a thorough inspection of the entire system, and verify that no damage to conductors or insulation has occurred. Do not open sealed devices such as molded case circuit breakers or fuses. Replace these devices if they are damaged. For more information about these devices, refer to the appropriate instruction manual listed in “Section 11—Reference Publications”.

Inspection and Clean-up of Clean Water Sprayed or Splashed Switchboards

Follow steps 1–10 only if:

- No signs of physical damage to the equipment are present.
- The switchboard has not been submerged or exposed to water for long periods of time.
- The water that has been in contact with the switchboard has not been contaminated with sewage, chemicals, or other substances that can negatively affect the integrity of the electrical equipment.
- The water that has been in contact with the switchboard has not entered any area of the enclosure that may contain wiring installed as intended and located above any live part. Specifically, inspect for water entering through conduits located above live parts.

If any one or more of these conditions have not been met, contact Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada).

If **ALL** of the conditions listed have been met, proceed as follows:

1. Turn off all power supplying this equipment before working on or inside the equipment.
2. Always use a properly rated voltage sensing device to confirm all power is off.
3. Disconnect and electrically isolate the switchboard so that no contact can be made with energized parts.
4. Wipe off all moisture from the bus bars, insulators, and insulating material with a clean, dry, lint-free cloth. Do **not** use cleaning agents or water displacement sprays.
5. Prepare the switchboard for insulation resistance (Megger®) testing by disconnecting all line side supply connections and all load side cable connections to isolate the switchboard from the wiring system.

ENGLISH

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE OR INJURY

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating “Warning: Disconnect Plug Before Dielectric Test.”
- Some Micrologic trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

Failure to follow these instructions can result in injury or equipment damage.

6. Turn all circuit breakers or switches to their ON position. The switchboard must remain de-energized.
7. Use a megohmmeter with a capacity of 500–1,000 Vdc and apply voltage from:
   a. Each phase-to-ground with circuit breaker on.
   b. Phase-to-phase with circuit breaker on.
8. Record resistance values. Refer to “Section 10—Switchboard Insulation Resistance Chart” on page 41.
9. If resistance measurements are less than 0.5 megohm, call Square D Services at 1-888-778-2733 (US) or 1-800-265-3374 (Canada) for recommendations.
10. If resistance measurements are greater than 0.5 megohm, the equipment can be energized using the procedures listed in “Section 6—Energizing the Switchboard” on page 30.

Section 9—
Torque Values for Electrical Connections

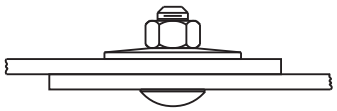
Table 5: Incoming, Branch, and Neutral Lug

Socket Size Across Flats	Torque Value
1/4 in.	180 lb-in (20 N•m)
5/16 in.	250 lb-in (28 N•m)
3/8 in.	340 lb-in (38 N•m)
1/2 in. ★	450 lb-in (51 N•m)
★ Certain lugs require 620 lb-in (70 N•m) and are marked as such.	

Table 6: Multiple Conductor Neutral and/or Ground Bar

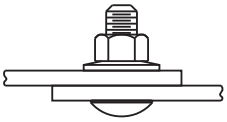
Screw Type	Lug Wire Range	Conductor Size	Torque Value
Slotted Head	14–4	14-10 Cu, 12-10 Al	20 lb-in (2 N•m)
		8 Cu-Al	25 lb-in (3 N•m)
		6-4 Cu-Al	35 lb-in (4 N•m)
	14–1/0	14-8 Cu-Al	36 lb-in (4 N•m)
		6-1/0 Cu-Al	45 lb-in (5 N•m)
Socket Head	14–1/0	All	100 lb-in (11 N•m)
	6–300 kcmil	All	275 lb-in (31 N•m)

ENGLISH

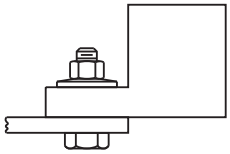


Carriage bolt
Hex nut
Conical washer

Hardware Description	Torque Value
1/2 in.	720–840 lb-in (81–95 N•m)

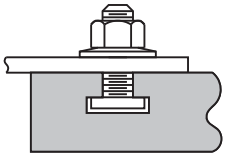


Carriage bolt
Conical washer assembly
(Keps nut)



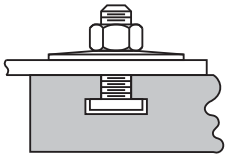
Hex head bolt
Conical washer assembly
(Keps nut)

Hardware Description	Torque Value
1/4 in.	50–75 lb-in (6–8 N•m)
5/16 in.	80–125 lb-in (9–14 N•m)
3/8 in.	175–225 lb-in (20–25 N•m)
1/2 in.	250–350 lb-in (28–40 N•m)



Square head (Tee) bolt
Conical washer assembly
(Keps nut)

Hardware Description	Torque Value
1/4 in.	50–75 lb-in (6–8 N•m)
3/8 in.	175–225 lb-in (20–25 N•m)
1/2 in.	250–350 lb-in (28–40 N•m)



Square head (Tee) bolt
Conical washer

Hardware Description	Torque Value	
	Conical Washer OD	Square Head (Tee) Bolt Conical Washer
3/8 in.	0.87 in. (22 mm)	250–280 lb-in (28–32 N•m)
	1.00 in. (25 mm)	130–150 lb-in (15–17 N•m)
1/2 in.	1.25 in. (32 mm) 2.25 in. (57 mm)	450–550 lb-in (51–62 N•m)

Hex head bolt
(2) Conical washers

Hardware Description	Torque Value	
	Conical Washer OD	Hex Head Bolt (2) Conical Washers
5/16 in.	0.90 in. (23 mm)	145–160 lb-in (16–18 N•m)
3/8 in.	0.87 in. (22 mm)	250–280 lb-in (28–32 N•m)
	1.00 in. (25 mm)	130–150 lb-in (15–17 N•m)
1/2 in.	1.25 in. (32 mm) 2.25 in. (57 mm) 3.00 in. (76 mm)	720–840 lb-in (81–95 N•m)

ENGLISH

Section 10—Switchboard Insulation Resistance Chart

Always use a 500 or 1,000 Vdc megohmmeter when testing insulation resistance.

NOTE: The Neutral–Ground column is provided to record the results of the pre-energizing checkout procedure only.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power to the switchboard before testing.
- Always use a properly rated voltage sensing device to confirm power is off.

Failure to follow these instructions will result in death or serious injury.

Date	Phase–Phase			Phase–Ground			Neutral–Ground
	All Disconnects Open						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground
Date	All Disconnects Closed						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground

ENGLISH

Section 11—
Reference Publications

Schneider Electric publications are available through your local Schneider Electric representative. These publications include device replacement procedures and listings of spare parts to make ordering and servicing of replacement parts quick and convenient. Any maintenance procedure or device not listed, such as an I-Line interior, is not customer serviceable.

Contact your local Schneider Electric representative for information at 1-888-778-2733 in the US, or at 1-800-265-3374 in Canada. Or, refer to the Technical Library at http://www.schneider-electric.us/ to obtain the appropriate publications.

For information about obtaining NEMA documents, write to:

National Electrical Manufacturers Association (NEMA)
Attention: Customer Service
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

Other Reference Publications	Publication Number
General Instructions for Proper Installation, Operation, and Maintenance of Switchboards Rated 600 V or Less	NEMA Publication PB2.1
Application Guide for Ground Fault Protective Devices for Equipment	NEMA Publication PB2.2
Circuit Breakers	NEMA Publication AB-4
Enclosed and Miscellaneous Distribution Switches	NEMA Publication KS-1
Electrical Equipment Maintenance	NFPA 70B-1999

Section 12—Installation and Maintenance Log

DATE	INITIALS	MAINTENANCE PERFORMED

80043-055-10 **12/2011**
Replaces 80043-055-09 05/2010

Schneider Electric USA, Inc.
8821 Garners Ferry Road
Hopkins, SC 29061 USA
1-888-778-2733
www.schneider-electric.us

Approved as an American National Standard
ANSI Approval Date: June 14, 2010

ANSI/NEMA PB 2.1-2007

General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less

Published by

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www.nema.org

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CONTENTS

Figures

Foreword

This publication is a guide of practical information containing instructions for the proper handling, installation, operation, and maintenance of deadfront distribution switchboards rated 600 Volts or less.

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency regarding handling, installation, operation, or maintenance.

It is recommended that work described in this set of instructions be performed only by qualified personnel familiar with the construction and operation of switchboards and that such work be performed only after reading this complete set of instructions. For specific information not covered by these instructions, you are urged to contact the manufacturer of the switchboard directly.

PB 2.1-2007 revises and supersedes PB 2.1-2002.

In the preparation of this Standards Publication input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product section by contacting the following:

Vice President, Technical Services
National Electrical Manufacturers Association
1300 North 17th Street
Rosslyn, Virginia, 22209

This Standards Publication was developed by the Panelboard and Distribution Board Section. Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Panelboard and Distribution Board Section was composed of the following members:

Eaton Electrical Inc.—Pittsburgh, PA
GE—Plainville, CT
Hubbell, Inc.—Bridgeport, CT
Milbank Manufacturing Company—Kansas City, MO
Penn Panel & Box Company—Collingdale, PA
Reliance Controls Corporation—Racine, WI
Siemens Industry, Inc.—Norcross, GA
Square D Company—Palatine, IL

Section 1
GENERAL

1.1 SCOPE

This publication covers floor-mounted deadfront switchboards which consist of an enclosure, molded case and low-voltage power circuit breakers, fusible or non-fusible switches, instruments, and metering, monitoring, or control equipment, with associated interconnections and supporting structures. These units are used in the distribution of electricity at:

a. 600 volts and less
b. 6000 amperes or less

1.2 REFERENCES

National Electrical Manufacturers Association
1300 North 17th Street
Rosslyn, Virginia 22209

AB 4- 2003 *Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications*

PB 2.2- 2004 *Application Guide for Ground Fault Protective Devices for Equipment*

Guidelines for Handling Water Damaged Electrical Equipment

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

NFPA 70- 2005 *National Electrical Code*

NFPA 70E- 2004 *Safety Related Work Practices*

1.3 GENERAL

WARNING—HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. UNLESS OTHERWISE SPECIFIED, INSPECTION AND MAINTENANCE SHOULD ONLY BE PERFORMED ON SWITCHBOARDS AND EQUIPMENT TO WHICH POWER HAS BEEN TURNED OFF, DISCONNECTED, AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER'S WARNINGS AND INSTRUCTIONS.

Safety related work practices, as described in NFPA 70E, should be followed at all times.

CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the switchboard manufacturer before using these products to clean, dry, or lubricate switchboard components during installation or maintenance.

1.3.1 Successful Operation

The successful operation of switchboards is dependent upon proper handling, installation, operation, and maintenance. Neglecting fundamental installation and maintenance requirements may lead to severe personal injury, death, or damage to electrical equipment or other property.

1.3.2 Qualified Personnel

Installation, operation, and maintenance of switchboards should be conducted only by qualified personnel.

1.3.3 Definition of Qualified Personnel

For purposes of these guidelines, a qualified person is one who is familiar with the installation, construction, and operation of the equipment and the hazards involved. In addition, the person is:

1.3.3.1 Knowledgeable of Requirements

Knowledgeable of the requirements of the *National Electrical Code* and of all other applicable codes, laws, and standards.

1.3.3.2 Trained and Authorized to Test, Energize, Clear, Ground, Tag, and Lockout

Trained and authorized to test, energize, clear, ground, tag, and lockout circuits and equipment in accordance with established safety practices.

1.3.3.3 Trained in Proper Care and Use of Protective Equipment

Trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, and flash resistant clothing in accordance with established safety practices.

1.3.3.4 Trained in Rendering First Aid

Trained in rendering first aid.

Section 2
HANDLING

NOTE—These guidelines are provided to help avoid personal injury and equipment damage during handling and to facilitate moving the switchboard at the job site.

2.1 MANUFACTURER'S HANDLING INSTRUCTIONS

Follow the manufacturer's handling instructions for the specific equipment, if available.

2.2 CARE TO AVOID DAMAGE

Handle the switchboard with care to avoid damage to components, the frame or finish.

2.3 UPRIGHT POSITION

Keep the switchboard in an upright position unless otherwise indicated by the manufacturer.

2.4 EQUIPMENT CAPACITY

Verify that handling equipment capacity is sufficient for the switchboard weight.

2.5 CONCEALED DAMAGE

When the switchboard is received, unpack it sufficiently to inspect it for concealed damage and to determine that the shipment is complete and correct.

2.6 STORAGE PRIOR TO INSTALLATION

If the switchboard is to be stored prior to installation, replace the packing for protection during that period. When conditions permit, leave the packing intact until the switchboard or sections are at their final installation location. If the packing is removed, cover the top and any openings to protect the equipment against dust and debris during the construction period. (See section 3).

2.7 SHIPPING SKID

The switchboard should remain secured to the shipping skid to prevent distortion of the bottom of the frame during moving.

2.8 ROD OR PIPE ROLLERS

Rod or pipe rollers, with the aid of pinch bars, provide a simple method of moving the switchboard on one floor level if there is little or no incline. Steady the load to prevent tipping.

2.9 FORKLIFT TRUCK

A forklift truck may offer a more convenient method of handling the switchboard and has the added advantage of permitting it to be hoisted between levels. Balance the load carefully and use a safety strap when handling or moving switchboards with a forklift.

2.10 OVERHEAD HOISTING

When it is necessary to move the switchboard between elevations without a suitable platform elevator, overhead hoisting may be required. Lifting plates and eye bolts (Figure 2-1), or channels, angles, or bars with lift holes (Figure 2-2) may be provided as a permanent or removable part of the switchboard. If they are not, cable, chain, or band slings (Figure 2-3) may be rigged around the switchboard.

2.10.1 Rigid Spreaders or Spanner Bars

Use rigid spreaders (Figure 2-1) or spanner bars (Figure 2-3) to provide the vertical lift on eye bolts and lifting slings to avoid crushing or otherwise damaging the frame or its finish. Lifting bars on long lineups may require additional spreaders to reduce the horizontal compressive force.

2.10.2 Rigging Lengths

Select or adjust the rigging lengths to compensate for any unequal weight distribution of load and to maintain the switchboard in an upright position.

2.10.3 Angle between Lifting Cables and Vertical

Do not allow the angle between the lifting cables and vertical to exceed 45 degrees in order to reduce the tension on the rigging and the compressive load on the lifting or spanner bars and spreaders.

2.10.4 Slings with Safety Hooks or Shackles

Do not pass ropes or cables through the lift holes in bars, angles, or channels. Use slings with safety hooks or shackles.

2.10.5 Removal of Switchboard Top Covers

The switchboard may contain a heavy transformer with overhead lifting means. Consult the manufacturer regarding the removal of the switchboard top covers and the utilization of such internal lifting means.

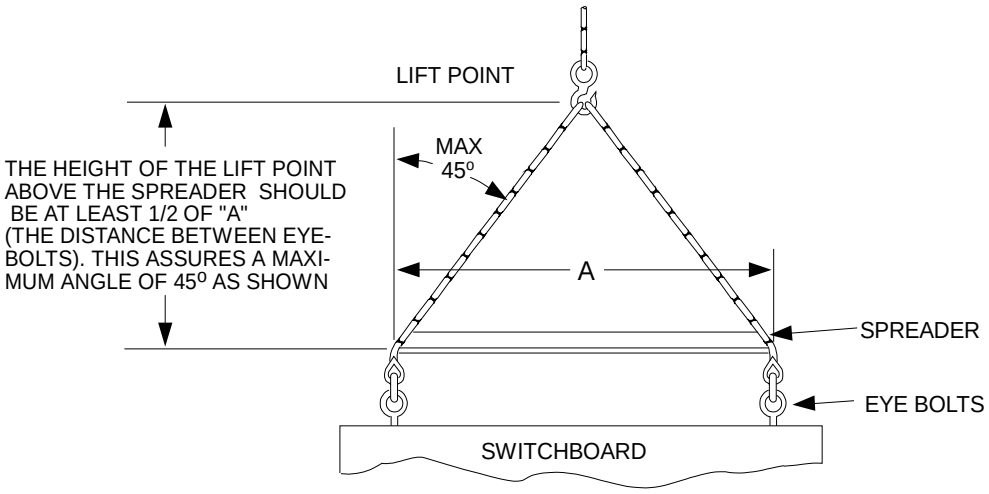

Figure 2-1
LIFTING WITH EYE BOLTS

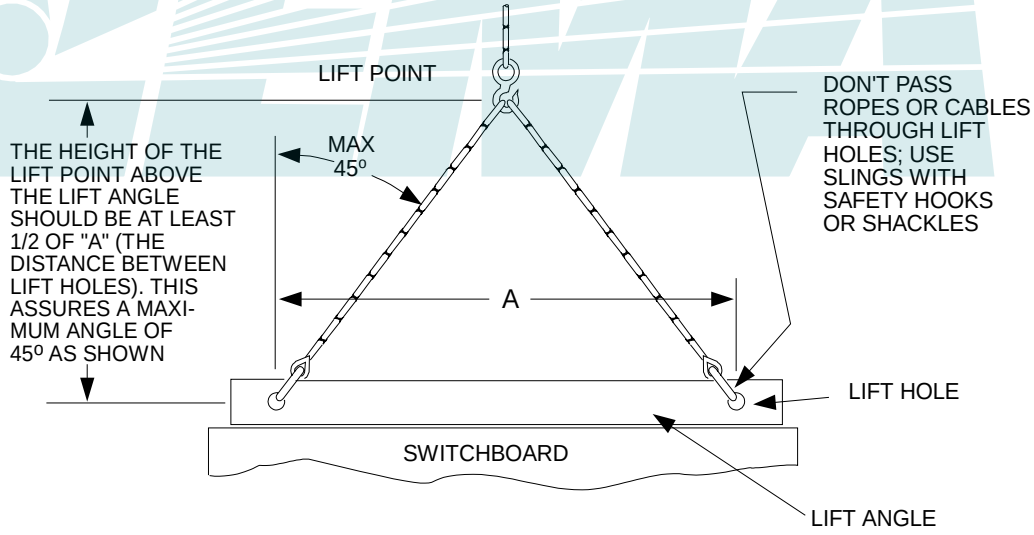

Figure 2-2
LIFTING WITH INTEGRAL LIFT ANGLE

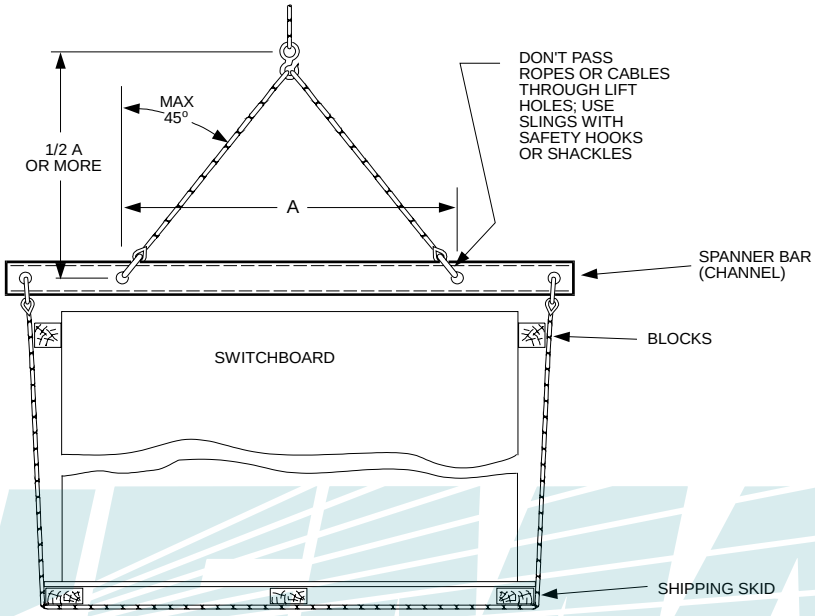

Figure 2-3
LIFTING WITH SLING RIGGING

Section 3
STORAGE

3.1 CLEAN, DRY SPACE HAVING UNIFORM TEMPERATURE

A switchboard that is not installed and energized immediately should be stored in a clean, dry space having a uniform temperature to prevent condensation. Preferably, it should be stored in a heated building having adequate air circulation and protected from dirt, fumes, water, and physical damage.

3.2 PROTECTION FROM WEATHER AND DIRT

It is recommended that switchboards should not be stored outdoors. However, if it must be stored outdoors, cover it securely to provide protection from weather and dirt. Temporary electrical heating should be installed to prevent condensation; approximately 250 watts per section is adequate for the average switchboard size and environment. All loose packing or flammable materials inside the switchboard should be removed before energizing space heaters.

3.3 OUTDOOR SWITCHBOARDS ARE NOT WEATHER RESISTANT UNTIL INSTALLED

Outdoor switchboards are not weather resistant until completely and properly installed and should be treated exactly the same as indoor switchboards until after they are installed.

3.4 UN-ENERGIZED OUTDOOR SWITCHBOARD SHOULD BE KEPT DRY INTERNALLY

An un-energized outdoor switchboard should be kept dry internally by installing temporary heating (see 3.2) or by energizing any self-contained space heaters.

Section 4
INSTALLATION OF SWITCHBOARD OR ENCLOSURE

4.1 MANUFACTURER'S INSTALLATION INSTRUCTIONS

Install the switchboard in a neat and workmanlike manner following the manufacturer's installation instructions, if available.

4.2 LOCATION

Locate the switchboard in the area indicated on the building plans. The switchboard enclosure should be suitable for the environment or protected by other means. Additional precautions may be necessary, during installation, to prevent moisture, water, or other contaminants from entering and accumulating within the enclosures. Clearances or working spaces are as follows:

4.2.1 Clearance from Walls

Clearance from walls (not rear accessible)—minimum of 1/2 inch

4.2.2 Working Clearances

Working clearances vary substantially depending on voltage and specific applications. See Section 110.26 of the *National Electrical Code.*

NOTE—Spaces for working clearances and clearances from walls should not be used for storage. Working spaces should have adequate lighting.

4.3 CHANNEL SILLS

When channel sills are used, they should be embedded in the concrete floor or grouted on the surface. In either case, they should be installed in an aligned position and be level over the entire length prior to installing the switchboard.

4.4 CONDUIT AND OTHER RACEWAYS

Position the switchboard so that the raceway stubs or floor openings are located in the area specified on the manufacturer's drawing. In the absence of drawings, locate the switchboard over the raceways or floor openings so as to provide cable bending space and clearances to energized parts or other obstructions. See Section 408.10 of the *National Electrical Code*.

4.5 LEVELING AND SECURING

Install the switchboard in its final position, progressively leveling each section and bolting the frames together if they are separated. If necessary, secure the switchboard to walls or other supporting surfaces. Security should not depend on wooden plugs driven into holes in masonry, concrete, plaster, or similar materials.

4.6 SPLICE BUS

Connect all through and ground bus at shipping breaks, using the splice bus and hardware supplied with the switchboard. Tighten bolted connections in accordance with the manufacturer's torque specifications. If not furnished, consult the manufacturer.

4.7 GROUNDING AND BONDING

Ground and bond the switchboard as follows:

4.7.1 Grounded Systems

Switchboard used as service equipment for a grounded system or as a main switchboard for a separately derived system.

4.7.1.1 Grounding Electrode System in Switchboard

If the connection for the grounding electrode system is to be in the switchboard, install a grounding electrode conductor sized in accordance with Sections 250.66 or 250.166 of the *National Electrical Code* from the grounding electrode to the switchboard ground bus or ground terminal designated by the manufacturer. See Sections 250.62 and 250.64 of the *National Electrical Code*.

4.7.1.2 Switchboards Used as Service Equipment on Grounded Systems

Switchboards used as service equipment on systems that are grounded at any point are required to have a grounded conductor brought to the switchboard in accordance with Section 250.24(C) of the *National Electrical Code*. This conductor is required even if the switchboard is supplying loads that are only phase-to-phase connected.

4.7.1.3 Installation of Main Bonding Jumper

Unless already done at the factory, install the main bonding jumper from the incoming grounded conductor bus (neutral) to the ground bus or other location designated by the manufacturer.

4.7.1.4 Steps 4.7.1.1 Through 4.7.1.3

Steps 4.7.1.1 through 4.7.1.3 must effectively connect together the grounding electrode, the switchboard frame, all outgoing equipment grounding conductors, and the grounded conductor bus (neutral) of the system on the supply side of any neutral disconnecting link.

4.7.1.5 Neutral Disconnecting Link

Do not connect any grounding conductors to the load side of any neutral disconnecting link or any sensor used for ground fault protection. Do not connect equipment grounding conductors directly to the grounded conductor bus (neutral).

4.7.1.6 Dual Fed Switchboard or System

Where the switchboard or system is dual fed (double-ended) and has ground fault protection, special precautions are necessary to accomplish proper grounding and bonding. Follow the manufacturer's instructions.

4.7.2 Ungrounded Systems—Service Equipment or Separately Derived System Main

4.7.2.1 Conductor Sized in Accordance with *National Electrical Code*

Install a grounding electrode conductor sized in accordance with Sections 250.66 or 250.166 of the *National Electrical Code* from the grounding electrode to the switchboard ground bus or ground terminal designated by the manufacturer. See Sections 250.62 and 250.64 of the *National Electrical Code*. This should effectively connect together the grounding electrode, the switchboard frame, and all outgoing equipment grounding conductors.

4.7.3 Grounded or Ungrounded Systems

Applications other than service equipment or other than main for separately derived systems.

4.7.3.1 Grounding Conductor Size in Accordance with *National Electrical Code*

Ground the switchboard frame and any ground bus by means of an equipment grounding conductor having a size in accordance with Section 250.122 of the *National Electrical Code* and run with the main supply conductors or by bonding to the raceway enclosing the main supply conductors in accordance with Sections 250.118 and 250.120 of the *National Electrical Code*.

4.8 UNUSED OPENINGS

Effectively close all unused openings in the switchboard enclosure.

4.9 DAMP INDOOR LOCATIONS

In damp indoor locations, shield the switchboard so as to prevent moisture and water from entering and accumulating therein.

4.10 UNUSUAL SERVICE CONDITIONS

Unless the switchboard has been designed for unusual service conditions, it should not be located where it will be exposed to ambient temperatures above 40°C (104°F), high humidity, corrosive or explosive fumes, dust, vapors, dripping or standing water, abnormal vibration, mechanical shock, tilting, or other unusual operating conditions.

Section 5
INSTALLATION OF CONDUIT AND CONDUCTORS

5.1 PREVENT MOISTURE OR WATER FROM ENTERING

Conduits and other raceways should be installed to prevent moisture or water from entering and accumulating within the enclosure. All metallic raceways (including stubs) should be bonded to the switchboard. All raceways should be located in the areas recommended by the manufacturer to avoid conductor interference with structural members and live parts. Before pulling any conductors into the switchboard, verify that their size, temperature rating, and conductor insulation comply with the switchboard markings. See Section 110.14(C) of the *National Electrical Code*.

5.2 TEMPERATURE RATINGS

Care should be exercised to ensure that the types and temperature ratings of conductors being installed in the switchboard are suitable for use with the terminals which have been provided.

5.3 COMPRESSION (CRIMP) TERMINALS

If compression (crimp) terminals are used, crimp with the tool(s) recommended by the manufacturer.

5.4 STRIPPING INSULATION FROM CONDUCTORS

Care should be exercised in stripping insulation from the conductors so as not to nick or ring the conductor. For aluminum, clean all oxide from the stripped portion and apply an oxide inhibiting compound. All mechanical terminals should be tightened per the manufacturer's torque specifications. If not furnished, consult the manufacturer.

5.5 PROPER WIRING METHODS

Refer to Article 300 of the *National Electrical Code* for proper wiring methods. Conductors should enter the switchboard in the section in which they are to be terminated, except as noted in Section 408.3(A)(3) of the *National Electrical Code.*

5.6 CONDUCTOR LOCATION IN SWITCHBOARD

Provision should be made to locate conductors in the switchboard so that they will be free from physical damage and to avoid overheating. If required by the manufacturer's instructions, secure the conductors as necessary in order to withstand short-circuit forces. The largest practical bending radii should be maintained to avoid damaging the insulation and causing terminals to loosen. Exercise care so that the conductors will not interfere with any moving parts.

5.7 CONDUCTORS 1/0 AWG IN SIZE AND LARGER

Conductors 1/0 AWG in size and larger may be run in parallel. All parallel conductors should be of the same size, length, and material to assure the equal division of current, as required by Section 310.4 of the *National Electrical Code*. If conductors pass through metal having magnetic properties, all of the circuit conductors, including the neutral, should be run through the same opening, as specified by Section 300.20(A) of the *National Electrical Code*.

5.8 INCOMING AND OUTGOING CONTROL CONNECTIONS

All incoming and outgoing control connections should be made in accordance with the switchboard manufacturer's schematic and wiring diagrams.

5.9 PREVENT CONDUCTOR INSULATION FROM CRACKING OR SPLITTING

Installation of conductors should be done at temperatures above freezing to prevent conductor insulation from cracking or splitting, unless the conductor insulation is suitable for installation at temperatures below freezing.

5.10 *NATIONAL ELECTRICAL CODE*, SECTION 725.54

Refer to the National Electrical Code, Section 725.54 for the separation requirements for conductors of Class 2 and Class 3 remote control, signaling and power-limited circuits.

Section 6
INSTALLATION OF SWITCHBOARD INTERIOR

6.1 INSTRUCTIONS IF SWITCHBOARD INTERIOR WAS NOT FACTORY–MOUNTED

Follow these instructions if the switchboard interior(s) was not mounted at the factory.

6.2 UNPACKING

Exercise care in unpacking the switchboard interior to prevent damage.

6.3 INSPECTION

Check for shipping damage and check to make sure the interior is the correct one for the installation.

6.4 STORAGE

Store the switchboard interior in a clean dry place where it will not be subject to physical damage.

6.5 CLEANING

Clean the switchboard enclosure of all foreign material prior to the installation of the interior. If parts at connection points are splattered with cement, plaster, paint, or other foreign material, remove the foreign material with great care to avoid damage to the plating.

CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the switchboard manufacturer before using these products to clean, dry, or lubricate switchboard components during installation or maintenance.

6.6 MANUFACTURER'S INSTRUCTIONS

Carefully follow the switchboard manufacturer's instructions.

6.7 INTERIOR INSTALLATION

Install the interior and tighten it securely in the enclosure. Install the section bus connection to the through bus, if needed.

Section 7
STEPS TO BE TAKEN BEFORE ENERGIZING

7.1 ACCESSIBLE ELECTRICAL CONNECTIONS

Tighten all accessible electrical connections to the manufacturer's torque specifications. If such information is not provided with the equipment, consult the manufacturer.

7.2 BLOCKS OR OTHER TEMPORARY HOLDING MEANS

Remove all blocks or other temporary holding means used for shipment from all component devices and the switchboard interior.

7.3 INTEGRITY OF ALL BUS MOUNTING MEANS

Check the integrity of all bus mounting means.

7.4 ENCLOSURE

Check the enclosure to see that it has not been damaged in such a manner as to reduce electrical spacings.

7.5 OPERATING MECHANISMS

Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain that they operate freely.
Check the integrity of all electrical and mechanical interlocks and padlocking mechanisms. For key interlocked systems, assure that only the required number of keys are accessible to the operator

7.6 ELECTRICAL INSULATION RESISTANCE TEST

Conduct an electrical insulation resistance test to ensure that the switchboard is free from short circuit or ground fault conditions. With the neutral isolated from ground and the switches and circuit breakers open, conduct electrical insulation resistance tests from phase to phase, phase to ground, phase to neutral, and neutral to ground. If the resistance reads less than 1 megohm while testing with the branch circuit devices in the open position, the system may be unsafe and should be investigated. If after the investigation and possible corrections, low readings are still observed, the manufacturer should be contacted. Some electronic equipment (metering, TVSS, etc.) may be damaged by this testing. Refer to the manufacturer's equipment markings for guidelines.

7.7 ELECTRICAL RELAYS, METERS, AND INSTRUMENTATION

Check electrical relays, meters, and instrumentation to determine that connections are made properly and that the devices function properly.

7.8 ELECTRICALLY OPERATED SWITCHES, CIRCUIT BREAKERS, AND OTHER MECHANISMS

With loads disconnected, electrically exercise all electrically operated switches, circuit breakers, and other mechanisms to determine that the devices operate properly. An auxiliary source of control power may be necessary to provide power to the electrical operators.

7.9 GROUND FAULT PROTECTION SYSTEM

Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions. See Section 230.95 of the *National Electrical Code* and NEMA Standards Publication PB 2.2.

7.10 ADJUSTABLE TIME CURRENT TRIP DEVICE SETTINGS

Set any adjustable time current trip device settings to the proper values.

NOTE—Experience has indicated that damage from overcurrent can be reduced if the devices used for overload and short-circuit protection are set to operate instantaneously (that is, without intentional time delay) at 115 percent of the highest value of phase current which is likely to occur as the result of any anticipated motor starting or welding currents.

7.11 FIELD WIRING

Make certain that field wiring is clear of live parts and, when specified by the manufacturer, physically secured to withstand the effects of short circuits.

7.12 GROUNDING CONNECTIONS

Check to determine that all grounding connections are properly made. If the switchboard is used as service equipment, make certain that the neutral, if present, is properly bonded to the cabinet. If there is no ground bus, make certain that the sections of the switchboard which are shipped separately are connected in such a way as to ensure a continuous grounding path.

7.13 FOREIGN MATERIAL

Remove all foreign material from the inside of the switchboard before closing the enclosure.

7.14 COVERS AND DOORS

Install covers, close doors, and make certain that no conductors are pinched and that all enclosure parts are properly aligned and tightened.

Section 8
ENERGIZING EQUIPMENT

WARNING—HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ENERGIZING A SWITCHBOARD FOR THE FIRST TIME AFTER INITIAL INSTALLATION OR MAINTENANCE IS POTENTIALLY DANGEROUS.

8.1 QUALIFIED PERSONNEL PRESENT

Only qualified personnel should energize equipment for the first time. If short circuit conditions caused by damage or poor installation practices have not been detected in the checkout procedure specified in Section 7, serious personal injury and damage can occur when the power is turned on.

8.2 NO LOAD ON SWITCHBOARD

There should be no load on the switchboard while it is being energized. Turn off all the downstream loads.

8.3 ENERGIZED IN SEQUENCE

The equipment should be energized in sequence by starting at the source end of the system and working towards the load end. In other words, energize the main devices, then the feeder devices, and then the branch-circuit devices. Turn the devices on with a firm positive motion.

8.4 AFTER ALL MAIN, FEEDER, AND BRANCH CIRCUIT DEVICES HAVE BEEN CLOSED

After all main, feeder, and branch circuit devices have been closed, loads such as lighting circuits, contactors, heaters, and motors may be turned on.

Section 9
MAINTENANCE

9.1 MAINTENANCE PROGRAM FOR SWITCHBOARDS

A maintenance program for switchboards should be conducted on a regularly scheduled basis in accordance with the following:

9.2 FIELD TEST

A switchboard which has been carrying its regular load for at least 3 hours just prior to inspection should be field tested by feeling the deadfront surfaces of circuit breakers, switches, interior trims, doors, and enclosure sides with the palm of the hand. If the temperature of these surfaces does not permit you to maintain contact for at least 3 seconds, this may be an indication of trouble and investigation is necessary. Thermographic (infrared) scanning has become a useful method of investigating thermal performance.

WARNING—HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. UNLESS OTHERWISE SPECIFIED, INSPECTION AND MAINTENANCE SHOULD ONLY BE PERFORMED ON SWITCHBOARDS TO WHICH POWER HAS BEEN TURNED OFF, DISCONNECTED AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER'S WARNINGS AND INSTRUCTIONS.

Safety related work practices, as described in NFPA 70E, should be followed at all times.

CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the switchboard manufacturer before using these products to clean, dry, or lubricate switchboard components during installation or maintenance.

9.3 SWITCHBOARD INSPECTION ONCE EACH YEAR

Inspect the switchboard once each year or after any severe short circuit.

9.4 ACCUMULATION OF DUST AND DIRT

If there is an accumulation of dust and dirt, clean out the switchboard by using a brush, vacuum cleaner, or clean lint-free rags. Avoid blowing dust into circuit breakers or other components. Do not use a blower or compressed air.

9.4.1 All Visible Electrical Joints and Terminals

Carefully inspect all visible electrical joints and terminals in the bus and wiring system.

9.4.2 All Conductors and Connections

Visually check all conductors and connections to be certain that they are clean and secure. Loose and/or contaminated connections increase electrical resistance which can cause overheating. Such overheating is indicated by discoloration or flaking of insulation and/or metal parts. Pitting or melting of connecting surfaces is a sign of arcing due to a loose, or otherwise poor connection. Parts which show evidence of overheating or looseness should be cleaned and re-torqued or replaced if damaged. Tighten bolts and nuts at bus joints to manufacturer's torque specifications.

CAUTION—Do not remove plating from aluminum parts in joints or terminations. Damage to plating can result in overheating. Replace damaged aluminum parts.

9.4.3 Fuse Clip Contact Pressure and Contact Means

Examine fuse clip contact pressure and contact means. If there is any sign of overheating or looseness follow the manufacturer's maintenance instructions or replace the fuse clips. Loose fuse clips can result in overheating.

9.4.4 All Conditions Which Caused Overheating

Be sure that all conditions which caused the overheating have been corrected.

9.5 PROPER AMPERE, VOLTAGE, AND INTERRUPTING RATINGS

Check circuit breakers, switches, and fuses to ensure they have the proper ampere, voltage, and interrupting ratings. Ensure that non-current-limiting devices are not used as replacements for current-limiting devices. Never attempt to defeat rejection mechanisms which are provided to prevent the installation of the incorrect class of fuse.

9.5.1 All Mechanisms Are Free and in Proper Working Order

Operate each switch or circuit breaker several times to ensure that all mechanisms are free and in proper working order. Replace as required. See NEMA AB 4 for maintenance of molded case circuit breakers.

9.6 OPERATION OF ALL MECHANICAL COMPONENTS

Check the operation of all mechanical components. Replace as required.

9.6.1 Full On and Off Positions

Exercise switch operating mechanisms and external operators for circuit breakers to determine that they operate freely to their full on and off positions.

9.6.2 Integrity of Electrical and Mechanical Interlocks

Check the integrity of all electrical and mechanical interlocks and padlocking mechanisms. For key interlocked systems, assure that only the required number of keys are accessible to the operator.

9.6.3 Missing or Broken Parts

Whenever practical, check all devices for missing or broken parts, proper spring tension, free movement, corrosion, dirt, and excessive wear.

9.6.4 Manufacturer's Instructions

Adjust, clean, and lubricate or replace parts according to the manufacturer's instructions.

9.6.4.1 Clean, Nonmetallic, Light, Grease or Oil

Use clean, nonmetallic, light grease or oil as instructed.

9.6.4.2 Molded Case Circuit Breakers

Do not oil or grease parts of molded case circuit breakers.

9.6.4.3 Lubrication with Clean, Light Grease

If no instructions are given on the devices, sliding copper contacts, operating mechanisms, and interlocks, they may be lubricated with clean, light grease.

9.6.4.4 Excess Lubrication

Wipe off excess lubrication to avoid contamination.

CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the switchboard manufacturer before using these products to clean, dry, or lubricate switchboard components during installation or maintenance.

9.6.5 Readily Accessible Copper Electrical Contacts, Blades, and Jaws

Clean and dress readily accessible copper electrical contacts, blades, and jaws according to the manufacturer's instructions when inspection indicates the need.

9.7 DETERIORATED INSULATING MATERIAL AND ASSEMBLIES

Look for and replace deteriorated insulating material and assemblies where sealing compounds have melted.

9.8 MOISTURE OR SIGNS OF PREVIOUS WETNESS

Look for any moisture or signs of previous wetness or dripping inside the switchboard.

NOTE—Condensation in conduits or dripping from outside sources is one known cause of switchboard malfunction.

9.8.1 Conduits Which Have Dripped Condensate

Seal off any conduits which have dripped condensate, and provide means for further condensate to drain away from the switchboard.

9.8.2 Cracks or Openings

Seal off any cracks or openings which have allowed moisture to enter the enclosure. Eliminate the source of any dripping on the enclosure and any other source of moisture.

9.8.3 Insulating Material Which is Damp

Replace or thoroughly dry and clean any insulating material which is damp or wet or shows an accumulation of deposited material from previous wettings.

9.8.4 Moisture Damaged Component Device

Inspect all component devices. Replace any component device which shows evidence of moisture damage or has been subjected to water damage or flooding. Additional information may be found in the NEMA document *Guidelines for Handling Water Damaged Electrical Equipment*.

9.9 WATER DAMAGE

In the event of water damage, e.g., flooding or sprinkler discharge, the manufacturer should be consulted before clean up and corrective action is attempted.

9.10 SEVERE ELECTRICAL SHORT CIRCUIT

If a severe electrical short circuit has occurred, the excessive currents may have resulted in structural component and/or bus and conductor damage due to mechanical distortion, thermal damage, metal deposits, or smoke. Examine all devices and bus supports for cracks or breakage. The manufacturer should be consulted before clean up and correction is attempted.

9.11 GROUND FAULT PROTECTION SYSTEM

Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions. See Section 230.95 of the *National Electrical Code* and NEMA Standards Publication PB 2.2.

9.12 INSULATION RESISTANCE

Check insulation resistance (See 7.6) under any of the following conditions:

a. If a severe short circuit has occurred. (See 9.10)
b. If it has been necessary to replace parts or clean insulating surfaces
c. If the switchboard has been exposed to high humidity, condensation, or dripping moisture.

Section 10
PERMISSIBLE LOADING OF SWITCHBOARDS

10.1 SWITCHBOARDS WITHOUT MAIN OVERCURRENT PROTECTIVE DEVICES

For switchboards without main overcurrent protective devices (main lug switchboard), the total continuous load current through the supply bus should not exceed the current rating of the switchboard.

10.2 SWITCHBOARDS WITH A SINGLE MAIN OVERCURRENT PROTECTIVE DEVICE

For switchboards with a single main overcurrent protective device, the total continuous load current on the protective device should not exceed 80 percent of its ampere rating unless the device is rated to carry 100 percent of its ampere rating.

10.3 SWITCHBOARDS WITH A MULTIPLE MAIN OVERCURRENT PROTECTIVE DEVICE

For switchboards with a multiple main overcurrent protective devices, the total continuous current through the supply bus should not exceed the current rating of the switchboard. The total continuous load current on each main overcurrent protective device should not exceed 80 percent of its ampere rating unless the device is rated to carry 100 percent of its ampere rating.

10.4 FEEDER AND BRANCH CIRCUIT OVERCURRENT PROTECTIVE DEVICES IN SWITCHBOARDS

For feeder and branch circuit overcurrent protective devices in switchboards, the total continuous load current on the overcurrent protective device should not exceed 80 percent of its ampere rating unless the device is rated to carry 100 percent of its ampere rating.

10.5 HARMONICS IN THE ELECTRICAL SYSTEM

Some types of electrical equipment cause harmonics in the electrical system which may result in overheating. This condition should be considered when determining switchboard loading.

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Replaces / Reemplaza / Remplace 8291-0068C 10/2010

SDSA3650 Surge Protective Device (SPD)
Dispositivo de protección contra sobretensiones transitorias (SPD) SDSA3650
Dispositif de protection contre les surtensions transitoires (SPD) SDSA3650

SDSA3650

SDSA3650D

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

Introduction

The SDSA3650 Surge Protective Device (SPD) is designed to provide surge suppression for three-phase services up to 600 Vac, including delta (SDSA3650D).

Introducción

El dispositivo de protección contra sobretensiones transitorias SDSA3650 ha sido diseñado para proporcionar supresión de sobretensiones a acometidas de tres fases hasta un máximo de 600 V~, incluyendo los sistemas en delta (SDSA3650D).

Introduction

Le dispositif de protection contre les surtensions transitoires SDSA3650 est conçu pour fournir la suppression des surtensions transitoires pour des services triphasés jusqu'à 600 V~, y compris le dispositif en triangle (SDSA3650D).

Precautions

Precauciones

Précautions

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA y NOM-029-STPS.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.
- Este equipo deberá estar correctamente conectado a tierra de acuerdo con los códigos aplicables. Utilice un conductor de conexión a tierra del equipo para conectar este último a la tierra del sistema de alimentación.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez toutes les alimentations de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.
- Cet appareil doit être effectivement mis à la terre selon tous les codes en vigueur. Utilisez un conducteur de m.à.l.t. d'appareil pour raccorder celui-ci à la terre du système d'alimentation.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

CAUTION / PRECAUCIÓN / ATTENTION

LOSS OF SURGE SUPPRESSION Turn off all power supplying the equipment and isolate the Surge Protective Device before Megger® or hi-potential testing. **Failure to follow these instructions can result in equipment damage.**	**PÉRDIDA DE SUPRESIÓN DE SOBRETENSIONES TRANSITORIAS** Desenergice el equipo y aísle el dispositivo de protección contra sobretensiones transitorias antes de realizar cualquier prueba de rigidez dieléctrica o con Megger®. **El incumplimiento de estas instrucciones puede causar daño al equipo.**	**PERTE DE LA SUPPRESSION DES SURTENSIONS TRANSITOIRES** Coupez toute alimentation de cet appareil et isolez le dispositif de protection contre les surtensions transitoires avant de procéder à l'essai de rupture diélectrique ou avec Megger®. **Si ces directives ne sont pas respectées, cela peut entraîner des dommages matériels.**

Table / Tabla / Tableau 1 : General Specifications / Especificaciones generales / Spécifications générales [1] [2]

Description / Descripción / Description	Wye / Conexión en estrella / Raccordement en étoile		Delta / Conexión en delta / Raccordement en triangle
Product Catalog Number / No. de catálogo del producto / Nº de catalogue de produit	SDSA3650	SDSA3650E	SDSA3650D
Maximum Surge Current / Corriente transitoria máx. / Courant max. de surtension	40 kA/Phase / 40 kA/fase / 40 kA/phase		
System Voltage (U_o) / Tensión del sistema (U_o) / Tension du système (U_o)	208Y/120 V, 380Y/220 V, 400Y/230 V, 480Y/277 V, 600Y/347 V		240 V, 480 V, 600 V, 240/120 V High-Leg Delta / extremo alto de una instalación en delta / sommet du triangle
Maximum Continuous Operating Voltage (MCOV), (U_c) / Tensión máxima de funcionamiento continuo (MCOV), (U_c) / Tension de fonctionnement continu maximale (MCOV), (U_c)	L-N 750 V, L-L 1500 V		L-L 1500 V
Connection Method / Método de conexión / Méthode de raccordement	Parallel, 12 AWG Wire / Conductor sólido calibre 3,31 mm^2 (12 AWG), paralelo / En parallèle, fil rigide de calibre 12 AWG		
Lead Length / Longitud de los conductores / Longueur des conducteurs	20 ±1 in. / pulg / po	36 ±1 in. / pulg / po	20 ±1 in. / pulg / po
Operating and Storage Temperature / Temperatura de funcionamiento y almacenamiento / Température de fonctionnement et d'entreposage	-40 °F to +160 °F (-40 °C to +70 °C) / -40 °C a +70 °C (-40 °F a +160 °F) / -40 °C a +70 °C (-40 °F a +160 °F)		
Frequency / Frecuencia / Fréquence	50/60 Hz		
Diagnostics / Diagnóstico / Diagnostics	Green Status LEDs / LED de estado verde / DÉL d'état verte		

[1] Contains no serviceable parts / Contiene piezas libres de mantenimiento / Ne contient aucune pièce à réparer ou entretenir

[2] Suitable for use on a circuit capable of delivering not more than 200 kA rms symmetrical amperes. / Se puede usar en un circuito capaz de suministrar no más de 200 kA simétricos rcm. / Convient à un circuit capable de fournir pas plus de 200 kA RMS symétriques.

Installation

1. Turn off all power supplying this equipment before working on or inside equipment.
2. For mounting, see Figure 1.
3. Confirm SPD is rated for the system by comparing voltage measurements to the Line Voltage (L-L, L-N) on the product label (see Figure 2).
4. Confirm the black wires are connected to the line wires and the neutral wire is connected to the white wire (see Figure 2).

   NOTE: Delta model SDSA3650D does not include or require a white wire.
5. Twist wires 1/2 turn every 12 in. (30 cm) of length.
6. Keep conductor length as short as possible with no sharp bends.

   NOTE: Do not loop or coil wires.
7. Install cover and/or close door on equipment.

Instalación

1. Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
2. Para obtener detalles de montaje, vea la figura 1.
3. Asegúrese de que el SPD sea adecuado para su sistema comparando las mediciones de tensión en la tensión de línea (L-L, L-N), especificadas en la etiqueta del producto (vea la figura 2).
4. Asegúrese de que los conductores negros estén conectados a los conductores de línea y el conductor blanco al conductor neutro (vea la figura 2).

   NOTA: El modelo SDSA3650D en delta no incluye ni requiere conductor blanco.
5. Tuerza los conductores ½ vuelta o más por cada 305 mm (12 pulgadas) de longitud.
6. Mantenga la longitud de los conductores lo más corta posible evitando doblarlos en ángulo recto.

   NOTA: No haga bucles o enrolle los cables.
7. Instale la cubierta y/o cierre la puerta del equipo.

Installation

1. Couper toutes les alimentations de l'appareil avant d'y travailler.
2. Pour le montage voir la figure 1.
3. S'assurer que le SPD est de la valeur nominale convenant à votre système en comparant les mesures de tension à la tension de ligne (L-L, L-N) sur l'étiquette du produit (voir la figure 2).
4. S'assurer que les fils noirs sont raccordés aux fils de ligne et que le fil blanc est raccordé au fil du neutre (voir la figure 2).

   REMARQUE : Le modèle SDSA3650D en triangle (delta) n'inclut pas ou n'exige pas un fil blanc.
5. Torsader les conducteurs de 1/2 tour ou plus par 305 mm (12 po) de longueur.
6. Maintenir la longueur des conducteurs aussi courte que possible et sans courbures accentuées.

   REMARQUE : Ne pas faire de boucles et ne pas enrouler les fils.
7. Installer le couvercle ou fermer la porte de l'appareil.

Figure / Figura / Figure 1 : Mounting and Wiring / Montaje y alambrado / Montage et câblage

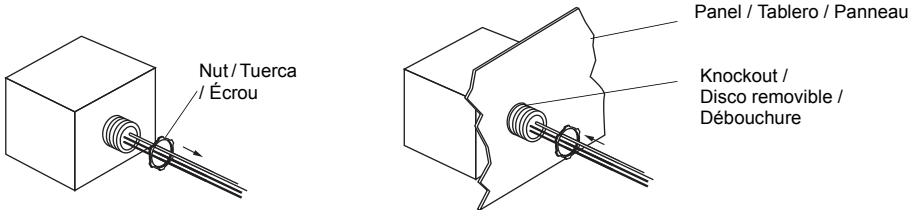
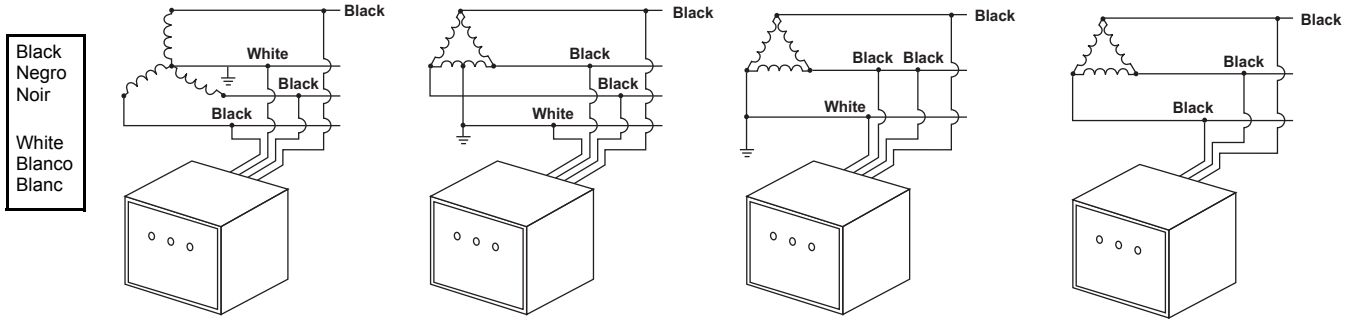


Figure / Figura / Figure 2 : Wiring / Alambrado / Câblage



SDSA3650/SDSA3650E

3-phase, 4-wire
208Y/120 Vac, or 480Y/277 Vac, or 600Y/347 Vac

3 fases, 4 hilos de 208Y/120 V~ (ca), o 480Y/277 V~ (ca) o 600/347 V~ (ca)

Triphasé à 4-fils de 208Y/120 Vca, ou 480Y/277 Vca, ou 600Y/347 Vca

SDSA3650/SDSA3650E

3-phase, 4-wire 240/120 Vac High-Leg Delta

3 fases, 4 hilos de 240/120 V~ (ca) extremo alto de una instalación en delta

Triphasé à 4-fils 240/120 Vca sommet du triangle

SDSA3650/SDSA3650E

3-phase, 4-wire (corner grounded)
240 Vac, or 480 Vac, or 600 Vac

3 fases, 4 hilos (puesto a tierra en esquina) de 240 V~ (ca), o 480 V~ (ca), o 600 V~ (ca)

Triphasé à 4-fils (mis à la terre par le coin) 240 Vca, ou 480 Vca, ou 600 Vca

SDSA3650D

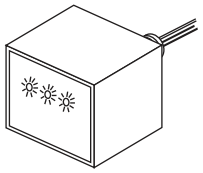
3-phase, 3-wire (ungrounded)
240 Vac, or 480 Vac, or 600 Vac

3 fases, 3 hilos (sin conexión a tierra) de 240 V~ (ca), o 480 V~ (ca), o 600 V~ (ca)

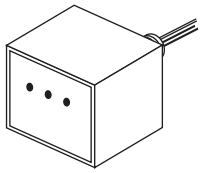
Triphasé à 3-fils (non mis à la terre) 240 Vca, ou 480 Vca, ou 600 Vca

For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

Figure / Figura / Figure 3 : Diagnostic Operation / Diagnóstico del funcionamiento del equipo / Diagnostic de fonctionnement



LED ON = OK /
LED ENCENDIDO = funcionamiento normal /
DÉL ALLUMÉE = OK



LED OFF = Loss of surge suppression /
LED APAGADO = pérdida de supresión de sobretensiones transitorias /
DÉL ÉTEINTE = Perte de suppression des surtensions transitoires /

- **LED ON** = Normal Operation
- **LED OFF** = Check circuit breakers and connections. Verify line voltage at point of connection; if all correct, replace unit.

- **LED ENCENDIDO** = funcionamiento normal
- **LED APAGADO** = Revise los interruptores automáticos y las conexiones. Verifique la tensión de línea en el punto de conexión; si todo se encuentra en órden, sustituya el SPD.

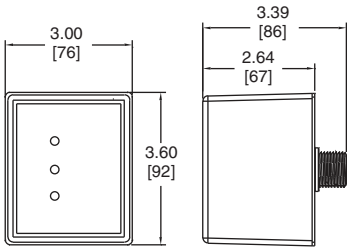
- **DÉL ALLUMÉE** = Fonctionnement normal
- **DÉL ÉTEINTE** = Vérifier les disjoncteurs et les raccordements. Vérifier la tension de ligne au point de raccordement; si tout est correct, remplacer le SPD.

Dimensions

Dimensiones

Dimensions

Figure / Figura / Figure 4 : Dimensions / Dimensiones / Dimensions



in. / pulg / po
[mm]

NOTE: Knockout trade size is 0.5 in. (13 mm). Actual hole size is 0.875 in. (22 mm).

NOTA: El tamaño estándar del disco desprendible es de 13 mm (0,5 pulg). El tamaño real del agujero es de 22 mm (0,875 pulg).

REMARQUE: La taille commerciale des débouchures est de 13 mm (0,5 po). Taille réelle du trou : 22 mm [0,875 po].

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For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

PowerLogic™ Series 800 Power Meter
Installation Guide
63230-500-282A1

English

Safety Precautions

Read and follow all safety precautions and instructions before installing and working with this equipment.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. In the USA, see NFPA 70E.
- Only qualified electrical workers should install this equipment. Such work should be performed only after reading this entire set of instructions.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Turn off all power supplying the power meter and the equipment in which it is installed before working on it.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Before closing all covers and doors, carefully inspect the work area for tools and objects that may have been left inside the equipment.
- Use caution while removing or installing panels so that they do not extend into the energized bus; avoid handling the panels, which could cause personal injury.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- NEVER bypass external fusing.
- NEVER short the secondary of a PT.
- NEVER open circuit a CT; use a shorting block to short circuit the leads of the CT before removing the connection from the power meter.
- Before performing Dielectric (Hi-Pot) or Megger testing on any equipment in which the power meter is installed, disconnect all input and output wires to the power meter. High voltage testing may damage electronic components contained in the power meter.
- The power meter should be installed in a suitable electrical enclosure.

Failure to follow this instruction will result in death or serious injury

Additional Resources

The Series 800 Power Meter User Guide provides additional information and is available online. Go to http://www.schneider-electric.com > in the Search window enter **PM800** > in the drop-down box click **PM800 -** Power meter > On **PM800** screen, click the **Downloads** tab, then click the **Tech publications** tab > click on the document name to download or read the document file. Firmware updates can also be downloaded at this Web site.

Introduction

The Series 800 Power Meter ships in three different configurations. The following icons are used in this document to highlight features specific to each of these configurations:

- **I** — Power meter with integrated display
- **U** — Power meter unit only
- **RD** — Power meter unit with remote display

Box Contents

Table 1: Box contents based on model

Model Description	Box Contents
I U RD	• 1 power meter • 1 hardware kit (63230-500-16) containing: — 4 connectors — 9 lugs — 2 mounting clips — 1 terminator (MCT2W) — 1 template • 1 installation guide
I Additionally includes:	• 1 display integrated with the power meter (PM8D(MG))
RD Additionally includes:	• 1 remote display (63230-500-120(MG)) • 1 remote display adapter (PM8RDA) • 1 hardware kit (63230-500-96) containing: — 1 communications cable (CAB3M) — 4 screws — 2 display retainers • 1 hardware kit (633230-500-163): — 1 4-wire RS485 Comm 2 connector — 1 crimp connector • 1 DIN slide (installed on unit) • 1 remote display installation guide
U Additionally includes:	• 1 DIN slide (installed on unit)

Power Meter Hardware

Figure 1: Series 800 Power Meter with integrated display

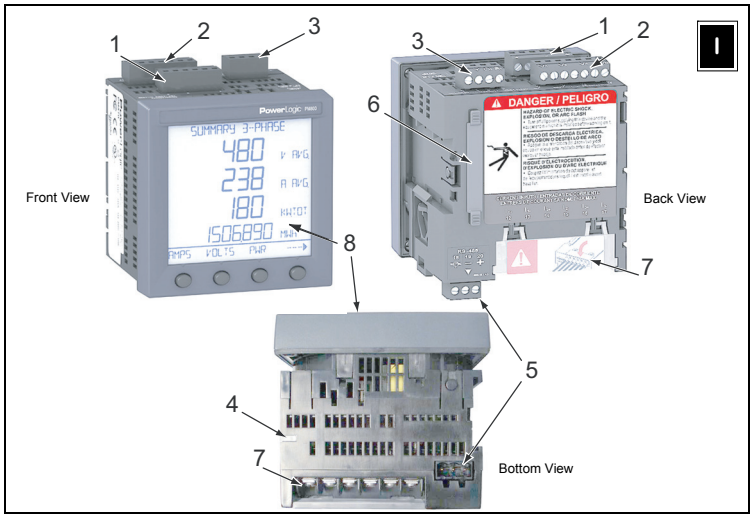


Table 2: Parts of the power meter with integrated display

No.	Part	Description
1	Control power supply connector	Connection for control power to the power meter.
2	Voltage inputs	Voltage metering connections.
3	I/O connector	KY pulse output/digital input connections.
4	Heartbeat LED	A green flashing LED indicates the power meter is ON.
5	RS485 port (COM1)	The RS485 port is used for communications with a monitoring and control system. This port can be daisy-chained to multiple devices.
6	Option module connector	Used to connect option modules to the power meter.
7	Current inputs	Current metering connections.
8	Integrated display	Visual interface to configure and operate the power meter.

Figure 2: Series 800 Power Meter without display

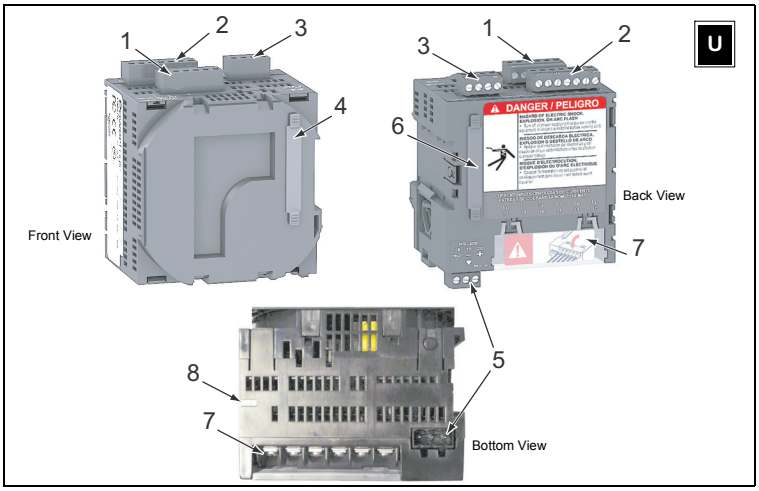


Table 3: Parts of the Power Meter without display

No.	Part	Description
1	Control power supply connector	Connection for control power to the power meter.
2	Voltage inputs	Voltage metering connections.
3	I/O connector	KY pulse output/digital input connections.
4	Display connector	Used to connect an integrated display or a Remote Display Adapter (PM8RDA).
5	RS485 port (COM1)	The RS485 port is used for communications with a monitoring and control system. This port can be daisy-chained to multiple devices.
6	Option module connector	Used to connect option modules to the power meter.
7	Current inputs	Current metering connections.
8	Heartbeat LED	A green flashing LED indicates the power meter is ON.

Figure 3: Series 800 Power Meter with Remote Display and Adapter

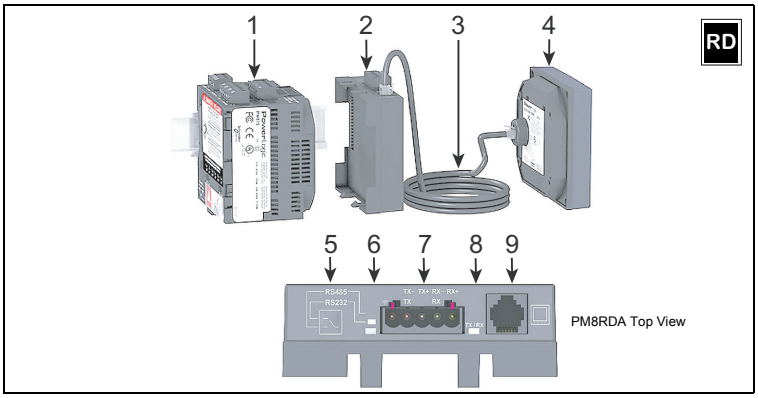


Table 4: Parts of the Power Meter with Remote Display and Adapter (see Figure 2 for connector detail)

No.	Part	Description
1	Power meter unit	
2	Remote display adapter (PM8RDA)	Provides the connection between the remote display and the power meter, and provides an additional RS232/ RS485 connection (2- or 4-wire).
3	Remote display cable	Connects the remote display to the remote display adapter (meter).
4	Remote display	Visual interface to configure and operate the power meter.
5	Communications mode button	Use to select the communications mode (RS232 or RS485).
6	Communications mode LED	When lit, the LED indicates the communications port is in RS232 mode.
7	RS232/RS485 port	The RS485 port is used for communications with a monitoring and control system. This port can be daisy-chained to multiple devices.
8	Tx/Rx Activity LED	The LED flashes to indicate communications activity.
9	Remote display connector	Connects the remote display to the remote display adapter (meter).

Installation

I U RD Installation Considerations

When choosing a mounting location, consider the following points:

- Allow for easy access to all parts of the power meter. Allow extra space for wiring, fuse disconnects, shorting blocks, accessories, or other components. Make sure to route the wires so they do not cover the back of the unit or cooling vents on the power meter.
- Install the power meter in a protective enclosure (for example, in the USA use a Type 1 rated enclosure or better).
- For European Community (CE) compliance, the disconnect circuit breaker must be placed within reach of the power meter and labeled: **Disconnect Circuit Breaker for Power Meter**.
  NOTE: The disconnect circuit breaker must be rated for the short circuit current at the connection points.

CAUTION

IMPROPER VENTILATION

- Mount the power meter only as described in this document.
- Provide clearances around the power meter as illustrated in Figure 4, Figure 5, and Figure 6.

Failure to follow this instruction can result in equipment damage.

- Locate the power meter in an area where immediate environmental conditions fall within the acceptable range. For control power voltages above 300 Vac, the temperature range for the meter block is -25°C to +65°C. The front display has a range of -10°C to +50°C.

Wire Specifications

Voltage inputs up to 600 Vac L-L / 347 Vac L-N and control power up to 415 Vac / 250 Vdc complies with metering category III (refer to online documentation for detailed specs). Also, terminal wiring insulation should have a minimum temperature rating of 80°C. Polarity marks (■) must be followed as shown for CTs and PTs.

Dimensions and Mounting

I Power Meter with Integrated Display

Figure 4: Power meter with integrated display dimensions

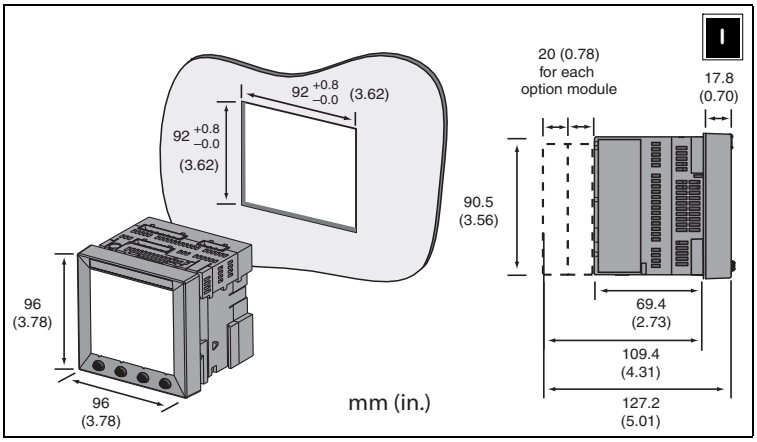


Figure 5: Clearances for mounting a single power meter

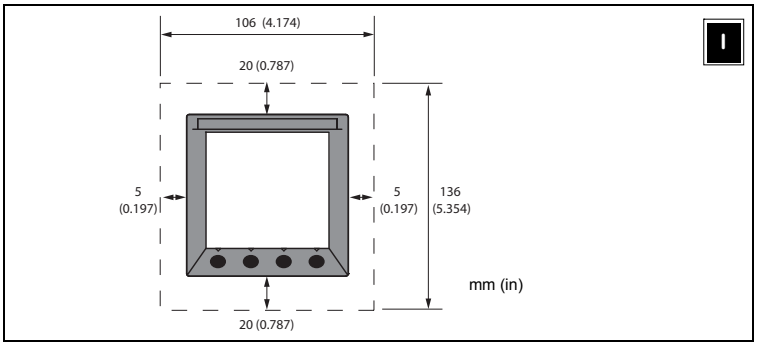


Figure 6: Clearances for mounting multiple power meters

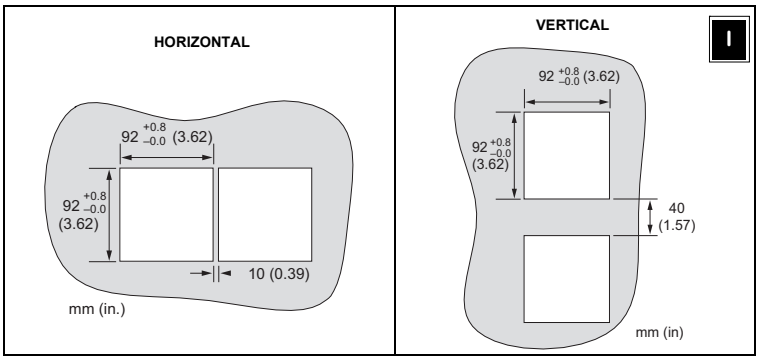
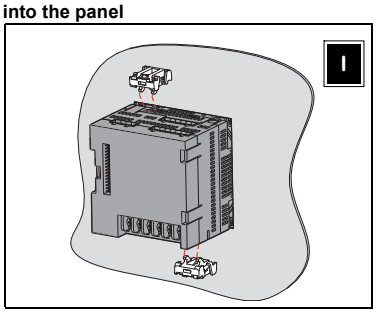
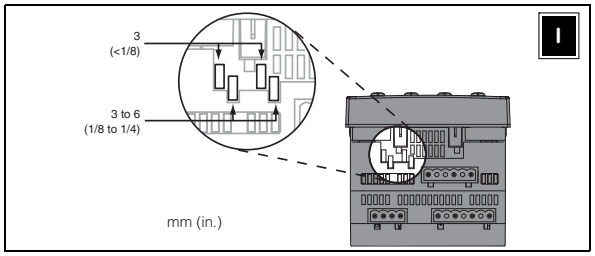


Figure 7: Mounting the power meter into the panel

1. Using the template included with the power meter, make a square cutout 92 mm x 92 mm (3.62 in. x 3.62 in.).
2. Insert the power meter through the cutout.
3. Attach the two mounting clips to the power meter as shown.
   There are two sets of mounting slots. The first set is for installation locations thinner than 3 mm (1/8 in.); the second is for installation locations 3 to 6 mm (1/8 to 1/4 in.).

NOTE: Use on a flat surface of a protective enclosure (for example, in the USA use a Type 1 rated enclosure or better).





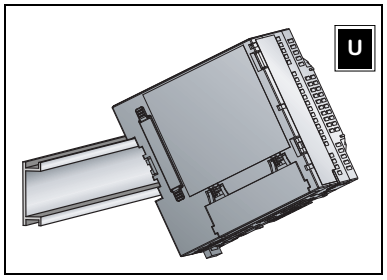
Power Meter Without Display

U DIN Rail Mounting

Figure 8: DIN Rail Mounting

1. Refer to the section on Installation Considerations.
2. Place the power meter so that the slot in the base rests on one edge of the 35 mm DIN rail, and snap it securely into place.

NOTE: DIN rail mounting is used to install power meters that do not include an integrated display.



RD Power Meter With Remote Display

The PM8XXRD ships with a remote display and a remote display adapter (PM8RDA) already installed (see Figure 3). For detailed mounting instructions, refer to the installation guide that ships with the remote display models. To mount, do the following:

1. Place the power meter unit behind the round or square cutout (see Figures 9 and 11).
2. Position the remote display on the front of the panel and attach the two retainers and screws (see Figures 9 and 11).
   NOTE: If you have a 4-inch diameter cutout, you will need the PM8G mounting adapter.
3. Mount the assembled power meter unit, the PM8RD, and option modules (see Figure 10).
4. Use the remote display cable to connect the PM8RDA to the remote display.

PM8XXU models can be used with a remote display kit (PM8RD). *The power meter units of the remote display models mount on a DIN rail as shown in Figure 10. The power meter units are exactly the same in the RD, U, and I models.*

CAUTION

ESD-SENSITIVE EQUIPMENT

You must ground yourself and discharge any static charge before removing or attaching the display.

Failure to follow this instruction can result in equipment damage.

I RD Replacing Analog Meters

You can replace an analog meter using a PM800 with an integrated display or a PM800 with a remote display.

To replace an analog meter with an integrated display model, complete the following steps:

1. Remove the original meter. Refer to the meter's documentation for instructions.
   NOTE: After removing the original meter, if you have a 4-inch diameter cutout, you will need the PM8G mounting adapter.
2. Ground yourself and discharge any static charge.
3. If you have a PM800 with Integrated Display, remove the display from the power meter.
   a. Insert a screwdriver into the engraved slot of one of the clips on the display.
   b. Gently, but firmly, pull the screwdriver towards the front of the power meter display until the clip releases. Be sure to hold the display to keep the clip from reattaching.
   c. Repeat steps 3a and 3b to release the adjacent clip and the clips on the other side.
   d. Gently pull the display off of the power meter.
4. Place the power meter behind the round cut-out.
5. Replace the display onto the power meter through the cut-out. The clips on the top and bottom of the display will securely snap into place.
6. Attach the two mounting clips to the power meter (see Figure 7).
7. If you have a PM800 with Remote Display, refer to the product's installation guide, and see also the previous section titled, Power Meter With Remote Display.

Figure 9: Replacing analog meters with PM800 Remote Display models

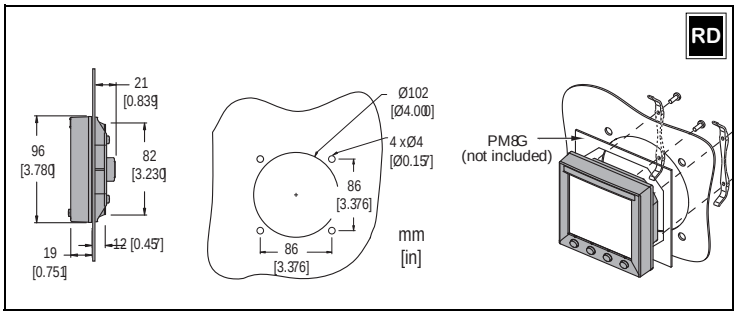
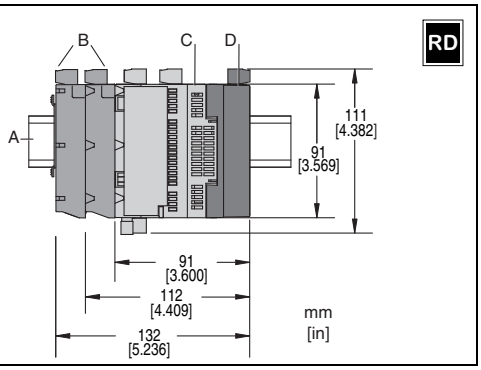


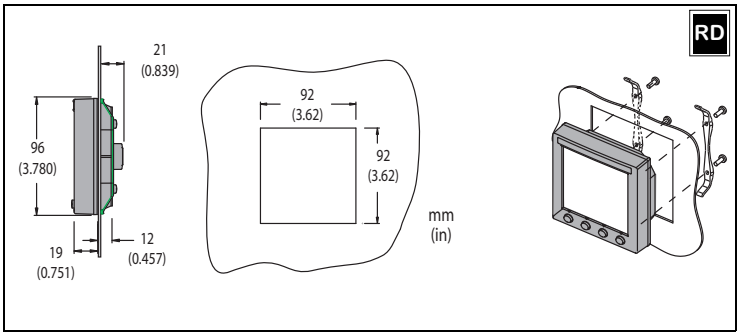
Figure 10: PM8RDA dimensions and mounting

A. 35 mm DIN rail
B. Option modules
C. Power Meter without display
D. Remote display adapter (PM8RDA)



PM800 Remote Display Dimensions and Mounting Options

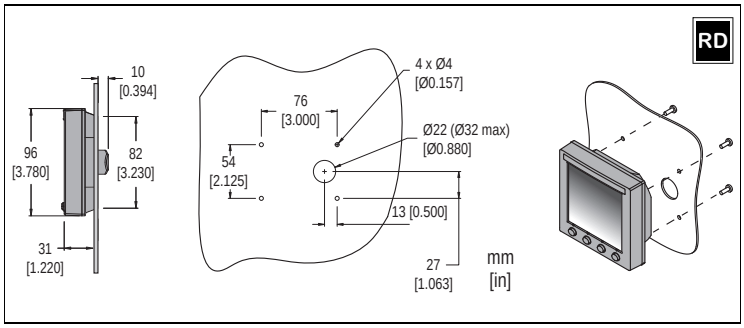
Figure 11: Square cutout and mounting for Remote Display



I RD Surface Mount for CM3000/CM4000 Display Retrofit with a PM800 Remote Display

Refer to section titled Power Meter With Remote Display, and see Figure 12.

Figure 12: Surface Mount for CM3000/CM4000 Display Retrofit with a PM800 Remote Display Model



Wiring

I U RD Supported System Types

Table 5: Wire Connection Specifications for PM800

Description	Connection Numbers	Wire Dimensions		Torque		Insulation Strip Length	
Power supply	1 to 3	12 to 24 AWG	2.5 to 0.2 mm²	5 lb·in	0.56 N·m	1/4 in	6.35 mm
Voltage inputs (PTs)	8 to 11	12 to 24 AWG	2.5 to 0.2 mm²	5 lb·in	0.56 N·m	1/4 in	6.35 mm
Current inputs (CTs)*	12 to 17	12 to 24 AWG	2.5 to 0.2 mm²	12 lb·in	1.35 N·m	5/16 in*	8.0 mm*
RS485 communications	18 to 20	12 to 24 AWG	2.5 to 0.2 mm²	5 lb·in	0.56 N·m	1/4 in	6.35 mm
I/Os	4 to 7	12 to 24 AWG	2.5 to 0.2 mm²	5 lb·in	0.56 N·m	1/4 in	6.35 mm

*NOTE: * Current inputs (CTs) must have spade or ring terminal connections.*

NOTE: For replacement connectors, order hardware kit 63230-500-16.

Table 6: Voltages Less Than or Equal to 347Vac L-N/600Vac L-L, Direct Connect, No PTs

Number of Wires	CTs		Voltage Connections			Meter Configuration		Figure Number
	Qty.	ID	Qty.	ID	Type	System Type	PT Primary Scale	
Single- or Two-Phase Wiring								
2	1	I1	2	V1, Vn	L-N	10	No PT	1
	1	I1	2	V1, V2	L-L	11	No PT	2
3	2	I1, I2	3	V1, V2, Vn	L-L with N	12	No PT	3
Three-Phase Wiring								
3	2	I1, I3	3	V1, V2, V3	Delta	30	No PT	4
	3	I1, I2, I3	3	V1, V2, V3	Delta	31	No PT	5
	1	I1	3	V1, V2, V3	Delta (balanced)	32	No PT	6
4	3	I1, I2, I3	3	V1, V2, V3, Vn	4-wire Delta	40	No PT	7
	3	I1, I2, I3	3	V1, V2, V3, Vn	Wye	40	No PT	7
	1	I1	3	V1, V2, V3, Vn	Wye (balanced)	44	No PT	8

Table 7: Voltages Greater Than 347 Vac L-N/600 Vac L-L

Number of Wires	CTs		Voltage Connections			Meter Configuration		Figure Number
	Qty.	ID	Qty.	ID	Type	System Type	PT Primary Scale	
Three-Phase Wiring								
3	2	I1, I3	2	V1, V3 (V2 to Ground)	Delta	30	Based on voltage	9
	3	I1, I2, I3	2	V1, V3 (V2 to Ground)	Delta	31	Based on voltage	10
	1	I1	2	V1, V3 (V2 to Ground)	Delta (balanced)	32	Based on voltage	11
4	3	I1, I2, I3	3	V1, V2, V3, (Vn to Ground)	Wye	40	Based on voltage	12
	2	I1, I2, I3	3	V1, V2, V3, (Vn to Ground)	Wye (balanced)	40	Based on voltage	13
	3	I1, I2, I3	2	V1, V3 (Vn to Ground)	Wye	42	Based on voltage	14
	1	I1	3	V1, V2, V3, (Vn to Ground)	Wye (balanced)	44	Based on voltage	15

The following symbols are used in the wiring diagrams:

Table 8: Wiring Diagram Symbols

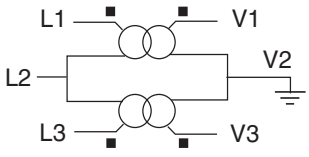
Symbol	Description
	Voltage disconnect
	Fuse
	Earth ground
S1=X1= ■ S2=X2	Current transformer US equivalent:

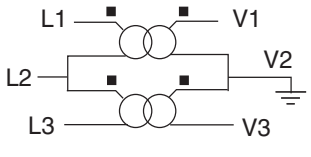
Table 8: Wiring Diagram Symbols *(continued)*

Symbol	Description
	Shorting block
	Potential transformer US equivalent:

*NOTE: The disconnect circuit breaker must be placed within reach of the power meter and labeled: **Disconnect Circuit Breaker for Power Meter**.*

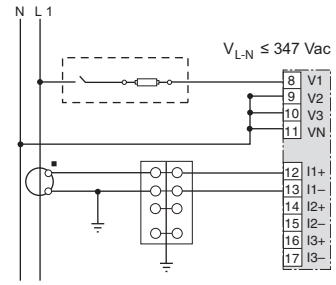
NOTE: In 2 PT systems, these connections are equivalent.





NOTE: The direction in which current and voltages flow affects measurements. Therefore, pay close attention to the polarity marks when connecting CTs and PTs (X1=S1= ■).

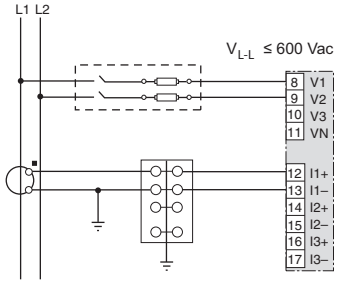
Figure 1: 1-Phase Line-to-Neutral 2-Wire System 1 CT



NOTES:

- Use system type 10.

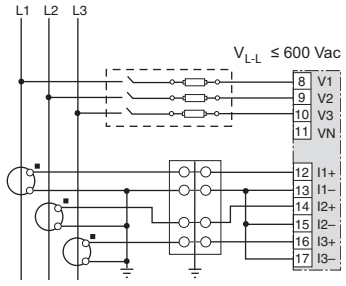
Figure 2: 2-Phase Line-to-Line 2-Wire +System 1 CT



NOTES:

- Use system type 11

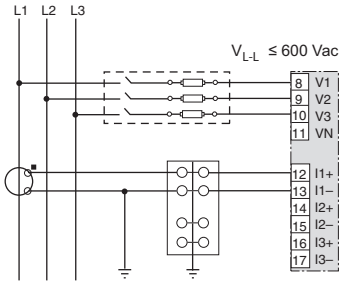
Figure 5: 3-Phase 3-Wire 3 CT no PT



NOTES:

- Use system type 31.
- The meter displays "I_g" (ground current).

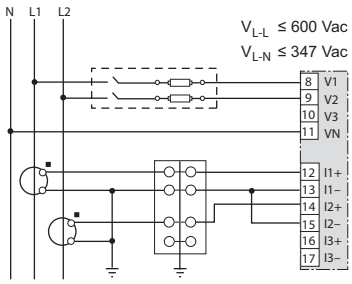
Figure 6: 3-Phase 3-Wire Direct Voltage Input Connection 1 CT (balanced)



NOTES:

- Use system type 32.
- Neutral current readings will be reported as zero.

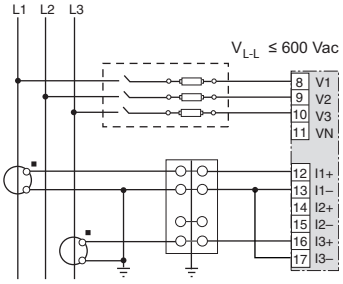
Figure 3: 2-Phase 3-Wire Direct Voltage Connection 2 CT



NOTES:

- Use system type 12.

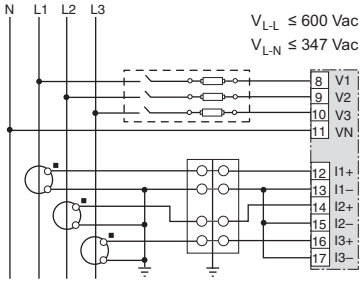
Figure 4: 3-Phase 3-Wire 2 CT no PT



NOTES:

- Use system type 30.

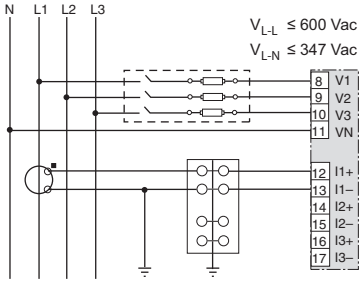
Figure 7: 3-Phase 4-Wire Wye Direct Voltage Input Connection 3 CT



NOTES:

- Use with 480Y/277 V and 208Y/120 V systems.
- Use system type 40.

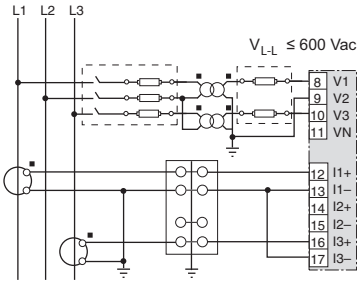
Figure 8: 3-Phase 4-Wire Direct Voltage Input Connection 1 CT (balanced)



NOTES:

- Use system type 44.
- Neutral current readings will be reported as zero.

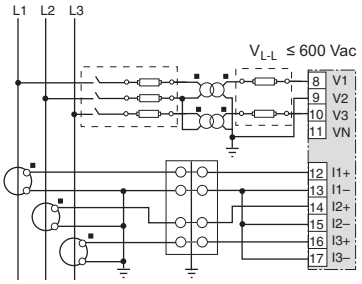
Figure 9: 3-Phase 3-Wire Delta Connection 2CT 2 PT



NOTES:

- For an open delta PT connection with 120 V L-L secondaries, use system type 30.

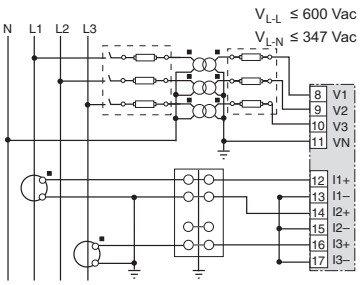
Figure 10: 3-Phase 3-Wire Delta Connection 3CT 2PT



NOTES:

- Use System type 31.
- The meter displays "I_g" (ground current).
- For an open delta PT connection with 120 V L-L secondaries, use system type 31.

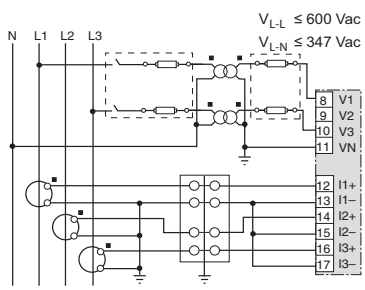
Figure 13: 3-Phase 4-Wire Wye 3-wire 3 PT 2 CT



NOTES:

- Use system type 40.
- Neutral current readings will be reported as zero.

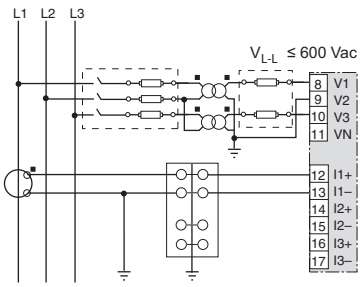
Figure 14: 3-Phase 4-Wire Wye 3CT 2PT



NOTES:

- Use system type 42.

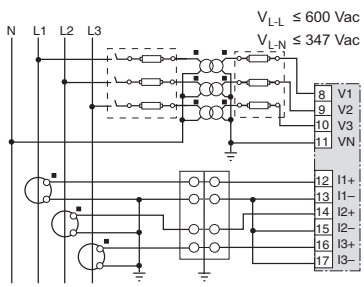
Figure 11: 3-Phase 3-Wire 1CT 2PT (balanced)



NOTES:

- Use system type 32.
- Neutral current readings will be reported as zero.

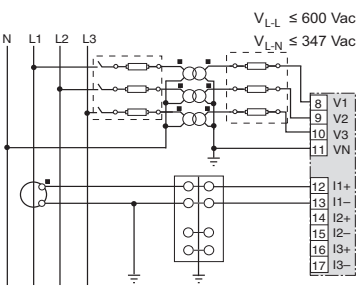
Figure 12: 3-Phase 4-Wire Wye Connection 3 CT 3 PT



NOTES:

- Use system type 40.

Figure 15: 3-Phase 4-Wire Wye 3PT 1CT (balanced)



NOTES:

- Use system type 44.
- Neutral current readings will be reported as zero.

Figure 16: Direct Connect Control Power (Phase to Phase)

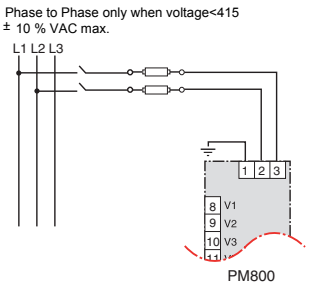


Figure 17: Direct Connect Control Power (Phase to Neutral)

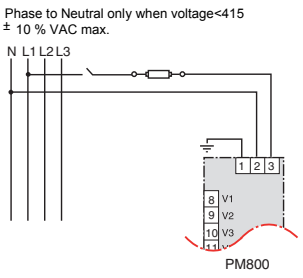


Figure 18: Direct Connect Control Power (DC Control Power)

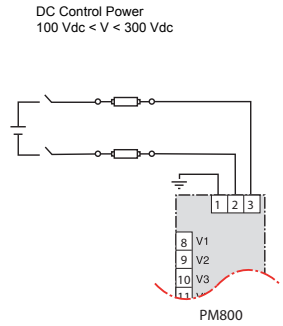


Figure 19: Control Power Transformer Connection

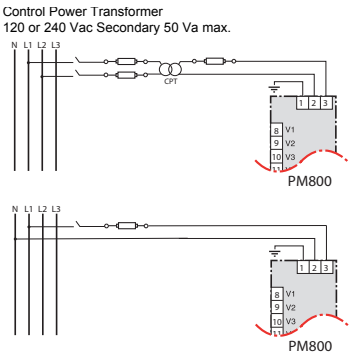


Table 9: Fuse Recommendation

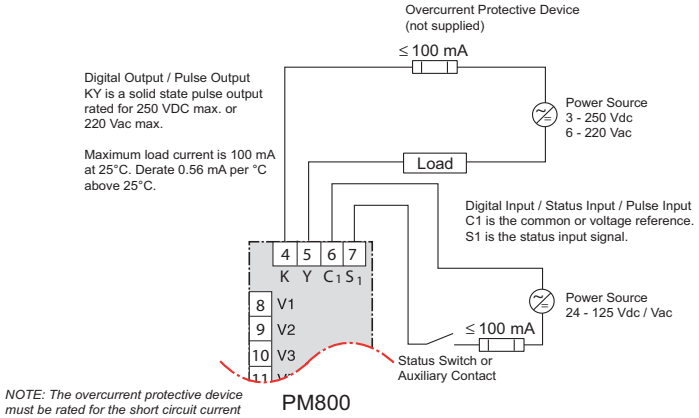
Control Power Source	Source Voltage (V_S)	Fuse	Fuse Amperage
CPT	$V_S \leq 125$ V	FNM or MDL	250 mA
CPT	$125 < V_S \leq 240$ V	FNQ or FNQ-R	250 mA

Table 9: Fuse Recommendation *(continued)*

Control Power Source	Source Voltage (V_S)	Fuse	Fuse Amperage
Line Voltage	$V_S \leq 240$ V	FNQ-R	250 mA
Line Voltage	$V_S > 240$ V	FNQ-R	250 mA
DC	$V_S \leq 300$ V	LP-CC	500 mA

The voltage input protection devices must be rated for the short circuit current at the connection points.

Figure 13: Standard Input/Output Wiring



NOTE: The overcurrent protective device must be rated for the short circuit current at the connection point.

CAUTION

VOLTAGE TRANSIENTS OVER 500 V CAN DAMAGE DIGITAL INPUTS

- Do not use digital inputs to directly monitor circuits with highly inductive loads.
- Use auxiliary contacts and isolated power supply when monitoring inductive loads.

Failure to follow this instruction will result in equipment damage.

Switching of inductive devices such as relay coils and motors results in high voltage transients from back electromotive force (EMF). To monitor this type of circuit, use an isolated power supply, such as the 24 Vdc power supply included with the PM8M26, and an auxiliary contact on the circuit breaker or switch.

Communications

I U RD Power Meter Communications Capabilities

Table 10: COM1 2-wire, RS485 Port Capabilities

Communications port	RS485: • 2-wire with shield • EIA compliant • Allows the power meter to be connected to a daisy chain of up to 31 devices
Baud rate	9600*, 19200, 38400
Communications distances	See Table 11.
Protocols	Modbus RTU*, Jbus, Modbus ASCII
Parity	ODD, EVEN*, NONE

*default

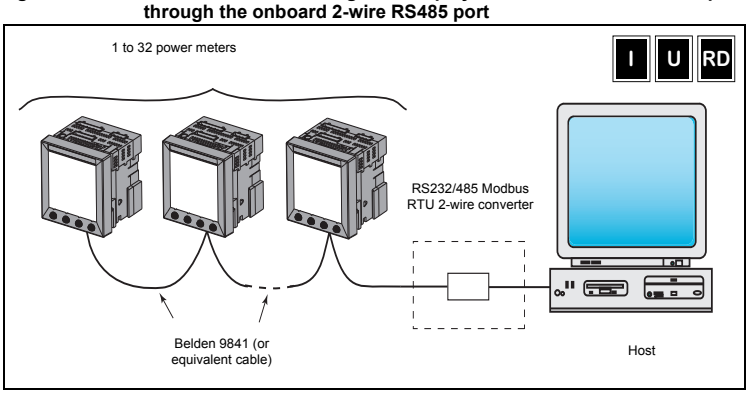
Table 11: 2-wire, RS485 Communications Distances

Baud Rate	Maximum Communication Distances
	1 to 32 Devices
9600	2,438 m (8,000 ft.)
19200	1,829 m (6,000 ft)
38400	914 m (3,000 ft)

NOTES:

- Distances are for 2-wire devices and 4-wire devices configured for 2-wire operation.
- Distances listed should be used as a guide only and cannot be guaranteed for non-PowerLogic devices. Refer to the master device's documentation for any additional distance limitations.

Figure 14: Power meters with integrated displays connected to a PC serial port through the onboard 2-wire RS485 port



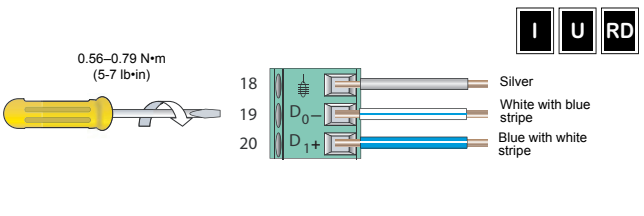
Daisy-chaining Devices to the Power Meter

The RS485 port allows the power meter to be connected in a daisy chain with up to 32, 2-wire devices. In this document, communications link refers to a chain of devices that are connected by a communications cable.

To daisy-chain devices to the power meter, use communications cable containing a twisted-shielded pair (Belden 9841 or equivalent) and the three-terminal connector of the RS485 port on the power meter.To connect to the power meter, follow these steps:

1. Strip 6 mm (0.25 in.) of insulation from both ends of the cable wires and insert one end into the holes in the connector.
2. On the top of the connector, torque the wire binding screws 0.56–0.79 N•m (5–7 lb•in).

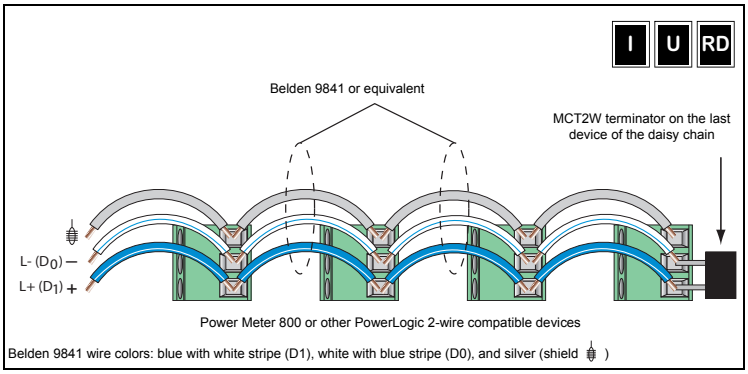
Figure 15: RS485 connection



2-wire Devices

To daisy-chain the power meter to another 2-wire PowerLogic device, wire the power meter's RS485 communications terminals to the matching communications terminals of the next device. In other words, wire the D_1 (+) terminal of the power meter to the D_1 (+) terminal of the next device, wire D_0 (–) to D_0 (–), and shield (⏚) to shield (⏚) as shown in Figure 16.

Figure 16: Daisy-chaining 2-wire devices



- If the power meter is the first device on the daisy chain, connect it to the host device using the MCI-101 kit (or equivalent RS232 to RS422/RS485 converter).
- If the power meter is the last device on the daisy chain, terminate it. See below.
- See Table 11 for the maximum daisy-chain communications distances for 2-wire devices.

Terminating the Communications Link

For proper RS485 communications performance, you must use the MCT2W terminator to terminate the last device on the communications link. To terminate the power meter using the MCT2W terminator, insert the wires of the terminator directly into terminals 19 and 20 of the RS485 communications connector on the power meter.

NOTES:

- *Terminate **only the last device** on the link. If a link has only one device, terminate that device.*
- Some PowerLogic devices use a removable communications connector. If the last device on the communications link is not a power meter, refer to the instruction bulletin for that device for termination instructions.

RD Power Meter With Remote Display Communications

The communications port on the remote display adapter can be configured to operate as a 2-wire, RS485 port; a 4-wire, RS485 port; or an RS232 port.

NOTE: The 4-wire, RS485 configuration is useful for integrating power meters into existing 4-wire, RS485 daisy chains.

Table 12: COM2 RS485 Port Capabilities

	2-wire	4-wire
Communications Port	• 2-wire with shield • EIA compliant • Allows the power meter to be connected to a daisy chain of up to 32 devices	• 4-wire with shield • EIA compliant • Allows the power meter to be connected to a daisy chain of up to 32 devices
Baud Rate	9600*, 19200, 38400	9600*, 19200, 38400
Communications Distances	See Table 11.	See Table 13.
Protocols	Modbus RTU*, Jbus, Modbus, ASCII	Modbus RTU*, Jbus, Modbus, ASCII
Parity	ODD, EVEN*, NONE	ODD, EVEN*, NONE
		*default

Table 13: COM2 4-wire, RS485 Communications Distances

Baud Rate	Maximum Communication Distances	
	1 to 16 Devices	17 to 32 Devices
9600	3,048 m (10,000 ft.)	1,219 m (4,000 ft.)
19200	1,548 m (5,000 ft.)	762 m (2,500 ft.)
38400	1,524 m (5,000 ft.)	762 m (2,500 ft.)

NOTE: Distances listed should be used as a guide only and cannot be guaranteed for non-POWERLOGIC devices. Refer to the master device's documentation for any additional distance limitations.

Power Meter With Remote Display Connections

COM2 RS485, 4-wire

Figure 17: COM2 RS485, 4-wire

- Use Belden 8723, 9842, or equivalent
  - RX+ Green, RX- White
  - TX+ Red, TX- Black
  - Shield Silver (use crimp connector)
- For Belden 9842
  - RX+ Blue/White stripe
  - RX- White/Blue stripe TX+ Orange/White stripe
  - TX- White/Orange stripe
- Connect shield to earth ground at the master port **only**.
- If the meter is the last device, terminate it with 3090MCTAS485 terminator (not included).

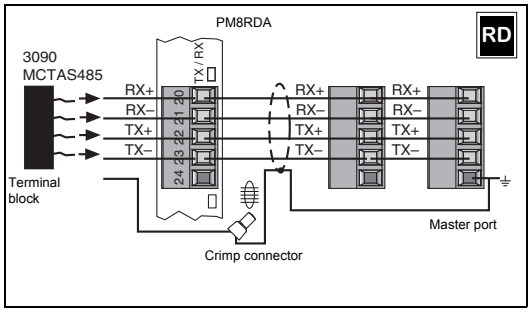
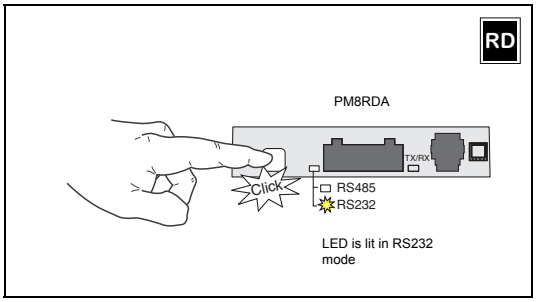


Figure 18: PM8RDA 4-wire RS485 and RS232 selection

To change to RS232 mode, press and hold the mode button until the LED is lit. LED is lit in RS232 mode.

NOTE: Communications mode default is RS485. The LED is unlit.



NOTE: To learn more about the 2-wire or RS232 configurations of COM2 on the PM8RDA, refer to the installation guide for the Remote Display Kit for PM800 meters (document number 63230-500-221).

I U RD Ethernet Communications

Ethernet communication is available by adding a PM8ECC Module to the power meter. Installation instructions are included with the module.

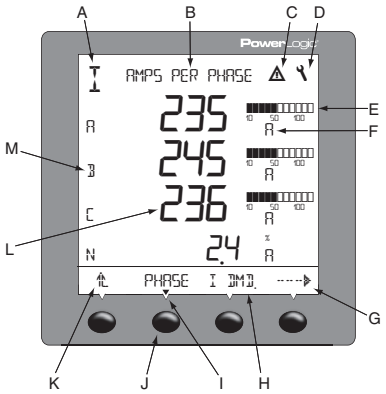
Operation

I RD Operating the Display

Power meters are equipped with large, back-lit LCD displays. They can show up to five lines of information plus a sixth row of menu options. Figure 19 shows the different parts of the power meter display.

Figure 19: Power meter display

A. Type of measurement
B. Screen title
C. Alarm indicator
D. Maintenance icon
E. Bar chart (%)
F. Units
G. Display more menu items
H. Menu item
I. Selected menu indicator
J. Button
K. Return to previous menu
L. Values
M. Phase



How the Buttons Work

The buttons are used to select menu items, display more menu items in a menu list, and return to previous menus. A menu item appears over one of the four buttons. Pressing a button selects the menu item and displays the menu item's screen. When you have reached the highest menu level, a black triangle appears beneath the selected menu item. To return to the previous menu level, press the button below ⇑. To cycle through the menu items in a menu list, press the button below ⇢ (see Figure 19).

NOTE: Each time you read "press" in this document, press and release the appropriate button beneath the menu item. For example, if you are asked to "Press PHASE," you would press and release the button below the PHASE menu item.

Changing Values

When a value is selected, it flashes to indicate that it can be modified. A value is changed by doing the following:

- Press + or – to change numbers or scroll through available options.
- If you are entering more than one number, press ⇠ to move to the next number in the sequence.
- To save your changes and move to the next field, press OK.

Basic Setup

A basic setup for the power meter includes:

- CTs ratios.
- PTs ratios.
- Nominal frequency.
- System type.
- Communication. (Note that RD models include two communications ports, COM1 and COM2.)

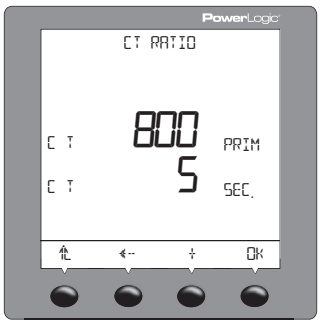
To begin power meter setup, do the following:

1. Scroll through the Level 1 menu list until you see MAINT.
2. Press MAINT.
3. Press SETUP.
4. Enter your password.
   NOTE: The default password is 0000.

Use the following examples as models to set up the power meter for first time use:

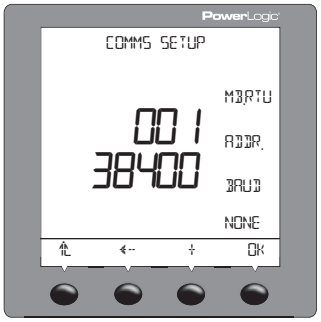
CTs Ratios Setup

1. Press ⇢ until METER is visible.
2. Press METER.
3. Press CT.
4. Enter the PRIM (primary CT) number.
5. Press OK.
6. Enter the SEC. (secondary CT) number.
7. Press OK.
8. Press ⇞ until you are asked to save your changes.
9. Press YES to save the changes.



Communications Setup

1. Press ⇢ until COMMS (communications) is visible.
2. Press COMMS (communications).
3. Select the protocol: MB.RTU (Modbus RTU), Jbus, MB. A.8 (Modbus ASCII 8 bits), MB. A.7 (Modbus ASCII 7 bits).
4. Press OK.
5. Enter the ADDR (power meter address).
6. Press OK.
7. Select the BAUD (baud rate).
8. Press OK.
9. Select the parity: EVEN, ODD, or NONE.
10. Press OK.
11. Press ⇞ until you are asked to save your changes.
12. Press YES to save the changes.



For Power Meters with Remote Displays, use the same communication setup procedure as above, but go to COM2.

Power Meters without Display Setup

To set up a power meter without a display (see Figure 2), you will need a means of communication between the power meter and your computer. Additionally, you will need to install Schneider Electric Meter Configuration software on your computer. This configuration software can be downloaded at no cost from www.powerlogic.com.

Troubleshooting

Refer to Table 14 for information on potential problems and their possible causes. Contact your local Schneider Electric sales representative for further assistance.

Heartbeat LED

The heartbeat LED helps to troubleshoot the power meter. The LED works as follows:

- **Normal operation** — the LED flashes at a steady rate during normal operation.
- **Communications** — the LED flash rate changes as the communications port transmits and receives data. If the LED flash rate does not change when data is sent from the host computer, the power meter is not receiving requests from the host computer.
- **Hardware** — if the heartbeat LED remains lit and does not flash ON and OFF, there is a hardware problem. Do a hard reset of the power meter (turn OFF power to the power meter, then restore power to the power meter). If the heartbeat LED remains lit, contact your local sales representative.
- **Control power and display** — if the heartbeat LED flashes, but the display is blank, the display is not functioning properly. If the display is blank and the LED is not lit, verify that control power is connected to the power meter.

Table 14: Troubleshooting

Potential Problem	Possible Cause	Possible Solution
The maintenance icon is illuminated on the power meter display.	When the maintenance icon is illuminated, it indicates a potential hardware or firmware problem in the power meter.	When the maintenance icon is illuminated, go to MAINT (MAINTENANCE) >DIAG (DIAGNOSTICS). Error messages display to indicate the reason the icon is illuminated. Note these error messages and call Technical Support or contact your local sales representative for assistance.
The display shows error code 3. (PM810)	Loss of control power or meter configuration has changed.	Set date and time.
The display is blank after applying control power to the power meter.	The power meter may not be receiving the necessary power.	• Verify that the power meter line (L) and neutral (N) terminals (terminals 2 and 3) are receiving the necessary power. • Verify that the heartbeat LED is blinking. • Check the fuse.

Table 14: Troubleshooting *(continued)*

The data being displayed is inaccurate or not what you expect.	Power meter is grounded incorrectly.	Verify that the power meter is grounded.
	Incorrect setup values.	Check that the correct values have been entered for power meter setup parameters (CT and PT ratings, System Type, Nominal Frequency, and so on).
	Incorrect voltage inputs.	Check power meter voltage input terminals L (8, 9, 10, 11) to verify that adequate voltage is present.
	Power meter is wired improperly.	Check that all CTs and PTs are connected correctly (proper polarity is observed) and that they are energized. Check shorting terminals.
Cannot communicate with power meter from a remote personal computer.	Power meter address is incorrect.	Check to see that the power meter is correctly addressed.
	Power meter baud rate is incorrect.	Verify that the baud rate of the power meter matches the baud rate of all other devices on its communications link.
	Communications lines are improperly connected.	Verify the power meter communications connections.
	Communications lines are improperly terminated.	Check to see that a multipoint communications terminator is properly installed.
	Incorrect route statement to power meter.	Check the route statement.

Getting Technical Support

Please refer to the *Technical Support Contacts* provided in the power meter shipping carton or go to www.powerlogic.com, select your country > tech support for support phone numbers by country.

Schneider Electric
295 Tech Park Drive,
Suite 100
LaVergne, TN 37086 USA
Tel: +1 (615) 287-3400
www.powerlogic.com
www.schneider-electric.com

63230-500-282A1

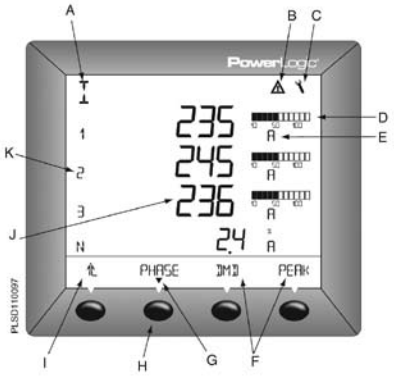
Replaces 63230-500-200A4 and 63230-500-224A1

PowerLogic® PM800 series
Quick Reference Guide

Parts of the Display

A. Type of measurement
B. Screen Title
C. Alarm Indicator
D. Maintenance icon
E. Bar Chart (%)
F. Units
G. Display more menu items
H. Menu item
I. Selected menu indicator
J. Button
K. Return to previous menu
L. Values
M. Phase

Power Meter Display



Display Buttons

Navigation	
---▸	View more menu items on the current level.
↰	Return to the previous menu level.
▼	Indicates the menu item is selected and there are no menu levels below the current level.
Change Values	
↑	Change values or scroll through the available options. When the end of a range is reached, pressing + again returns to the first value or option.
◂--	Select the next position in a number.
OK	Move to the next editable field or exit the screen if the last editable field is selected.

Abbreviated List of IEC Power Meter Menu Items:

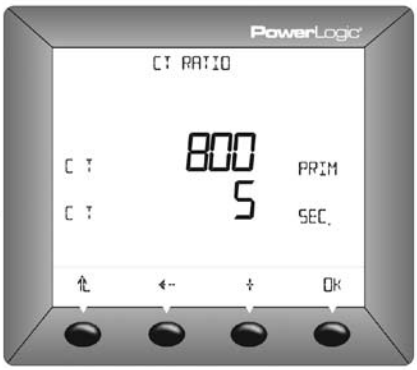
- AMPS (1) → PHASE, DMD, UNBAIL.
- VOLTS (U-V) → VL-L, VL-N
- PWR (PQS) → PWR, PHASE, DMD
- ENERG (E) → WH, VAH, VARH, INC
- PF → TRUE, DISPL
- HZ (F)
- THD → VL-L (U), VL-N (V), I
- MINMX → MINMX, I, V, POS, PF, F, THD V, THD I
- HARM → VL-L (U), VL-N (V), I
- ALARM → ACTIV, HIST
- I/O → D OUT, D IN, A OUT, A IN (A OUT, A IN: PM8M222)
- TIMER
- CONTR①
- MAINT
  - RESET → METER, E, DMD, MINMX, MODE②, TIMER
  - SETUP → DATE, TIME, LANG, COMMS (COM), METER, ALRAM, I/O PASSW, TIMER, ADVAN
    - COMMS (COM): PM8RD → COMM1, COMM2
    - I/O PASSW: D OUT (Digital KY Out), D IN (Digital In); PM8M2222, PM8M26, AND PM8M22 → A OUT (Analog Out), A IN (Analog In); PM8M2222
  - DIAGN → METER, REG, CLOCK

Setup Meter System Type

1. In SETUP mode, press ⇢ until METER is visible
2. Press METER.
3. Press ⇢ until SYS (sytem type) is visible.
4. Press SYS.
5. Select your system type based on the (A) number of wires. (B) number of CTs, (C) the number of volatage connections (either direct connect or with PT), and (D) the SMS system type.
6. Press OK.
7. Press ↑ until you are asked to save your changes.
8. Press YES to save the changes.

Setup CT Ratio:

1. Press ⇢ uuntil METER is visible
2. Press METER.
3. Press CT.
4. Enter the PRIM (primary CT) number.
5. Press OK
6. Enter the SEC. (secondary CT) number.
7. Press OK
8. Press ↑ until you are asked to save your changes
9. Press YES to save the changes.



Setup PT Ratio:

1. Press ⇢ uuntil METER is visible
2. Press METER.
3. Press PT.
4. Enter the SCALE value: x1, x10, x100. No PT (for direct connect).
5. Press OK
6. Enter the PRIM (primary CT) value.
7. Press OK
8. Enter the SEC. (secondary CT) value.
9. Press OK.
10. Press ↑ until you are asked to save your changes.
11. Press YES to save the changes.

Power Meter With Remote Display Communications Setup:

1. Press ⇢ uuntil COMMS (communications) is visible
2. Press COMM1 (communications).
3. Select the protocol: MB.RTU (Modbus RTU). Jbus, MB, A.8 (Modbus ASCII 8 bits), MB, A.7 (Modbus ASCII 7 bits).
4. Press OK.
5. Enter the ADDR (power meter address).
6. Press OK.
7. Select the BAUD (baud rate).
8. Press OK.
9. Select the parity: EVEN, ODD, or NON.
10. Press OK.
11. Press ↑ until you are asked to save your changes.
12. Press YES to save the changes.

Comm2 Setup:

1. Press ⇢ uuntil COMMS (communications) is visible.
2. Press COMM2 (communications).
3. Select the protocol: MB.RTU (Modbus RTU). Jbus, MB, A.8 (Modbus ASCII 8 bits), MB, A.7 (Modbus ASCII 7 bits).
4. Press OK.
5. Enter the ADDR (power meter address).
6. Press OK.
7. Select the BAUD (baud rate).
8. Press OK.
9. Select the parity: EVEN, ODD, or NON.
10. Press OK.
11. Press ↑ until you are asked to save your changes.
12. Press YES to save the changes.

Power Meter With Integrated Display Communications Setup:

1. Press ⇢ uuntil COMMS (communications) is visible.
2. Press COMMS (communications).
3. Select the protocol: MB.RTU (Modbus RTU). Jbus, MB, A.8 (Modbus ASCII 8 bits), MB, A.7 (Modbus ASCII 7 bits).
4. Press OK.
5. Enter the ADDR (power meter address).
6. Press OK.
7. Select the BAUD (baud rate).
8. Press OK.
9. Select the parity: EVEN, ODD, or NON.
10. Press OK.
11. Press ↑ until you are asked to save your changes.
12. Press YES to save the changes.

Schneider Electric - North America
295 Tech Park Drive, LaVergne, TN 37086
Ph: 866-466-7627
PowerLogic.com

SQUARE D
by Schneider Electric

Instruction Bulletin

48049-243-04
Rev. 01, 09/2012

Replaces 48049-243-04 ECN 681C, 03/2006

PowerPact™ R-Frame and NS1600b–NS3200 Circuit Breakers

Retain for future use.

Necessary Tools

Screwdriver, Pozidriv® #2 or #3, or slotted

Socket Wrench

Screwdrivers, long-shanked slotted (2)

Additional Information

This bulletin provides installation instructions for PowerPact R-frame and NS1600b–NS3200 circuit breakers. Tripping functions are controlled by the Micrologic™ trip unit.

For additional information see the following user guides available on the Schneider Electric™ website:

- Bulletin 0612IB1201: PowerPact™ Circuit Breakers Dimensional Drawings
- Bulletin 48049-136-05: Micrologic 2.0A, 3.0A, 5.0A, and 6.0A Electronic Trip Units
- Bulletin 48049-330-03: Micrologic 5.0H and 6.0H Electronic Trip Units
- Bulletin 48049-137-05: Micrologic 5.0P and 6.0P Electronic Trip Unit
- Bulletin 48049-207-05: Micrologic 2.0, 3.0 and 5.0 Electronic Trip Units

To access the website go to:

http://www.schneider-electric.com

1. Select “United States” in the country pull-down menu. Click “OK”
2. Under “Popular Links” on the left side of the page, select “Technical Library”.
3. Use the Advanced Search option to search by document number.

For application assistance, please call 1-888-778-2733.

ENGLISH

Installation

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Turn off or trip circuit breaker before installation.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Lift circuit breaker by case using lifting equipment. Do not remove lifting equipment until all mounting hardware is securely tightened. Never lift circuit breaker by its handle.

Failure to follow these instructions will result in death or serious injury.

Individually-Mounted Circuit Breaker Installation

⚠ DANGER

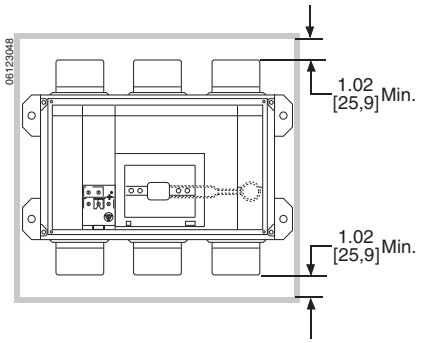
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

Clearance requirements must be met for proper operation of the equipment.

Failure to follow these instructions will result in death or serious injury.

1. Check enclosure clearances, see Figure 1.
2. Prepare enclosure for circuit breaker (See Figure 22 for mounting hole and cover cutout dimensions).
   - — Drill mounting holes.
   - — Cut opening in cover for circuit breaker handle escutcheon.

Figure 1: Minimum Clearance Requirement



Dimensions: in. [mm]

Minimum enclosure size:
3P: 30 x 21 x 7 in. (762 x 533 x 176 mm)
4P: 30 x 25.5 x 7 in. (762 x 648 x 178 mm)

Minimum ventilation (100% Rated Circuit Breakers Only):
40.25 in.2 (260 cm2) on top and bottom of enclosure

NOTICE

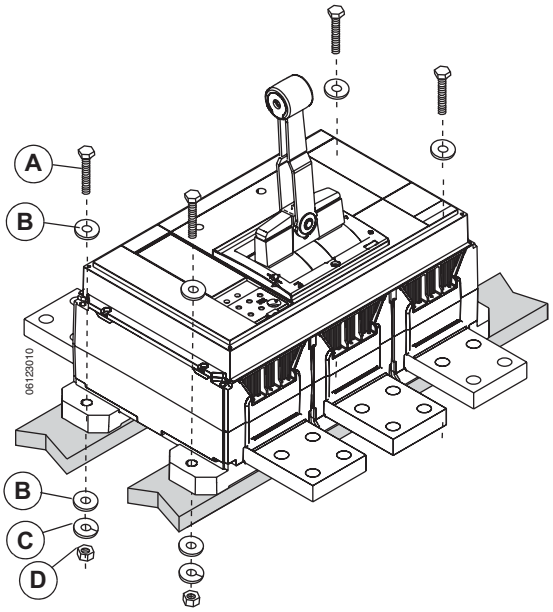
HAZARD OF OVERHEATING

Do not mount circuit breaker on ferrous material.

Failure to follow these instructions can result in equipment damage.

3. Mount circuit breaker on 3/4 in. (19 mm) Glastic™ or equivalent non-ferrous material, using one 3/8 in. Grade 5 bolt (A), two flat washers (B), one split lockwasher (C) and one nut (D) per mounting foot (provided). Torque bolts (A) to 180 lb-in (20 N•m).

Figure 2: Mount Circuit Breaker



NOTICE

HAZARD OF OVERHEATING

For cable connection, lugs must be mounted on RLTB or RLTBE terminal pads. Do not mount lugs directly on circuit breaker terminal.

Failure to follow these instructions can result in equipment damage.

If using RLTB or RLTBE terminal pads, see RLTB or RTLBE terminal pad instructions.

For dimensional information refer to the Schneider Electric website (see page 1).

Table 1: Individually-Mounted Circuit Breaker Connection

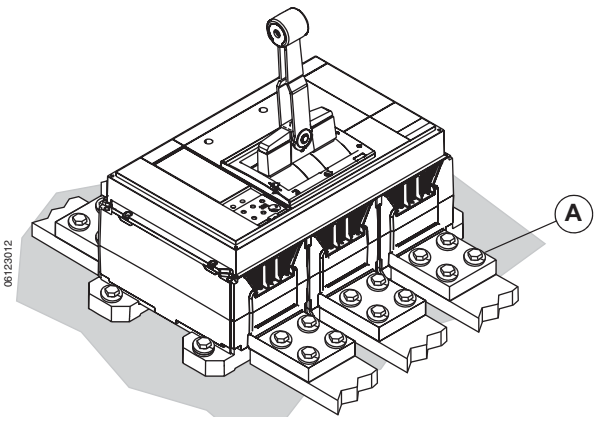
Type	Connection	Rated	Connection Mounting
UL/IEC ○○ ○○	Bus	2500 A, 100% rated	Bus to RLTB (3P) or RLTB4 (4P) terminal pad kits (provided) or equivalent bus structure.
		3000 A, 80% rated	Bus to RL3TB (3P) or RL3TB4 (4P) terminal pad kits (provided) or equivalent bus structure.
		3000 A, 100% rated	Bus to RL3TB (3P) or RL3TB4 (4P) terminal pad kits (provided) or equivalent bus structure.
		All other bussed circuit breakers	Bus directly to circuit breaker or to optional RLTB terminal pad mounting kits.
	Cable	3000 A, 80% and 100% rated	Cable to lugs mounted on RL3TB terminal pad kits.
		All other cabled circuit breakers	Cable to lugs mounted on RLTB terminal pad kits.
IEC ○○○	Bus	3200 A	Bus to RLTBE terminal pad kits (provided) or equivalent bus structure.
		Less than 3200 A	Bus directly to circuit breaker or to optional RLTBE terminal pad mounting kits.

4. For direct bussing, secure bus directly to circuit breaker using four 1/2 in. Grade 5 bolts (A) per terminal for UL/IEC circuit breakers and three 10 mm Grade 8.8 bolts per terminal for IEC circuit breakers. Finger tighten all bolts, then torque them to 900 lb-in (100 N•m).

   NOTE: Make sure that circuit breaker terminals are flat against bus bars.

5. Tighten equipment bus connections and supports.

Figure 3: Direct Bus Installation



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I-Line™ Circuit Breaker Installation

NOTICE

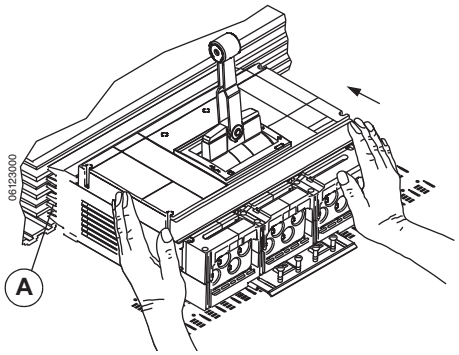
HAZARD OF EQUIPMENT DAMAGE

- Do not adjust jaws.
- Do not remove joint compound.
- If necessary, use Square D™ joint compound PJC7201.

Failure to follow these instructions can result in equipment damage.

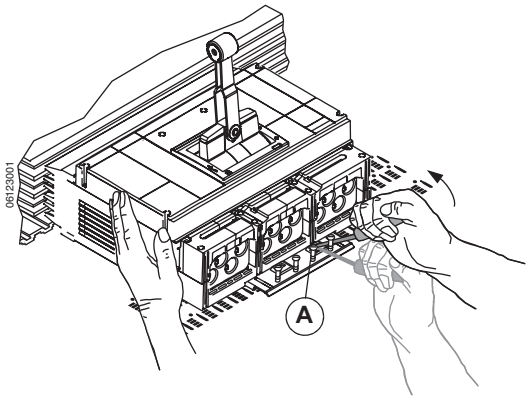
1. Place circuit breaker on I-Line pan with jaws (A) pushed against bus.

Figure 4: Place Circuit Breaker on Pan



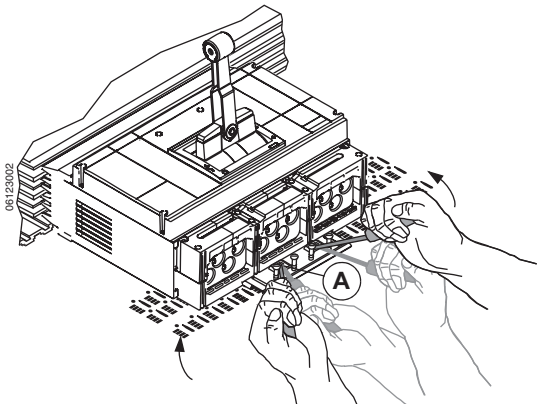
2. Insert long-shanked screwdriver (A) into slot. Rack circuit breaker onto bus.

Figure 5: Start Racking Circuit Breaker onto Bus



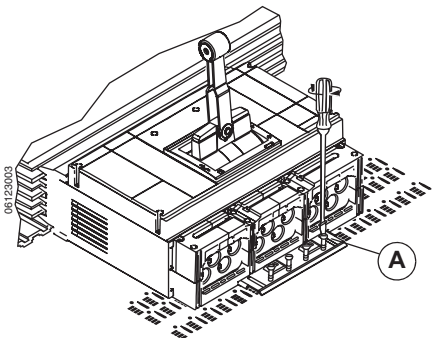
3. Insert second screwdriver (A) into bottom slot. Rack circuit breaker onto bus, using alternate screwdrivers until circuit breaker jaws completely engage bus bars.

Figure 6: Continue Racking Circuit Breaker onto Bus



4. Tighten four screws (A) firmly without bending mounting bracket.

Figure 7: Tighten Mounting Bracket Screws

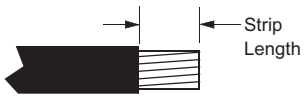


Cable Installation

Square off conductor ends and preform conductors to final configuration. Using a proper insulation stripping tool, strip conductor ends as recommended in Table 2 below. Do not nick strands.

For field-installable lug kits, see instruction bulletin shipped with each lug kit.

Figure 8: Install Cables



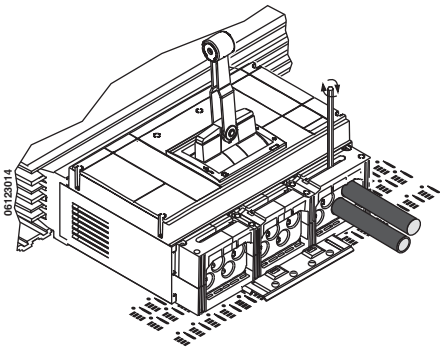


Table 2: Circuit Breaker Lug Information

Catalog Number	Conductors		Strip Length[1]	Wire Binding Screw Torque	Lug Mounting Screw Torque)
	Qty.	Size			
AL1200R53K[2]	4	#3/0–600 kcmil (95–300 mm²) Al/Cu	1-3/16 in. (30 mm)	450 lb-in (50 N•m)	180 lb-in (20 N•m)
CU1200R53K	4	#3/0–600 kcmil (95–300 mm²) Cu	1-3/16 in. (30 mm)	450 lb-in (50 N•m)	180 lb-in (20 N•m)

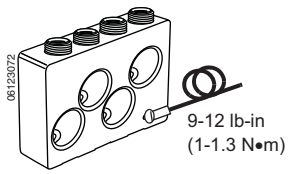
1 Conductors must be cut square for secure termination.

2 For version with tapped hole for control wire order AL1200R53**T**K.

AL1200R53TK Lug Only

Install control wire using 6-32 x 5/16 in. screw.

Figure 9: AL1200R53TK Lug



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Cable Restraint

Restrain circuit breaker conductors as indicated in Table 3.

Wrap conductors using 30 ft. (10 m) of 1/2 in. (12 mm) sisal rope or equivalent.

NOTICE

HAZARD OF CONDUCTOR MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain circuit breaker conductors as required in Table 3.

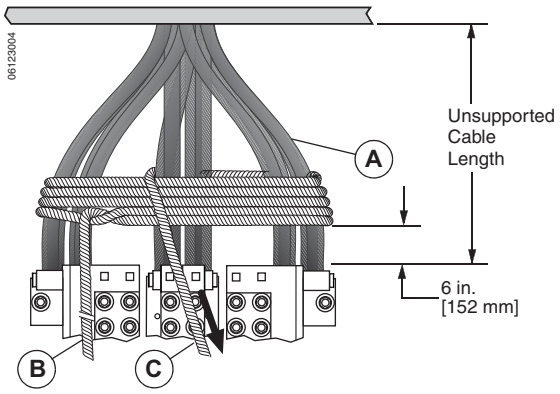
Failure to follow these instructions can result in equipment damage.

Table 3: Cable Restraint Recommendations

Circuit Breaker Installation	Available Fault Current	Conductors Used	Unsupported Cable Length	Restraint Recommended
Individually-mounted	≤ 65 kA	Six 600 kcmil or larger	≤ 24 in. (610 mm)	No
	All other cases			Yes

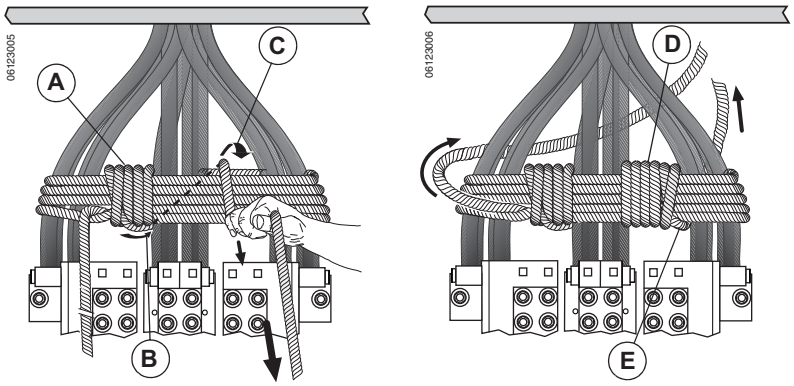
1. Begin wrapping conductors (A) 6 in. (152 mm) above circuit breaker. Wrap conductors four times, leaving 3 ft. (1 m) of excess rope at the first end (B). Pull rope (C) taut.

Figure 10: Wrap Conductors



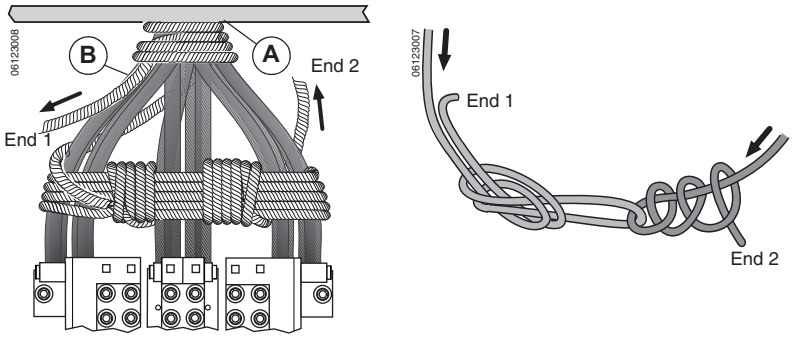
2. Wrap rope (A) several times until space between first two sets of conductors is completely filled. Weave final rope loop underneath previous loop (B). Bring rope (C) through right-hand space. Pull rope taut.
3. Wrap rope (D) several times until space between second and third set of conductors is completely filled. Weave final rope loop (E) underneath previous loop as shown. Pull rope taut.

Figure 11: Wrap Rope



4. Wrap rope several times around conductors where conductors exit enclosure (A). Weave final rope loop (B) underneath previous loop as shown. Pull rope taut.
5. Tie rope End 1 and End 2 together as shown. Rope must be taut. Cut off excess rope and tape ends to prevent fraying.

Figure 12: Wrap Conductors

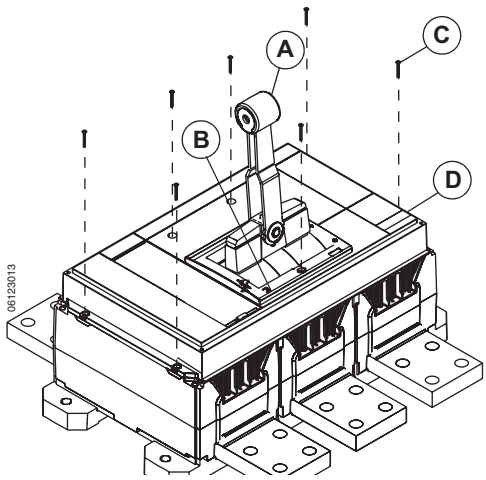


Accessory Installation

This subsection applies if circuit breaker has factory-installed or field-installed accessories

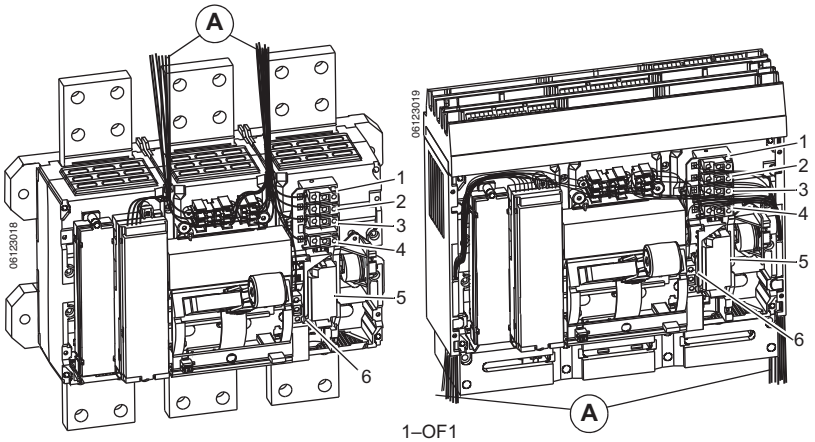
1. Make sure circuit breaker handle (A) is in tripped position by moving handle to ON (I) position, then pushing push-to-trip button (B).
2. Loosen the seven accessory cover screws (C) and remove accessory cover (D).

Figure 13: Remove Accessory Cover



3. Install field-installable circuit breaker accessories as instructed in the instructions packed with each accessory.
4. Install control wiring (A) to accessories. Torque screws to 10 lb-in (1.2 N•m).

Figure 14: Install Accessory Control Wiring



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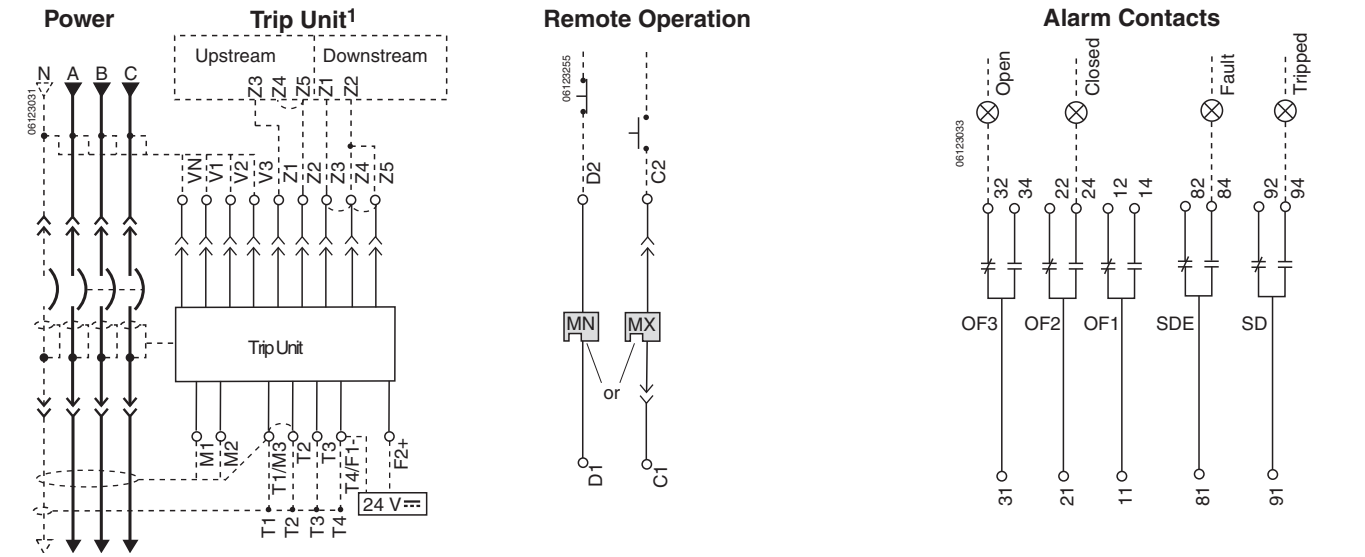
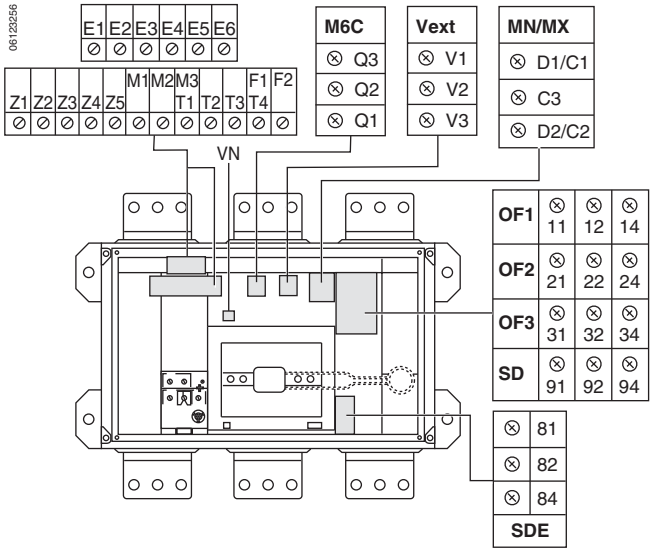
Accessory Control Wiring Diagrams

NOTE: All diagrams show circuit breaker in tripped position.

Figure 15: Accessory Control Wiring Diagrams





Connector	Recommended Wire Size
V1, V2, V3, Vn	22–16 AWG (0.3–1.5 mm²)
E1–E2	22 AWG (0.3 mm²) min. shielded pair cable or twisted pair copper wires
T	22 AWG (0.3 mm²) stranded shielded cable
M	Refer to MDGF instructions
Z1–Z5	22–18 AWG (0.3–0.8 mm²)
OF, SD, SDE	18–16 AWG (0.8–1.5 mm²)
MN, MX	18–14 AWG (0.8–2.5 mm²)
F	Size per aux 24 Vdc power supply
E3–E6, Q1, Q2, Q3	22 AWG (0.3 mm2) shielded twisted pairs with sheild grounded at one end (Belden 8723 or equal)

Trip Unit					
Basic	**A**	**P**	**H**	**Connector**	**Description**
–	•	•	•	Com: E1-E6	Circuit breaker communication module E1 = + 24 Vdc E2 = Common E3 = Out - E4 = Out + E5 = In - E6 = In +
–	•	•	•	Z	Zone-selective Interlocking (ZSI) Z1 = ZSI OUT signal Z2 = ZSI OUT Z3 = ZSI IN signal Z4 = ZSI IN short-time delay Z5 = ZSI IN ground fault
–	•	•	•	T	External neutral sensor
–	–	•	•	M6C: Q1, Q2, Q3	6 programmable contacts 24 Vdc external power supply required
–	•	•	•	M	Modified differential ground fault (MDGF)
–	•	•	•	F	24 Vdc external power supply
–	–	•	•	Vn[3]	External neutral voltage takeoff
–	–	•	•	V1, V2, V3	External phase voltage takeoff
Function				**Connector**	**Description**
Auxiliary Contacts				OF	Open/Closed circuit breaker or switch position contacts
				SD	Bell alarm
				SDE	Electrical fault alarm contact
Remote Operation				MN	Undervoltage trip device
				MX	Shunt trip

[1] Remove factory jumpers between Z3, Z4 and Z5 if ZSI is connected. Remove factory jumper between T1 and T2 if neutral CT is connected.
[2] C3 terminal is used only for communicating shunt trip
[3] Neutral voltage takeoff supplied as flying lead.

Ground-Fault Protection for Equipment

If circuit breaker does not have integral ground-fault tripping or alarm, skip this subsection.

A three-phase, four-wire circuit requires an external neutral current transformer (CT). Connect neutral CT to circuit breaker according to wiring diagrams in Figure 17.

1. Connect the primary:
   - — If load is connected to lower end of circuit breaker, connect load neutral to H1 terminal of neutral CT.
   - — If supply power is connected to lower end of circuit breaker, connect supply neutral to H1 terminal of neutral CT.

NOTE: The equipment grounding connection must be upstream (line side) of the neutral CT and a neutral connection must exist from the supply transformer to the equipment.

2. For circuit breakers using Micrologic 5.0P, 6.0P, 5.0H or 6.0H trip units, connect the Vn voltage measurement connector plug (A) into Vn connector shipped with the circuit breaker (B). Connect this wire to the Vn terminal of the neutral current transformer. (This is necessary to allow the trip unit to make voltage measurements.) Terminals Vc and Vn are internally connected.
3. Connect T1, T2, T3 and T4, as shown, to the control wiring terminals as described in the accessory wiring sections which follow.
4. Ground terminal GND of the neutral current transformers only if no other ground exists in the control system. (Check NEC requirements and connect ground to equipment ground bus.)

NOTE: The following terminals are internally connected:

- Vc and Vn
- T4 and GND

NOTE: Modified differential ground-fault circuitry and ground-source return ground-fault circuitry require the use of a modified differential ground-fault module (MDGF) and special current transformers. For wiring of those systems, see the instructions with the MDGF.

Figure 16: Neutral Current Transformers

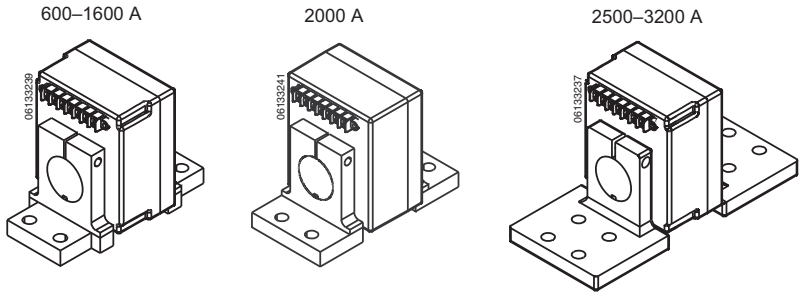
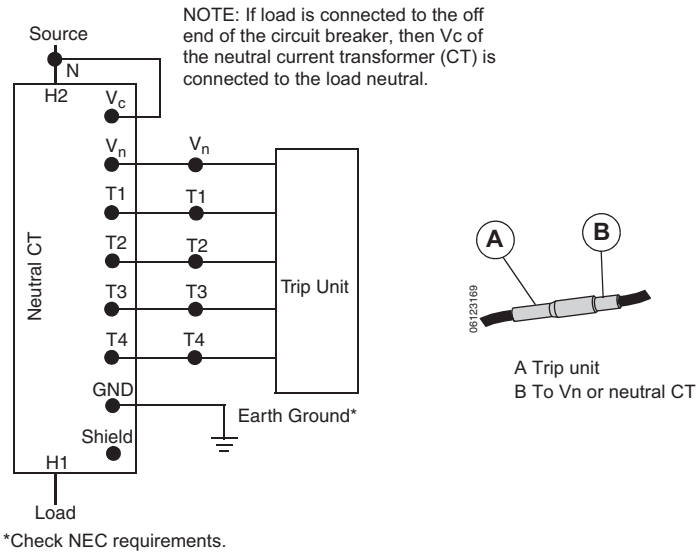


Figure 17: Wiring for Ground-Fault Sensing



*Check NEC requirements.

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Replace Accessory Cover

NOTICE

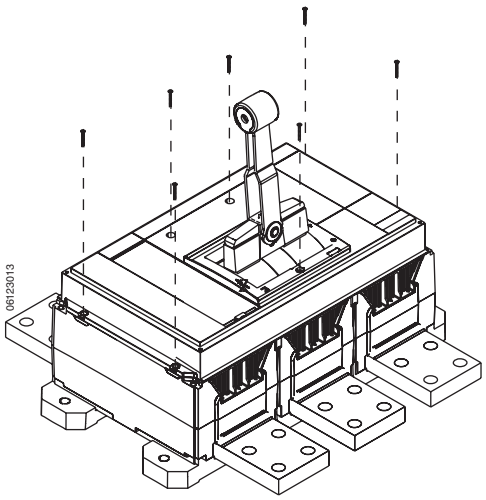
HAZARD OF EQUIPMENT DAMAGE

Accessory cover must be secured with all seven screws tightened to stated torque. Do not overtorque screws. Do not use power equipment to torque screws.

Failure to follow these instructions can result in equipment damage.

Replace accessory cover. Replace all seven accessory cover screws. Hand tighten screws to 11–13 lb-in (1.2–1.5 N•m). Do not exceed torque specification of screws.

Figure 18: Accessory Cover Replacement

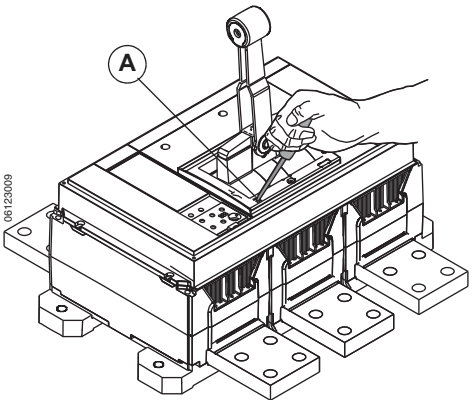


Operation

Press push-to-trip button (A) at installation to check operation and then once a year to exercise circuit breaker.

NOTE: Push-to-trip button will not trip circuit breaker if it is in the OFF (O) position.

Figure 19: Push-to-Trip Button



Circuit Breaker Removal

Turn off all power supplying this equipment before working on or inside equipment.

Remove circuit breaker in reverse order of installation.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

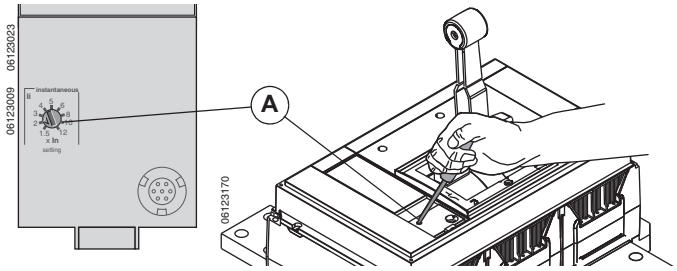
Failure to follow these instructions will result in death or serious injury.

Trip Unit Adjustment

For ET1.0I Electronic Trip Units: Adjust instantaneous trip (Ii) by adjusting switch (A).

For Micrologic™ Trip Units refer to the trip unit user guide available on the Schneider Electric website (see page 1).

Figure 20: Instantaneous Trip Switch Adjustment



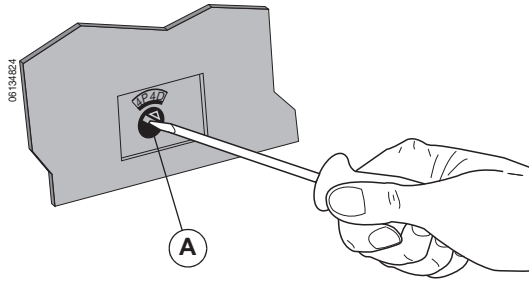
Neutral Protection Adjustment

NOTE: Applies to four-pole circuit breakers only

A. For ET electronic trip units and Micrologic 2.0, 3.0, 5.0, 2.0A, 3.0A and 5.0A electronic trip units:
   - — Remove fourth pole lens cover.
   - — Use a slotted screwdriver to adjust neutral setting on circuit breaker (A).
   - — Replace fourth pole lens cover. Torque screw to 5.3 in-lb (0.6 N•m).

B. For Micrologic 5.0P, 6.0P, 5.0H and 6.0H electronic trip units refer to the trip unit user guide available on the Schneider Electric website (see page 1).

Figure 21: Adjust Circuit Breaker System Type Switch (on Four-Pole Circuit Breaker)



Circuit Breaker Switch Setting	Neutral Protection
4P 3D	No neutral protection
3P N/2	1/2 neutral protection
4P 4D	Full neutral protection (Factory default setting)

Testing

Circuit breaker trip unit operation can be tested using the Hand-held Test Kit or the Full-function Test Kit.

TROUBLESHOOTING

If problems occur during installation, refer to information below. If trouble persists, contact the field office.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70ENFPA 70E or CSA Z462.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Troubleshooting may require energizing auxiliary devices with a test power supply. Make sure that the power supply is off before connecting or disconnecting it to the auxiliary device.
- Do not touch the terminals of the device during the test.

Failure to follow these instructions will result in death or serious injury.

Condition	Possible Causes	Solution
Circuit breaker fails to stay closed.	1. Trip adjustment set too low. 2. Undervoltage trip not energized. 3. Shunt trip energized. 4. Short circuit or overload on system.	1. Adjust trip setting. 2. Energize undervoltage trip. 3. De-energize shunt trip. 4. Check system for short circuit or overload.
Circuit breaker trips, but no short circuit or overload is evident.	1. Trip adjustment set too low. 2. Voltage is below undervoltage trip setting.	1. Adjust trip setting. 2. Check system for low voltage.
Push-to-trip button will not trip circuit breaker.	Circuit breaker already tripped or off (O).	Move circuit breaker handle to reset, then to on (I).
Circuit breaker cannot be opened manually.	Damage to current path.	Contact local field office.

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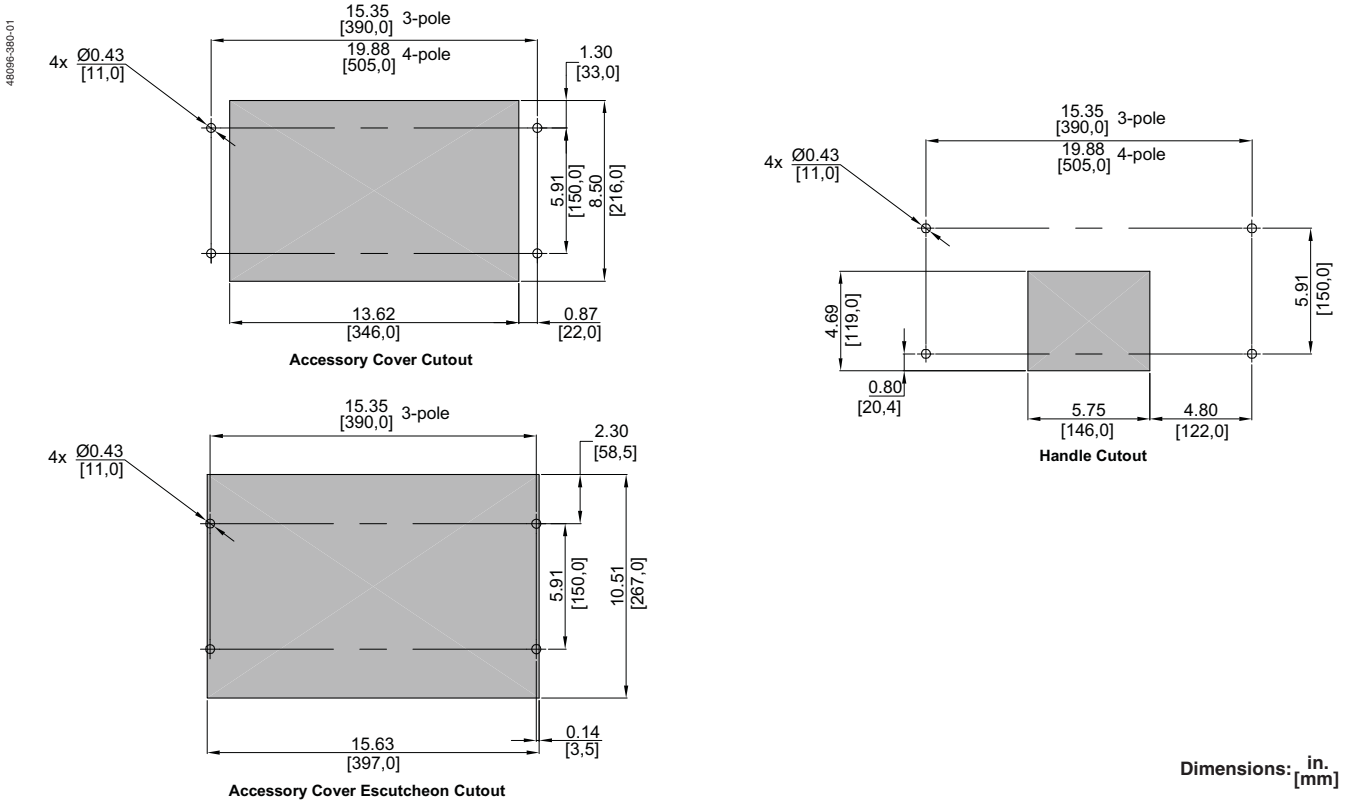
Dimensions

For dimensional information refer to the Schneider Electric website (see page 1).

Figure 22: Mounting Hole and Enclosure Cover Cutouts Dimensions



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Micrologic™ 2.0, 3.0 and 5.0 Electronic Trip Units

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Instruction Bulletin

48049-207-05
Rev. 01, 07/2012

Retain for future use.

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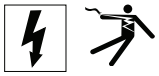
Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

ANSI 

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

IEC 

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This Class A digital apparatus complies with Canadian ICES-003.

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Table of Contents

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Section 1—General Information

Introduction

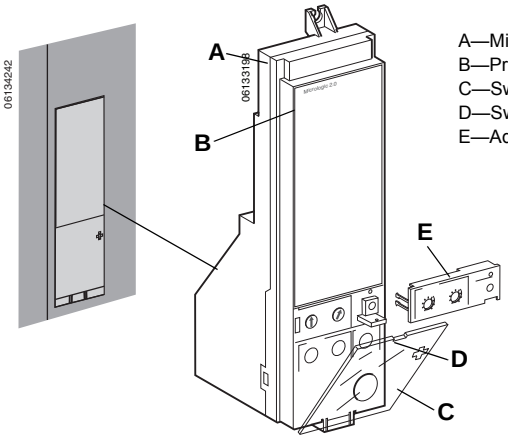
Micrologic™ trip units (A) provide adjustable tripping functions on electronic trip circuit breakers. The product name (B) specifies the level of protection provided by the trip unit.

Micrologic 3.0 Trip Unit

- Type of protection
  - 2—Basic IEC protection (LS0)
  - 3—Basic UL protection (LI)
  - 5—Selective protection (LSI)
- Trip unit series
  - 0—Indicates the first version

Micrologic trip units are field replaceable to allow for upgrading of the trip unit in the field. For complete information on available circuit breaker models, frame sizes, interrupting ratings, sensor plugs, rating plugs and trip units, see the product catalog.

Figure 1: Micrologic Trip Unit



A—Micrologic Trip Unit
B—Product Name
C—Switch Cover
D—Switch Cover Opening Slot
E—Adjustable Rating Plug

Trip Unit Settings

On the face of the trip unit are adjustable switches to allow changing of trip characteristics. Trip units are shipped with the long-time pickup switch set at 1.0 and all other trip unit adjustments set at their lowest settings.

Micrologic 2.0 Trip Unit

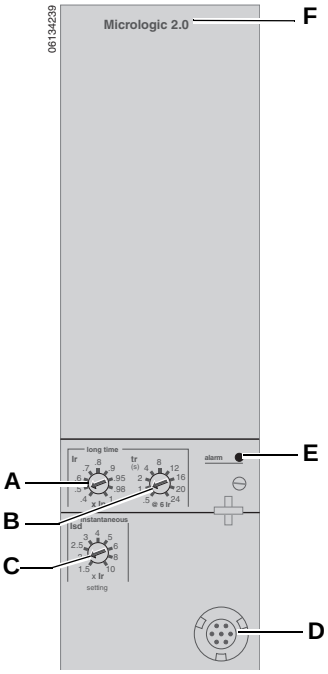
NOTE: For use with IEC circuit breakers only.

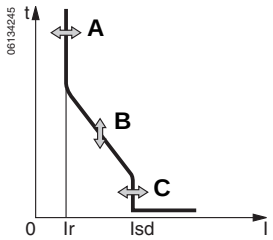
The Micrologic 2.0 trip unit provides basic IEC (LS0) protection.

A. Long-time pickup (Ir) switch
B. Long-time delay (tr) switch
C. Short-time pickup (Isd) switch*
D. Test plug receptacle
E. Overload indicator light
F. Trip unit name

*Short-time delay is factory set at 0 (no delay), thus short-time pickup provides instantaneous protection.

Figure 2: Micrologic 2.0 Trip Unit





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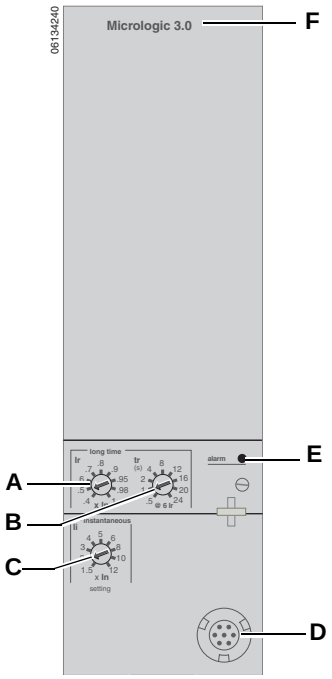
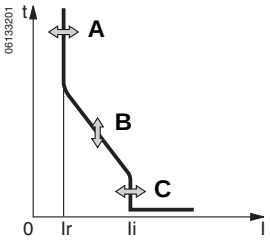
Micrologic 3.0 Trip Unit

The Micrologic 3.0 trip unit provides basic (LI) protection.

A. Long-time pickup (Ir) switch
B. Long-time delay (tr) switch
C. Instantaneous pickup (Ii) switch
D. Test plug receptacle
E. Overload indicator light
F. Trip unit name

Figure 3: Micrologic 3.0 Trip Unit



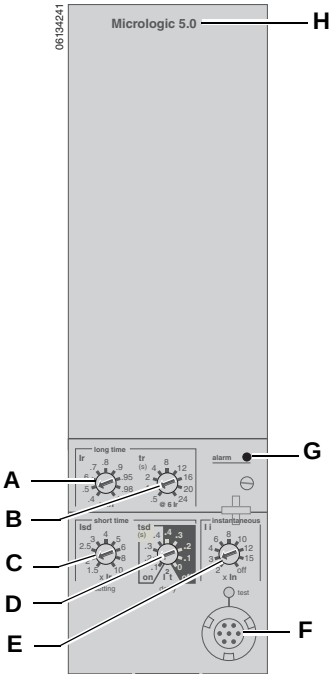


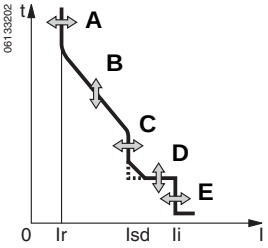
Micrologic 5.0 Trip Unit

The Micrologic 5.0 trip unit provides selective (LSI) protection.

A. Long-time pickup (Ir) switch
B. Long-time delay (tr) switch
C. Short-time pickup (Isd) switch
D. Short-time delay (tsd) switch
E. Instantaneous pickup (Ii) switch
F. Test plug receptacle
G. Overload indicator light
H. Trip unit name

Figure 4: Micrologic 5.0 Trip Unit





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Trip Unit Switches

Long-Time Protection

Long-time protection protects equipment against overloads.

- Long-time protection is standard on all trip units.
- The long-time pickup (Ir) (A) sets maximum current level (based on sensor plug rating In) which circuit breaker will carry continuously. If current exceeds this value, circuit breaker will trip after the preset time delay. The long-time pickup (Ir) is adjustable from 0.4–1.0 times the sensor plug rating (In).
- The long-time delay (tr) (B) sets the length of time that the circuit breaker will carry an overcurrent below the short-time or instantaneous pickup current level before tripping. See Table 1 for long-time delay settings.
- The overload indicator light (C) indicates that the Ir long-time pickup threshold has been exceeded.
- Both long-time pickup and long-time delay are on the field-replaceable adjustable rating plug. To change settings to more precisely match the application, various rating plugs are available. For instructions on replacing the rating plug, see Section 4—Adjustable Rating Plug Replacement.
- The In value can be changed by replacing the sensor plug below the trip unit. For further information, see the instructions packed with the sensor plug replacement kit.
- Long-time protection uses true RMS measurement.

Thermal imaging provides continuous temperature rise status of the wiring, both before and after the device trips. This allows the circuit breaker to respond to a series of overload conditions which could cause conductor overheating, but would go undetected if the long-time circuit was cleared every time the load dropped below the pickup setting or after every tripping event.

NOTE: If checking trip times, wait a minimum of 15 minutes after circuit breaker trips before resetting to allow the thermal imaging to reset completely to zero.

Figure 5: Long-Time Protection Switches

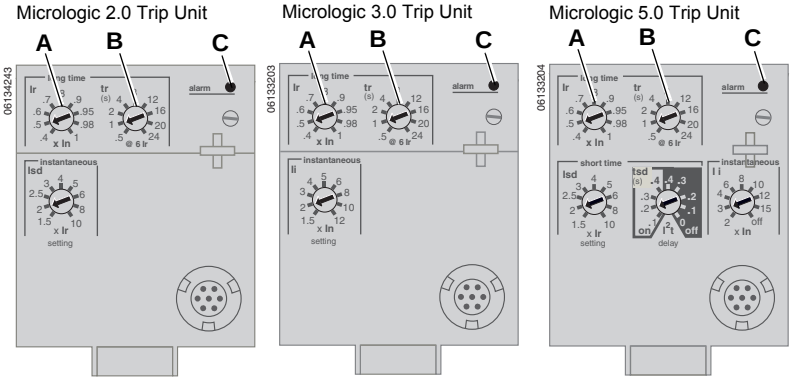

Table 1: Micrologic Trip Unit Long-Time Delay Values

Setting[1]	Long-Time Delay in Seconds[2]								
tr at 1.5 x Ir	12.5	25	50	100	200	300	400	500	600
tr at 6 x Ir	0.5	1	2	4	8	12	16	20	24
tr at 7.2 x Ir	0.34[3]	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6

[1]In = sensor rating. Ir = In x long-time pickup. Trip threshold between 1.05 and 1.20 Ir.
[2]Time-delay accuracy +0/-20%
[3]For Micrologic 5.0 trip units, when tsd is set to 0.4 off or 0.4 on, then tr = 0.5 instead of 0.34.

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Short-Time Protection

Short-time protection protects equipment against short circuits.

- Short-time protection is standard on 2.0 and 5.0 trip units. It is not available on 3.0 trip units.
- Short-time protection is based on the long-time pickup (Ir)
- The short-time pickup (Isd) (A) sets the current level (below instantaneous trip level) where the circuit breaker will trip after the preset time delay.
- The short-time delay (tsd) (B) sets the length of time that the circuit breaker will carry an overcurrent above the short-time pickup current level before tripping. It is adjustable on the 5.0 trip unit and factory set to zero on the 2.0 trip unit.
- The I^2t on/I^2t off option provides improved selectivity with downstream protective devices:
- With I^2t off selected, fixed time delay is provided.
  - — With I^2t on selected, inverse time I^2t protection is provided up to 10 x Ir. Above 10 x Ir, a fixed time delay is provided.
  - — Intermittent currents in the short-time tripping range which do not last sufficiently long to trigger a trip are accumulated and shorten the trip delay appropriately.
- Setting tsd to the 0 setting turns off time-delay features.
- Short-time protection uses true RMS measurement.
- Short-time delay can be adjusted to provide selectivity with a downstream circuit breaker.

Figure 6: Short-Time Protection Switches

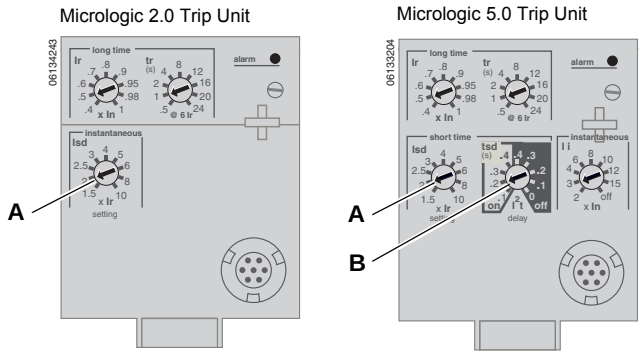

Table 2: Micrologic Trip Unit Short-Time Delay Values

Setting	Short-Time Delay				
I^2t off (Isd at 10 Ir) (seconds)	0	0.1	0.2	0.3	0.4
I^2t on (Isd at 10 Ir) (seconds)	–	0.1	0.2	0.3	0.4
tsd (min. trip) (milliseconds)	20	80	140	230	350
tsd (max. trip) (milliseconds)	80	140	200	320	500

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Instantaneous Protection

Instantaneous protection protects equipment against short circuits with no intentional time delay.

- Instantaneous protection (Ii) (A) is standard on 3.0 and 5.0 trip units.*
- Instantaneous protection for 2.0 trip units is based on the circuit breaker sensor rating (Ir).
- Instantaneous protection for 3.0 and 5.0 trip units is based on the long-time delay pickup (In).
- Circuit breaker open command is issued as soon as threshold current is exceeded.
- Instantaneous protection for 3.0 and 5.0 trip units use peak current measurement. Instantaneous protection for 2.0 trip units use RMS current measurement.
- When instantaneous protection switch is set to off, the instantaneous protection is disabled.

*Instantaneous protection on 2.0 trip units is achieved by using short-time protection (Isd) with short-time delay factory set to 0 (zero).

Figure 7: Instantaneous Protection Switches

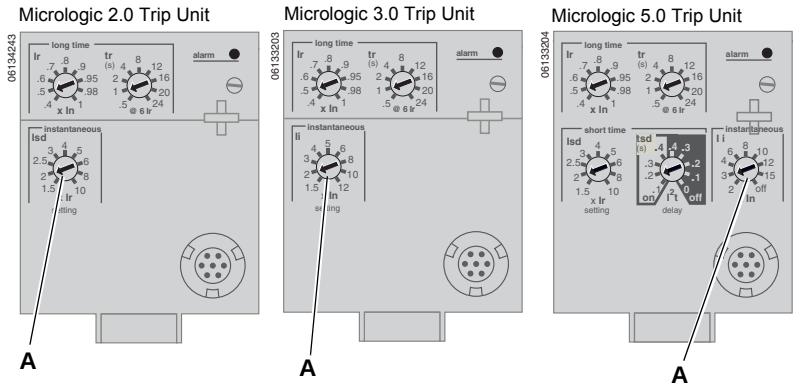


Table 3: Micrologic Instantaneous Values

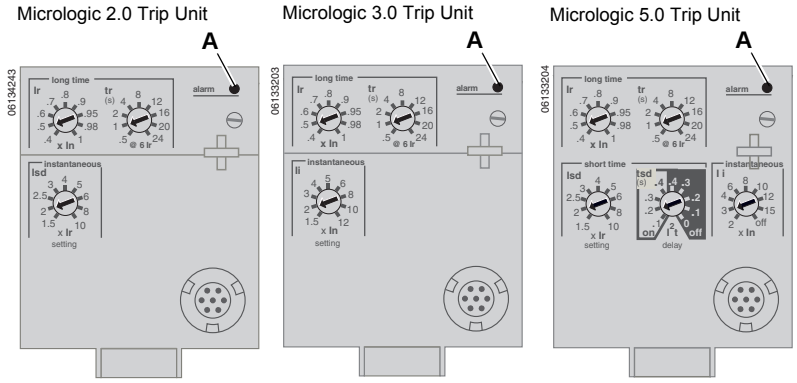
Setting	Interruption Current								
2.0 Isd (= Ir x..)	1.5	2	2.5	3	4	5	6	8	10
3.0 Ii (= In x..)	1.5	2	3	4	5	6	8	10	12
5.0 Ii (= In x..)	2	3	4	6	8	10	12	15	off

Ii = UL and ANSI instantaneous
Isd = IEC instantaneous (short-time with zero delay)
In = sensor rating
Ir = long-time pickup

Overload Indicator Light

The overload indicator light (A) lights when the Ir long-time pickup level has been exceeded.

Figure 8: Overload Indicator Lights



Trip Unit Testing

Trip unit functions can be tested using primary injection testing or secondary injection testing.

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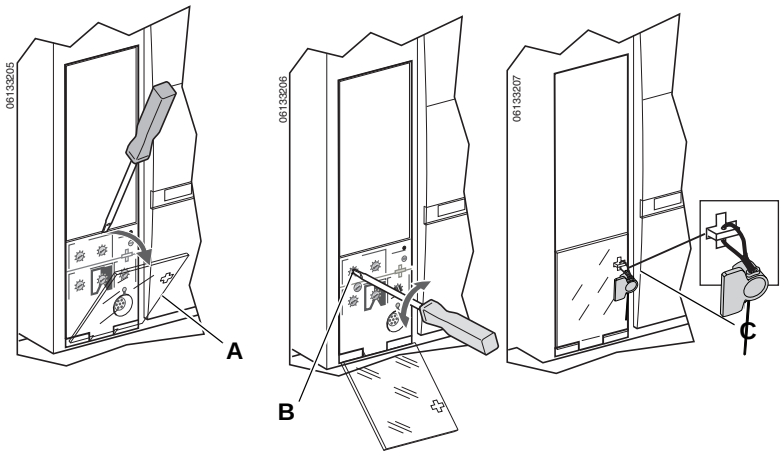
Section 2—Operation

Switch Adjustment

1. Open switch cover (A).
2. Adjust the appropriate switches (B) to desired values.
3. Replace switch cover. Use wire seal MICROTUSEAL (C), if necessary, to provide tamper evidence.

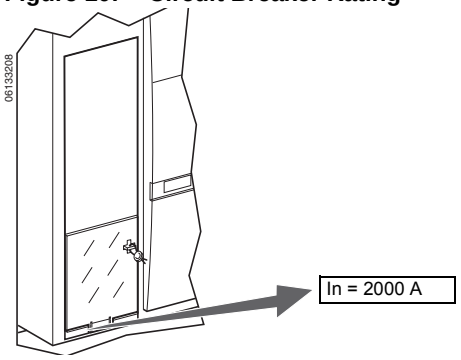
Figure 9: Adjust Switch Settings



Examples

Circuit breaker is rated 2000 A.

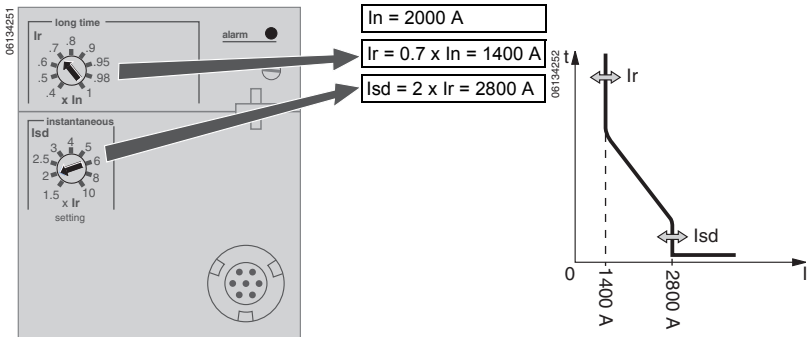
Figure 10: Circuit Breaker Rating



Micrologic 2.0 Trip Unit

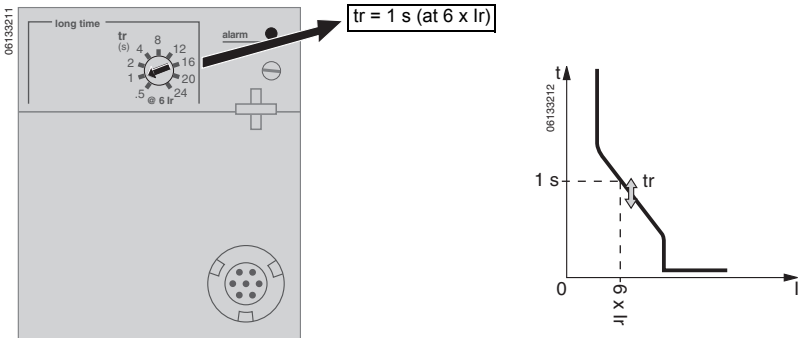
1. Set pickup levels.

Figure 11: Set Pickup Levels



2. Set time delay.

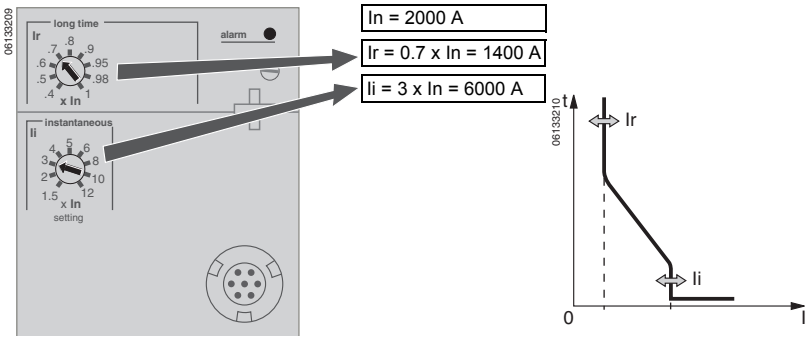
Figure 12: Set Time Delay



Micrologic 3.0 Trip Unit

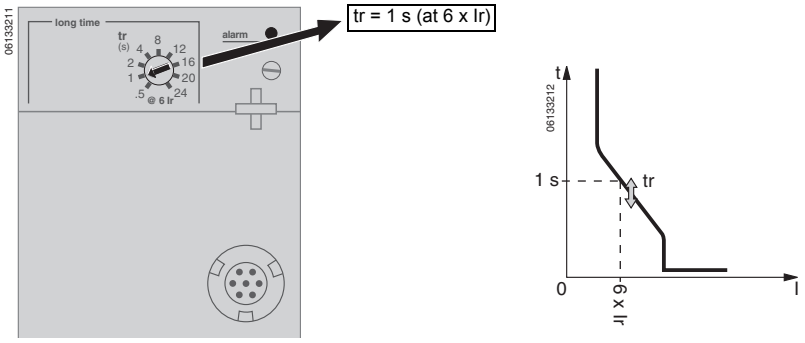
1. Set pickup levels.

Figure 13: Set Pickup Levels



2. Set time delay.

Figure 14: Set Time Delay



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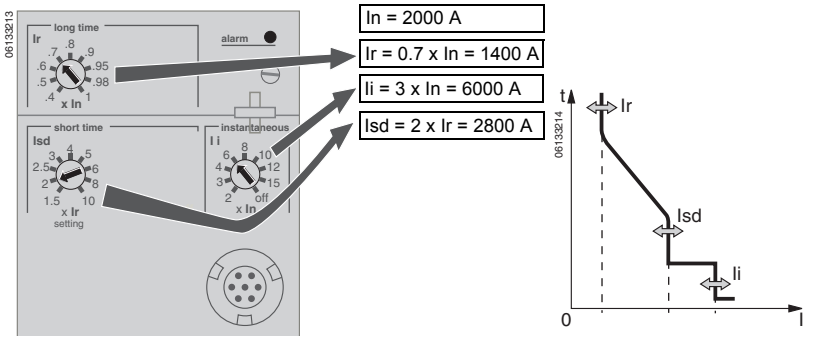
Micrologic 5.0 Trip Unit

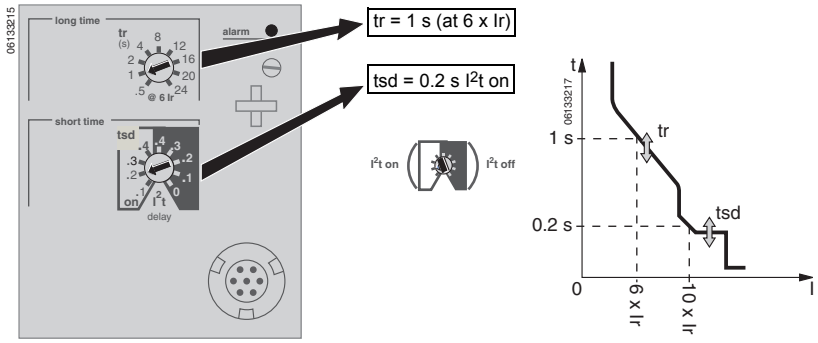
1. Set pickup levels.

Figure 15: Set Pickup Levels



2. Set time delay.

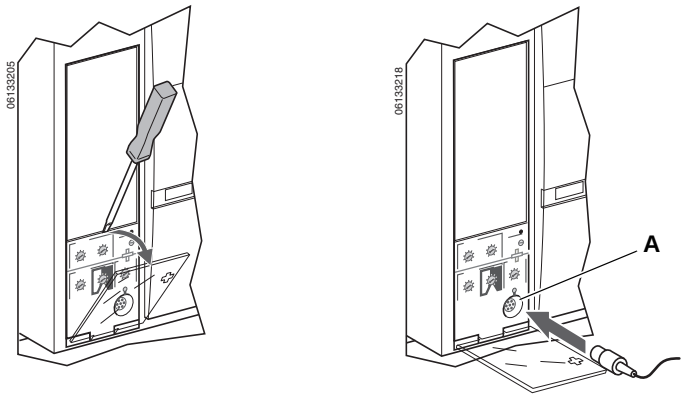
Figure 16: Set Time Delay



Trip Unit Operation Verification

Use a test kit connected to the trip unit test plug receptacle (A) to verify trip unit is functioning as desired. See instructions shipped with test kit to perform verification tests.

Figure 17: Verify Trip Unit Operation



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Section 3—Trip Unit Replacement

Trip unit replacement must be done by qualified persons, as defined by the National Electric Code, who are familiar with the installation and maintenance of power circuit breakers.

Before replacing trip unit, confirm that the circuit breaker is in good working condition. If the condition of the circuit breaker is unknown, do not proceed. For assistance in evaluating the condition of the circuit breaker, call Technical Support.

Read this entire section before starting the replacement procedure.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Failure to follow these instructions for installation, trip test and primary injection testing may result in the failure of some or all protective function.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- Replacement/upgrading of a trip unit in the field must be done by qualified persons, as defined by the National Electric Code, who are familiar with the installation and maintenance of power circuit breakers.
- Before replacing/upgrading trip unit, confirm that the circuit breaker is in good working condition. If the condition of the circuit breaker is unknown, do not proceed. For assistance in evaluating the condition of the circuit breaker, call Technical Support.
- If the circuit breaker fails to function properly in any manner upon completion of the trip unit installation, immediately remove the circuit breaker from service and call Field Services.
- Turn off all power supplying this equipment before working on or inside equipment. Follow instructions shipped with circuit breaker to disconnect and reconnect circuit breaker.
- Replace all devices, doors and covers before returning equipment to service.

Failure to follow this instruction will result in death or serious injury.

Required Tools

- Torque-controlled screwdriver, set at 7 in-lbs (0.8 N•m) ± 10% (Lindstrom torque driver MAL500-2 or equivalent)
- Micrologic Full-Function Test Kit (part number S33595)

Preparation

Record Switch Settings

Record all trip unit switch setting for later use.

Circuit Breaker Disconnection

Disconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker. The circuit breaker must be completely isolated. (For a drawout circuit breaker, place circuit breaker in the disconnected position. For a fixed-mounted circuit breaker, all voltage sources, including auxiliary power, must be disconnected.)

Circuit Breaker Accessory Cover Removal

Remove circuit breaker accessory cover as directed in the Install Accessories section of the circuit breaker instruction bulletin shipped with the circuit breaker.

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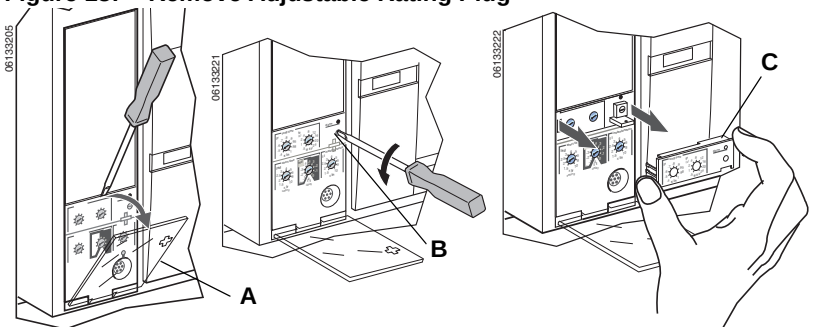
Rating Plug Removal

A small Phillips screwdriver is needed to remove the adjustable rating plug.

1. Open switch cover (A).
2. Unscrew adjustable rating plug mounting screw (B).
3. Remove adjustable rating plug (C). Save for installation in replacement trip unit.

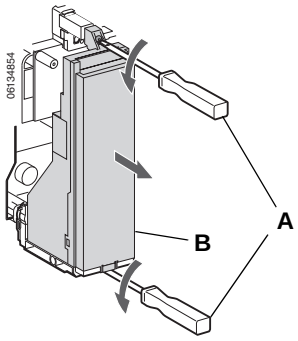
Figure 18: Remove Adjustable Rating Plug



Trip Unit Removal

1. Loosen two trip unit screws (A).
2. Slide out trip unit (B).

Figure 19: Remove Existing Trip Unit



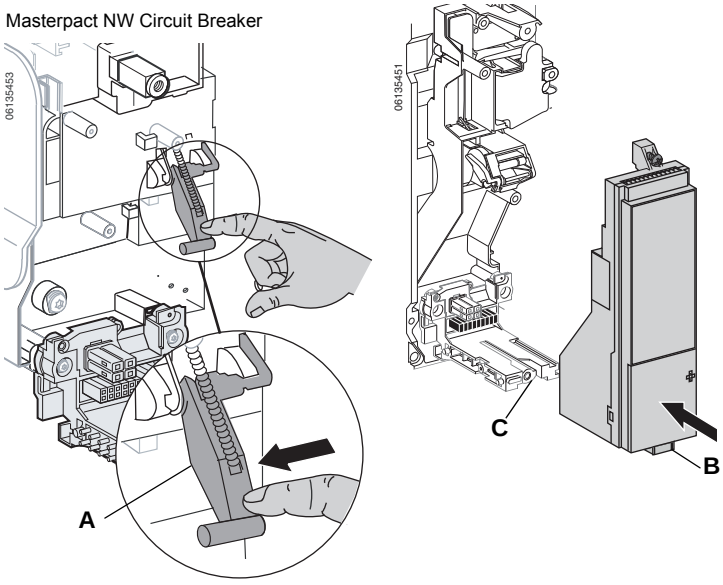
Trip Unit Replacement

Trip Unit Installation

1. Inspect trip unit connector pins and surfaces. If there is any damage, misaligned pins, or contamination, stop installation and contact the local sales office for factory authorized service.
2. Inspect trip unit mounting base on the circuit breaker. Clear any debris from area and check that all accessory wiring is properly routed for the trip unit being installed. If there is any damage or contamination, stop installation and contact the local sales office for factory authorized service.
3. For Masterpact NW circuit breaker only: Manually depress trip unit interlock (A) and hold it in place during steps 4–6 below.
4. Align guide rail (B) on bottom of trip unit with guide rail slot (C) on trip unit mounting base in circuit breaker and gently slide the trip unit in until it stops.

NOTE: The Masterpact NT and NW trip unit mounting bases are shock mounted and therefore can flex slightly.

Figure 20: Install Trip Unit



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⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

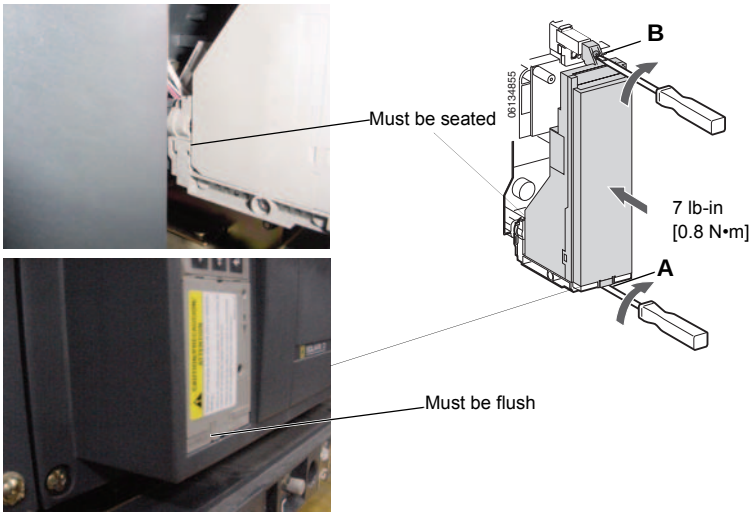
Check installation of trip unit to assure proper connections and seating.

Failure to follow this instruction can result in equipment damage or improper circuit breaker tripping.

5. Align the trip unit so top mounting screw (B) aligns with the top threaded insert and start the screw by turning the screw two full rotations.
6. Use a torque-controlled screwdriver to drive the bottom screw to 7 in-lbs (0.8 N•m) ± 10%. The back of the trip unit must be flush with the trip unit mounting base.
7. Use a torque-controlled screwdriver to drive the top screw to 7 in-lbs (0.8 N•m) ± 10%. Mounting tab must be flush with the mounting standoff and sensor plug.

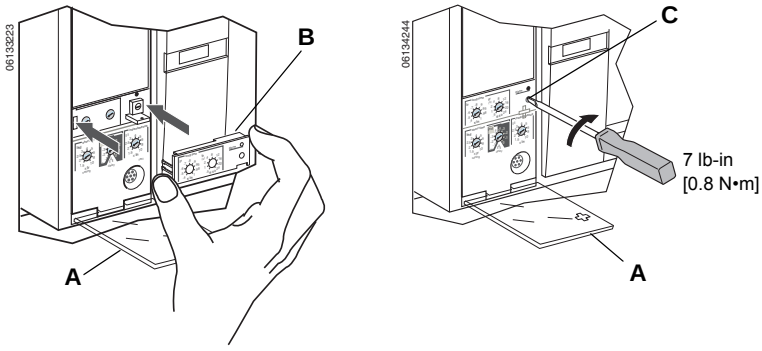
NOTE: The face of the closed switch cover must be flush with adjoining mounting base surfaces. If these surfaces are not flush, stop installation and contact the local sales office for factory authorized service.

Figure 21: Install Trip Unit



8. Install adjustable rating plug into the trip unit.
   a. Open switch cover (A) on new trip unit.
   b. Inspect mounting area for debris and contamination.
   c. Gently push adjustable rating plug (B) into new trip unit.
   d. Tighten adjustable rating plug mounting screw (C). The plug will be drawn into position flush with front face as screw is tightened.
9. Set trip unit switches to values recorded above or per coordination study results.
10. Close switch cover (A).

Figure 22: Install Adjustable Rating Plug



Circuit Breaker Accessory Cover Replacement

Replace circuit breaker accessory cover as directed in the Install Accessories section of the circuit breaker instruction bulletin shipped with the circuit breaker.

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Trip Unit Installation Check

Secondary Injection Testing

Field installation of a trip unit requires secondary injection testing with a Full-Function Test Kit. This will ensure that the newly-installed trip unit is functioning properly. The test will require opening and closing the circuit breaker. Follow the procedures outlined in the instruction bulletins shipped with the circuit breaker and the Full-Function Test Kit.

1. Make sure the circuit breaker is isolated from all upstream and downstream devices.
2. Perform secondary injection testing as outlined in the instruction bulletin shipped with the Full-Function Test Kit. Verify that all applicable trip unit functions are operating properly.
3. Repeat step 2 with the circuit breaker in the open position.

   NOTE: The test kit will state that the circuit breaker should be closed when performing the test. Do not close the circuit breaker for this step.
4. If any test fails, do not put the circuit breaker into service and contact the local sales office for factory authorization service.

Primary Injection Testing

Primary injection testing is recommended to ensure that all trip system connections have been correctly made. Perform primary injection testing per the instructions in the Field Testing and Maintenance Guide, bulletin 0600IB1201.

Trip Unit Setup

Reset the trip unit switches to original values, as recorded at the beginning of this section.

Circuit Breaker Reconnection

Reconnect circuit breaker as directed in the circuit breaker instruction bulletin shipped with the circuit breaker.

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Section 4—Adjustable Rating Plug Replacement

NOTE: To select correct replacement rating plug, see the product catalog.

NOTE: If adjustable rating plug is removed, the circuit breaker will default to a long-time pickup rating of 0.4 x In and a long-time delay at whatever setting was selected before the rating plug was removed.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

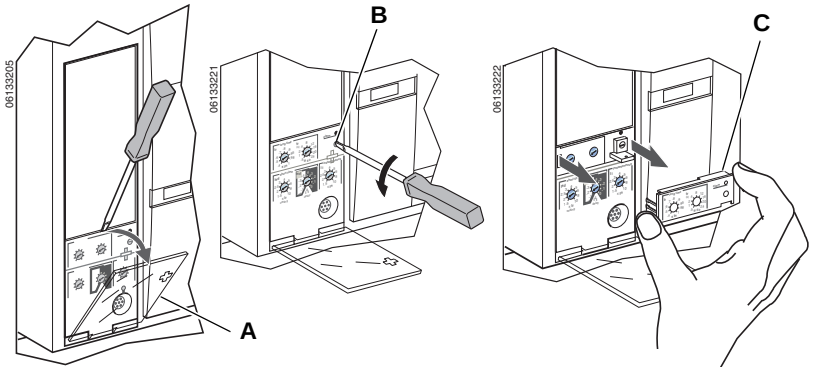
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment. Follow instructions shipped with circuit breaker to disconnect and reconnect circuit breaker.
- Replace all devices, doors and covers before returning equipment to service.

Failure to follow this instruction will result in death or serious injury.

Rating Plug Removal

1. Open circuit breaker contacts:
   - — For NT and NW circuit breakers, press the “Push to open” button on the circuit breaker.
   - — For other circuit breakers, move handle to the off (O) position.
2. Open switch cover (A).
3. Unscrew adjustable rating plug mounting screw (B).
4. Remove adjustable rating plug (C).

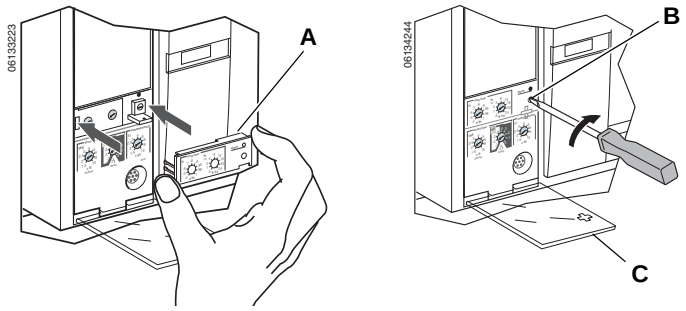
Figure 23: Remove Adjustable Rating Plug



New Rating Plug Installation

1. Inspect mounting area for debris and contamination.
2. Gently push in new rating plug (A).
3. Tighten adjustable rating plug mounting screw (B).
4. Set the switches on the trip unit (see Section 2—Operation).
5. Close switch cover (C).

Figure 24: Install New Adjustable Rating Plug



3700 Sixth St. SW
Cedar Rapids, IA 52404 USA
1-888-778-2733
www.schneider-electric.us

48049-207-05 Rev. 01, 07/2012
Replaces 48049-207-05 10/2007

PANELBOARDS

THIS SECTION CONTAINS DETAILED DRAWINGS ON THE FOLLOWING PANELS:

DESIGNATION	*TYPE*	*VOLTAGE*	*AIC*	*MOUNTING*	*PBA*	*NOTES AND REMARKS*
PANEL L1A	NQ	208Y/120V 3Ph 4W 60Hz	42kA	Top Trim: Surface - Hinged	701T	Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L1A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
PANEL L1A	NQ	208Y/120V 3Ph 4W 60Hz	42kA	Top Trim: Surface - Hinged	701T	Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L1A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
PANEL L2A	NQ	208Y/120V 3Ph 4W 60Hz	42kA	Top Trim: Surface - Hinged	701T	Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L2A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
PANEL L2A	NQ	208Y/120V 3Ph 4W 60Hz	42kA	Top Trim: Surface - Hinged	701T	Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L2A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
PANEL L3A	NQ	208Y/120V 3Ph 4W 60Hz	42kA	Top Trim: Surface - Hinged	701T	Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L3A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
PANEL L3A	NQ	208Y/120V 3Ph 4W 60Hz	42kA	Top Trim: Surface - Hinged	701T	Ship Together,Standard Solid Neutral,Additional Aluminum Isolated Ground Bar,Standard Ground Bar Group User Placement Standard Nameplate: Engraved as Follows Line 1: PANEL L3A Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on
PANEL EL1	NQ	208Y/120V 3Ph 4W 60Hz	10kA	Bottom Trim: Surface - Hinged	707HR	Standard Panel (Box Ahead),Standard Solid Neutral,Standard Ground Bar Standard Nameplate: Engraved as Follows Line 1: PANEL EL1 Size: 3.50" Wide x 1.00" High (Std) Color: White Surface / Black Letters Plastic/Adhesive - Screw-on

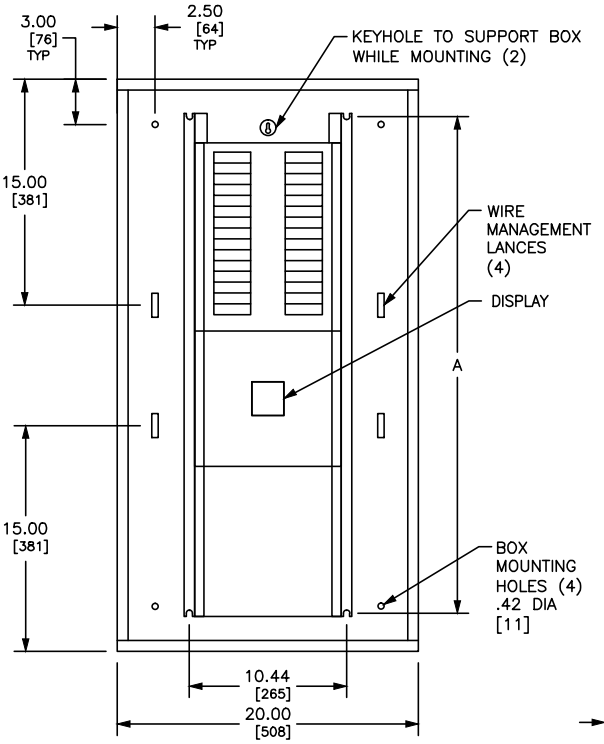
PLEASE CONFIRM THAT THE PANEL DETAILS MATCHES THE PLANS AND SPECIFICATIONS.

ALL LUGS ON PANELBOARDS AND CIRCUIT BREAKERS ARE RATED AT 75 DEGR C.

ALL LUGS ARE SIZED PER UL STANDARDS. PLEASE CONFIRM THAT THEY ARE APPROPRIATE FOR THE QUANTITY AND SIZE OF THE CABLE BEING CONNECTED.

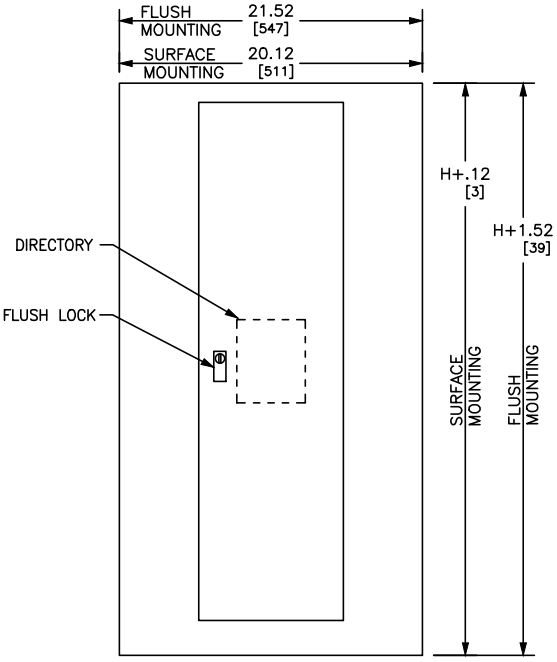
PLEASE CONFIRM TOP OR BOTTOM FEED, AND SURFACE OR FLUSH COVERS.

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

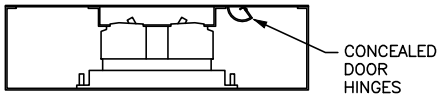


TYPICAL BOX WITH INTERIOR

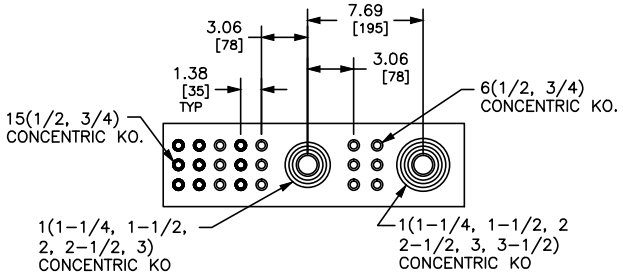
TYPICAL BOX SIDE VIEW



TYPICAL FRONT



TYPICAL MOUNTING OF QO, QOB BREAKERS



ENDWALL WITH KNOCKOUTS
(OTHER ENDWALL IS BLANK)

REFER TO DP CATALOG CLASS 1640 FOR ADDITIONAL INFORMATION

TYPE 1 ENCLOSURE

NQ PANELBOARDS MEET THE APPLICABLE REQUIREMENTS OF UL AND CSA.

BOX: CODE GAUGE GALVANIZED STEEL. ONE ENDWALL IS BLANK, THE OTHER HAS KNOCKOUTS.

FRONT: MONO-FLAT CONSTRUCTION WITH CONCEALED TRIM SCREWS AND DOOR HINGES. ANSI 49 GRAY BAKED ENAMEL FINISH ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.

LOCK: FLUSH LOCK WITH BRUSHED STAINLESS STEEL ESCUTCHEON. NSR-251 KEY.

DUAL DIMENSIONS: INCHES / MILLIMETERS

MAXIMUM MAIN LUGS AMPERE RATING	MAXIMUM NUMBER OF CIRCUITS	H		A	
		IN	MM	IN	MM
100A WITH SPD	18	44.00	1118	39.00	991
	30	50.00	1270	45.00	1143
100A WITH SPD & SUB FEED LUGS OR FEED THRU LUGS	18	44.00	1118	39.00	991
	30	50.00	1270	45.00	1143
225A WITH SPD	30	50.00	1270	45.00	1143
	42 & 54	56.00	1422	51.00	1295
	72	62.00	1575	57.00	1448
	84	68.00	1727	63.00	1600
225A WITH SPD & SUB FEED LUGS	30	56.00	1422	51.00	1295
	42 & 54	62.00	1575	57.00	1448
	72	68.00	1727	63.00	1600
	84	74.00	1880	69.00	1753
225A WITH SPD & FEED THRU LUGS	30 & 42	56.00	1422	51.00	1295
	54	62.00	1575	57.00	1448
	72	68.00	1727	63.00	1600
	84	74.00	1880	69.00	1753

NOTE: SFL AND SFB NOT AVAILABLE WITH CONTACTORS

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L3A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (CIRCUIT BREAKER TYPE)
DRAWN BY:	CAD	DRAWING TYPE:	PAD DRAWING
ENGR:	----		
DATE:	AUGUST 21 2012		
DRAWING STATUS:	RECORD	DWG# A31751120-701T-01	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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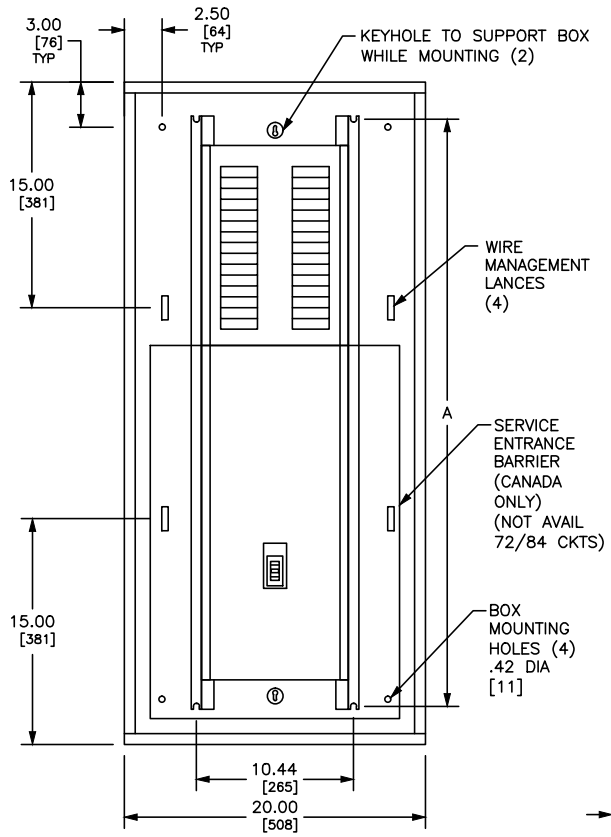
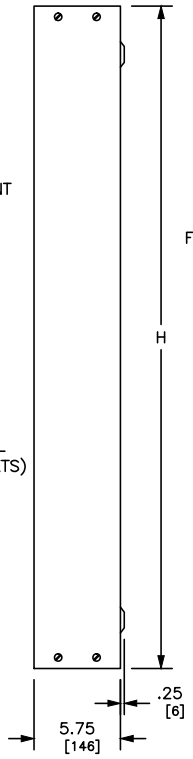
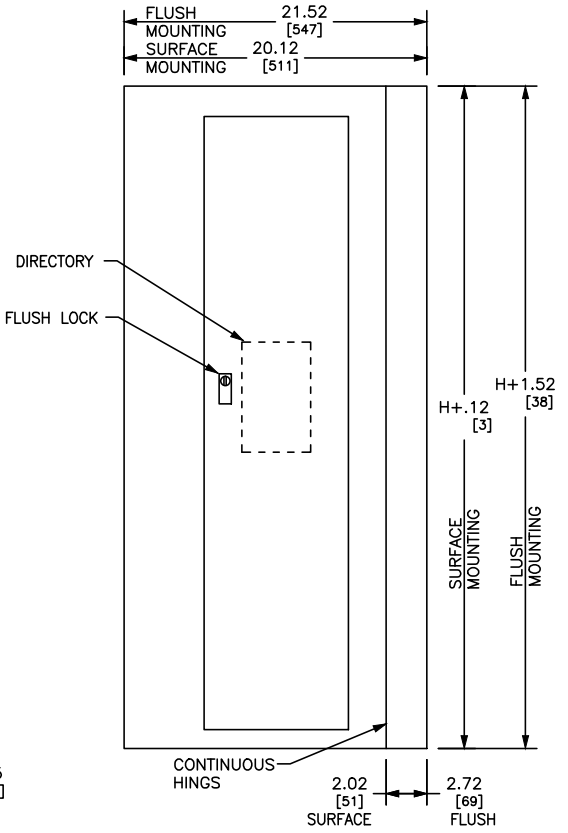


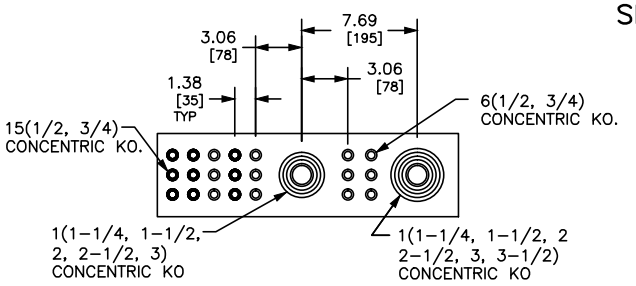
TYPICAL BOX WITH INTERIOR



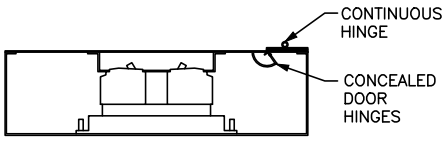
TYPICAL BOX
SIDE VIEW



TYPICAL FRONT



ENDWALL WITH KNOCKOUTS
(OTHER ENDWALL IS BLANK)



TYPICAL MOUNTING OF
QO, QOB BREAKERS

DUAL DIMENSIONS: INCHES
MILLIMETERS

REFER TO DP CATALOG CLASS 1640 FOR ADDITIONAL INFORMATION

NQ PANELBOARDS MEET THE APPLICABLE REQUIREMENTS OF UL AND CSA.

BOX: CODE GAUGE GALVANIZED STEEL. ONE ENDWALL IS BLANK, HE OTHER HAS KNOCKOUTS.

FRONT: MONO-FLAT CONSTRUCTION WITH CONCEALED TRIM SCREWS AND DOOR HINGES. ANSI 49 GRAY BAKED ENAMEL FINISH ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.

LOCK: FLUSH LOCK WITH BRUSHED STAINLESS STEEL ESCUTCHEON. NSR-251 KEY.

MAXIMUM MAIN BREAKER AMPERE RATING	MAXIMUM NUMBER OF CIRCUITS	H		A	
		IN	MM	IN	MM
250A	30	44.00	1118	39.00	991
	42 & 54	50.00	1270	45.00	1143
	72	56.00	1422	51.00	1295
	84	62.00	1575	57.00	1448
250A WITH FEED THRU LUGS	30 & 42	50.00	1270	45.00	1143
	54	56.00	1422	51.00	1295
	72	62.00	1575	57.00	1448
	84	68.00	1727	63.00	1600
250A WITH SUB FEED BREAKER	30	62.00	1575	57.00	1448
	42 & 54	68.00	1727	63.00	1600
	72	74.00	1880	69.00	1753
	84	80.00	2032	75.00	1905

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL EL1
JOB LOCATION:	TOPEKA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type)
DRAWN BY:	CAD	DRAWING TYPE:	PAD DRAWING
ENGR:			
DATE:	August 09 2013		
DRAWING STATUS:	RECORD	DWG# A31751120-707HR-01	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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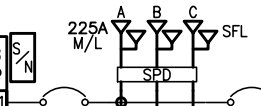


CKT NO	ACCESSORIES	TYPE	RATING AMP/P	S/N	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1		QOB	20/1		20/1	QOB		2
3		QOB	20/1		20/1	QOB–GFI		4
5		QOB	20/1		20/1	QOB		6
7		QOB	20/1		20/1	QOB		8
9		QOB	20/1		20/1	QOB		10
11		QOB	20/1		20/1	QOB		12
13		QOB	20/1		20/1	QOB		14
15		QOB	20/1		20/1	QOB		16
17		QOB	20/1		20/1	QOB		18
19		QOB	20/1		20/1	QOB		20
21		QOB	20/1		20/1	QOB		22
23		QOB	20/1		20/1	QOB–GFI		24
25		QOB	20/1		20/1	QOB–GFI		26
27		QOB	20/1		20/1	QOB		28
29		QOB	20/1		20/1	QOB		30
31	HLO Fixed Off/On	QOB	20/1		20/1	QOB–GFI		32
33	HLO Fixed Off/On	QOB	20/1		20/1	QOB	HLO Fixed Off/On	34
35		QOB	20/1		20/1	QOB		36
37		QOB	20/1		20/1	QOB		38
39		QOB	20/1		20/1	QOB		40
41		QOB	20/1		20/1	QOB		42

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC62SHR
BOX CAT#: MH62
DIMENSIONS:
62"H x 20"W x 5.75"D
WIRE BENDING SPACE:
TOP – 9.26
BOTTOM – 17.2
SIDE – 6.13
PBA:701T

BUSSING: Aluminum
Tin Plated

OPTIONAL FEATURES:
SHIP TOGETHER
Aluminum Solid Neutral
GROUP USER PLACEMENT
ALUMINUM GROUND BAR
ADDITIONAL Aluminum Isolated GRD BAR
SPD DRY CONTACTS
SPD SURGE COUNTER
SPD PEAK SURGE RATING/PHASE: 160kA
SPD LINE TO GRD PROTECT

----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
(Continued on next page.)

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 225A
42kA SYMS. SCCR
Series Rated w/ JG

MAIN: MAIN LUGS : 225A
ACC: SUBFEED LUGS
Top FEED
INCOMING CONDUCTORS(S) PER NEC:
(2) 1/0 – 350 kcmil

BRANCH MOUNTING TYPE: BOLT–ON

----------BRANCH SUMMATION----------
35 – 20A/1P QOB
4 – 20A/1P QOB–GFI
3 – 20A/1P QOB HPL

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L1A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# 031751120-005-01	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

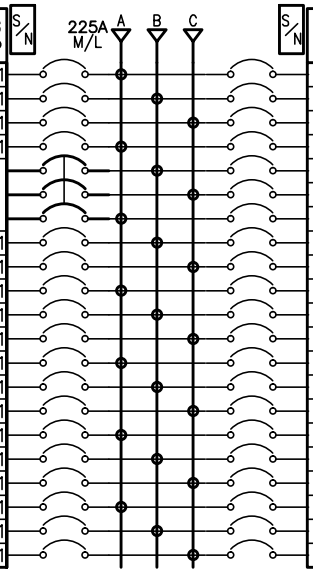
PHYSICAL DATA CONTINUED

LINE 1: PANEL L1A
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw–on

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**PANEL L1A**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# **031751120–005–01**	PG **2** OF **2** REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

CKT NO	ACCESSORIES	TYPE	RATING AMP/P	S/N
43	HLO Fixed Off/On	QOB	20/1	
45	HLO Fixed Off/On	QOB	20/1	
47	HLO Fixed Off/On	QOB	20/1	
49		QOB	20/1	
51		QOB	50/3	
53				
55				
57		QOB	20/1	
59		QOB	20/1	
61		QOB	20/1	
63		QOB	20/1	
65		QOB	20/1	
67		QOB	20/1	
69		QOB	20/1	
71		QOB	20/1	
73		QOB	20/1	
75		QOB	20/1	
77		QOB	20/1	
79		QOB	20/1	
81		QOB	20/1	
83		QOB	20/1	



S/N	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
	20/1	QOB		44
	20/1	QOB		46
	20/1	QOB		48
	20/1	QOB		50
	20/1	QOB		52
	20/1	QOB		54
	20/1	QOB		56
	20/1	QOB		58
	20/1	QOB		60
	20/1	QOB		62
	20/1	QOB		64
	20/1	QOB		66
	20/1	QOB		68
	20/1	QOB		70
	20/1	QOB		72
	20/1	QOB		74
	20/1	QOB		76
	20/1	QOB		78
	20/1	QOB		80
	20/1	QOB		82
	20/1	QOB		84

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC38SHR
BOX CAT#: MH38
DIMENSIONS:
38"H x 20"W x 5.75"D
WIRE BENDING SPACE:
TOP – 9.26
BOTTOM – 5
SIDE – 6.13
PBA:701T

BUSSING: Aluminum
Tin Plated

OPTIONAL FEATURES:
SHIP TOGETHER
Aluminum Solid Neutral
GROUP USER PLACEMENT
ALUMINUM GROUND BAR
ADDITIONAL Aluminum Isolated GRD BAR

----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
LINE 1: PANEL L1A
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw-on

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 225A
42kA SYMS. SCCR
Series Rated w/ JG

MAIN: MAIN LUGS : 225A
Top FEED
INCOMING CONDUCTORS(S) PER NEC:
(2) 1/0 – 350 kcmil

BRANCH MOUNTING TYPE: BOLT-ON

----------BRANCH SUMMATION----------

3 – 20A/1P QOB HPL
1 – 50A/3P QOB
36 – 20A/1P QOB

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L1A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 2 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# 031751120-018-02	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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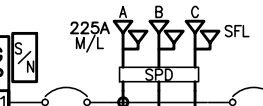

CKT NO	ACCESSORIES	TYPE	RATING AMP/P	S/N	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1		QOB	20/1		20/1	QOB		2
3		QOB	20/1		20/1	QOB–GFI		4
5		QOB	20/1		20/1	QOB		6
7		QOB	20/1		20/1	QOB		8
9		QOB	20/1		20/1	QOB		10
11		QOB	20/1		20/1	QOB		12
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15		QOB	20/1		20/1	QOB		16
17		QOB	20/1		20/1	QOB		18
19		QOB	20/1		20/1	QOB		20
21		QOB	20/1		20/1	QOB		22
23		QOB	20/1		20/1	QOB–GFI		24
25		QOB	20/1		20/1	QOB–GFI		26
27		QOB	20/1		20/1	QOB–GFI		28
29		QOB	20/1		20/1	QOB		30
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33		QOB	20/1		20/1	QOB		34
35		QOB	20/1		20/1	QOB		36
37		QOB	20/1		20/1	QOB		38
39		QOB	20/1		20/1	QOB		40
41		QOB	20/1		20/1	QOB		42

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC62SHR
BOX CAT#: MH62
DIMENSIONS:
62''H x 20''W x 5.75''D
WIRE BENDING SPACE:
TOP – 9.26
BOTTOM – 17.2
SIDE – 6.13
PBA:701T
BUSSING: Aluminum
Tin Plated
OPTIONAL FEATURES:
SHIP TOGETHER
Aluminum Solid Neutral
GROUP USER PLACEMENT
ALUMINUM GROUND BAR
ADDITIONAL Aluminum Isolated GRD BAR
SPD DRY CONTACTS
SPD SURGE COUNTER
SPD PEAK SURGE RATING/PHASE: 160kA
SPD LINE TO GRD PROTECT
----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
(Continued on next page.)

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 225A
42kA SYMS. SCCR
Series Rated w/ JG
MAIN: MAIN LUGS : 225A
ACC: SUBFEED LUGS
Top FEED
INCOMING CONDUCTORS(S) PER NEC:
(2) 1/0 – 350 kcmil
BRANCH MOUNTING TYPE: BOLT–ON
----------BRANCH SUMMATION----------
38 – 20A/1P QOB
4 – 20A/1P QOB–GFI

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L2A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# 031751120-006-01	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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PHYSICAL DATA CONTINUED

LINE 1: PANEL L2A
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw–on

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**PANEL L2A**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# **031751120–006–01**	PG **2** OF **2** REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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CKT NO	ACCESSORIES	TYPE	RATING AMP/P	S/N	225A M/L A B C	S/N	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
43		QOB	20/1				20/1	QOB		44
45		QOB	20/1				20/1	QOB		46
47		QOB	20/1				20/1	QOB		48
49		QOB	20/1				20/1	QOB		50
51		QOB	20/1				20/1	QOB		52
53		QOB	20/1				20/1	QOB		54
55		QOB	20/1				20/1	QOB		56
57		QOB	20/1				20/1	QOB		58
59		QOB	20/1				20/1	QOB		60
61		QOB	20/1				20/1	QOB		62
63		QOB	20/1				20/1	QOB		64
65		QOB	20/1				20/1	QOB		66
67		QOB	20/1				20/1	QOB		68
69		QOB	20/1				20/1	QOB		70
71		QOB	20/1				20/1	QOB		72
73		QOB	20/1				20/1	QOB		74
75		QOB	20/1				20/1	QOB		76
77		QOB	20/1				20/1	QOB		78
79		QOB	20/1				20/1	QOB		80
81		QOB	20/1				20/1	QOB		82
83		QOB	20/1				20/1	QOB		84

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC38SHR
BOX CAT#: MH38
DIMENSIONS:
38"H x 20"W x 5.75"D
WIRE BENDING SPACE:
TOP – 9.26
BOTTOM – 5
SIDE – 6.13
PBA:701T

BUSSING: Aluminum
Tin Plated

OPTIONAL FEATURES:
SHIP TOGETHER
Aluminum Solid Neutral
GROUP USER PLACEMENT
ALUMINUM GROUND BAR
ADDITIONAL Aluminum Isolated GRD BAR

----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
LINE 1: PANEL L2A
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw-on

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 225A
42kA SYMS. SCCR
Series Rated w/ JG

MAIN: MAIN LUGS : 225A
Top FEED
INCOMING CONDUCTORS(S) PER NEC:
(2) 1/0 – 350 kcmil

BRANCH MOUNTING TYPE: BOLT-ON
----------BRANCH SUMMATION----------
42 – 20A/1P QOB

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L2A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 2 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# 031751120-019-02	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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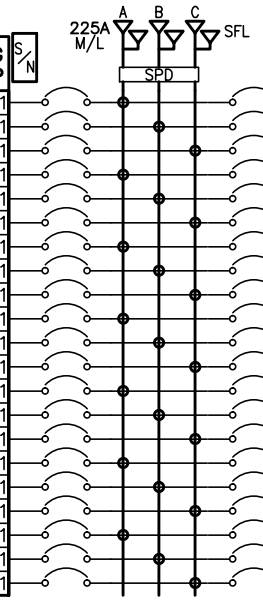

CKT NO	ACCESSORIES	TYPE	RATING AMP/P	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1		QOB	20/1	20/1	QOB		2
3		QOB	20/1	20/1	QOB–GFI		4
5		QOB	20/1	20/1	QOB		6
7		QOB	20/1	20/1	QOB		8
9		QOB	20/1	20/1	QOB		10
11		QOB	20/1	20/1	QOB		12
13		QOB	20/1	20/1	QOB		14
15		QOB	20/1	20/1	QOB		16
17		QOB	20/1	20/1	QOB		18
19		QOB	20/1	20/1	QOB		20
21		QOB	20/1	20/1	QOB		22
23		QOB	20/1	20/1	QOB–GFI		24
25		QOB	20/1	20/1	QOB–GFI		26
27		QOB	20/1	20/1	QOB–GFI		28
29		QOB	20/1	20/1	QOB		30
31		QOB	20/1	20/1	QOB		32
33		QOB	20/1	20/1	QOB		34
35		QOB	20/1	20/1	QOB		36
37		QOB	20/1	20/1	QOB		38
39		QOB	20/1	20/1	QOB		40
41		QOB	20/1	20/1	QOB		42

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC62SHR
BOX CAT#: MH62
DIMENSIONS:
62''H x 20''W x 5.75''D
WIRE BENDING SPACE:
TOP – 9.26
BOTTOM – 17.2
SIDE – 6.13
PBA:701T
BUSSING: Aluminum
Tin Plated
OPTIONAL FEATURES:
SHIP TOGETHER
Aluminum Solid Neutral
GROUP USER PLACEMENT
ALUMINUM GROUND BAR
ADDITIONAL Aluminum Isolated GRD BAR
SPD DRY CONTACTS
SPD SURGE COUNTER
SPD PEAK SURGE RATING/PHASE: 160kA
SPD LINE TO GRD PROTECT
----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
(Continued on next page.)

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 225A
42kA SYMS. SCCR
Series Rated w/ JG
MAIN: MAIN LUGS : 225A
ACC: SUBFEED LUGS
Top FEED
INCOMING CONDUCTORS(S) PER NEC:
(2) 1/0 – 350 kcmil
BRANCH MOUNTING TYPE: BOLT–ON
----------BRANCH SUMMATION----------
38 – 20A/1P QOB
4 – 20A/1P QOB–GFI

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L3A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# 031751120-007-01	PG 1 OF 2 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

PHYSICAL DATA CONTINUED

LINE 1: PANEL L3A
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw–on

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	**PANEL L3A**
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 1 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# **031751120–007–01**	PG **2** OF **2** REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
–	----	--	--/--/--	–	----	--	--/--/--

CKT NO	ACCESSORIES	TYPE	RATING AMP/P	S/N	225A M/L A B C	S/N	RATING AMP/P	TYPE	ACCESSORIES	CKT NO
43		QOB	20/1				20/1	QOB		44
45		QOB	20/1				20/1	QOB		46
47		QOB	20/1				20/1	QOB		48
49		QOB	20/1				20/1	QOB		50
51		QOB	20/1				20/1	QOB		52
53		QOB	20/1				20/1	QOB		54
55		QOB	20/1				20/1	QOB		56
57		QOB	20/1				20/1	QOB		58
59		QOB	20/1				20/1	QOB		60
61		QOB	20/1				35/2	QOB		62
63		QOB	20/1							64
65		QOB	20/1				20/1	QOB		66
67		QOB	20/1				20/1	QOB		68
69		QOB	20/1				20/1	QOB		70
71		QOB	20/1				20/1	QOB		72
73		QOB	20/1				20/1	QOB		74
75		QOB	20/1				20/1	QOB		76
77		QOB	20/1				20/1	QOB		78
79		QOB	20/1				20/1	QOB		80
81		QOB	20/1				20/1	QOB		82
83		QOB	20/1				20/1	QOB		84

PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC38SHR
BOX CAT#: MH38
DIMENSIONS:
38"H x 20"W x 5.75"D
WIRE BENDING SPACE:
TOP – 9.26
BOTTOM – 5
SIDE – 6.13
PBA:701T

BUSSING: Aluminum
Tin Plated

OPTIONAL FEATURES:
SHIP TOGETHER
Aluminum Solid Neutral
GROUP USER PLACEMENT
ALUMINUM GROUND BAR
ADDITIONAL Aluminum Isolated GRD BAR

----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
LINE 1: PANEL L3A
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw-on

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 225A
42kA SYMS. SCCR
Series Rated w/ JG

MAIN: MAIN LUGS : 225A
Top FEED
INCOMING CONDUCTORS(S) PER NEC:
(2) 1/0 – 350 kcmil

BRANCH MOUNTING TYPE: BOLT-ON

----------BRANCH SUMMATION----------
40 – 20A/1P QOB
1 – 35A/2P QOB

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL L3A
JOB LOCATION:	WICHITA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type) PANEL 2 OF 2
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 21 2012		
DRAWING STATUS:	RECORD	DWG# 031751120-020-02	PG 1 OF 1 REV –

REV	DESCRIPTION	BY	DATE	–	----	--	--/--/--
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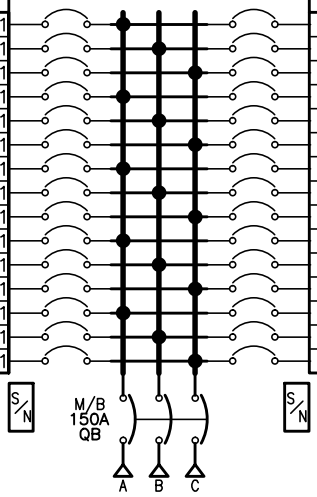
CKT NO	ACCESSORIES	TYPE	RATING AMP/P
1		QOB	20/1
3		QOB	20/1
5		QOB	20/1
7		QOB	20/1
9		QOB	20/1
11		QOB	20/1
13		QOB	20/1
15		QOB	20/1
17		QOB	20/1
19		QOB	20/1
21		QOB	20/1
23		QOB	20/1
25		QOB	20/1
27		QOB	20/1
29		QOB	20/1

RATING AMP/P	TYPE	ACCESSORIES	CKT NO
20/1	QOB		2
20/1	QOB		4
20/1	QOB		6
20/1	QOB		8
20/1	QOB		10
20/1	QOB		12
20/1	QOB		14
20/1	QOB		16
20/1	QOB		18
20/1	QOB		20
20/1	QOB		22
20/1	QOB		24
20/1	QOB		26
20/1	QOB		28
20/1	QOB		30



PHYSICAL DATA

ENCLOSURE Type 1
Surface – Hinged
FRONT CAT#: NC44SHR
BOX CAT#: MH44
DIMENSIONS:
44''H x 20''W x 5.75''D
WIRE BENDING SPACE:
TOP – 5
BOTTOM – 9.26
SIDE – 6.13
PBA: 707HR

BUSSING: Aluminum
Tin Plated

OPTIONAL FEATURES:
ALUMINUM SOLID NEUTRAL
ALUMINUM GROUND BAR

----------STANDARD EQUIPMENT NAMEPLATE----------
Engraved as Follows
LINE 1: PANEL EL1
COLOR: White Surface / Black Letters
SIZE: 3.50" Wide x 1.00" High (Std)
TYPE: Plastic/Adhesive – Screw–on

ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz
System Ampacity: 150A
10kA SYMS. SCCR

MAIN: MAIN BREAKER QB 150A
Bottom FEED
10kA AIR
INCOMING CONDUCTORS(S) PER NEC:
#4 – 300 kcmil

BRANCH MOUNTING TYPE: BOLT–ON
----------BRANCH SUMMATION----------
30 – 20A/1P QOB

JOB NAME:	BEHAVIORAL HEALTH BUILDING	EQUIPMENT DESIGNATION:	PANEL EL1
JOB LOCATION:	TOPEKA KS	EQUIPMENT TYPE:	NQ (Circuit Breaker Type)
DRAWN BY:	CAD	DRAWING TYPE:	ONE LINE DIAGRAM
ENGR:			
DATE:	August 09 2013		
DRAWING STATUS:	RECORD	DWG# 031751120-037-01	PG 1 OF 1 REV –

NQ/NQM Panelboards and QONQ Load Centers

Information Manual
Class 1640

Instruction Bulletin

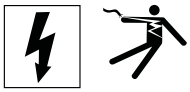
80043-712-04

Retain in the directory card pocket for future use.

by Schneider Electric

HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in property damage.

Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Introduction

This bulletin contains instructions for installing Square D® brand NQ circuit breaker panelboards and QONQ load centers. These panelboards and load centers are Underwriters Laboratories (cULus) listed and accept QO® and QOB branch circuit breakers.

For technical support on the installation of this panelboard, contact the Square D/Schneider Electric Customer Information Center at 1-888-SquareD (1-888-778-2733).

See the labels on the equipment for rating and safety information. Additional equipment labels are provided with this document.

Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this entire instruction bulletin and the included NEMA PB 1.1 standards publication before installing, operating, or maintaining this equipment.
- Local codes vary, but are adopted and enforced to promote safe electrical installations. A permit may be needed to do electrical work, and some codes may require an inspection of the electrical work.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn OFF all power supplying this equipment before working on or inside the equipment.
- Always use a properly-rated voltage sensing device to confirm all power is OFF.
- Replace all devices, doors and covers before turning ON power to this equipment.

Failure to follow these instructions will result in death or serious injury.

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Installation

This section provides instructions for the following NQ panelboard and QONQ load center procedures:

Interior Mounting for Square D Brand Enclosures

A separate standards publication, titled “General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less” (NEMA PB1.1), has been provided with this equipment. Familiarize yourself with the content of this document before proceeding with any of the following procedures.

If you did not receive a copy of this document, or if you have any questions regarding this equipment, contact your local distributor or Schneider Electric representative.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Ensure all connections are properly tightened.
- Refer to the torque information label provided on the panelboard before tightening the connections.

Failure to follow these instructions can result in equipment damage.

To properly mount and install the NQ panelboard or QONQ load center interior, please refer to the NEMA PB 1.1 standards publication, and follow the instructions below for either “Surface Mounting (Enclosure Mounted on Wall)” or “Flush Mounting (Enclosure Recessed in Wall).”

Surface Mounting (Enclosure Mounted on Wall)

1. Mount the enclosure as instructed in the NEMA PB 1.1 standards publication.
2. Remove the interior trim from the trim brackets.
3. Install the interior as described below:
   a. Set the interior on the enclosure studs. An elevating screw is not required (See Figure 1 on page 10).
   b. Tighten the keps nuts against the interior side rails until the rails are against the back of the enclosure.
   c. Remount the interior trim after wiring.
4. If used as service entrance equipment, neutral bonding is required. See the “Neutral Bonding Strap/Cable Installation” instructions on page 11.
5. Apply equipment labels (located in the bag assembly) as directed by the instructions on the back of the equipment label sheet.

Flush Mounting (Enclosure Recessed in Wall)

1. Mount the enclosure as instructed in the NEMA PB 1.1 standards publication.
2. Remove the interior trim from the trim brackets.
3. Install the interior as described below:
   a. Thread the (4) 10-32 x .875 in. self-tapping, elevating screws provided with the flush trim into the side rails.
   b. Set the interior on the enclosure studs (see Figure 1 on page 10). Place the keps nuts onto the enclosure studs, but do not tighten.
   c. Adjust the screws so that the lip of the interior trim is approximately 0.25 inches (6.35 mm) from wall line.
   d. Tighten the keps nuts against the side rails.
   e. Remount the interior trim after wiring.
4. If used as service entrance equipment, neutral bonding is required. See the “Neutral Bonding Strap/Cable Installation” instructions on page 11.
5. Apply equipment labels (located in the bag assembly) as directed by the instructions on the back of the equipment label sheet.

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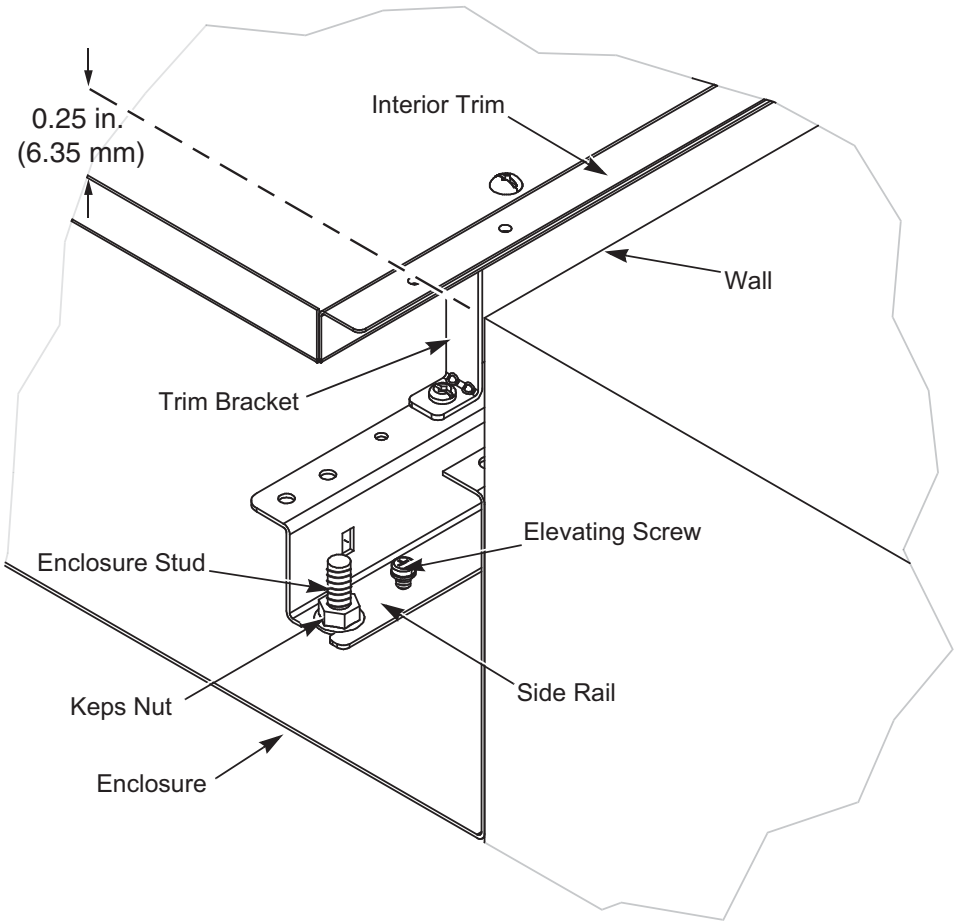
Figure 1: Interior Mounting of Square D Brand Enclosures



Neutral Bonding Strap/Cable Installation

The neutral bonding strap/cable should be used only when the panelboard is **installed** as service equipment.

To properly bond the neutral to the panelboard, follow the instructions for either “100 or 250 A Maximum NQ Panelboards” or “400 or 600 A Maximum NQ Panelboards and QONQ Load Centers” below and on page 13, respectively.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn OFF all power supplying this equipment before working on or inside the equipment.
- The main bonding strap/cable should be used only when the panelboard is installed as service equipment.
- Do not mix the mounting screws with the interior trim screws.

Failure to follow these instructions will result in death or serious injury.

NOTE: The bonding strap/cable parts are found in the bag assembly provided with the interior.

100 or 250 A Maximum NQ Panelboards

To install a neutral bonding strap on a 100 or 250 A maximum NQ panelboard, refer to Figure 2 and follow the instructions below.

1. Align the bonding strap on the side rail, as pictured.

   NOTE: For some applications, it may be necessary to remove the lug (not pictured) before installing the bonding strap.

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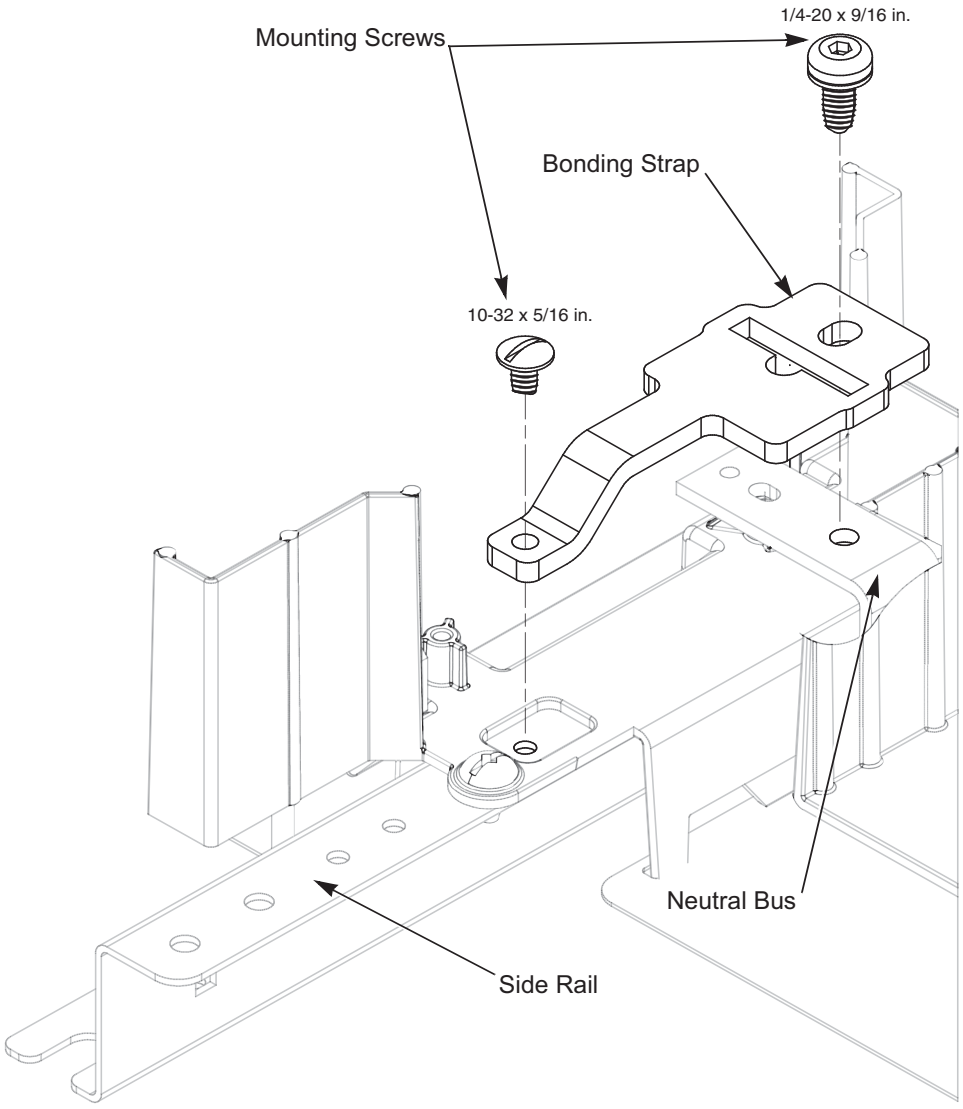
2. Insert the two mounting screws, as pictured. Tighten the 10-32 screw to 10–12 lb-in (1.1–1.4 N•m) and the 1/4-20 to 25–30 lb-in (2.8–3.4 N•m).

   NOTE: If the lug was removed in Step 1 above, reinstall it on top of the bonding strap. Use the 1/4-20 x 11/16 in. mounting screw with feed-through lug, sub-feed lug, sub-feed breaker, or 200% neutral applications. Use the 1/4-20 x 7/8 in. lug mounting screw with 200% neutral on 225 A applications with feed-through lug, sub-feed lug, or sub-feed breaker applications. Lug mounting screws are provided in the bonding strap bag assembly.

Figure 2: Bonding Strap Installation — 100 or 250 A Maximum NQ Panelboards



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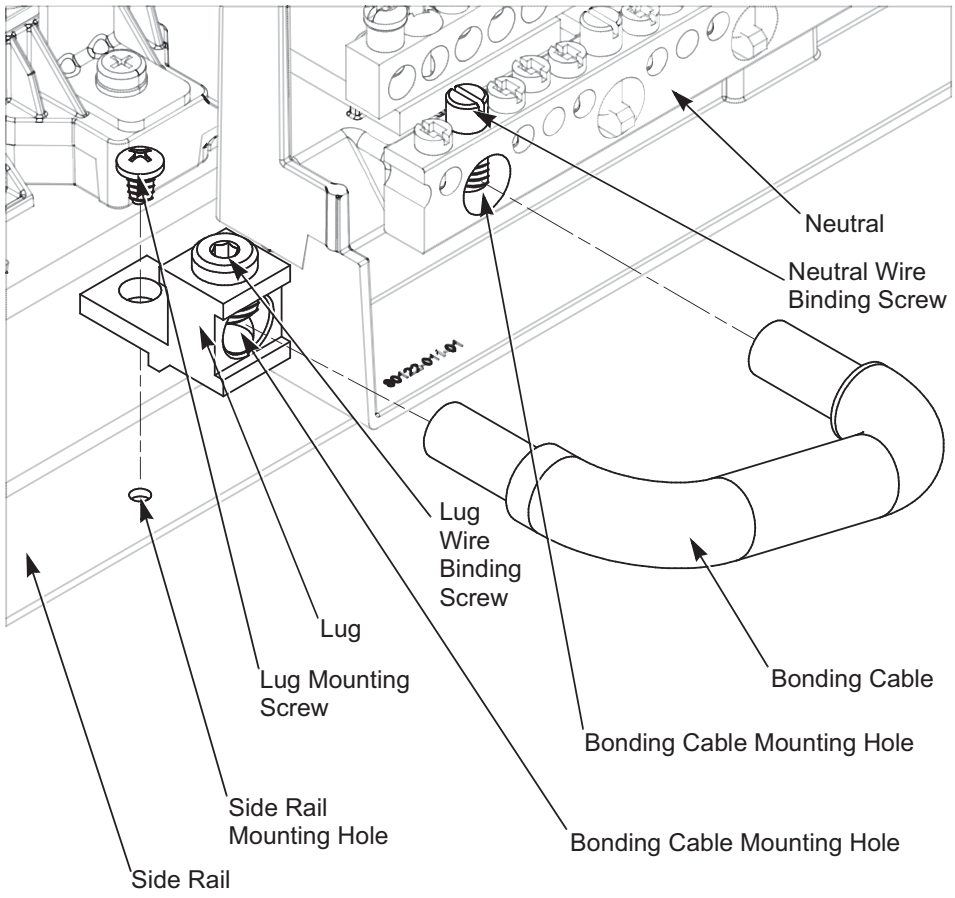
400 or 600 A Maximum NQ Panelboards and QONQ Load Centers

To install a neutral bonding cable on a 400 or 600 A maximum NQ panelboard and QONQ load center, refer to Figure 3 and follow the instructions below.

1. Align the lug on the side rail mounting hole, as pictured.
2. Tighten the lug mounting screw against the side rail to 10–12 lb-in (1.1–1.4 N•m).
3. Align the bonding cable, as pictured, and insert it into the lug and neutral mounting holes.
4. Tighten both the lug wire binding screw and the neutral wire binding screw to 45–50 lb-in (5.1–5.6 N•m).

Figure 3: Bonding Cable Installation — 400 or 600 A Maximum NQ Panelboards and QONQ Load Centers



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QO and QOB Circuit Breaker Installation and Removal

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn OFF all power supplying this equipment before working on or inside equipment.
- Always use a properly-rated voltage sensing device to confirm that all power is OFF.
- All unused spaces must be filled with blank fillers.
- Replace all devices, doors and covers before turning ON power to this equipment.

Failure to follow these instructions will result in death or serious injury.

QO and QOB Breaker Installation

Refer to Figure 4 on page 16 for the following instructions:

1. Turn OFF all power to the panelboard.
2. Turn the breaker OFF.
3. Remove the interior trim.
4. Snap the wire terminal end of the circuit breaker onto the mounting rail.
5. Engage the branch connector.

   For QO Circuit Breakers:

   a. Push inward until the plug-on jaws fully engage the branch connector.

   For QOB Circuit Breakers:

   a. Push inward until the breaker connector is centered on the branch connector mounting hole. Engage the screw into the branch connector hole and tighten it to the torque values shown on the interior wiring and torque diagram.

6. Install the load wire.
7. Reinstall the interior trim.

QO and QOB Breaker Removal

Refer to Figure 4 on page 16 for the following instructions:

1. Turn OFF all power to the panelboard.
2. Remove the load wire.
3. Remove the interior trim.
4. Disengage the branch connector.

   For QO Circuit Breakers:

   a. Pull outward until the plug-on jaws fully disengage the branch connector.

   For QOB Circuit Breakers:

   a. Loosen the screw in the breaker connector and pull the breaker off of the branch connector.

5. Snap the wire terminal end of the circuit breaker off of the mounting rail.
6. Reinstall the interior trim.

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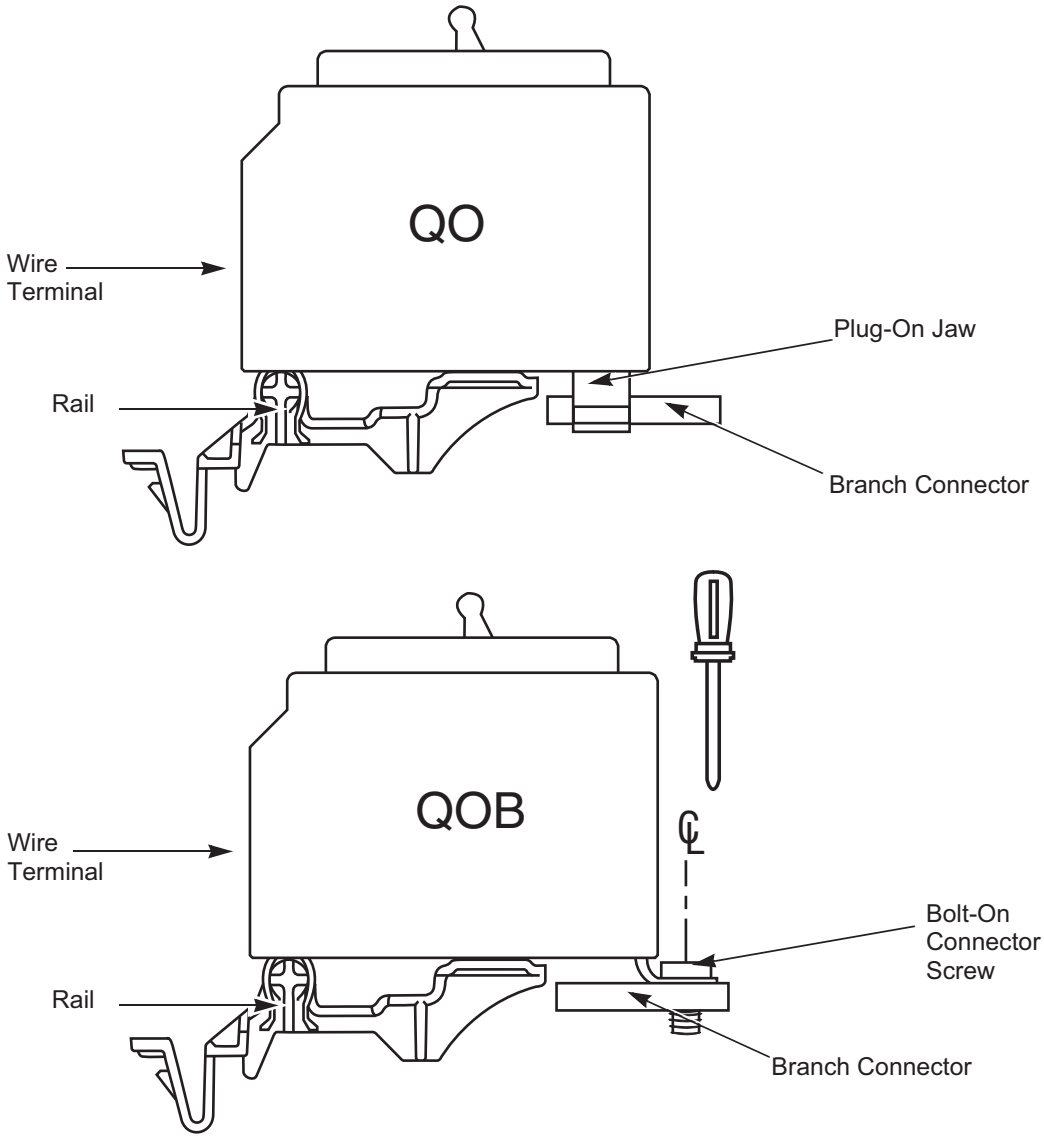
Figure 4: QO and QOB Circuit Breaker Installation and Removal



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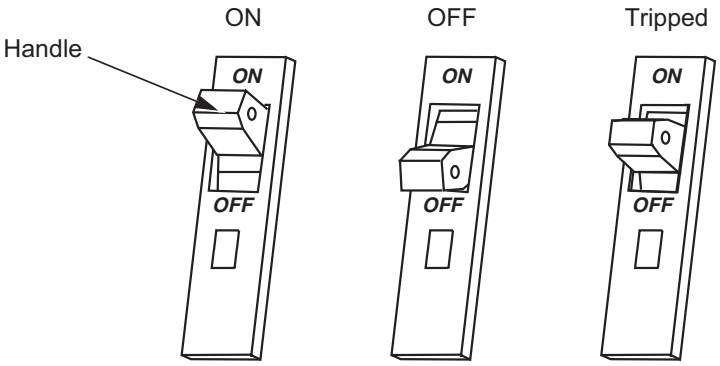
Circuit Breaker Reset Instructions

If the circuit breaker is tripped, the handle will be at the mid-position between ON and OFF. To reset the circuit breaker, push the handle to the OFF position, then to the ON position.

Figure 5: Circuit Breaker Handle Positions



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Interior Trim Preparation

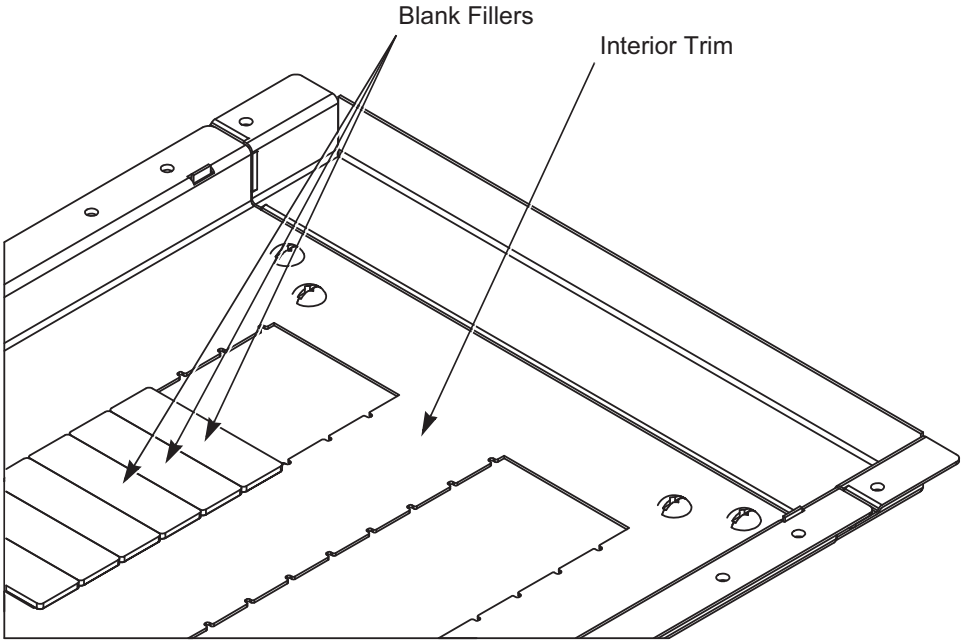
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Before energizing the panelboard, all unused spaces must be filled with blank fillers.
- Replace all devices, doors, and covers before energizing this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 6: Interior Trim Diagram



NOTE: The back of the interior trim lists the catalog number for its corresponding compatible blank fillers.

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Appendix 1: Specifications

Typical Wiring

Table 1: Panelboard Typical Wiring[1]

	1-Phase Panelboards		3-Phase Panelboards	
Voltage AC	**Phase**	**Wires**	**Phase**	**Wires**
208Y/120	—	—	3	4
120/240	1	3	—	—
240[2]	1	2	3	3
240[3]	3	3	—	—
240/120[4]	—	—	3	4 Delta

1 Additional information is provided on the panelboard. See the main circuit breaker rating, if used.

2 For this system, the neutral is not used and only circuit breakers rated 240 V AC minimum should be used. Do not use circuit breakers rated 120 V or 120/240 V AC.

3 For a grounded “B” phase system, only circuit breakers rated 240 V AC minimum should be used. Do not use circuit breakers rated 120 V or 120/240 V AC.

4 When wiring for a delta system, phases “A” and “C” must be 120 V to neutral, phase “B” 208 V to neutral. Connect only circuit breakers rated 240 V AC minimum. Do not use circuit breakers rated 120 V or 120/240 V to “B” phase.

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Integral Main or Sub-Feed:
DJ, FI, KI, H, J, LA, LC, LH, QB, QD, QG, QJ, QO(B)VH

Figure 7: NQ/NQM 100–225 A Main Lugs or 100–250 A Main Breaker Diagram

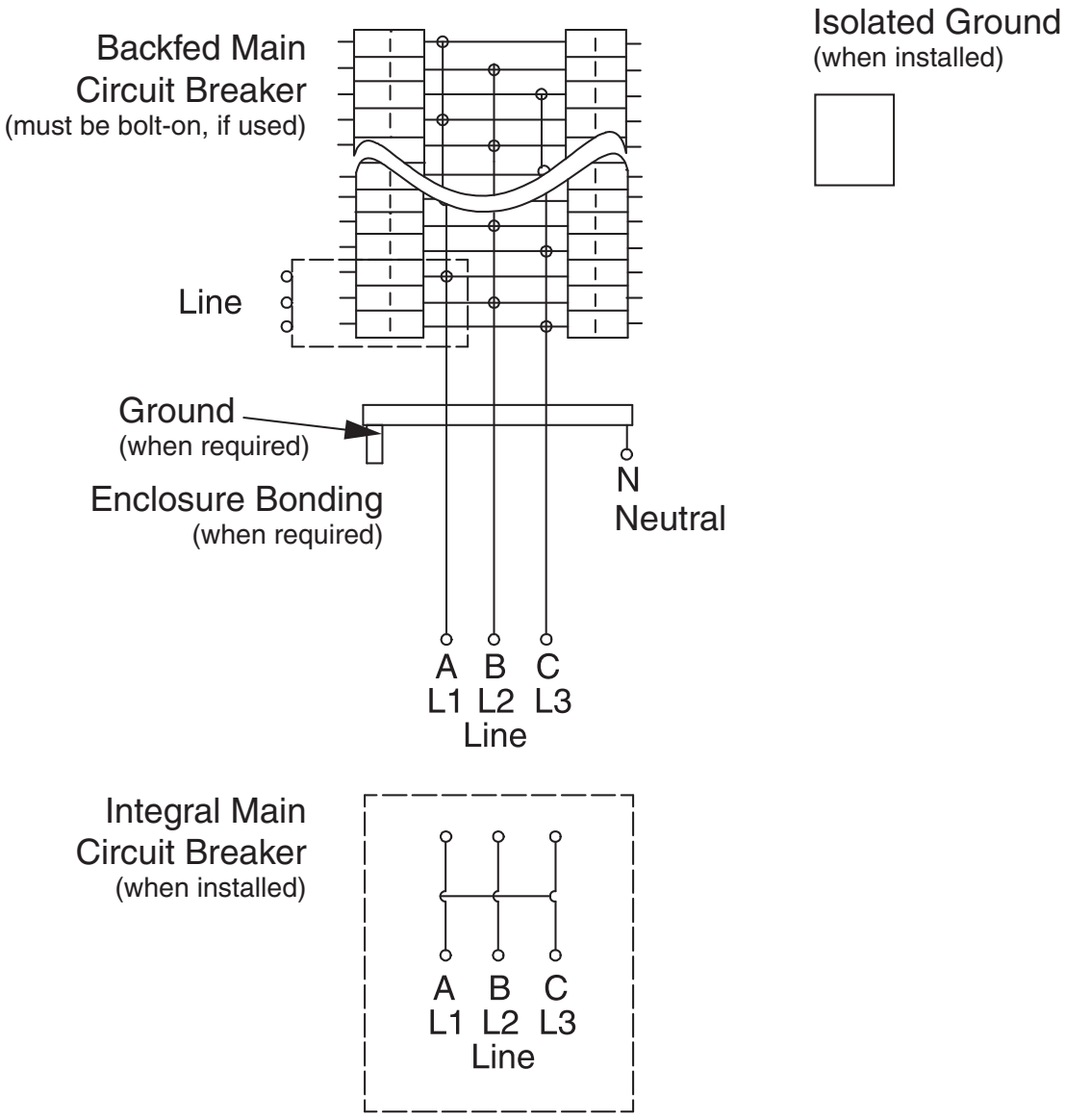

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Figure 8: NQ Panelboard or QONQ Load Center 400–600 A Main Lugs or Main Circuit Breaker with or without Feed-Through Lugs Diagram

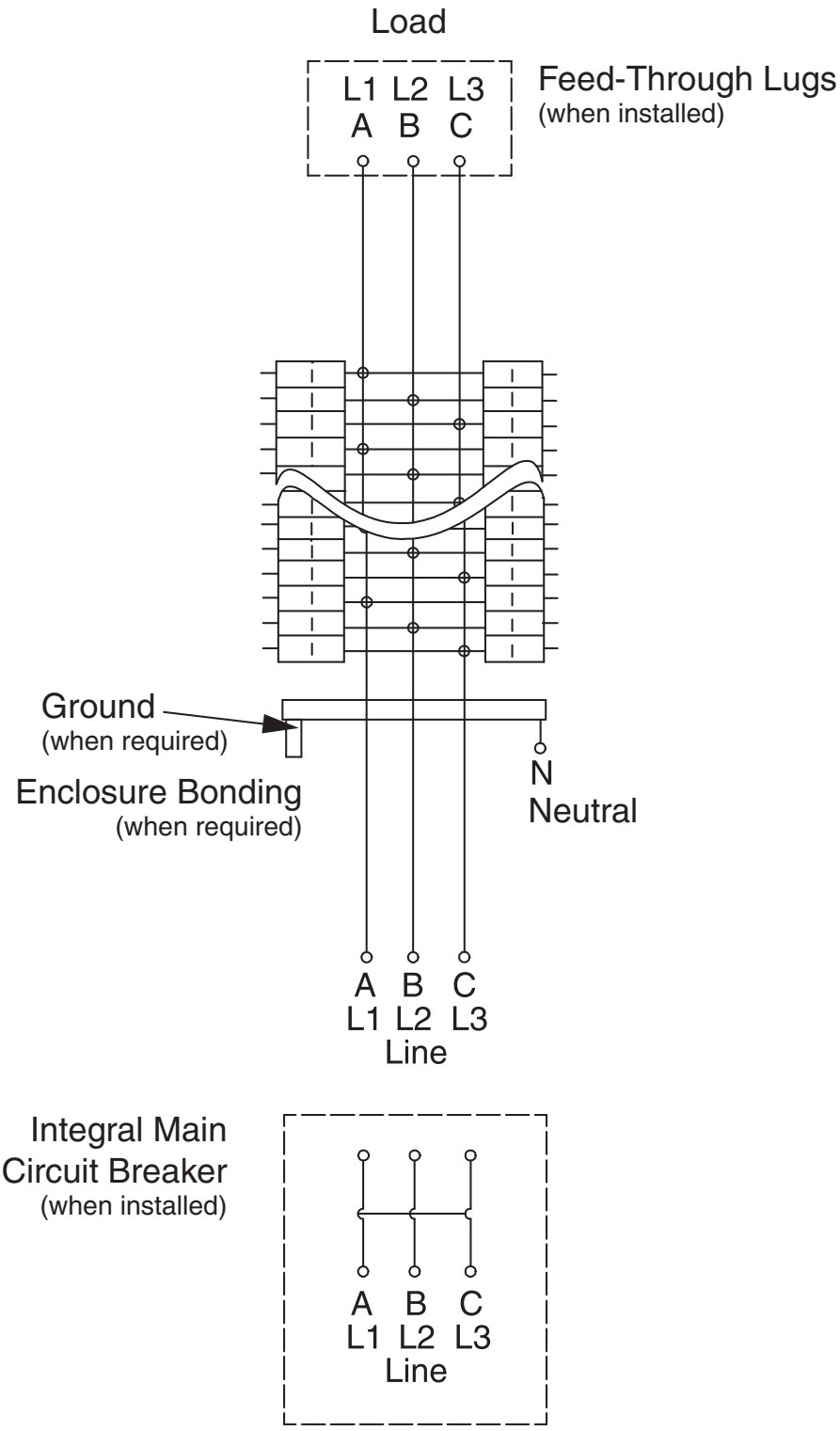

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Figure 9: NQ Panelboard or QONQ Load Center 400–600 A Main Circuit Breaker with Feed-Through Lugs or Sub-Feed Circuit Breakers Diagram

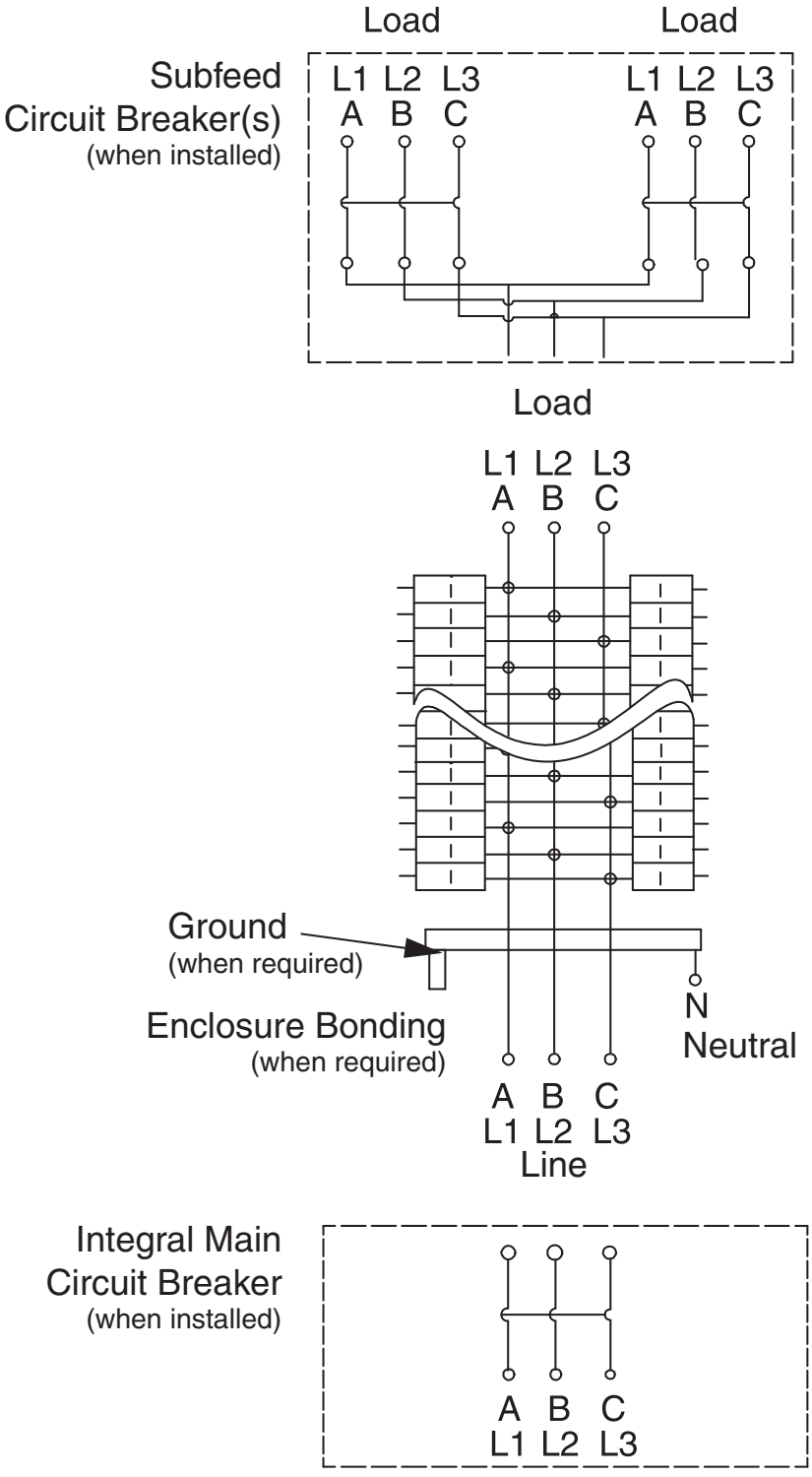

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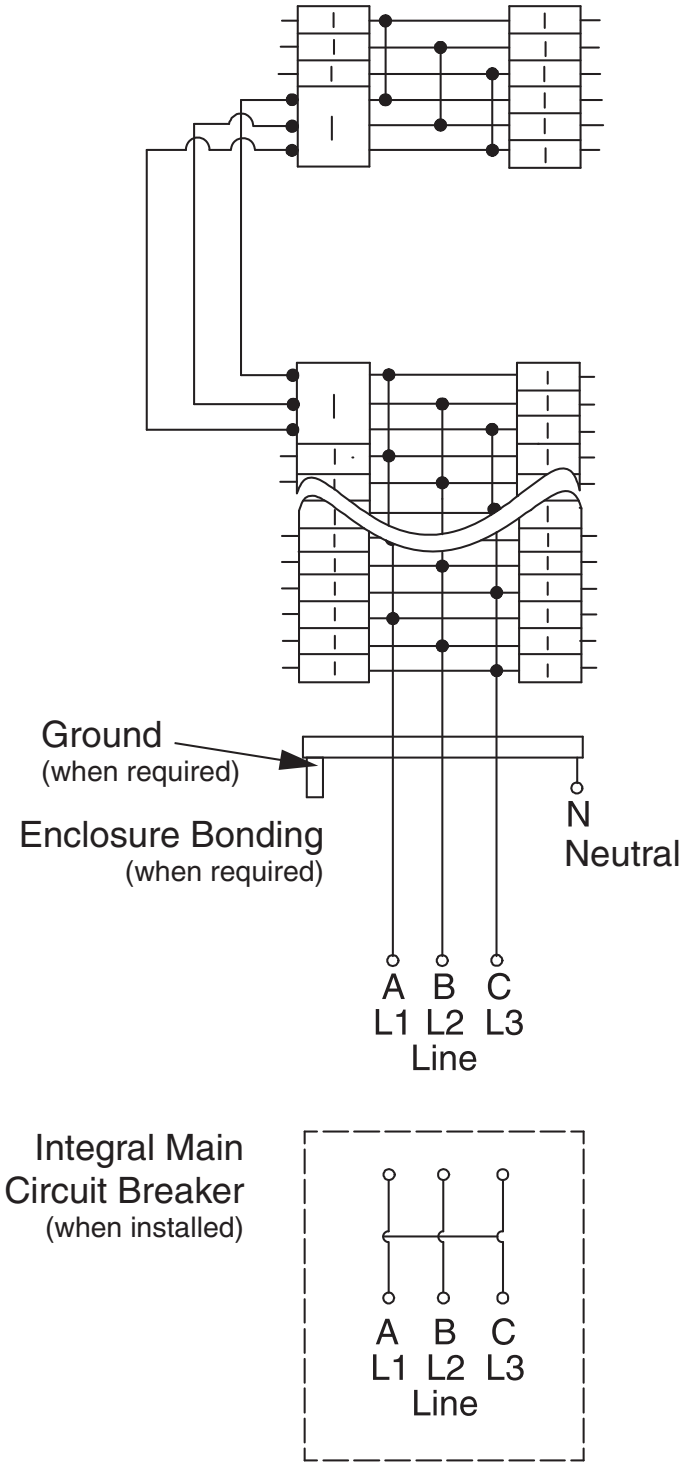
Figure 10: Typical NQ Panelboard with Split Bus Diagram



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Panelboard Ratings

Refer to NEC section 110-22 and CEC rule 14-014 for more information. The series rated system label is located in the bag assembly.

Table 2: Series Connected Breaker Ratings (RMS Symmetrical)

Max. System Voltage AC [1] [2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3] [4] [5] [6]			
			Type	1 Pole	2 Pole	3 Pole
120/240 1PH	22,000	MG	QO (B)	15–30A	—	—
	25,000	HD, JD	QO (B) PL		15–60 A	15–30 A
	65,000	HG, JG	QO (B) PL			
	100,000	HJ, JJ	QO (B) PL			
	125,000	HL, JL	QO (B) PL			
120/240 1PH 208Y/120	100,000	DJ 400A	QO (B)	15–70 A	15–125 A	—
			QO (B) GFI	15–30 A	40–60 A	—
			QO (B) AFI	15–20 A	—	—
			QO (B) VH	—	150 A	15–150 A
		QJ	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) VH	—	150 A	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
208Y/120	18,000	LA/LH (L) 34200MC	QO (B)	15–30A	15–30 A	15–30 A
		LA/LH (L) 34225MC				
		LA/LH (L) 34250MC				
		LA/LH (L) 34400MC				

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1] [2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges[3] [4] [5] [6]			
			Type	1 Pole	2 Pole	3 Pole
240	22,000	QO (B) VH	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) PL	15–30 A	15–30 A	—
			QO (B) AFI	15–20 A	—	—
		Q2-H	QO (B)	15–70 A	15–100 A	15–30 A
			QO (B) GFI	15–30 A	15–30 A	—
			QO (B) AFI	15–20 A	—	—
	25,000	QD	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) VH	—	150 A	35–150 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
		ED, FD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
		KD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		HD, JD	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
			QO (B) H	—	15–100 A	—
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QOB 2150VH	—	150 A	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1] [2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges [3] [4] [5] [6]			
			Type	1 Pole	2 Pole	3 Pole
240	42,000	LA, MA	Q2L-H	—	100–225 A	100–225 A
			QDL	—	70–225 A	70–225 A
		LC400A	QO (B)	15–70 A	—	—
			QO (B) VH	15–30 A	15–125 A	15–100 A
			QOBVH	—	150 A	—
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		LC600A	QO (B) VH	15–30 A	15–125 A	15–100 A
			QOBVH	—	150 A	—
			QO (B) GFI	—	15–60 A	—
			QO (B) AFI	15–20 A	—	—
		MG	QO (B) VH	15–30 A	15–30 A	15–30 A
	65,000	LC400A	QO (B)	15–30 A	—	—
			QO (B) VH	15–30 A	15–125 A	15–100 A
			QOBVH	—	150 A	—
			QO (B) GFI	15–30 A	—	15–50 A
			QO (B) AFI	15–20 A	—	—
		LC600A	QO (B) VH	15–30 A	15–125 A	35–100 A (3P208 V max) 15–30 A (3P240 V max)
			QOBVH	—	150 A	—
			QO (B) GFI	—	—	15–50 A
			QO (B) AFI	15–20 A	—	—
		DJ 400A	QO (B)	15–70 A	15–125 A	—
			QO (B) VH	—	150 A	15–150 A
			QO (B) H	—	15–100 A	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1] [2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges[3] [4] [5] [6]			
			Type	1 Pole	2 Pole	3 Pole
240	65,000	DJ__W	QO (B)	15–70 A	15–150 A	—
			QO (B)-AFI	15–20 A	—	—
			QO (B)-GFI	15–30 A	15–60 A	—
			QO (B)-VH	—	110–125 A	15–150 A
		EG, FG, KG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—
		QG	QO (B)	15–70 A	15–125 A	15–30 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) VH	—	150 A	35–150 A
		QG, HG, JG	QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
		HG, JG	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) H	—	15–100 A	—
			QO B2150VH	—	150 A	—
		FC_ or KC_22___	QO (B)	15–70 A	15–100 A	15–100 A
		FC_ or KC_32___	QO (B) AS	15–30 A	15–30 A	15–30 A
	100,000	FC_ or KC_24___	QO (B) GFI	15–30 A	15–30 A	—
		FC_ or KC_34___	QO (B) AFI	15–20 A	—	—
		EJ, FJ	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
			QO (B) AFI	15–20 A	—	—

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Table 2: Series Connected Breaker Ratings (RMS Symmetrical) *(continued)*

Max. System Voltage AC [1] [2]	Max. Short Circuit Current Rating	Square D Brand Integral or Remote Main Circuit Breakers and Remote Main Fuses	Square D Brand Branch Circuit Breaker Catalog Designation and Allowable Ampere Ranges[3] [4] [5] [6]			
			Type	1 Pole	2 Pole	3 Pole
240	100,000	HJ, JJ	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) VH	—	—	35–150 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A
	125,000	HL, JL	QO (B) PL	15–30 A	15–60 A	15–30 A
			QO (B) AFI	15–20 A	—	—
			QO (B) H	—	15–100 A	—
			QOB 2150VH	—	150 A	—
	200,000	FI, KI	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	—
			QO (B) AFI	15–20 A	—	—
	65,000	400 A Max. Class J or T6 Fuses	QO (B) VH	15–30 A	15–125 A	15–100 A
			QOB-VH	—	150 A	—
			QO (B) AFI	15–20 A	—	—
	100,000	200 A Max. Class T3 Fuses	QO (B) AFI	15–20 A	—	—
	200,000	200 A Max. Class J or T6 Fuses and 400 A Max. Class T3 Fuses	QO (B)	15–70 A	15–125 A	15–100 A
			QO (B) AS	15–30 A	15–30 A	15–30 A
			QO (B) GFI	15–30 A	15–60 A	15–50 A

1 For shown circuit breakers rated less than this maximum voltage, the indicated short circuit current rating also applies, but at the voltage rating of the circuit breaker.

2 Short circuit tests are conducted at 100–105% of the maximum rated voltage of the panelboard.

3 Suffixes HID, SWD, and SWN may also be applied to the applicable branch circuit breakers shown above. Suffix SWN may **not** be applied in combination with LC main breakers.

4 Where QO (B) circuit breakers are shown above, QO (B) H, QO (B) VH, and QH (B) circuit breakers may also be used.

5 Where QO (B) GFI circuit breakers are shown above, QO (B) EPD and/or QO (B) EPE circuit breakers may also be used.

6 Where QO (B) AFI circuit breakers are shown above, QO (B) CAFI circuit breakers may also be used.

Table 3: Short Circuit Current Rating[1] for Main Lug Interiors with Sub-Feed or Feed-Through Lugs

Maximum System Voltage AC	Maximum Current Rating	Branch Circuits	Application	Adder[2]	Maximum Short Circuit Current Rating[3]
240	100	18, 30	SFL and FTL	—	10,000
	225	30, 42, 54, 72, 84	SFL	6 inches (152.4 mm)	
		42	FTL	—	
		30, 54, 72, 84		6 inches (152.4 mm)	
	400	30, 42, 54, 72, 84	SFL	—	25,000
		30, 84	FTL	—	
		42, 54, 72		6 inches (152.4 mm)	
	600	30, 42, 54, 72, 84	FTL	12 inches (304.8 mm)	

1 This rating applies to main lug interiors, equipped with sub-feed or feed-through lugs, where the device feeding the interior is unknown or not a Square D brand device. Use of a Square D brand main circuit breaker ahead of these lugs will result in a rating equal to the rating of the breaker. Short circuit tests are conducted at 100–105% of the maximum rated voltage of the panelboard.

2 The adder is the additional length of the enclosure.

3 RMS symmetrical amperes, for three cycles.

CE Marking

Interiors with the “CE” mark meet the IEC 60439-1 standard.

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Appendix 2: Accessory Kits

An assortment of field-installable accessory kits are available for NQ panelboards:

- Equipment Ground Bar Kits
- Oversized Lug Kits for 100–250 A Panelboards
- Sub-Feed Lug Kits for 100–400 A Panelboards
- Main Lug Kits
  - — Mechanical Lug Kits — Aluminum
  - — Mechanical Lug Kits — Copper
  - — Versa-Crimp® Compression Lug Kits — Aluminum
  - — Versa-Crimp Compression Lug Kits — Copper

Equipment Ground Bar Kits

Equipment ground bar kits, suitable for copper or aluminum wire, meet the grounding needs of NQ panelboards and QONQ load centers.

Table 4: Equipment Ground Bar Kits Specifications

Panelboard		Use Ground Bar Kit Catalog Number	
Branch Circuit	**Mains Rating**	**Aluminum[1]**	**Copper[2]**
1–42	600 A Maximum	(1) PK27GTA	(1) PK27GTACU
54–84		(2) PK27GTA	(2) PK27GTACU

1 Aluminum bars suitable for 60° C or 75° C Copper or Aluminum conductors.

2 Copper bars suitable for 60° C or 75° C Copper conductors.

NOTE: Ground bar mounting locations are identified by the ground symbol ⏚ stamped into the backwall of the enclosure.

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Oversized Lug Kits for 100–250 A Panelboards

Oversized lug kits are available for applications where termination conductors of 3 AWG or larger are required for the neutral.

Table 5: Oversized Lug Kits for 100–250 A Panelboards Specifications

Circuit Breaker Rating	Kit Catalog Number	Wire Range
70 A	QO70AN	(1) 10–2 Al (1) 5.76–33.6 mm^2 (1)14–4 Cu (1) 2.08–21.1 mm^2
80–125 A	Q1100AN	(1) 4–1/0 Al/Cu (1) 42.4–53.5 mm^2
125–150 A	Q1150AN	(1) 1–4/0 Al/Cu (1) 42.4–107 mm^2

Sub-Feed Lug Kits for 100–400 A Panelboards

Sub-feed main lugs are available for 100, 225, or 400 A applications.

Table 6: Sub-Feed Lug Kits for 100–400 A Panelboards Specifications

Main Amps	Kit Catalog Number	Maximum Circuits
100	NQSFL1	18, 30
225	NQSFL2	30[1], 42[1], 54[1], 72[1], 84[1]
400	NQSFL4	30, 42, 54, 72, 84

[1] These panels require an additional 6 inches (152.4 mm) for the box and trim, for proper wire bending space.

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Main Lug Kits

Table 7: Mechanical Lug Kits — Aluminum

Panelboard Amps	Kit Catalog Number	Wire Range
100	Standard	#6–2/0 AWG 13.3–67.43 mm^2
225	Standard	#6–350 kcmil 13.3–177.3 mm^2
400	Standard	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53.48–380 mm^2 (2) 53.48–177.3 mm^2
600	Standard	(2) 1/0–750 kcmil (2) 53.48–380 mm^2
	NQALM6A	(3) #6–250 kcmil (3) 13.3–127 mm^2

Table 8: Mechanical Lug Kits — Copper

Panelboard Amps	Kit Catalog Number	Wire Range
100	NQCUM1	#6–2/0 AWG 13.3–67.43 mm^2
225	NQCUM2	#6–250 kcmil 13.3–127 mm^2
400	NQCUM4	(1) 1/0–750 kcmil (2) 1/0–350 kcmil (1) 53.48–380 mm^2 (2) 53.48–177.3 mm^2
600	NQCUM6	

Table 9: Versa-Crimp® Compression Lug Kits — Aluminum

Panelboard Amps	Kit Catalog Number	Wire Range	Crimp Tool
100	NQALV1	#8–1/0 AWG 8.36–53.48 mm^2	VC6 (All)
225	NQALV2	#4–300 kcmil 21.15–152 mm^2	
400	NQALV4	(2) 2/0–500 kcmil (2) 67.43–253.4 mm^2	VC6-3, VC6-FT
600	NQALV6		

Table 10: Versa-Crimp® Compression Lug Kits — Copper

Panelboard Amps	Kit Catalog Number	Wire Range	Crimp Tool
100	NQCUV1	#6–1/0 AWG 13.30–53.48 mm^2	VC6 (All), VC7 (All)
225	NQCUV2	2/0–300 kcmil 67.43–152 mm^2	VC6-3, VC7, VC6-FT, VC7-FT
400	NQCUV4	400–750 kcmil 202.7–380 mm^2	VC6-FT, VC7-FT, VC8
600	NQCUV6	(2) 250–500 kcmil (2) 126.7–253.4 mm^2	VC6-3, VC7, VC6-FT, VC7-FT

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of
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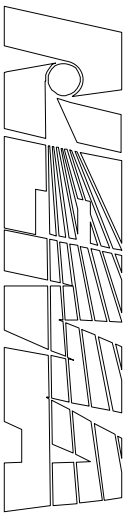

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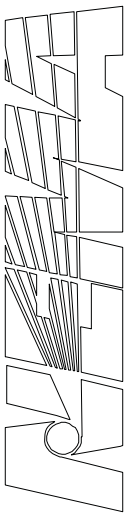

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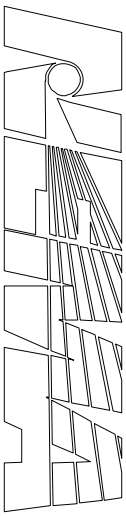
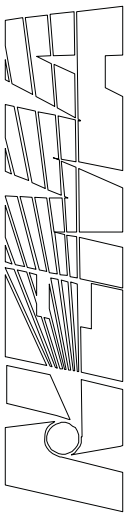


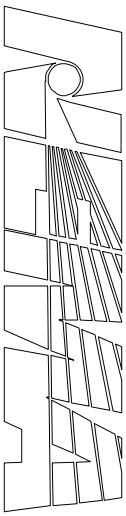


Foreword

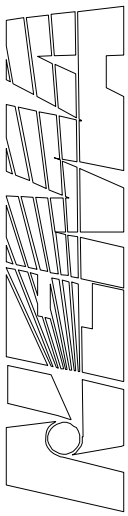
This publication is a guide of practical information containing instructions for the proper installation, operation, and maintenance of panelboards rated 600 volts or less.

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency regarding installation, operation, or maintenance.

It is recommended that work described in this set of instructions be performed only by qualified personnel familiar with the construction and operation of panelboards and that such work be performed only after reading this complete set of instructions. For specific information not covered by these instructions, you are urged to contact the manufacturer of the panelboard directly.



In the preparation of this Standards Publication input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product section by contacting the following: These recommendations will be reviewed periodically and updated as necessary.



Vice President, Engineering
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, Virginia 22209

Publication No. PB 1.1- 2007 revises and supersedes PB 1.1- 2002.

This Standards Publication was developed by the Panelboard and Distribution Board Product Group of the LVDE Section. Product Group approval of the standard does not necessarily imply that all Product Group members voted for its approval or participated in its development. At the time it was approved, the Product Group was composed of the following members:

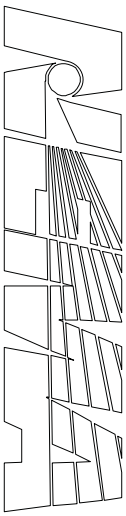
Eaton Electrical Inc.—Pittsburgh, PA
GE—Plainville, CT
Hubbell, Inc.—Orange, CT
Milbank Manufacturing Company—Kansas City, MO
Penn Panel & Box Company—Collingdale, PA
Reliance Controls Corporation—Racine, WI
Siemens Energy & Automation, Inc.—Alpharetta, GA
Square D Company—Palatine, IL

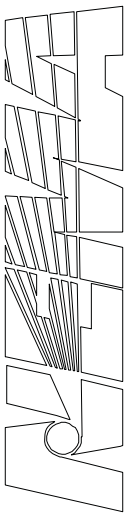
Section 1
SCOPE

This publication covers single panelboards or groups of panel units suitable for assembly in the form of single panelboards, including buses, and with or without switches or automatic overload protective devices (fuses or circuit breakers), or both. These units are used in the distribution of electricity at 600 volts and less with:

1600—ampere mains or less
1200—ampere branch circuits or less

Specifically excluded are live-front panelboards, panelboards employing cast enclosures for special service conditions, and panelboards designed primarily for residential and light commercial service equipment.





Section 2
REFERENCES

National Fire Protection Association (NFPA)
Batterymarch Park
Quincy, MA 02269

NFPA 70 2005 *National Electrical Code*
NFPA 70E 2004 *Safety Related Work Practices*

National Electrical Manufacturers Association (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, Virginia 22209

AB 4- 2003 *Guidelines for Inspection and Preventative Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications*

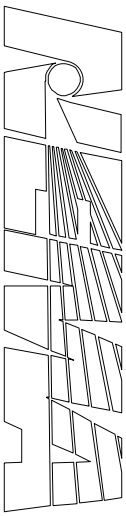
PB 2.2- 2004 *Application Guide for Ground Fault Protective Devices for Equipment*

Guidelines for Handling Water Damaged Electrical Products

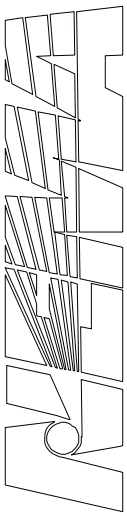
Section 3
GENERAL

WARNING—HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. UNLESS OTHERWISE SPECIFIED, INSPECTION AND MAINTENANCE SHOULD ONLY BE PERFORMED ON PANELBOARDS AND EQUIPMENT TO WHICH POWER HAS BEEN TURNED OFF, DISCONNECTED AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER'S WARNINGS AND INSTRUCTIONS.

Safety-related work practices, as described in NFPA 70E, should be followed at all times.



CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate components during installation or maintenance.



3.1 SUCCESSFUL OPERATION OF PANELBOARDS

The successful operation of panelboards is dependent upon proper installation, operation, and maintenance. Neglecting fundamental installation and maintenance requirements may lead to personal injury, death, or damage to electrical equipment or other property.

3.2 QUALIFIED PERSONNEL

Installation, operation, and maintenance of panelboards should be conducted only by qualified personnel.

3.3 DEFINITION OF QUALIFIED PERSONNEL

For purposes of these guidelines, a qualified person is one who is familiar with the installation, construction, and operation of the equipment and the hazards involved. In addition, the person is:

3.3.1 Requirements

Knowledgeable of the requirements of the *National Electrical Code* and of all other applicable codes, laws, and standards.

3.3.2 Established Safety Practices

Trained and authorized to test, energize, clear, ground, tag, and lockout circuits and equipment in accordance with established safety practices.

3.3.3 Protective Equipment

Trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, and flash resistant clothing in accordance with established safety practices.

3.3.4 First Aid

Trained in rendering first aid.

3.4 SUITABLE RATINGS

Verify that all equipment being installed has ratings suitable for the installation.

Section 4
INSTALLATION OF PANELBOARD CABINETS (BOXES)

4.1 INSTALLATION INSTRUCTIONS

Installation of the cabinet in a neat and workmanlike manner. Follow the manufacturer's installation instructions.

4.2 LOCATION IN BUILDING

Locate the cabinet so that it is readily accessible and not exposed to physical damage.

4.3 FLAMMABLE MATERIAL

Locate the cabinet well away from flammable material.

4.4 UNUSUAL SERVICE CONDITIONS

Do not locate the cabinet where it will be exposed to ambient temperatures above 40°C (104°F), corrosive or explosive fumes, dust, vapors, dripping or standing water, abnormal vibration, mechanical shock, high humidity, tilting, or unusual operating conditions, unless the cabinet/panelboard combination has been designed and so identified by the manufacturer for these conditions.

4.5 INDOOR DAMP LOCATIONS

Locate or shield the cabinet so as to prevent moisture and water from entering and accumulating therein. Mount the cabinet so that there is at least 1/4 inch of air space between the cabinet and the wall or other supporting surface.

4.6 WET LOCATIONS

Cabinets should be specifically approved for wet locations. Mount the cabinet so that there is at least 1/4 inch of air space between the cabinet and the wall or other supporting surface.

4.7 CLEARANCE FROM CEILING

Do not locate the cabinet against a non-fireproof ceiling; allow a space of 3 feet between the ceiling and cabinet unless an adequate fireproof shield is provided.

4.8 SPACE AROUND THE CABINET

When selecting a location, provide sufficient access and working space around the cabinet (See Section 110.26 of the *National Electrical Code*). The width of the working space in front of the panelboard should be at least 30 inches and this space should not be used as storage. The working space should have adequate lighting and a minimum head room of 6 feet 6 inches.

4.9 MOUNTING OF CABINET

The cabinet should be reliably secured to the mounting surface. Do not depend on wooden plugs driven into holes in masonry, concrete, plaster, or similar materials. (See Section 110.13 of the *National Electrical Code*.)

4.10 FLUSH MOUNTING IN WALL

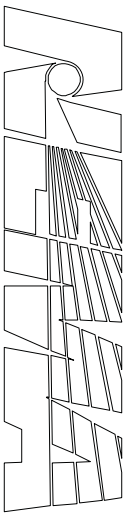
In walls of concrete, tile, or other noncombustible material, install the cabinet so that its front edge will not set back more than 1/4 inch from the finished surface. In walls of wood or other combustible material, cabinets should be flush with or project beyond the finished surface. (See Section 312.3 of the *National Electrical Code*.)

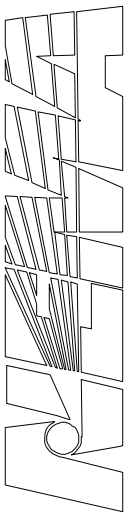
4.11 UNUSED OPENINGS IN CABINET

Effectively close unused openings in the cabinet to provide protection which is substantially equivalent to that afforded by the wall of the cabinet.

4.12 GROUNDING OF PANELBOARD CABINETS

Ground the cabinet as specified in Article 250 of the *National Electrical Code*. When the cabinet contains service equipment, it is necessary to bond the cabinet to the grounded (neutral) service conductor.





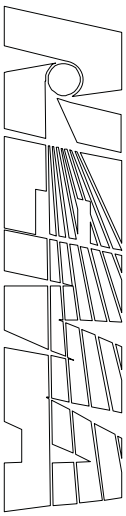
Section 5
INSTALLATION OF CONDUIT AND CONDUCTORS

5.1 CONDUITS INSTALLATION

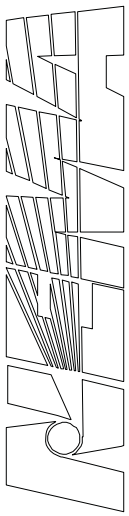
Conduits should be installed so as to prevent moisture or water from entering and accumulating within the enclosure. Provision should be made to protect conductors from abrasion in accordance with Article 312 of the *National Electrical Code*.

5.2 KNOCKOUTS REMOVAL

Knockouts should be removed as follows:



IMPORTANT—Remove knockouts, ONE AT A TIME, alternating INWARD and OUTWARD.



5.2.1 First Step—Remove Center Knockout

Remove center knockout INWARD.

5.2.1.1 Screwdriver Blade

Place screwdriver blade against point farthest from tie and strike INWARD (Figure 1). Bend back and forth to break tie.

5.2.2 Next Step—Remove Rings

Remove rings ONE AT A TIME without straining remaining rings.

5.2.2.1 Pry First Ring

Pry first ring OUTWARD with screwdriver midway between ties, using pliers flat against box under screwdriver (Figure 2). Bend ring sections OUTWARD with pliers, then back and forth to break ties (Figure 5-3).

5.2.2.2 Second Ring

Remove second ring INWARD by striking screwdriver (with blade against point midway between ties) then breaking ring sections inward and back and forth to break ties.

5.3 *NATIONAL ELECTRICAL CODE*, ARTICLE 300

Refer to the *National Electrical Code*, Article 300 for proper wiring methods. See 6.7 for making proper connections.

5.4 CONDUCTOR LENGTH

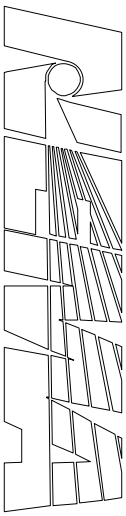
Keep conductor length to a minimum within the wiring gutter. Excessive conductor length will result in additional heating and may result in overheating. However, conductors should be long enough to reach the terminal location in a manner that avoids strain on the terminal.

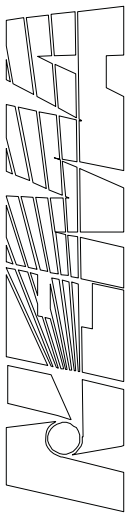
5.5 EXERCISE CARE

Exercise care to maintain the largest practical bending radius of conductors; otherwise the insulation may be damaged and terminal connections may become loosened. Deflection of conductors shall comply with NEC Section 312.6.

5.6 *NATIONAL ELECTRICAL CODE*, SECTION 725.54

Refer to the *National Electrical Code*, Section 725.54 for the separation requirements for conductors of Class 2 and Class 3 remote-control, signaling and power-limited circuits.





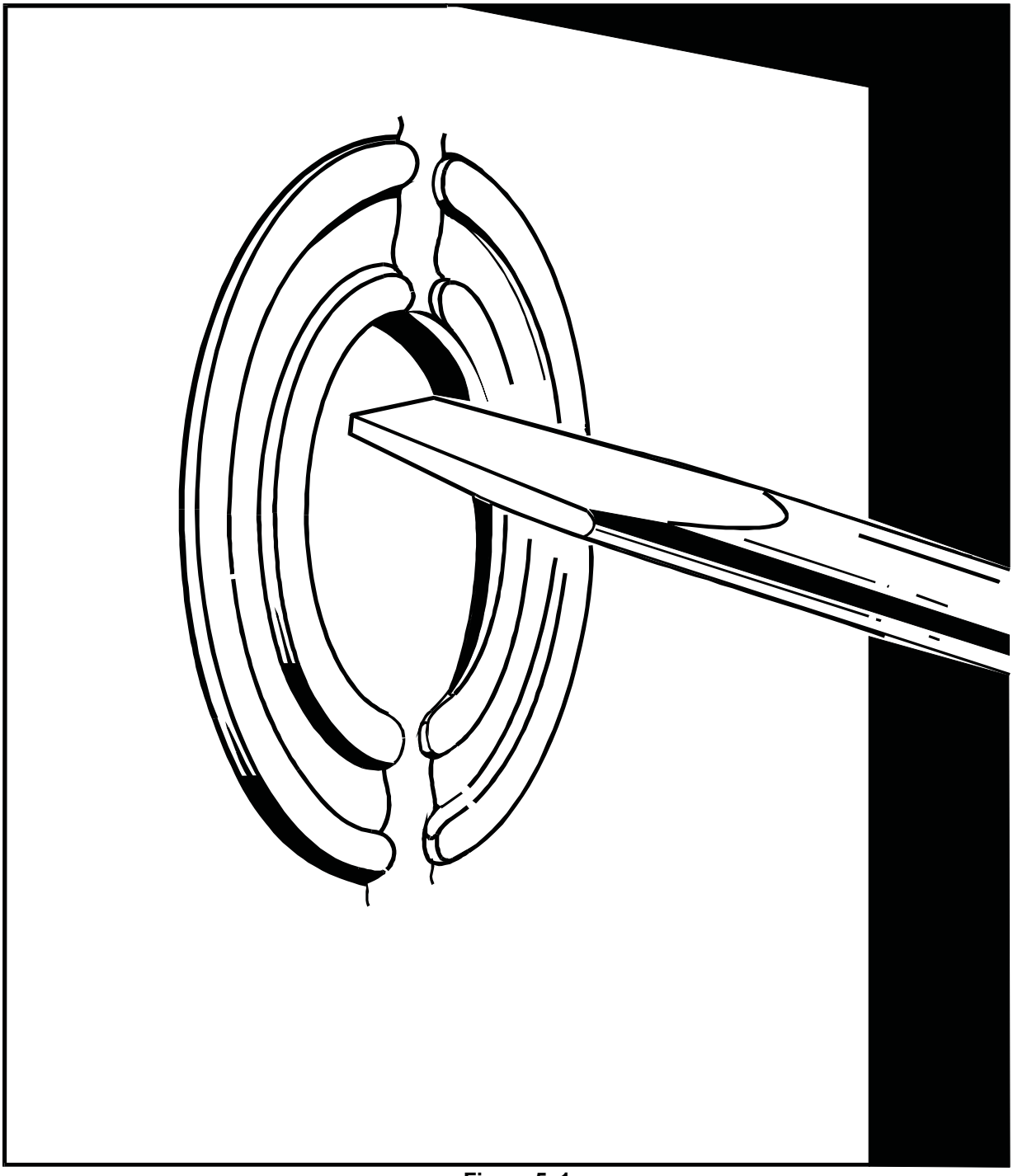


Figure 5–1
KNOCKOUT REMOVAL—STEP 1

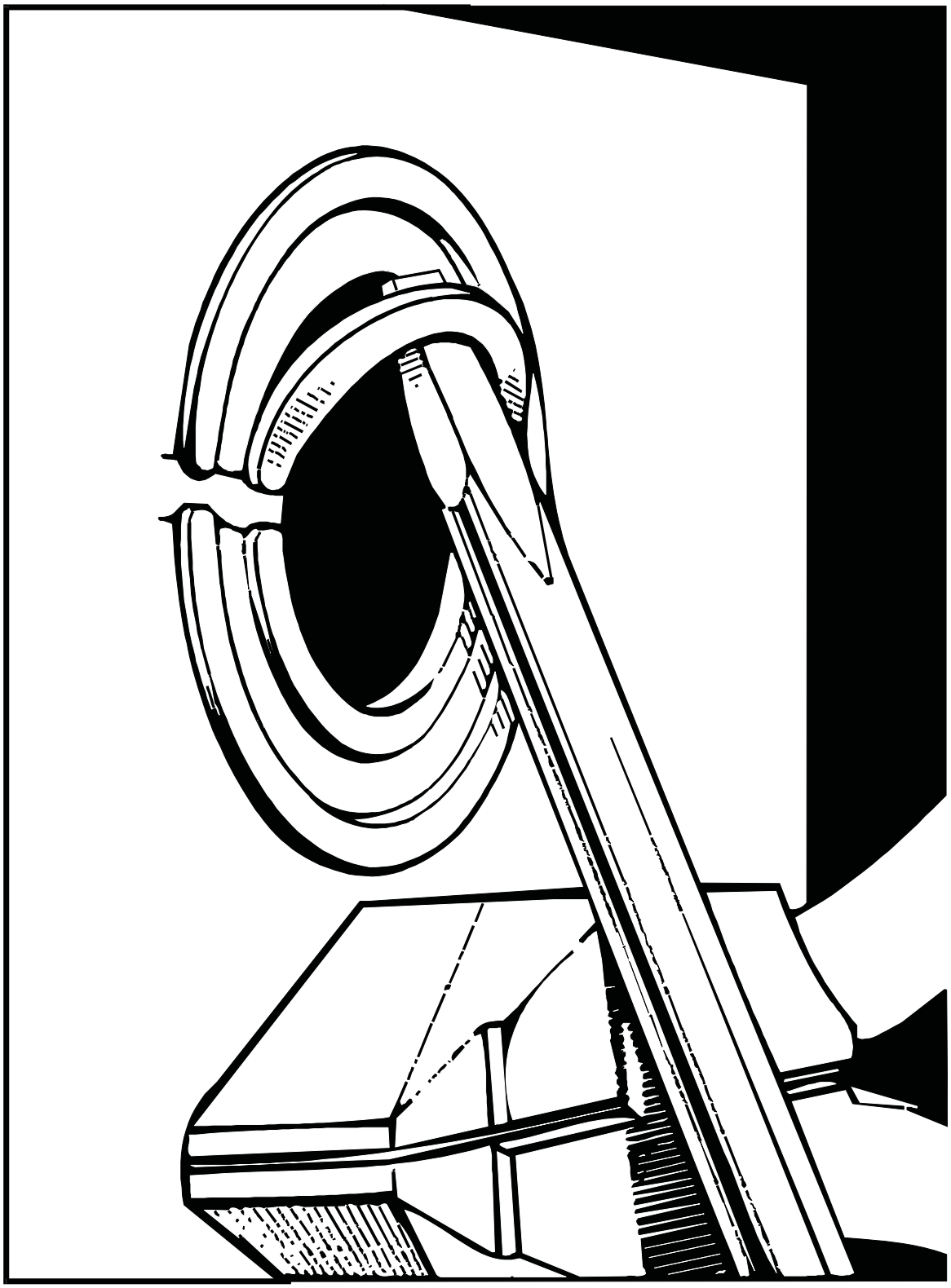


Figure 5–2
KNOCKOUT REMOVAL—STEP 2

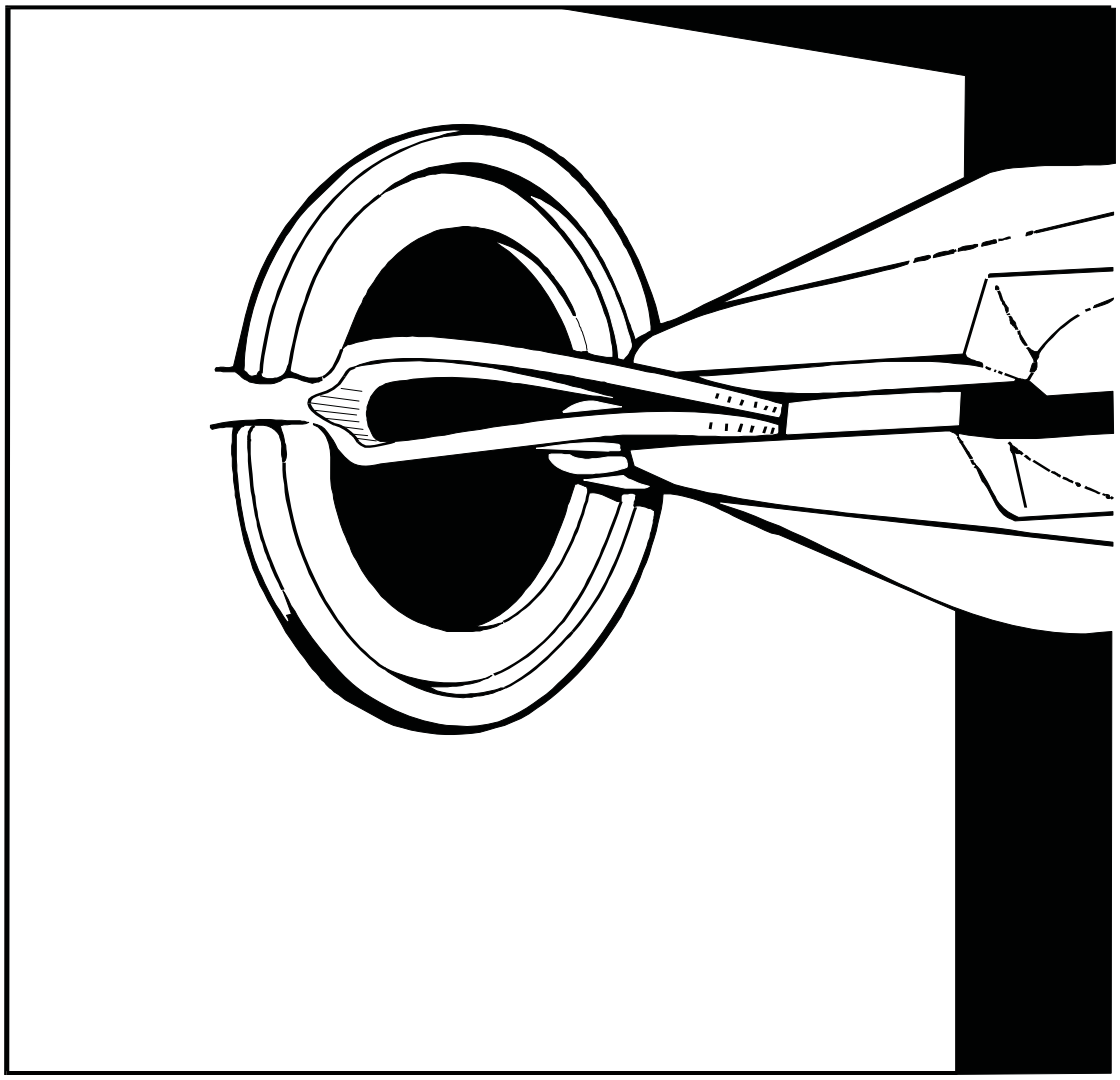


Figure 5–3
KNOCKOUT REMOVAL—STEP 3

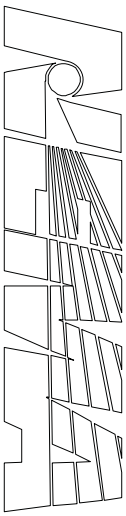
Section 6
INSTALLATION OF PANELBOARD

6.1 PROPER STORAGE

Store the panelboard in a clean, dry place located so that mechanical damage from work personnel in the area is not likely to happen.

6.2 UNPACKING

Care should be exercised in unpacking the panelboard to prevent damage and loss of instruction materials and loose parts.



6.3 INSPECTION

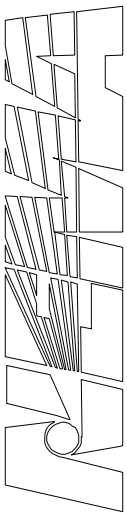
Check for shipping damage and check to make sure that the panelboard is the correct one for installation in the cabinet.

6.4 CARE

Care should be taken to protect the panelboard internal parts from contamination during the installation process.

6.4.1 Cleaning

Clean the cabinet of all foreign materials. If parts at connection points are spattered with cement, plaster, paint, or other foreign material, remove the foreign materials with great care to avoid damage to the plating.



CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate panelboard components during installation or maintenance.

6.5 MANUFACTURER'S INSTRUCTIONS

Carefully follow the manufacturer's instructions and labels.

6.6 INSTALLATION

6.6.1 Alignment Devices

Adjust the alignment devices where provided.

6.6.2 Panelboard

Install the panelboard, finalize its alignment, and tighten it securely in the cabinet.

6.6.3 Flange of Deadfront Shield

Unless otherwise instructed by the manufacturer, adjust the panelboard so that the flange of the deadfront shield is no more than 3/16 inch from (1) the front of the cabinet for surface mounting or (2) the surrounding wall surfaces for flush mounting.

6.7 LINE AND BRANCH CONDUCTORS

Connect Line and Branch Conductors

6.7.1 Conductors

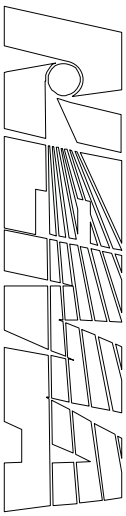
Use care in stripping insulation from conductors so as not to nick or ring the conductor. For aluminum, clean all oxide from the stripped portion and apply an antioxide compound.

6.7.1.1 Wiring Gutters

Distribute and arrange conductors neatly in the wiring gutters. (See Section 5.)

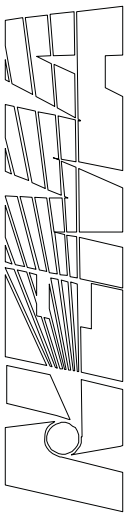
6.7.1.2 Types and Temperature Ratings

Care should be exercised to ensure that the types and temperature ratings of conductors being installed in the panelboard are suitable for use with the terminals, which have been provided.



6.7.1.3 Tighten All Terminals

Use the manufacturer's torque values. (See 7.1).



6.8 PANELBOARD GROUNDING

Ground the panelboard cabinet in accordance with 4.12. (See Section 408.40 of the *National Electrical Code*.)

6.8.1 Equipment Grounding Conductors

Where separate equipment grounding conductors are used, prepare equipment grounding conductors in accordance with 6.7.1 and connect them to the equipment grounding terminal bar. Check to be sure that the terminal bar is securely bonded to the cabinet or panelboard frame and that it is not connected to the neutral bar except at service equipment (as permitted in Section 250.28 of the *National Electrical Code*) or at separately derived systems (as permitted in Section 250.30 of the *National Electrical Code*).

NOTE—An equipment grounding terminal bar is not always required. For example, when a properly installed metallic raceway is used as the equipment grounding path or when the grounded conductor terminals (neutral bar) complies with the conditions of the last sentence of Section 408.40 of the *National Electrical Code*.

6.9 PROPER TYPE OR CLASS AND RATING

When installing circuit breakers or fuses, ensure that they are of the proper type or class and rating.

6.10 DEBRIS

Clean the cabinet of all debris, which has accumulated during the panelboard installation (see 6.4.1).

6.11 STEPS IN SECTION 7

If the job is complete, perform the steps in Section 7 and then install the cabinet front (see Section 8).

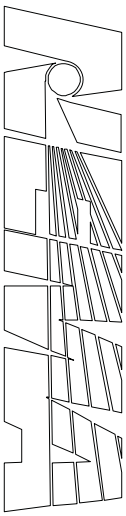
Section 7
STEPS TO BE TAKEN BEFORE ENERGIZING

7.1 ACCESSIBLE ELECTRICAL CONNECTIONS

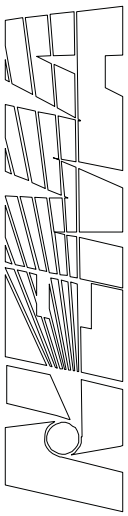
Tighten all accessible electrical connections to the manufacturer's torque specifications. If such information is not provided with the equipment, consult the manufacturer.

7.2 BLOCKS AND PACKING MATERIALS

Make certain that all blocks and packing materials used for shipment have been removed from all component devices and the panelboard.



7.3 SWITCHES, CIRCUIT BREAKERS, AND OTHER OPERATING MECHANISMS



Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain they operate freely.

Check the integrity of all electrical and mechanical interlocks and padlocking mechanisms. For key interlocked systems, assure that only the required number of keys are accessible to the operator.

7.4 SHORT CIRCUITS AND GROUND FAULTS

To make sure that the system is free from short circuits and ground faults, conduct an insulation resistance test phase to ground and phase to phase with the switches or circuit breakers in both the open and closed positions. If the resistance reads less than 1 megohm while testing with the branch circuit devices in the open position, the system may be unsafe and should be investigated. If after investigation and possible correction, low readings are still observed, the manufacturer should be contacted. Some electronic equipment (metering, TVSS, etc.) may be damaged by this testing. Refer to the manufacturers equipment markings for guidelines.

7.5 GROUND FAULT PROTECTION SYSTEM

Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions. See Section 230.95 of the *National Electrical Code* and NEMA Standards Publication PB 2.2, Application Guide for Ground Fault Protective Devices for Equipment.

7.6 ADJUSTABLE TIME CURRENT TRIP DEVICE SETTINGS

Set any adjustable time current trip device settings to the proper values.

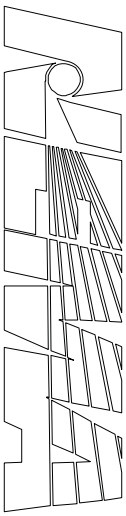
NOTE—Experience has indicated that damage from overcurrent can be reduced if the devices used for overload and short-circuit protection are set to operate instantaneously (that is, without intentional time delay) at 115 percent of the highest value of phase current which is likely to occur as the result of any anticipated motor starting or welding currents.

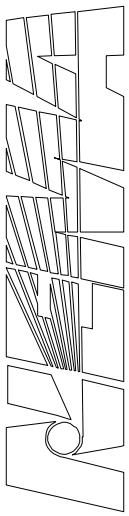
7.7 GROUNDING CONNECTIONS

Check to determine that all grounding connections are properly made. If the panelboard is used as service equipment, make certain that the neutral, if present, is properly bonded to the cabinet.

7.8 FOREIGN MATERIAL

Remove all foreign material from the panelboard and cabinet before installing the cabinet front. Make certain that all deadfront shields are properly aligned and tightened. Install the cabinet front in accordance with Section 8.





Section 8
INSTALLATION OF CABINET FRONT

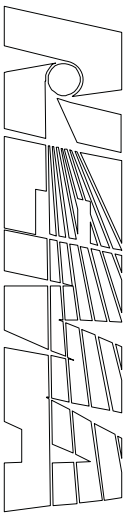
8.1 CABINET FRONT OR TRIM PACKAGE

The cabinet front or trim package is designed to prevent damage to the front during shipment and handling.

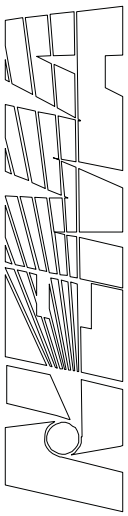
8.2 UNPACKING

Care should be used when unpacking and handling the cabinet front.

8.3 COVERS AND DOORS



Install covers, close doors, and make certain that no conductors are pinched and that all enclosure parts are properly aligned and tightened.



8.4 TOUCH-UP

A suitable paint or other corrosion-resistant finish should be applied to those places where the finish is damaged.

8.5 FRONT ALIGNMENT

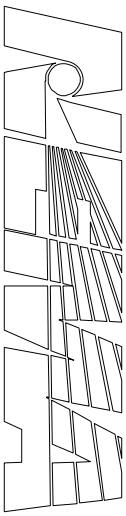
The cabinet front may be provided with an adjusting means to align it squarely with the building even though the cabinet may be slightly out of plumb with the building.

Section 9
ENERGIZING EQUIPMENT

WARNING—HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ENERGIZING A PANELBOARD FOR THE FIRST TIME AFTER INITIAL INSTALLATION OR MAINTENANCE IS POTENTIALLY DANGEROUS.

9.1 QUALIFIED PERSONNEL

Only qualified personnel should energize equipment for the first time. If short circuit conditions caused by damage or poor installation practices have not been detected in the procedures specified in Section 7, serious personal injury and damage can occur when the power is turned on.



9.2 LOAD ON THE PANELBOARD

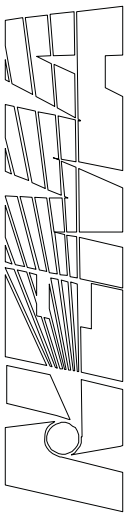
There should be no load on the panelboard when it is energized. Turn off all of the downstream loads.

9.3 ENERGIZED IN SEQUENCE

The equipment should be energized in sequence by starting at the source end of the system and working towards the load end. In other words, energize the main devices, then the feeder devices, and then the branch-circuit devices. Turn the devices on with a firm positive motion.

9.4 LOADS SUCH AS LIGHTING CIRCUITS, CONTACTORS, HEATERS, AND MOTORS

After all main, feeder, and branch circuit devices have been closed, loads such as lighting circuits, contactors, heaters, and motors may be turned on.



Section 10
MAINTENANCE

10.1 MAINTENANCE PROGRAM

A maintenance program for panelboards should be conducted on a regularly scheduled basis in accordance with the following:

10.2 PANELBOARD WHICH HAS BEEN CARRYING ITS REGULAR LOAD FOR AT LEAST 3 HOURS

A panelboard which has been carrying its regular load for at least 3 hours just prior to inspection should be field tested by feeling the deadfront surfaces of circuit breakers, switches, interior trims, doors, and enclosure sides with the palm of the hand. If the temperature of these surfaces does not permit you to maintain contact for at least 3 seconds, this may be an indication of trouble and investigation is necessary. Thermographic (infrared) scanning has become a useful method of investigating thermal performance.

WARNING—HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. UNLESS OTHERWISE SPECIFIED, INSPECTION AND MAINTENANCE SHOULD ONLY BE PERFORMED ON PANELBOARDS TO WHICH POWER HAS BEEN TURNED OFF, DISCONNECTED AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER'S WARNINGS AND INSTRUCTIONS.

Safety related work practices, as described in NFPA 70E, should be followed at all times.

CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate panelboard components during installation or maintenance.

10.3 INSPECT PANELBOARD ONCE EACH YEAR

Inspect the panelboard once each year or after any severe short circuit.

10.4 ACCUMULATION OF DUST AND DIRT

If there is an accumulation of dust and dirt, clean out the panelboard by using a brush, vacuum cleaner, or clean lint-free rags. Avoid blowing dust into circuit breakers or other components. Do not use a blower or compressed air.

10.4.1 Visible Electrical Joints and Terminals

Carefully inspect all visible electrical joints and terminals in the bus and wiring system.

10.4.2 Conductors and Connections

Visually check all conductors and connections to be certain that they are clean and secure. Loose and/or contaminated connections increase electrical resistance which can cause overheating. Such overheating is indicated by discoloration or flaking of insulation and/or metal parts. Pitting or melting of connecting surfaces is a sign of arcing due to a loose or otherwise poor connection. Parts which show evidence of overheating or looseness should be cleaned and re-torqued or replaced if damaged. Tighten bolts and nuts at bus joints to manufacturer's torque specifications.

CAUTION—Do not remove plating from aluminum parts in joints or terminations. Damage to plating can result in overheating. Replace damaged aluminum parts.

10.4.3 Fuse Clip Contact Pressure and Contact Means

Examine fuse clip contact pressure and contact means. If there is any sign of overheating or looseness, follow the manufacturer's maintenance instructions or replace the fuse clips. Loose fuse clips can result in overheating.

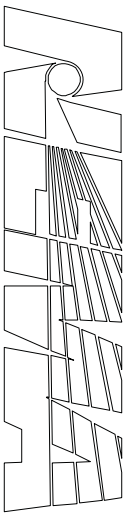
10.4.4 Plug Fuses

Re-tighten plug fuses.

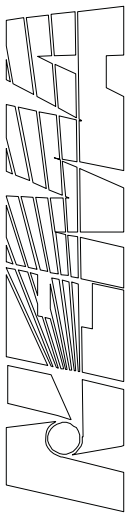
10.4.5 Conditions Which Caused Overheating

Be sure that all conditions which caused the overheating have been corrected.

10.5 PROPER AMPERE, VOLTAGE, AND INTERRUPTING RATINGS



Check circuit breakers, switches, and fuses to ensure they have the proper ampere, voltage, and interrupting ratings. Ensure that non-current-limiting devices are not used as replacements for current-limiting devices. Never attempt to defeat rejection mechanisms which are provided to prevent the installation of the incorrect class of fuse.



10.5.1 Mechanisms Free and in Proper Working Order

Operate each switch or circuit breaker several times to ensure that all mechanisms are free and in proper working order. Replace as required. See NEMA AB-4 for maintenance of molded case circuit breakers.

10.6 OPERATION OF ALL MECHANICAL COMPONENTS

Check the operation of all mechanical components. Replace as required.

10.6.1 Switch Operating Mechanisms

Exercise switch operating mechanisms and external operators for circuit breakers to determine that they operate freely to their full on and off positions.

10.6.2 Integrity of Electrical and Mechanical Interlocks

Check the integrity of all electrical and mechanical interlocks and padlocking mechanisms. For key interlocked systems, assure that only the required number of keys are accessible to the operator.

10.6.3 Missing or Broken Parts

Whenever practical, check all devices for missing or broken parts, proper spring tension, free movement, corrosion, dirt, and excessive wear.

10.6.4 Manufacturer's Instructions

Adjust, clean, and lubricate or replace parts according to the manufacturer's instructions.

10.6.4.1 Clean Nonmetallic Light Grease or Oil

Use *clean* nonmetallic light grease or oil as instructed.

10.6.4.2 Molded Case Circuit Breakers

Do *not* oil or grease parts of molded case circuit breakers.

10.6.4.3 Clean, Light Grease

If no instructions are given on the devices, sliding copper contacts, operating mechanisms, and interlocks may be lubricated with clean, light grease.

10.6.4.4 Excess Lubrication

Wipe off excess lubrication to avoid contamination.

CAUTION—Hydrocarbon spray propellants and hydrocarbon based sprays or compounds will cause degradation of certain plastics. Contact the panelboard manufacturer before using these products to clean, dry, or lubricate panelboard components during installation or maintenance.

10.6.5 Accessible Copper Electrical Contacts, Blades, and Jaws

Clean and dress readily accessible copper electrical contacts, blades, and jaws according to the manufacturer's instructions when inspection indicates the need.

10.7 DAMAGED INSULATING MATERIAL AND ASSEMBLIES

Look for and replace damaged insulating material and assemblies where sealing compounds have deteriorated.

10.8 MOISTURE OR SIGNS OF PREVIOUS WETNESS OR DRIPPING

Look for any moisture or signs of previous wetness or dripping inside the cabinet.

NOTE—Condensation in conduits or dripping from outside sources is one known cause of panelboard malfunction.

10.8.1 Conduits Which Have Dripped Condensate

Seal off any conduits which have dripped condensate, and provide means for further condensate to drain away from the panelboard.

10.8.2 Cracks or Openings

Seal off any cracks or openings which have allowed moisture to enter the enclosure. Eliminate the source of any dripping on the enclosure and any other source of moisture.

10.8.3 Insulating Material Which is Damp or Wet

Replace or thoroughly dry and clean any insulating material, which is damp or wet or shows an accumulation of deposited material from previous wettings.

10.8.4 Component Devices Which Show Evidence of Moisture Damage

Inspect all component devices. Replace any component device which shows evidence of moisture damage or has been subjected to water damage or flooding. Additional information may be found in the NEMA document “Guidelines for Handling Water Damaged Electrical Products.”

10.9 BEFORE CLEANUP AND CORRECTIVE ACTION IS ATTEMPTED

In the event of water damage, e.g., flooding or sprinkler discharge, the manufacturer should be consulted before clean up and corrective action is attempted.

10.10 SEVERE ELECTRICAL SHORT CIRCUIT

If a severe electrical short circuit has occurred, the excessive currents may have resulted in structural component and/or bus and conductor damage due to mechanical distortion, thermal damage, metal deposits, or smoke. Examine all devices and bus supports for cracks or breakage. The manufacturer should be consulted before cleanup and correction is attempted.

10.11 GROUND FAULT PROTECTION SYSTEM

Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions. See Section 230.95 of the *National Electrical Code* and NEMA Standards Publication PB 2.2, *Application Guide for Ground Fault Protective Devices for Equipment.*

10.12 INSULATION RESISTANCE

Check insulation resistance (see 7.4) under any of the following conditions:

10.12.1 Severe Short Circuit

If a severe short circuit has occurred (see 10.10);

10.12.2 Parts Replaced

If it has been necessary to replace parts or clean insulating surfaces;

10.12.3 Panelboard Exposed to High Humidity

If the panelboard has been exposed to high humidity, condensation, or dripping moisture.

Section 11
PERMISSIBLE LOADING OF PANELBOARDS

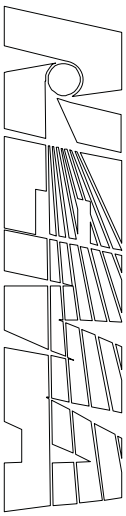
11.1 *NATIONAL ELECTRICAL CODE*

In compliance with the *National Electrical Code*, the normal continuous loads (3 hours or more) of panelboard circuits should be not more than 80 percent of the rating of the overcurrent protective device, unless the marking of the device indicates that it is suitable for continuous duty at 100 percent of its rating.

11.2 HARMONICS IN ELECTRICAL SYSTEM

Some types of electrical equipment cause harmonics in the electrical system, which may result in overheating. This condition should be considered when determining panelboard loading.

§



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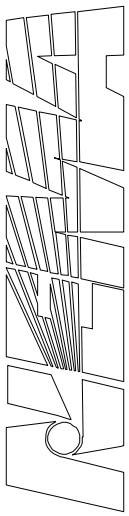


Data Bulletin

Replacement Parts

NQ Panelboards Main Lugs and Main Circuit Breaker
Class 1640

Retain for future use.

Overview

Miscellaneous hardware and commonly used lighting panelboard parts (manuals, directory cards, labels, elevating hardware, circuit numbering strips, keys, mounting screws/nuts, rail splice screws, and filler plates) can be found in the lighting panelboard repair parts kit.

To order a lighting panelboard repair parts kit
In the USA, use catalog number TBPANEL
In Canada, use catalog number TBCPANEL

This data bulletin lists the replacement parts for NQ panelboards. Do not replace a part not specifically listed in this bulletin. Instead, replace the entire assembly with the appropriate interior or kit. The following parts are replaceable:

- Panelboard Installation Bag Assembly
  - — Contains the parts that come in the bag assembly with the interior
- Interior Parts
  - — Standard main lugs (Al/Cu mechanical lugs)
  - — Branch connectors and hardware
  - — Bus covers
  - — Neutral bonding strap and hardware
- Deadfronts
  - — Complete deadfronts (individual sections not available)

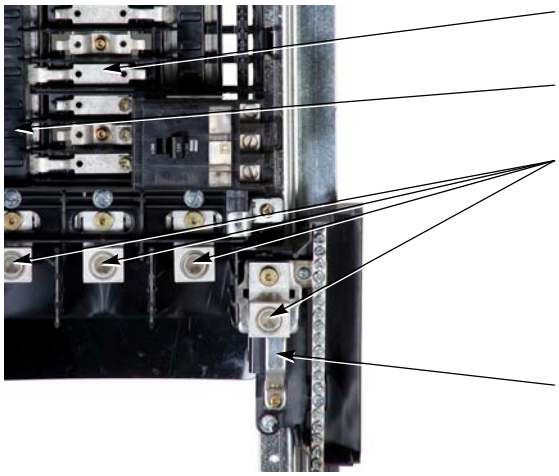
Panelboard Installation Bag Assembly

A replacement bag assembly (part number 80122-272-50) is available for 100–600 A NQ factory-assembled panelboards, with the following contents:

- Information Manual and NEMA installation manual
- Panelboard mounting hardware
- Circuit numbering strips
- French & Spanish language wire & torque labels

NOTE: A neutral bonding strap is not included in the panelboard installation bag assembly.

Interior Parts



Branch Connectors[1]	
NQ Branch Connectors	SKNQBC
Bus covers[2]	
NQ Bus Cover Kit (all amperages)	NQBCK
Aluminum Mechanical Main Lugs[3]	
100 A	NQALM1
225 A	NQALM2
400 A	NQALM4
600 A	NQALM6
600 A (3-cables per lug)	NQALM6A
Neutral bonding provisions and hardware[4]	
100/225	80122-269-50
400/600	80122-270-50

1 Kit includes two each A, B, and C phase and installation hardware.

2 Depending on circuit count, various combinations of 6-circuit bus covers and 9-circuit bus covers are used in construction of an interior. This kit contains two (2) of each.

3 Kit includes four lugs, insulators where required, and hardware.

4 Includes lugs and required screws.

Deadfronts and Filler Plates

Main Lug Interiors

For main lug interiors the entire deadfront is supplied as a replacement. Individual components are not available. Hardware is shipped with the deadfront. Deadfronts come without plastic filler plates. Filler plates are available as NQFP15.

Table 1: Replacement Deadfronts for Main Lug Interiors

Interior Pole Spaces		18	30	42	54	72	84
100 A	No Options	NQRPL18L1 NQRPL418L1	NQRPL30L1 NQRPL430L1	N/A			
	With SFL	N/A					
	With FTL						
	With TVSS						
225 A	No Options	N/A	NQRPL30L2 NQRPL430L2	NQRPL42L2 NQRPL442L2	NQRPL54L2 NQRPL454L2	NQRPL72L2 NQRPL472L2	NQRPL84L2 NQRPL484L2
	With SFL	N/A					
	With FTL	N/A	NQRPL30L2TFL NQRPL430L2TFL	NQRPL42L2TFL NQRPL442L2TFL	NQRPL54L2TFL NQRPL454L2TFL	NQRPL72L2TFL NQRPL472L2TFL	NQRPL84L2TFL NQRPL484L2TFL
	With SFB	N/A	NQRPLSFB2HJ or NQRPLSFB2Q				
	With TVSS	N/A					
400 A	No Options	N/A	NQRPL30L4 NQRPL430L4	NQRPL42L4 NQRPL442L4	NQRPL54L4 NQRPL454L4	NQRPL72L4 NQRPL472L4	NQRPL84L4 NQRPL484L4
	With SFL	N/A					
	With FTL	N/A	NQRPL30L4TFL NQRPL430L4TFL	NQRPL42L4TFL NQRPL442L4TFL	NQRPL54L4TFL NQRPL454L4TFL	NQRPL72L4TFL NQRPL472L4TFL	NQRPL84L4TFL NQRPL484L4TFL
	With SFB	N/A	NQRPLSFB6HJ or NQRPLSFB6Q				
	With TVSS	N/A					
600 A	No Options	N/A	NQRPL30L6 NQRPL430L6	NQRPL42L6 NQRPL442L6	NQRPL54L6 NQRPL454L6	NQRPL72L6 NQRPL472L6	NQRPL84L6 NQRPL484L6
	With SFL	N/A					
	With FTL	N/A	NQRPL30L6TFL NQRPL430L6TFL	NQRPL42L6TFL NQRPL442L6TFL	NQRPL54L6TFL NQRPL454L6TFL	NQRPL72L6TFL NQRPL472L6TFL	NQRPL84L6TFL NQRPL484L6TFL
	With SFB	N/A	NQRPLSFB6HJ or NQRPLSFB6Q				
	With TVSS	N/A					

Main Circuit Breaker Interiors

For replacement of main circuit breaker interior deadfronts, only the main breaker section of the deadfront is listed below. To order an entire main circuit breaker interior deadfront, please order the appropriate Main Lug Interior deadfront from the table above, and a Main Circuit Breaker Interior deadfront from the table below.

Table 2: Replacement Main Circuit Breaker Deadfront Sections[1]

100 A and 225 A	NQRPLMB1F	(for F-frame mains)
	NQRPLMB2HJ	(for H- and J-frame mains)
400 A	NQRPLMB4LA	(for LA/LH mains)
600 A	Contact the Customer Information Center	

[1] These do not vary by circuit count.

For repairs not involving the service parts addressed in this document, please call the Square D / Schneider Electric Customer Information Center:
In the USA, 1-888-SquareD (1-888-778-2733)
In Canada, 1-800-565-6699

Schneider Electric USA
252 North Tippecanoe
Peru, IN 46970 USA
1-888-SquareD
(1-888-778-2733)
www.schneider-electric.us

Schneider Electric Canada
19 Waterman Avenue,
M4B 1Y2
Toronto, Ontario
1-800-565-6699
www.schneider-electric.ca

30 A General Duty Safety Switches
Interrupteurs de sécurité universels de 30 A

Class Classe	Type Type	Series Série
3130	1	E02

Retain for future use. / À conserver pour usage ultérieur.

PRECAUTIONS

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized switch with door open.
- Turn off switch before removing or installing fuses or making load side connections.
- Always use a properly rated voltage sensing device at all line and load fuse clips to confirm switch is off.
- Turn off power supplying switch before doing any other work on or inside switch.
- Do not use renewable link fuses in fused switches.

Failure to follow these instructions will result in death or serious injury.

MESURES DE SÉCURITÉ

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Ne faites jamais fonctionner l'interrupteur sous tension avec la porte ouverte.
- Mettez l'interrupteur hors tension avant d'enlever ou d'installer des fusibles ou de faire des raccordements sur le côté charge.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée sur tous les porte-fusibles du côté ligne et charge pour s'assurer que l'interrupteur soit hors tension.
- Coupez l'alimentation de l'interrupteur avant d'y faire tout autre travail.
- N'utilisez pas de fusibles renouvelables dans les interrupteurs à fusibles.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

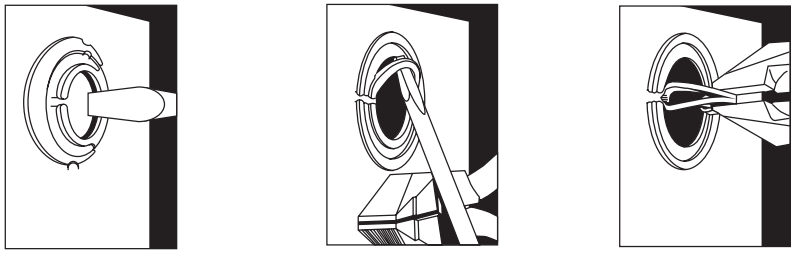
PREPARING THE ENCLOSURE

1. Select the wire size for the line, load, and neutral circuits. (Refer to the local codes.)
2. Select the proper wire clamp or use other approved methods to hold the wire to the enclosure wall.
3. Remove only those knockouts required for installation of the wire clamps or conduit.
4. To remove knockouts, see Figure 1.
   a. Drive center knockout inward.
   b. Alternately drive in or pry up outer rings, one at a time.
   c. Remove all loose knockout slugs or rings and all traces of metal shavings within the enclosure.

PRÉPARATION DU COFFRET

1. Sélectionner le calibre de fil pour les circuits de ligne, de charge et du neutre (consulter les codes locaux).
2. Sélectionner le serre-fils approprié ou utiliser d'autres méthodes autorisées pour maintenir le fil contre la paroi du coffret.
3. Retirer les débouchures appropriées nécessaires pour l'installation des serres-fils ou du conduit.
4. Pour retirer les débouchures, voir la figure 1.
   a. Pousser la débouchure centrale vers l'intérieur.
   b. Pousser ou relever alternativement les anneaux extérieurs, un par un.
   c. Retirer du coffret les chutes de débouchures ou anneaux et toutes traces de rognures métalliques.

Figure / Figure 1 : Removing the Knockouts / Retrait des débouchures



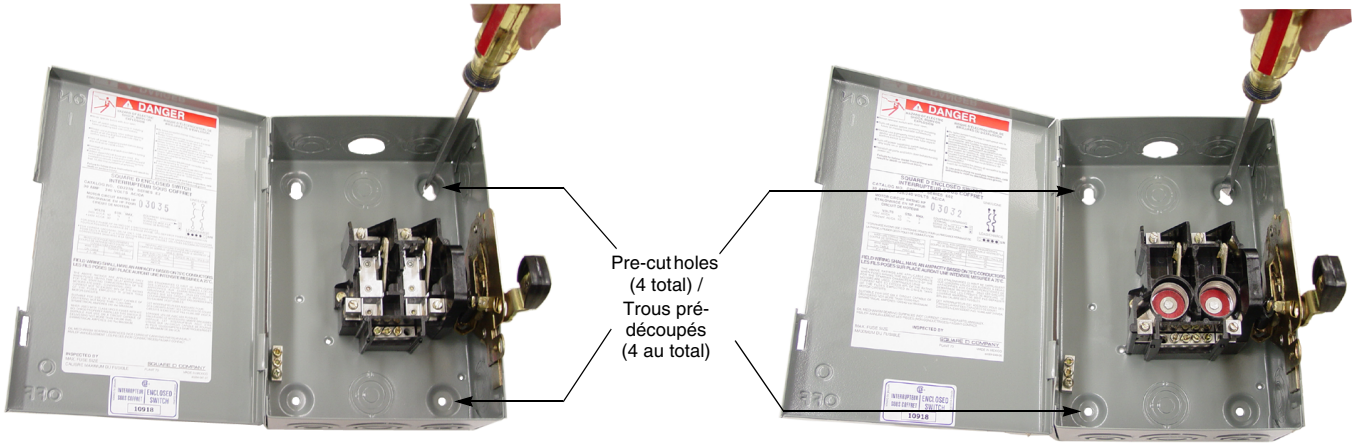
INSTALLING THE SWITCH

1. Mount the switch to the wall with screws or nails. Use the precut holes in the back of the enclosure. See Figure 2.

INSTALLATION DE L'INTERRUPTEUR

1. Monter l'interrupteur sur le mur à l'aide de vis ou de clous. Utiliser les trous pré-découpés à l'arrière du coffret. Voir la figure 2.

Figure / Figure 2 : Mounting the Switch / Montage de l'interrupteur



Cartridge Fuse Switch / Interrupteur à fusibles à cartouche

Plug Fuse Switch / Interrupteur à fusibles vissés

2. Pull the conductors into the enclosure.

NOTE: To avoid damage to the conductor insulation, use approved wire clamps, conduit, and bushings, or other methods approved for this purpose.

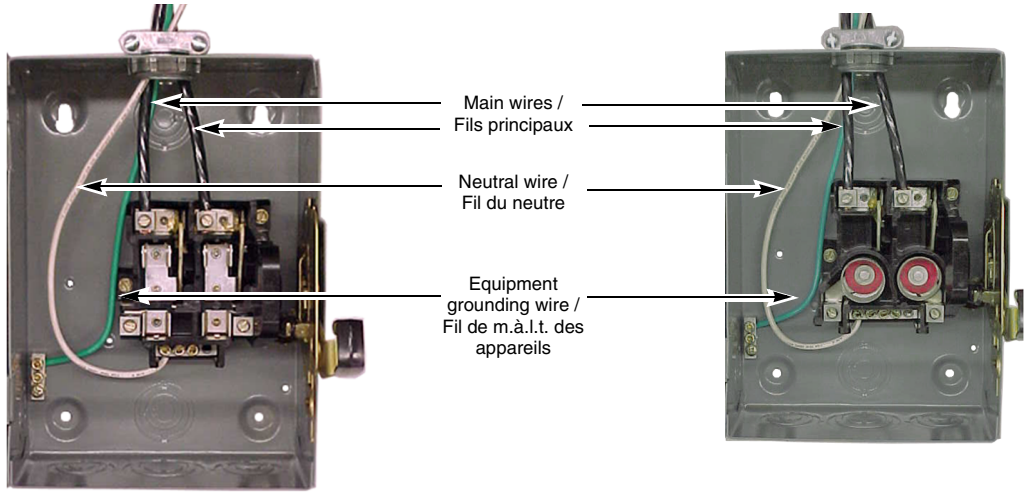
3. Following the wiring diagram on the cover, install the main and neutral wires. If the equipment ground wire (green wire or bare copper) is used, install the wire in the ground connector on the enclosure. See Figure 3.
4. Torque all the wire binding screws per the instructions provided on the enclosure wiring diagram.

2. Tirer les conducteurs à l'intérieur du coffret.

REMARQUE : Pour éviter d'abîmer l'isolation des conducteurs, utiliser des serre-fils, conduits et traversées approuvés, ou d'autres méthodes autorisées pour ce faire.

3. En suivant le schéma de câblage sur le couvercle, installer les fils principaux et de neutre. Si le fil de m.à.l.t. des appareils (fil vert ou de cuivre à nu) est utilisé, installer le fil dans le connecteur de terre du coffret. Voir la figure 3.
4. Serrer toutes les vis de fixation des fils selon les directives fournies sur le schéma de câblage du coffret.

Figure / Figure 3 : Wiring the Switch / Câblage de l'interrupteur



Cartridge Fuse Switch / Interrupteur à fusibles à cartouche

Plug Fuse Switch / Interrupteur à fusibles vissés

INSTALLING THE FUSES

INSTALLATION DES FUSIBLES

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off power supplying switch before installing or replacing fuses.
- Close cover before turning on power.

Failure to follow these instructions will result in death or serious injury.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Coupez l'alimentation de l'interrupteur avant d'installer ou de remplacer les fusibles.
- Fermez le couvercle avant de mettre sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

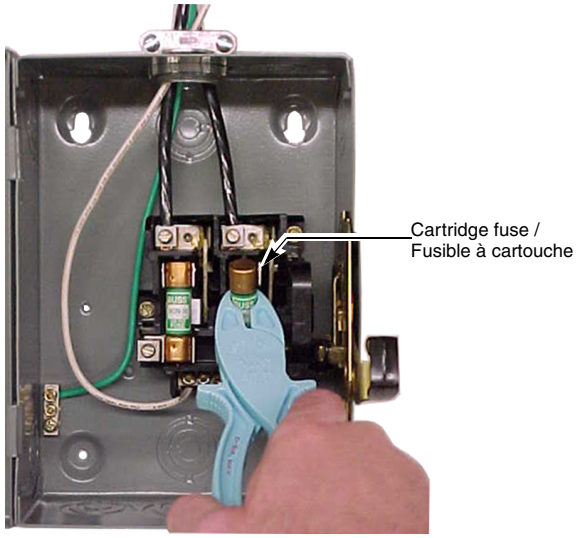
1. Turn the switch OFF (O).
2. Open the cover.
3. Install the fuses. See Figure 4.
4. Mark the maximum replacement fuse size on the label inside the door.
5. Exercise the operating mechanism to ensure proper operation. This is done by opening and closing the switch several times. The mechanism should be exercised at least once a year.

*NOTE: Ensure that the fuse clips are not damaged during **fuse** removal or replacement.*

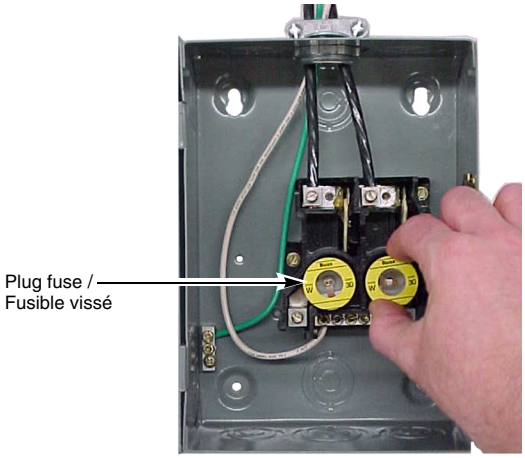
1. Mettre l'interrupteur hors tension (OFF).
2. Ouvrir le couvercle.
3. Installer les fusibles. Voir la figure 4.
4. Marquer le calibre maximum des fusibles de rechange sur l'étiquette à l'intérieur de la porte.
5. Manœuvrer le mécanisme de fonctionnement pour s'assurer de son bon fonctionnement. Cela s'effectue en ouvrant et fermant l'interrupteur plusieurs fois. Le mécanisme doit être manœuvré au moins une fois par an.

*REMARQUE : S'assurer que les porte-fusibles ne sont pas endommagés pendant le retrait ou le remplacement des **fusibles**.*

Figure / Figure 4 : Installing the Fuses / Installation des fusibles



Cartridge Fuse Switch / Interrupteur à fusibles à cartouche



Plug Fuse Switch / Interrupteur à fusibles vissés

ENERGIZING THE SWITCH

1. Close the cover.
2. Turn OFF (O) the switch.
3. Turn OFF (O) all of the downstream loads.
4. Turn ON (I) the power to the equipment in sequence; start at the source end of the system and work toward the load end.

MISE DE L'INTERRUPTEUR SOUS TENSION

1. Fermer le couvercle.
2. Mettre l'interrupteur hors tension (O).
3. Mettre hors tension (O) toutes les charges en aval.
4. Mettre les appareils sous tension (I) l'un après l'autre; commencer par l'extrémité source du système et continuer vers l'extrémité charge.

Schneider Electric USA
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Instruction Bulletin	Boletín de instrucciones	Directives d'utilisation

Series	Replaces
Serie	Reemplaza
Série	Remplace
F01	40272-266-03 11/2006

40272-266-04
05/2007
Lexington, KY, USA

GTK03 Equipment Grounding Bar Kit
Accesorio de barra de puesta a tierra del equipo
Kit de barre de m.à.l.t. de l'appareil

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

Precautions | Precauciones | Précautions

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma NFPA 70E.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnel (ÉPP) approprié et observez les méthodes de travail électrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension à valeur nominale appropriée pour s'assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

Si ces directives ne sont pas respectées, cela entraînera la mort ou des blessures graves.

42181

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SQUARE D

Contents

1 Grounding Bar
1 Mounting Screw
1 Equipment Grounding Label

Installation

1. Turn off all power supplying the equipment where kit will be installed.

NOTE: Three mounting locations are provided on bottom of enclosure, adjacent to ground symbol.

2. Mount grounding bar to bottom of enclosure , using mounting screw.
3. Tighten mounting screw to 20 lb-in. (2.3 N•m) after overcoming starting torque.
4. Apply equipment grounding label to enclosure beside grounding bar.
5. Install wiring to grounding bar. See equipment grounding label for wire size and binding screw torque.

Contenido

1 barra de puesta a tierra
1 tornillo de montaje
1 etiqueta de puesta a tierra del equipo

Instalación

1. Desenergice el gabinete en el que se instalará este accesorio.

NOTA: Se proporcionan tres ubicaciones de montaje en la parte inferior del gabinete, adyacentes al símbolo de tierra.

2. Monte la barra de puesta a tierra en la parte inferior del gabinete, utilizando el tornillo de montaje.
3. Apriete el tornillo de montaje a 2,3 N•m (20 lbs-pulg) una vez realizado el apriete inicial.
4. Adhiera la etiqueta de puesta a tierra del equipo al gabinete, junto a la barra de puesta a tierra.
5. Instale los cables en la barra de puesta a tierra. Consulte la etiqueta de puesta a tierra del equipo para obtener el tamaña de los conductores y el valor de par de apriete del tornillos de sujeción.

Contenu

1 barre de m.à.l.t.
1 vis de montage
1 étiquette de m.à.l.t. de l'appareil

Installation

1. Couper l'alimentation vers le coffret sur lequel ce kit doit être installé.

REMARQUE : Trois emplacements de montage sont fournis au fond du coffret, à côté du symbole de m.à.l.t.

2. Monter la barre de m.à.l.t. au fond du coffret, à l'aide de la vis de montage.
3. Serrer la vis de montage á 2,3 N•m (20 lb-po) après le serrage de départ.
4. Placer l'étiquette de m.à.l.t. de l'appareil sur le coffret, à côté de la barre de m.à.l.t.
5. Installer le câblage sur la barre de m.à.l.t. Consulter l'étiquette de m.à.l.t. de l'appareil pour obtenir le calibre des fils ainsi que le couple de serrage de la vis de fixation.

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40272-266-04

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Instruction Bulletin	Boletín de instrucciones	Directives d'utilisation

Series A01
Serie A01
Série A01

Replaces
Reemplaza
Remplace
40272-068-01
11/1996

40272-068-02
05/2007
Lexington, KY, USA

PKOGTA2 Service / Equipment Grounding Lug
Barra de puesta a tierra del equipo / tierra de acometida
Barre de m.à.l.t. de l'apparei / m.à.l.t. de service

Retain for future use. / Conservar para uso futuro. / À conserver pour usage ultérieur.

⚠ DANGER / PELIGRO / DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad eléctrica establecidas por su Compañía, consulte la norma 70E de NFPA.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo en él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de volver a energizar el equipo.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

RISQUE D'ÉLECTROCUTION, D'EXPLOSION OU D'ÉCLAIR D'ARC

- Portez un équipement de protection personnelle (ÉPP) approprié et observez les méthodes de travail élecrique sécuritaire. Voir NFPA 70E.
- Seul un personnel qualifié doit effectuer l'installation et l'entretien de cet appareil.
- Coupez l'alimentation de l'appareil avant d'y travailler.
- Utilisez toujours un dispositif de détection de tension ayant une valeur nominale appropriée pour vous assurer que l'alimentation est coupée.
- Replacez tous les dispositifs, les portes et les couvercles avant de mettre l'appareil sous tension.

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SQUARE D

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Contents

2 Lugs
1 Mounting screw
2 Labels

Mounting

1. Turn off all power supplying this equipment before working on or inside equipment.
2. Mount lugs to back of box where hole is provided.
3. Torque mounting lug screw to 25–45 lb-in. (2.8–5.0 N•m).

NOTE: When used for equipment grounding, place marker "Equipment Grounding Terminal" near lugs after installation. Attach torque label to box adjacent to grounding lugs.

Contenido

2 Zapatas
1 Tornillo de montaje
2 Etiquetas

Montaje

1. Desenergice el equipo antes de realizar cualquier trabajo en él.
2. Monte las zapatas en la parte posterior de la caja en el agujero provisto.
3. Apriete el tornillo de montaje de la zapata de 2,8 a 5,0 N•m (25 a 45 lbs-pulg).

NOTA: Cuando se utiliza como puesta a tierra del equipo, coloque la etiqueta "terminal de puesta a tierra del equipo" junto a las zapatas después de la instalación. Adhiera la etiqueta de par de apriete en la caja junto a las zapatas de tierra.

Contenu

2 Cosses
1 Vis de montage
2 Étiquettes

Montage

1. Couper l'alimentation de cet appareil avant d'y travailler.
2. Monter les cosses sur l'arrière du coffret en utilisant le trou fourni.
3. Serrer la vis de montage de la cosse entre 2,8 et 5,0 N•m (25 et 45 lb-po).

REMARQUE : Lorsqu'il est utilisé comme m.à.l.t. de l'appareil, placer le repère " Borne de m.à.l.t. de l'appareil " près des cosses après l'installation. Fixer l'étiquette de couple de serrage adjacent aux cosses de m.à.l.t.

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QO® and QOB Miniature Circuit Breakers

Catalog
0730CT9801R1/08
2008
Class 730

CONTENTS

SQUARE D
by Schneider Electric

Schneider Electric

General Information

QO® and QOB Circuit Breakers

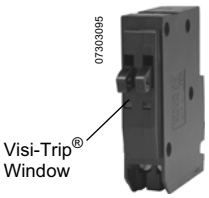
QO® (plug-on) and QOB (bolt-on) one-, two- and three-pole thermal-magnetic circuit breakers provide overcurrent protection and switching on ac and dc systems. Plug-on QO circuit breakers are for use in QO load centers, NQ and NQOD panelboards, OEM mounting bases, and Speed-D® switchboard distribution panels. Bolt-on QOB circuit breakers are for use in NQO and NQOD panelboards.

Operating mechanism

QO Circuit Breakers

QO and QOB circuit breakers have an overcenter, trip-free toggle mechanism with quick-make, quick-break action and positive handle indication. The tripping mechanisms in two-and three-pole circuit breakers operate such that an overcurrent on any pole of the circuit breaker will cause all poles of the circuit breaker to open simultaneously. Each pole has an individual thermal-magnetic trip element calibrated for 40°C ambient temperature.

Trip Indication



QO and QOB circuit breakers have Visi-Trip® trip indication, which provides a visual indication that the circuit breaker has tripped and interrupted the circuit. When the circuit breaker has tripped, the handle assumes a center position and the red Visi-Trip indicator appears in a window in the circuit breaker case. The Visi-Trip indicator is only visible when the circuit breaker has tripped. Trip indication immediately distinguishes the circuit from any other circuit which is merely in the on or off position. The circuit breaker can be reset by pushing the handle to OFF and then to ON.

Construction Standards

QO and QOB circuit breakers are built to comply with UL Standard 489, CSA 22.2 No. 5, NOM/ANCE and NEMA Standard AB1 and to meet Federal Specification W-C-375B/GEN. QO circuit breakers are UL Listed under UL File E84967 and are CSA Certified under CSA Master Contract 153555.

QO Circuit Breaker	UL Type
QO280–QO210	QOA, QOB
QO2110–QO2125	QOC, QOCB
QO2150–QO2200	QOC (no bolt-on version)

Ratings

When designing an electrical distribution system, overcurrent protective devices are generally selected based on performance requirements. Factors influencing this selection include system voltage, continuous current, interrupting rating, and frequency.

Voltage Rating

The circuit breaker must have a voltage rating greater than, or equal to, the system voltage. When a circuit breaker clears an overcurrent, it is done in two steps. First, the current sensing system identifies the overcurrent and releases the tripping mechanism. This results in a parting of the contacts. The circuit breaker must then extinguish the voltage arc across the contacts. If the circuit breaker has the correct voltage rating, it can efficiently extinguish this voltage arc. QO and QOB circuit breakers are rated for use in the following voltage systems:

- 120 Vac
- 208/120 Vac
- 120/240 Vac
- 240 Vac
- 48 Vdc (10–70 A for 1 and 2 pole circuit breakers, 10–60 A for 3 pole circuit breakers)

Continuous Current Rating

The continuous current rating of a circuit breaker is the maximum current in amperes (dc or rms ac at rated frequency) which a device will carry continuously without exceeding the specified allowable temperature rise. Sometimes referred to as the ampere rating or handle rating of the circuit breaker, the continuous current rating relates to the system current flow under normal conditions.

UL and CSA require that circuit breakers must be able to carry their continuous current rating indefinitely at 40°C in free air in order to achieve a UL Listing/CSA Certification. The National Electrical Code (NEC) and the Canadian Electrical Code (CEC) recognize that devices applied in end-use equipment can be affected by heat build up during normal operating conditions. For this reason, the codes require that circuit breakers be selected based on the characteristics of the load (particularly, the portion of the load which will be on continuously for three hours or more at a time).

Frequency Rating

The standard rated frequency for circuit breakers is 60 Hz. Circuit breakers are also rated for dc applications as shown in Table 1. Many Square D circuit breakers can also be applied on 50 Hz systems without derating. GFCI, AFCI and EPD devices are rated for 60 Hz operation only. Frequencies can affect the thermal, magnetic and short-circuit characteristics of circuit breakers. See Data Bulletin 0100DB0101 *Determining Current Carrying Capacity in Special Applications*. Contact the Field Sales office before applying circuit breakers on systems at frequencies other than 50/60 Hz.

Interrupting Rating

The interrupting rating of a circuit breaker is the highest current at rated voltage that the circuit breaker is intended to interrupt under standard test conditions. A circuit breaker must be chosen so that the interrupting rating is equal to or greater than the maximum available short-circuit current at the point where the circuit breaker is applied in the system.

Table 1: Interrupting Ratings

Circuit Breaker Type	Number of Poles	Ampere Rating	UL Listed Interrupting Rating[1]			
			120 Vac	120/240 Vac	240 Vac	48 Vdc[2]
QO	1	10–70 A	10 kA	10 kA	—	5 kA
	2	10–70 A	10 kA	10 kA	10 kA	5 kA
		80–100 A	10 kA	10 kA	10 kA	—
		110—200 A	10 kA	10 kA	—	—
	3	15–60 A	10 kA	10 kA	10 kA	5 kA
		70–100 A	10 kA	10 kA	10 kA	—
QOB	1	10–70 A	10 kA	10 kA	—	5 kA
	2	10–70 A	10 kA	10 kA	10 kA	5 kA
		80–100 A	10 kA	10 kA	10 kA	—
		110—125 A	10 kA	10 kA	—	—
	3	15–60 A	10 kA	10 kA	10 kA	5 kA
		70–100 A	10 kA	10 kA	10 kA	—
QO-H, QOB-H	2	15–100 A	10 kA[3]	10 kA[3]	10 kA[3]	—
QO-VH	1	15–30 A	22 kA	22 kA	—	—
	2	15–200 A	22 kA	22 kA	—	—
	3	15–100 A	22 kA	22 kA	22 kA	—
QOB-VH	1	15–30 A	22 kA	22 kA	—	—
	2	15–125 A	22 kA	22 kA	—	—
	3	15–150 A	22 kA	22 kA	22 kA	—
QOH	1	40–125 A	42 kA	42 kA	—	—
QH, QHB	1	15–30 A	65 kA	65 kA	—	—
	2	15–30 A	65 kA	65 kA	—	—
	3	15–30 A	65 kA	65 kA	65 kA	—
QO-GFI, QOB-GFI	1	15–30 A	10 kA	—	—	—
	2	15–60 A	10 kA	10 kA	—	—
QO-VHGFI, QOB-GFI	1	15–30 A	22 kA	—	—	—
QO-AFI, QOB-AFI	1	15–30 A	10 kA	—	—	—
QO-CAFI, QOB-CAFI	1	15–30 A	10 kA	—	—	—
QO-VHCAFI, QOB-VHCAFI	1	15–30 A	22 kA	—	—	—
QO-EPD, QOB-EPD	1	15–30 A	10 kA	—	—	—
	2	15–60 A	10 kA	10 kA	—	—
QO-PL	1	15–30 A	10 kA	10 kA	10 kA	—
	2	15–30 A	10 kA	10 kA	10 kA	—
	3	15–30 A	10 kA	10 kA	10 kA	—

1 10 kA and 5 kA are 1Ø-3Ø.

2 DC ratings do not apply to circuit breakers rated 10 A.

3 UL Listed 5,000 AIR on 3Ø grounded B-Phase Delta system.

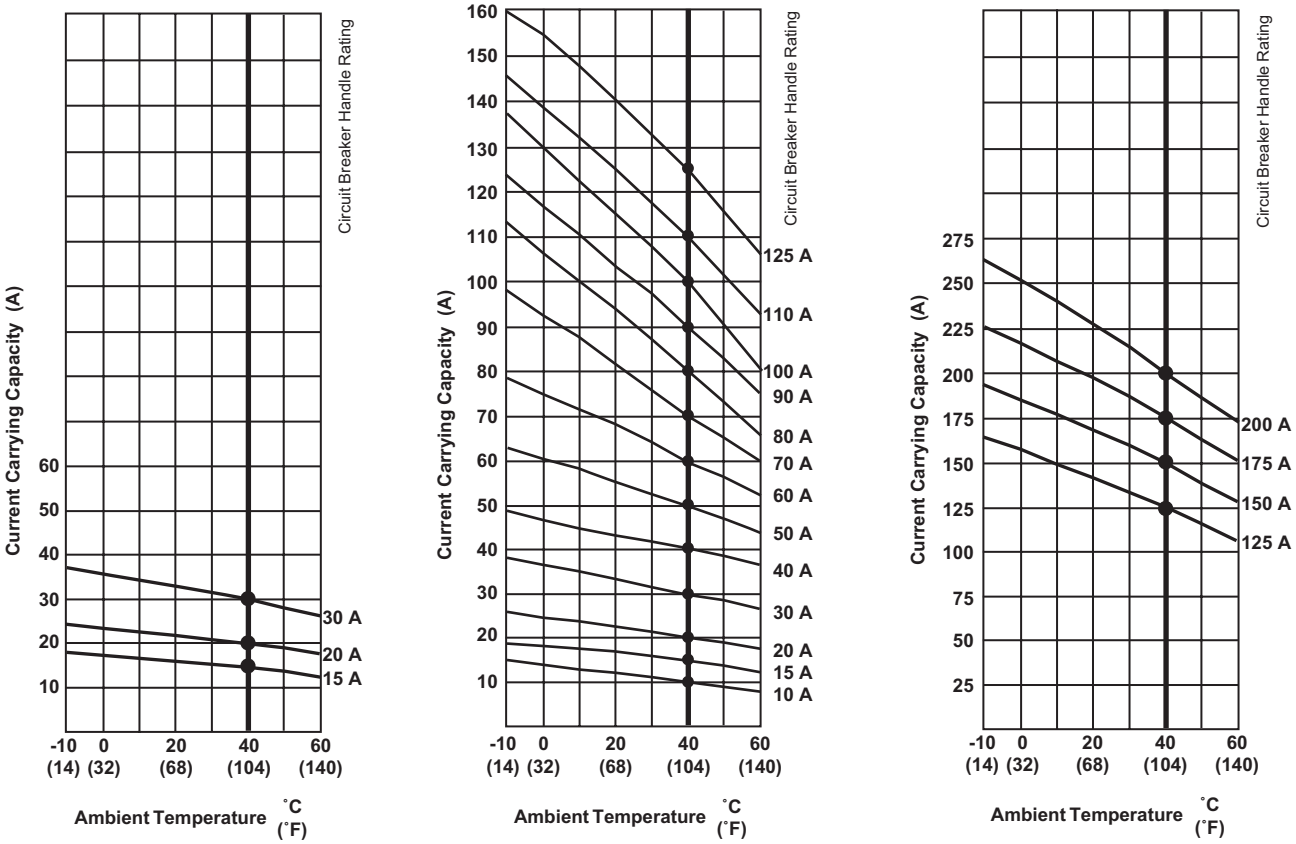
DC Voltage Rating

QO and QOB circuit breakers are available with a UL Listed 48 Vdc rating. See Table 1. Refer to Square D Data Bulletin 0601DB0401 for additional information on dc-rated circuit breakers.

Temperature Rating

To meet the requirements of Underwriters Laboratories Standard 489, molded case circuit breakers are designed, built, and calibrated for us on 60 Hz ac systems in 40°C (104°F) ambient temperature. When applied at ambient temperatures other than 40°C, the current-carrying capacity and/or trip charasteristics of the circuit breaker may vary.

Figure 1: Ambient Rerating Curves



QOT Circuit Breakers | QO, QOB Circuit Breakers | QE Circuit Breakers

IEC Rating

IEC rated QO circuit breakers are available. For further information contact the Field Sales office.

Terminology

HACR

HACR is a term used to designate circuit breakers which have been certified to be used on multi-motor and combination loads such as are found in heating, air conditioning and refrigeration equipment. QO circuit breakers meet the UL requirements for HACR circuit breakers and are suitable for group motor applications requiring HACR listing.

This means that QO and QOB circuit breakers meet the code requirements that HACR circuit breaker must be of the inverse time type and be approved for group installation. QO and QOB circuit breakers, except for GFI, AFI and EPD, are Listed with UL as HACR Type and are labeled accordingly.

Switching Duty (SWD) Circuit Breakers

QO and QOB circuit breakers are suitable for switching 120 Vac fluorescent lighting loads. The switching duty (SWD) listing applies only to one-pole 15 and 20 A circuit breakers rated at 347 Vac or less. The circuit breakers are subjected to specified temperature rise tests at predetermined periods during the endurance operations.

Terminations

The 10–30 A circuit breakers have pressure plate terminals suitable for single or two-wire terminations. Copper or aluminum conductors may be used as outlined in Table 2. QO-GFI 15–30 A and QO-AFI circuit breakers have pressure plate terminals suitable for single-wire terminations. These circuit breakers are suitable for use with 60°C or 75°C conductors.

The QO 35–200 A and all QO-PL and QOT tandem circuit breakers have box-type lugs suitable for single-wire terminations. These circuit breakers are suitable for use with 75°C conductors.

Table 2: Terminations

Circuit Breaker Types	Rating	Wire Size
QO, QOB, QO-VH, QOB-VH	10–30 A	(1) 14–8 AWG (1.5–3.3 mm^2) Al/Cu (2) 14–10 AWG (1.5–2.6 mm^2) Cu
	35–70 A	(1) 8–2 AWG (3.3–6.5 mm^2) Al/Cu
	80–125 A	(1) 4–2/0 AWG (5.2–9.3 mm^2) Al/Cu
QO, QOB, QO-VH	150–200 A	(1) 4 AWG–300 kcmil (5.2–50 mm^2) Al/Cu
QOB-VH	110–175 A	(1) 4 AWG–300 kcmil (5.2–50 mm^2) Al/Cu
QOT	15–20 A	(1) 12–8 AWG (2.0–3.3 mm^2) Al (1) 14–8 AWG (1.6–3.3 mm^2) Cu
QO-CAFI, QO-AFI, QO-GFI, QO-EPD, QOB-CAFI, QOB-AFI, QOB-GFI, QOB-EPD	15–30 A	(1) 12–8 AWG (2.0–3.3 mm^2) Al (1) 14–8 AWG (1.6–3.3 mm^2) Cu
QO-GFI, QO-EPD, QOB-GFI, QOB-EPD	40–60 A	(1) 12–4 AWG (2.0–4.1 mm^2) Al (1) 14–6 AWG (1.6–4.1 mm^2) Cu
QO-PL	10–60 A	(1) 12–2 AWG (2.0–6.5 mm^2) Al

Special Application Circuit Breakers

There are several special application circuit breakers in the QO family:

- QO-HM and QOB-HM High-Magnetic Circuit Breakers
- QO-HID and QOB-HID Circuit Breakers
- QO and QOB Miniature Switches
- QOK and QOBK Key-Operated Circuit Breakers
- QO-GFI and QOB-GFI Qwik-Gard® Circuit Breakers
- QO-EPD and QOB-EPD Equipment Protection Devices
- QO-SWN and QOB-SWN Switch Neutral Circuit Breakers
- QOT Tandem Circuit Breakers
- QO-PL and QOB-PL Powerlink® Circuit Breakers
- QO-AFI and QOB-AFI Branch Feeder Arc-Fault Circuit Interrupters (AFCI)
- QO-CAFI, QOB-CAFI Combination Arc-Fault Circuit Interrupters (AFCI)

This following sections describe the special application circuit breakers and provides application information for their use.

QO-HM and QOB-HM High Magnetic Circuit Breakers

QO-HM and QOB-HM high-magnetic circuit breakers are recommended for area lighting (such as athletic fields, parking lots, and outdoor signs), when using lamps of inherent high inrush current, individual dimmer applications or other applications where high inrush currents exceed standard tripping conditions. These circuit breakers are available in one-pole 15 and 20 A ratings only. QO-HM and QOB-HM circuit breakers are physically interchangeable with standard QO and QOB circuit breakers and accommodate the complete range of QO accessories.

QO-HM and QOB-HM circuit breakers are manufactured with the magnetic trip point calibrated at a much higher level than standard QO and QOB circuit beakers, as shown in Table 3.

Table 3: QO-HM and QOB-HM Circuit Breaker Magnetic Hold Levels

Continuous Current Rating	Maximum Full Cycle Magnetic Hold Level
15 A	315–525 A
20 A	322–537 A

QO-HID and QOB-HID High Intensity Discharge Circuit Breakers

QO-HID and QOB-HID circuit breakers are for use in high intensity discharge (HID) lighting systems, such as systems using mercury vapor, metal halide or high-pressure sodium lighting units. These circuit breakers are designed to handle the high inductive loads, harmonic currents and cycling which are inherent in HID lighting systems. QO-HID and QOB-HID circuit breakers are physically interchangeable with standard QO circuit breakers and accommodate the complete range of QO accessories.

QO-HID and QOB-HID circuit breakers are manufactured with larger contacts than standard QO and QOB circuit breakers to allow switching of high inductive loads. They also have magnetic characteristics similar to QO-HM and QOB-HM high-magnetic circuit breakers to allow the circuit breaker to hold in against the high starting inrush currents which are typical in HID lighting systems.

QO and QOB Miniature Switches

Miniature switches are intended for use as disconnecting devices only. They provide no overcurrent protection. QO and QOB switches are UL Certified for use on circuits capable of delivering not more than 10 kA when protected by an equivalent rated circuit breaker or fuse. These switches are available in 60 and 100 A rating.

QO and QOB switches are available with auxiliary switches only. (Shunt trip and bell alarm electrical accessories are not available on QO and QOB miniature switches.) QO and QOB switches are available with the complete range of handle accessories.

QOK and QOBK Key-Operated Circuit Breakers

1P QOK
Circuit Breaker

Key-operated QOK and QOBK circuit breakers provide an alternative means for turning a circuit breaker ON or OFF, as well as for resetting a tripped circuit breaker. The circuit breaker is turned on, off or reset with a special key included with the circuit breaker. Key-operated circuit breakers are available in one-pole construction only and can be mounted in any one-pole space which will accept a standard QO circuit breaker. These circuit breakers are available in 10–30 A ratings, with interrupting ratings of 10 kA at 120 Vac.

Replacement keys are available separately. Factory-installed or field-installable accessories are not available on key-operated circuit breakers.

1P QO-GFI
Circuit Breaker

2P QO-GFI
Circuit Breaker

QO-GFI and QOB-GFI Qwik-Gard® Ground-Fault Circuit Interrupters

Qwik-Gard® Ground-Fault Circuit Interrupters offer a means of providing ground-fault protection for people. Qwik-Gard "people protection" ground-fault circuit interrupters are built as Class A devices in accordance with UL Standard 489 and CSA C22.2 #144 for ground-fault circuit interrupters (GFCIs). Class A devices must trip at 6 milliamperes of ground-fault current and above, and hold below 4 milliamperes of ground-fault current.

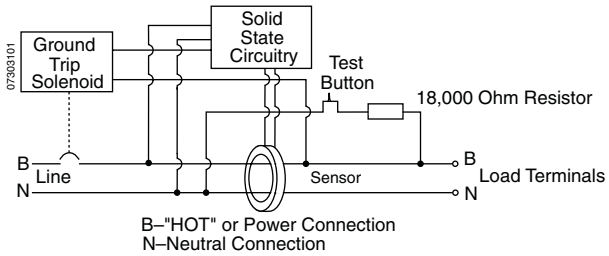
Qwik-Gard GFCIs provide the same branch circuit protection as standard QO circuit breakers. They are longer than standard QO circuit breakers, and thus require more gutter space. All QO electrical accessories except shunt trip and all QO mechanical accessories are available for QO-GFI and QOB-GFI circuit breakers.

Qwik-Gard circuit breakers are UL Listed and CSA Certified and available in both one- and two-pole constructions.

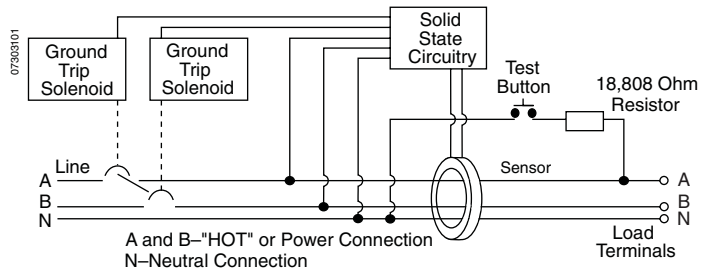
Qwik-Gard Ground-Fault Circuit Interrupter Operation

The ground-fault sensor in a Qwik-Gard GFCI continuously monitors the current flow in the load and neutral conductors. The sensor compares the current flow in all directions. If the current flowing back to the source is less than the current flowing out to the load, a ground fault exists. When the difference in current flow exceeds 6 milliamperes, the sensor sends a signal to trip the GFCI. The trip will be indicated by the Visi-Trip® indicator and the operating handle will move to the center tripped position.

Qwik-Gard Class A GFCIs include a self-contained means of testing the ground-fault circuitry. If the GFCI is connected correctly, with the pigtail connected to the neutral assembly in the load center or panelboard, pressing the test button will trip the GFCI and show a trip indication. UL requires that GFCIs must be operational at 85% of the rated voltage.



One-Pole Qwik-Gard Circuit Breaker



Two-Pole Qwik-Gard Circuit Breaker

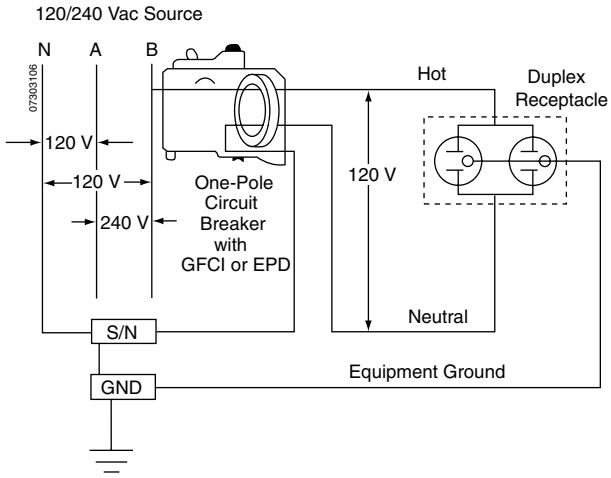
Proper Application of Qwik-Gard GFCIs

- Do not connect to swimming pool equipment installed before adoption of the 1965 National Electric Code
- Do not connect to electrical ranges or clothes dryers whose frames are grounded by a connection to the grounded circuit conductor.
- Do not use as a main circuit breaker in a panelboard or in reverse connected (backfed) applications.
- Do not megger, high-voltage or hi-pot test. Any voltage in excess of 240 Vac will damage the GFCI electronics so that the circuit breaker will not protect against low-level ground faults.
- Must be located no more than 250 ft. (76 m) from the load being served.
- RequiresS the same mounting space as standard QO circuit breakers.

One-Pole Qwik-Gard Ground-Fault Circuit Interrupters

One-pole Qwik-Gard GFCIs must be installed on independent circuits. Circuits which have a neutral common to more than one panel circuit conductor cannot be protected against ground faults by a one-pole GFCI because the current returning to the source through the neutral cannot be effectively split to prevent the Qwik-Gard GFCI from tripping under normal use.

Figure 2: Typical One-Pole Qwik-Gard GFCI Wiring

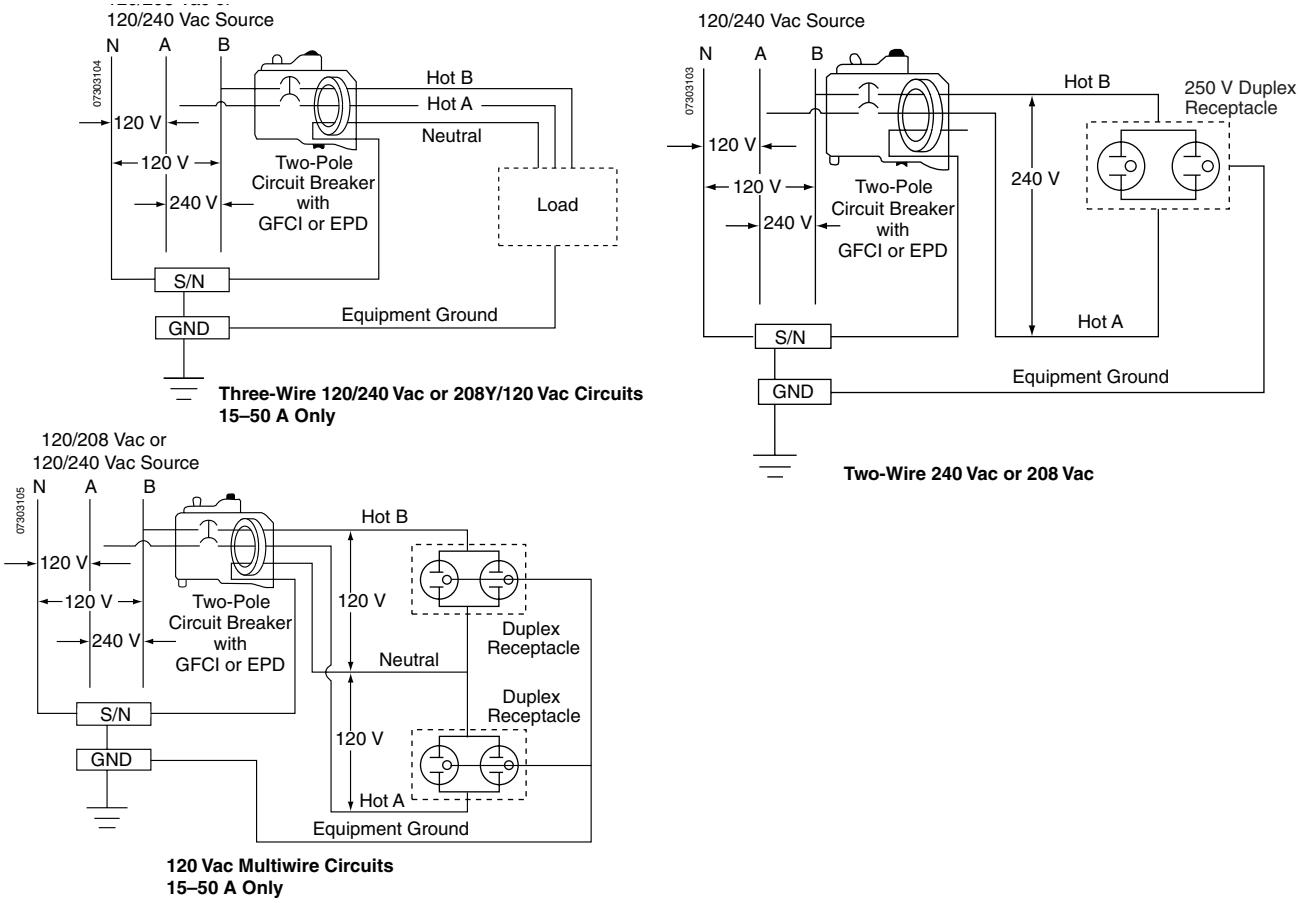


Two-Pole Qwik-Gard GFCIs

Two-pole Qwik-Gard GFCIs can be installed on a 120/240 Vac 1Ø3W system, the 120/240 Vac portion of a 120/240 Vac 3Ø4W system, or two phases and neutral of a 208Y/120 Vac 3Ø4W system. Regardless of the application, connections must be made to two “hot” busses and the panel neutral assembly. When installed on these systems, protection is provided for two-wire 240 Vac or 208 Vac circuit, three-wire 120/240 Vac or 208Y/120 Vac circuits and 120 Vac multiwire circuits.

The 60 A QO260GFI and QOB260GFI GFCIs are limited for use on 208 Vac and 240 Vac two-wire systems. These GFCIs require the panel neutral connection to provide the 120 Vac power necessary for testing the ground-fault circuitry.

Figure 3: Typical Two-Pole Qwik-Gard GFCI Wiring



QO-EPD and QOB-EPD Equipment Protection Devices

QO-EPD and QOB-EPD circuit breakers are one- and two-pole thermal-magnetic circuit breakers with integral **equipment** ground-fault protection. These circuit breakers are rated for use on 120/240 Vac and 120/208 Vac electrical systems to provide overcurrent protection, short-circuit protections and equipment ground-fault protection.

EPD circuit breakers are built in accordance with UL Standard 489. QO-EPD and QOB-EPD circuit breakers are not designed to protect people from the hazards of electrical shock. The ground-fault protection level is 30 milliamperes to protect electrical equipment such as heat trace tape.

QO-EPD and QOB-EPD circuit breakers include a self-contained means of testing the ground-fault circuitry. If the circuit breaker is connected correctly, with the pigtail connected to the neutral assembly in the load center or panelboard, pressing the test button will trip the circuit breaker and show a trip indication. EPD circuit breakers must be operational at 85% of the rated voltage.

EPD circuit breakers provide the same branch circuit protection as standard QO and QOB circuit breakers. They are longer than standard QO circuit breakers, and thus require more gutter space. All QO electrical accessories except shunt trip and all QO mechanical accessories are available for QO-EPD and QOB-EPD circuit breakers.

QO-SWN and QOB-SWN Switch Neutral Circuit Breakers

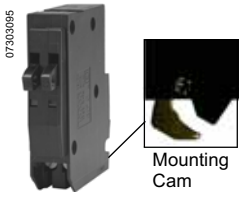
2 Wire and 3 Wire
QO-SWN Circuit Breaker

The QO-SWN and QOB-SWN switch neutral circuit breakers are designed to protect gas pump assemblies.These circuit breakers have provisions for switching the grounded conductor as outlined in the National Electrical Code.

The QO-SWN and QOB-SWN circuit breakers are designed to simultaneously open all grounded and ungrounded conductors. All branch circuit wiring is terminated on the load side of the circuit breaker. The panel neutral connection is made using the pigtail lead built into the circuit breaker. Two-wire circuit breakers require two pole spaces; three-wire circuit breaker require three pole spaces.

QO-SWN and QOB-SWN circuit breakers are available with the complete range of QO accessories.

QOT Tandem Circuit Breakers



1P QOT Tandem
Circuit Breaker

QOT tandem circuit breakers are manufactured so two one-pole, thermal-magnetic circuit breakers occupy only one QO pole space. They are used in applications where circuit loading is light and/or noncontinuous, as in residential applications. QOT circuit breakers are available in 15/15 ampere, 15/20 ampere and 20/20 ampere construction.

QOT circuit breakers have a mounting cam to limit their installation in QO load centers to only those positions having a mounting rail slot. This physically limits the total number of circuit beakers permitted in the panelboard for safe operation.

Each one-pole QOT circuit breaker provides individual switching and tripping action. Individual trip, two-pole circuit with common switching may be assembled by using a handle tie (kit QOTHT) between two adjacent QOT circuit breakers.

QO-PL and QOB-PL Powerlink® Remotely Operated CIrcuit Breakers

1P QO-PL
Circuit Breaker

2P QO-PL
Circuit Breaker

QOPLPS
Power Supply

QO-PL and QOB-PL circuit breakers combine overcurrent and short-circuit protection with remote switching. These circuit breakers are ideal for lighting loads or wherever power switching is required.

These circuit breakers are designed to be used with many types of control devices, from simple push buttons to programmable controllers and energy management systems. QO-PL and QOB-PL circuit breakers have all of the features of standard QO circuit breakers including Visi-Trip®, plus the added ability to be remotely switched on and off. They are rated for a minimum of 30,000 remote operations.

Remote switching is accomplished using a 24 Vdc power supply. Square D offers QOPLPS and QOBPLPS power supplies. These power supplies mount directly in any QO load center or NQ or NQOD panelboard just like a QO circuit breaker. They provide power to switch up to three QO-PL or QOB-PL circuit breakers simultaneously. A minimum of two seconds recharge time must be allowed between operation for non-simultaneous operations of circuit breakers being supplied by a power supply.

Table 4: Maximum Circuit Breakers per Power Supply

Voltage	Maximum QO-PL and QOB-PL Circuit Breakers Recommended per QOPLPS[1]
208Y/120 Vac	2
240 Vac	3

1 At ambient temperature of -25° through 40°C.

QO Arc-Fault Circuit Interrupter Circuit Breakers

1P QO-AFI
Circuit Breaker

QO arc-fault circuit interrupters (AFCI) quickly detects a wide range of arc-fault conditions, recognizes the nature and specific wave-form of an arc fault and trips the circuit breaker. Traditional circuit breakers and fuses are designed to detect overloads and short circuits. Arc-fault circuit breakers are designed to detect overloads, short circuits and arc faults.

An arc-fault circuit breaker opens the circuit and stops the arcing and high intensity heat before a fire is likely to ignite. It is designed with the same quick-open and Visi-Trip® features and reliability of other QO circuit breaker products, fits into most existing Square D load centers, and can generally be used as a direct replacement for a standard Square D circuit breakers. The AFCI overall size is larger than an equivalent QO circuit breaker.

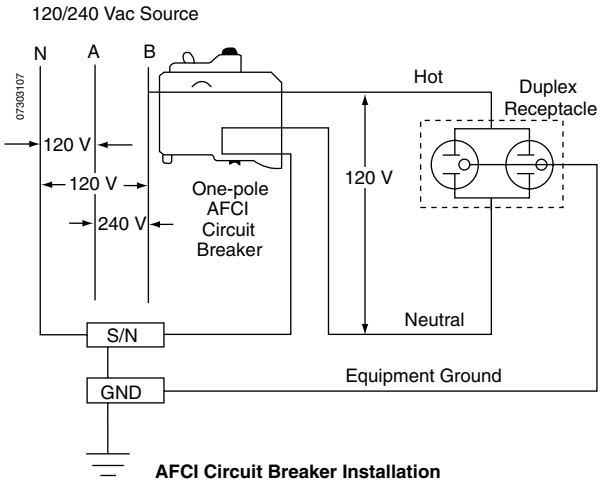
Arc-fault circuit breakers:

- Have special microprocessor-based arc identification to differentiate necessary operational arcs (associated with loads such as electric motors, switches and receptacles) from actual arc faults which can cause damage and fires.
- Differentiate true arc faults from chopped wave-forms associated with switched-mode power supplies on electrical appliances, computers and lamp dimmers.

QO AFCI's are available as Branch Feeder Type and Combination Type. Branch AFCI circuit breakers provide arc-fault protection of the branch circuit wiring. Combination AFCI circuit breakers provide arc-fault protection for the branch circuit and also provides protection of cord sets and power-supply cords.

The AFCI type required for an installation is generally governed by the installation codes which are adopted by local inspection authorities. Consult local building codes and inspection authorities to determine which type is required in your area.

Figure 4: Typical AFCI Circuit Breaker Installation



AFCI Circuit Breaker Installation

Accessories

Most QO and QOB circuit breakers can be supplied with electrical accessories factory-installed on one-, two- or three-pole circuit breakers. Electrical accessories are not available on AFCI circuit breakers.

Handle accessories are also available for field installation on QO and QOB circuit breakers. All field-installed handle accessories must be ordered separately.

Electrical Accessories

Only one electrical accessory can be installed per circuit breaker, and are factory-installed only. All electrical accessories occupy one additional pole space. The proper suffix number must be added to the circuit breaker catalog number to order an accessory. No field modification or field installation is possible on electrical accessories.

Table 5: Factory-Installed Electrical Accessory Suffix Numbers

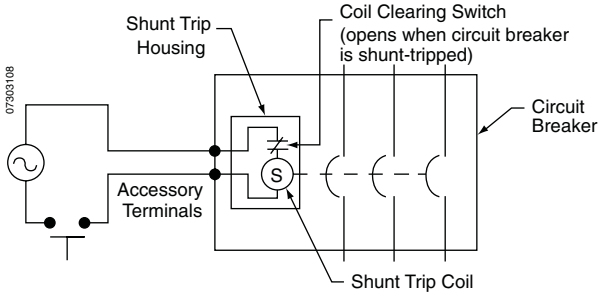
Accessory	Description	Voltage	Coil Burden	Max. Load	Catalog Suffix
Shunt Trip	Trips the circuit breaker from a remote location by means of a trip coil energized from a separate circuit. All shunt trips will operate at 75% or more of rated voltage. • For use with momentary or maintained push button. • Not available on QO-GF or QO-EPD circuit breakers. • Shunt trip terminals accept (2) 14–12 AWG Cu leads.	12 Vac/dc 24 Vac/dc	60 VA 168 VA	—	1042
		120 Vac 208 Vac 240 Vac	72 VA 228 VA 288 VA	—	1021
Auxiliary Switch “A” Contact	Circuit breaker open—One contact only, opens when circuit breaker is off or tripped. 5 A max at 120 Vac.	120 Vac	—	5 A	1200
Auxiliary Switch “B” Contact	Circuit breaker open—One contact only, closed when circuit breaker is off or tripped. 5 A max at 120 Vac.	120 Vac	—	5 A	1201
Alarm Switch	Used with control circuits and is actuated only when the circuit breaker has tripped. Standard construction includes a normally-open contact. • Alarm switch terminals accept (2) 14–12 AWG Cu leads.	120 Vac	—	5 A	2100

Shunt Trip

The shunt trip is used to trip the circuit breaker from a remote location by using a tripping coil energized from a separate circuit. When energized by a push-button or other pilot device, the shunt trip caused the circuit breaker to trip. The handle moves to the tripped position and the Visi-Trip® indicator appears. The trip coil has a coil clearing contact to break the coil circuit when the circuit breaker trips.

Shunt trips are available for QO and QOB circuit breakers only with standard control voltage ratings up to 240 Vac or 24 Vdc. (Shunt trips are not available on QO and QOB GFCI, AFCI, EPD and miniature switches.) Shunt trips operate at 75% or more of rated voltage.

Figure 5: Shunt Trip Wiring Diagram

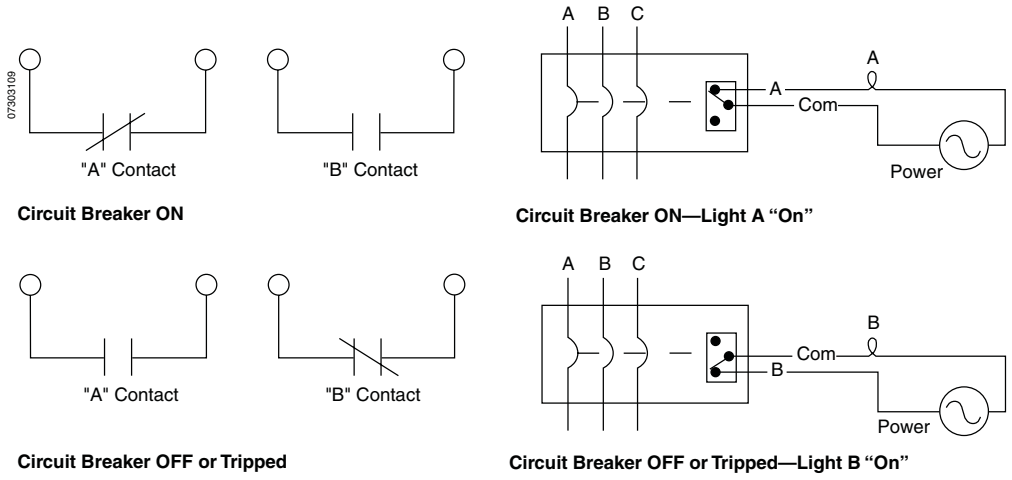


Auxiliary Switch

The auxiliary switch accessory monitors the circuit breaker contact status and provides a remote signal indicating whether the circuit breaker contacts are open or closed. When the circuit breaker is off or tripped, the auxiliary switch with an “A” contact is open and the auxiliary switch with a “B” contact is closed. When the circuit breaker is on, the auxiliary switch with an “A” contact is closed and the auxiliary switch with a “B” contact is open.

Auxiliary switches are available for QO and QOB circuit breakers and miniature switches. (Auxiliary switches are not available on QO and QOB AFI and CAFI products.)

Figure 6: Auxiliary Switch Wiring Diagrams



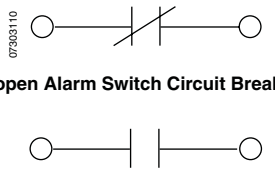
Alarm Switch

The alarm switch accessory monitors the circuit breaker trip status and is used to provide a remote warning signal indicating that the circuit breaker has tripped. This signal can be used in conjunction with a horn, pilot light, or some other indicator.

The contact on the standard alarm switch is open when the circuit breaker is in the off or on position and is closed when the circuit breaker is in the tripped position.

Alarm switches are actuated when the circuit breaker has tripped as a result of an overload, short circuit or shunt trip operation. Alarm switches are available for QO and QOB circuit breakers and miniature switches. (Alarm switches are not available on QO and QOB AFI and CAFI products.)

Figure 7: Alarm Switch Wiring Diagram



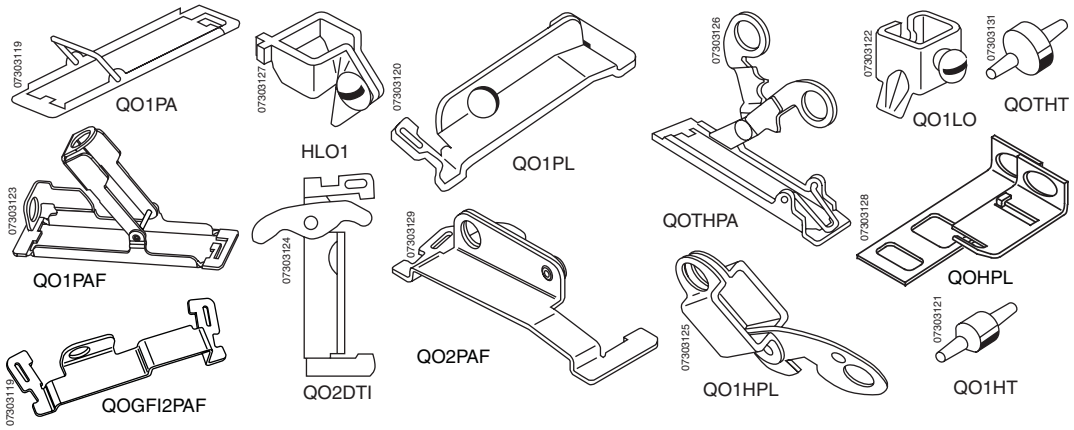
Handle Accessories

Field-installed handle accessories are also available.

Table 6: Field-Installable Handle Accessories

Accessory	Description	Catalog Number
Handle Tie	Converts any two adjacent 120/240 Vac 1P QO circuit breakers to independent trip 2P.	QO1HT
	Converts any two adjacent 120/240 Vac 1P side-by-side QOT circuit breakers to independent trip 2P.	QOTHT
Handle Clamp	Clamp for holding QO 1P handle in ON or OFF position.	QO1LO
	Clamp for holding QO or Q1 (1P, 2P, or 3P) circuit breaker handle in ON or OFF position.	HLO1
Handle Padlock Attachment for Padlocking in ON or OFF Position	Loose attachment for padlocking 1P QO circuit breaker in ON or OFF position.	QOHPL
	Fixed attachment for padlocking 1P QO circuit breaker in ON or OFF position.	QO1PA
	Attachment for padlocking 1P side-by-side QOT circuit breaker in ON or OFF position.	QOTHPA
	Fixed attachment for padlocking 2P QO-GFI circuit breaker in ON or OFF position.	GF12PA
	Loose attachment for padlocking 2P and 3P standard QO circuit breaker in ON or OFF position.	QO1HPL
	Fixed attachment for padlocking 2P and 3P standard QO circuit breaker in ON or OFF position.	QO1PL
Handle Padlock Attachment for Padlocking in OFF Position	Fixed attachment for padlocking 1P QO circuit breaker in OFF position only.	QO1PAF
	Fixed attachment for padlocking 2P and 3P QO circuit breakers in OFF position only.	QO2PAF
	Fixed attachment for padlocking 1P QO-GFI, QO-AFCI and QO-EPD circuit breakers in OFF position only.	QOGFI1PAF
	Fixed attachment for padlocking 2P QO-GFI and QO-EPD circuit breakers in OFF position only.	QOGFI12PAF
Sub-Feed Lugs	60 A 2P plug-on—2 spaces required (6–2 Al/Cu)	QO60SL
	125 A 2P plug-on—2 spaces required (12–2/0 Al/Cu)	QO2125SL
	225 A 2P plug-on—4 spaces required (4–300 Al/Cu)	QO2225SL
	125 A 3P plug-on—3 spaces required (12–2/0 Al/Cu)	QO3125SL
Mechanical Interlock Attachment	For interlocking the handles of two 2P or one 2P and one 1P QO and Q1 circuit breaker mounted side-by-side so that only one circuit breaker can be ON at a time (Not for QOU)	QO2DTI
Mechanical Interlock with Retaining Kit	For securing two adjacent back-fed circuit breakers in dual power supply applications. Can be used with two 2P or one 2P and one 1P QO circuit breaker in QO816L100 load center.	QO2DTIM

Figure 8: Handle Accessories



Handle Tie

The handle tie accessory converts any two adjacent one-pole QO circuit breakers to one independent trip multi-pole circuit breaker.

Handle Lock-Off (Clamp)

The handle lock-off accessories fasten the handle in the ON or OFF position. These handle lock-offs cannot be padlocked.

Handle Padlock Attachment

The handle padlock attachment allows padlocking the circuit breaker handles in either the ON or OFF position or in the OFF only position. Handle padlock attachments are available in two styles: removable and fixed.

The removable style is intended to be a temporary device. Once work on the circuit breaker has been completed, the attachment can be removed from the circuit breaker to resume normal operation.

The fixed style is intended to be a permanent device. Once the work on the circuit has been completed, the padlock can be removed for the circuit breaker to resume normal operation, but the attachment stays in place.

Mechanical Interlock Attachment

The mechanical interlock attachment locks the handles of two adjacent circuit breakers to prevent both circuit breakers from being on at the same time. Both circuit breakers may be switched to the off position with the mechanical interlock in place.

Mechanical Interlock Attachment with Retaining Kit

The mechanical interlock attachment locks the handles of two adjacent back-fed circuit breakers in dual power supply applications.

Trip Curves

The tripping characteristics of QO and QOB circuit breakers can be represented by a characteristic tripping curve that plots tripping time versus current level. The curve shows the amount of time required by a circuit breaker to trip at a given overcurrent level. The curve has a performance band that is bound by a minimum and a maximum value of clearing time. Total clearing time is the sum of the sensing time, unlatching time, mechanical operating time and arcing time of the circuit breaker. For currents in excess of 135% of the circuit breaker rating at rated ambient temperature (40°C), the circuit breaker will automatically open the circuit within limits specified by the band.

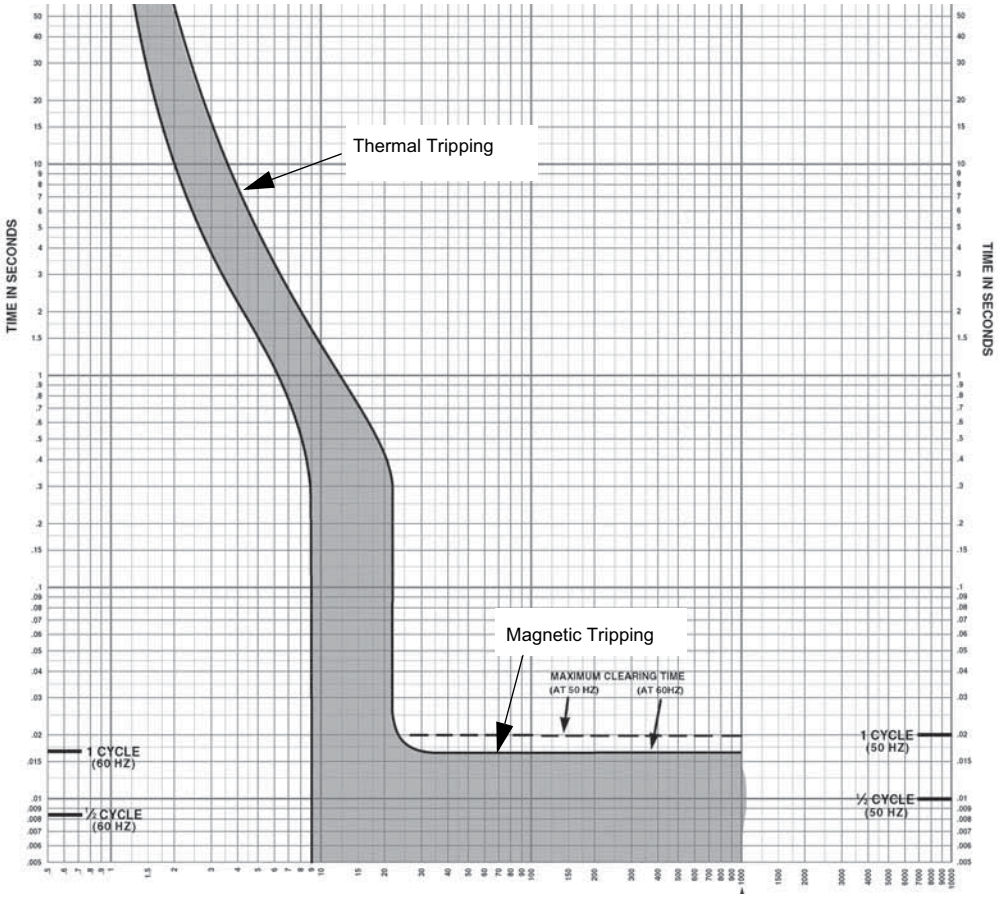
Thermal Tripping Characteristics

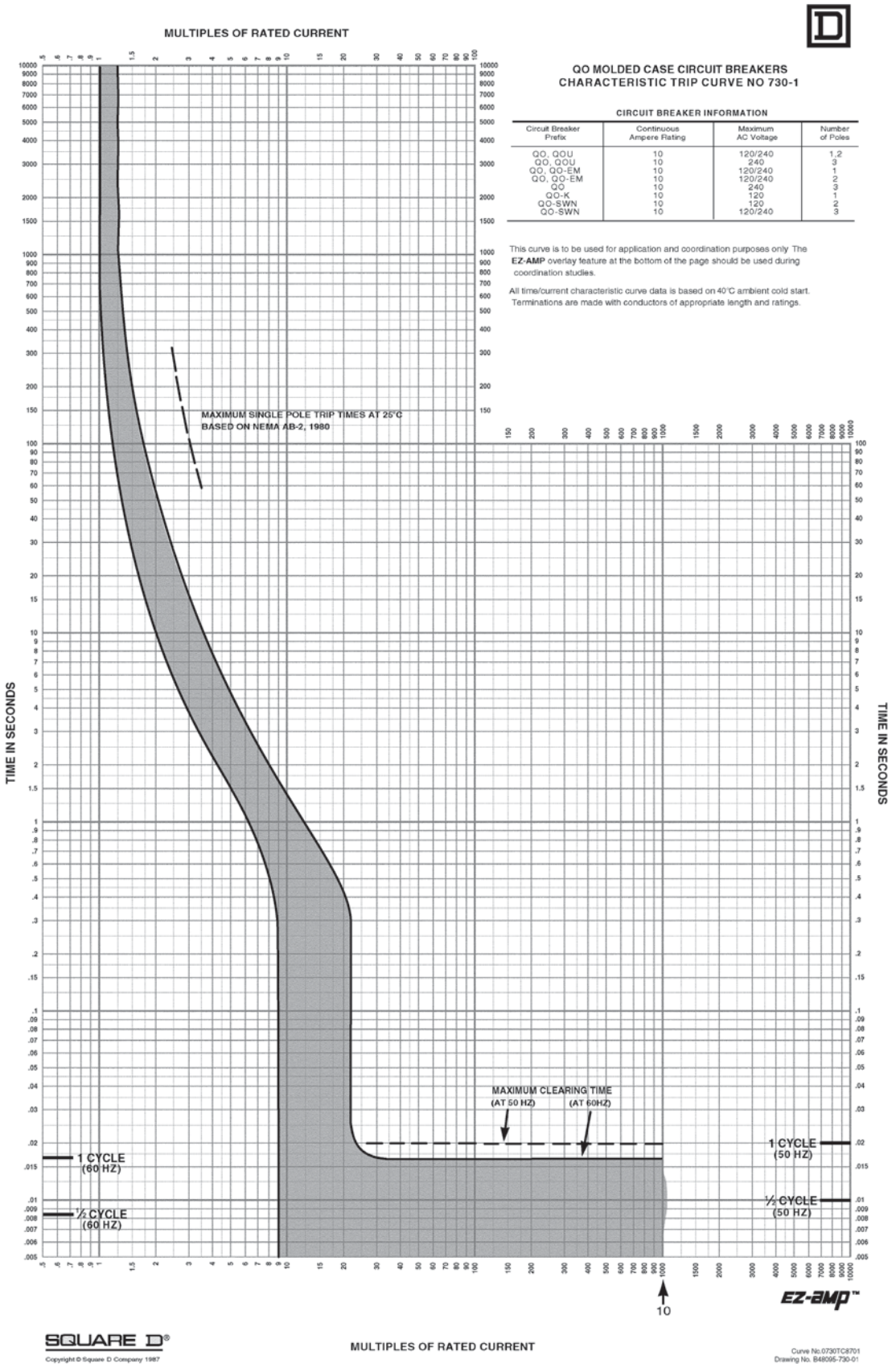
The upper left portion of each trip curve displays the thermal response of the circuit breaker. On low-fault current levels, up to the magnetic tripping level, thermal tripping occurs when a bimetal in the circuit breaker responds to heat associated with the overcurrent. The bimetal deflects, unlatching the mechanism and mechanically causing the circuit breaker to trip and open the circuit. The greater the overcurrent, the faster the circuit breaker will operate to clear the circuit.

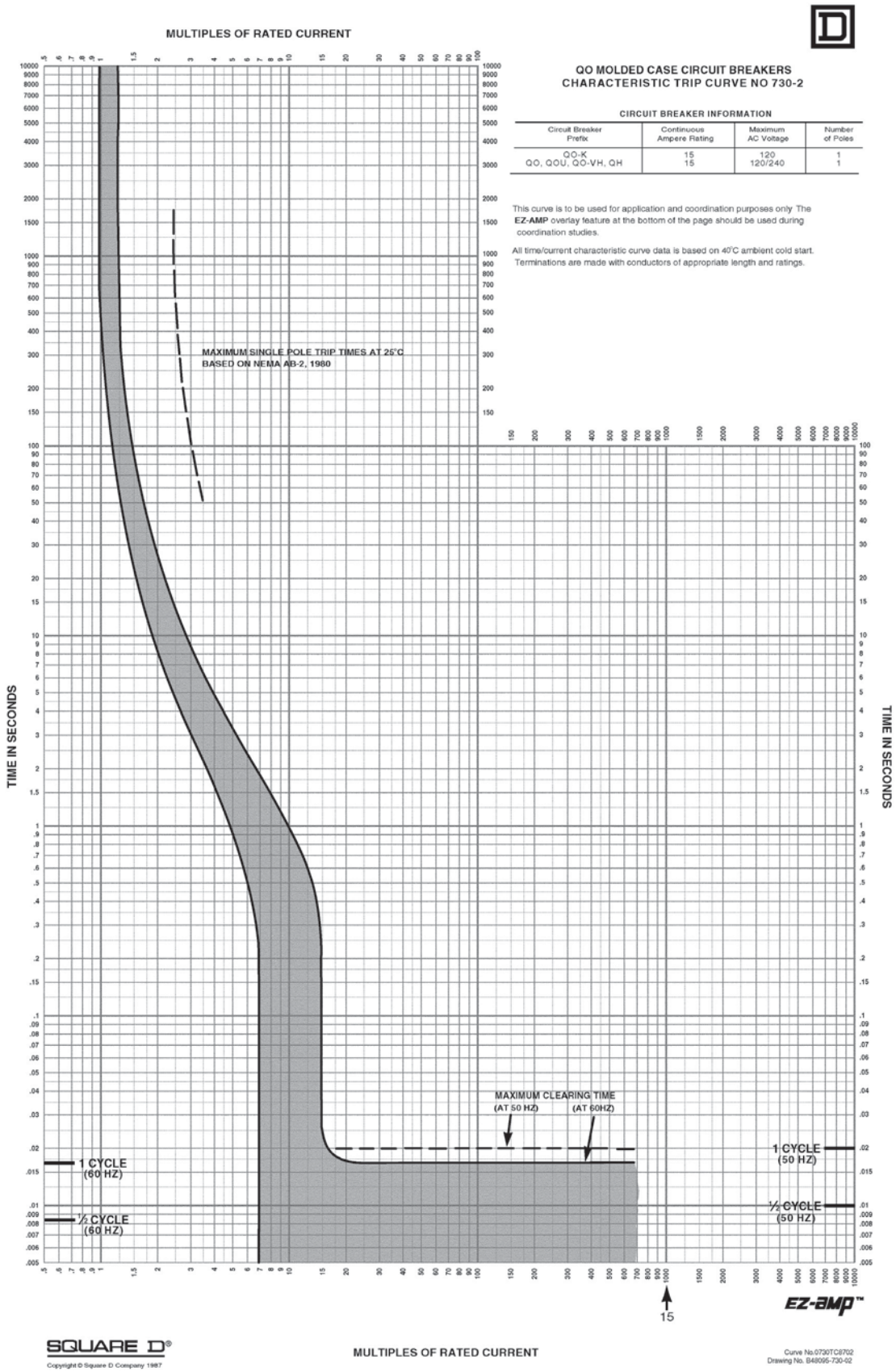
Magnetic Tripping Characteristics

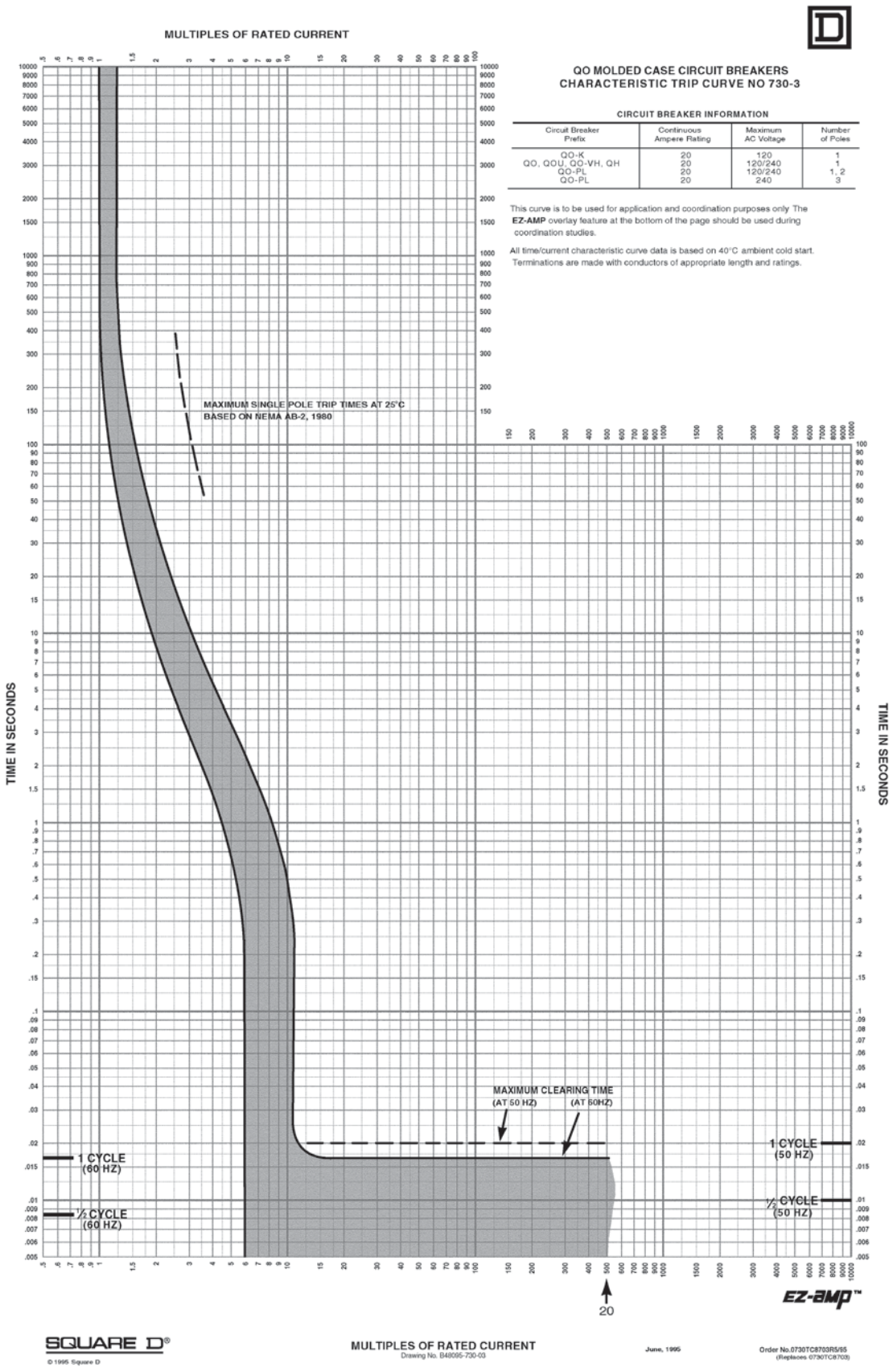
The lower right portion of each trip curve displays the magnetic tripping response of the circuit breaker. This takes place when overcurrents of sufficient magnitude operate in an internal magnetic armature which unlatches the mechanism. Magnetic tripping occurs with no intentional time delay.

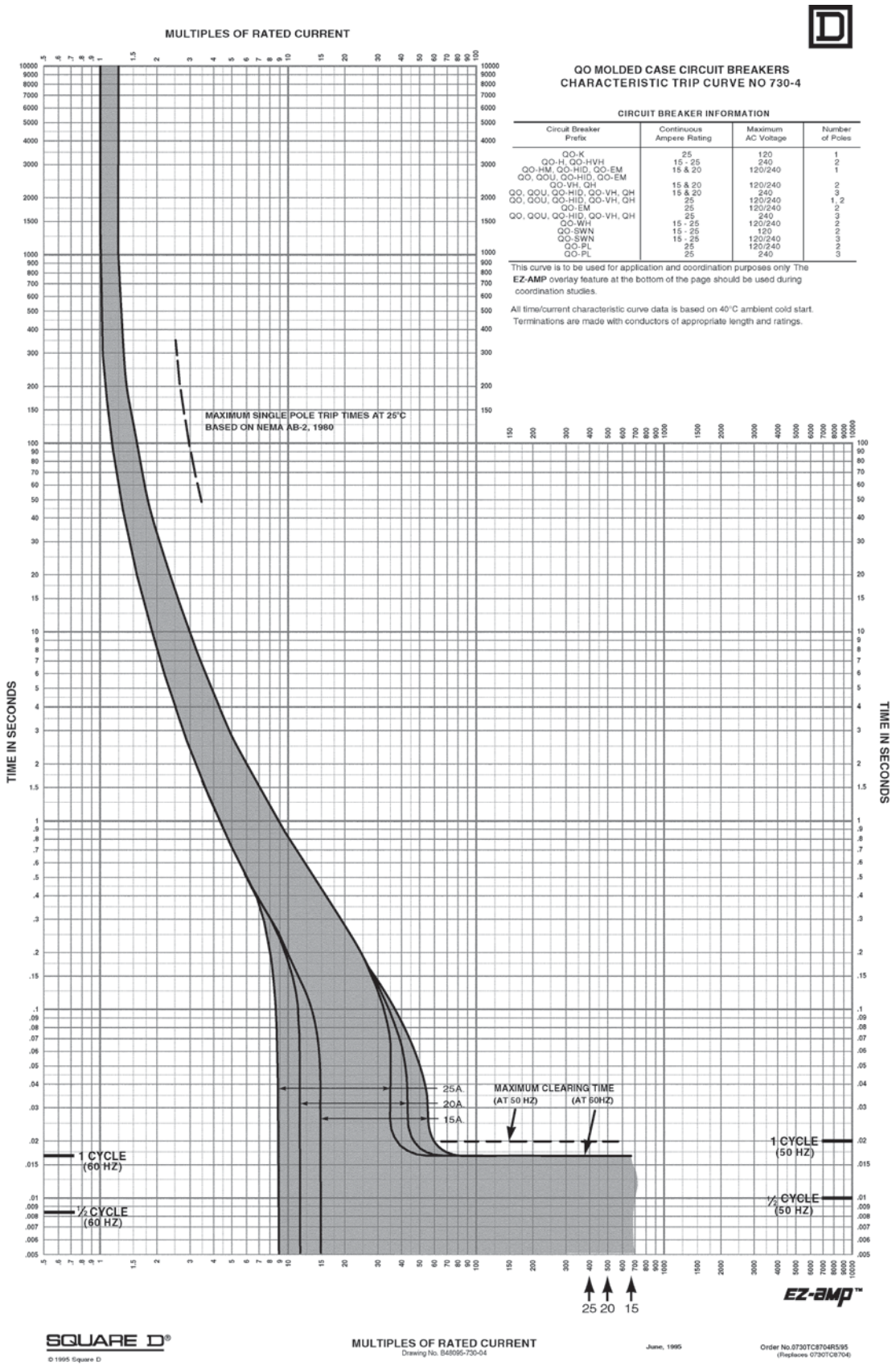
Figure 9: Typical QO Trip Curve

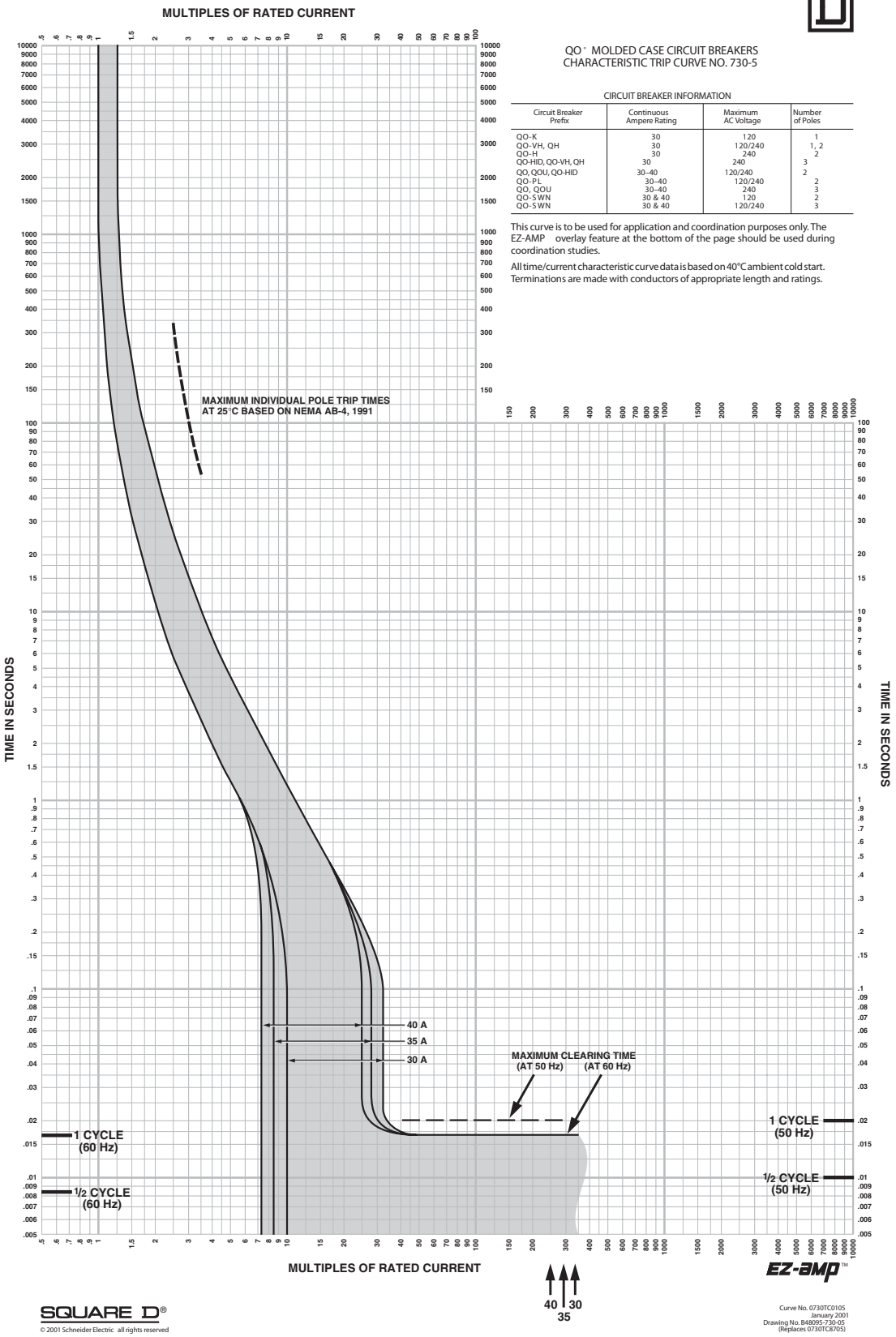












QO® MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 730-5

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-K	30	120	1
QO-VH, QH	30	120/240	1, 2
QO-H	30	240	2
QO-HID, QO-VH, QH	30	240	3
QO, QOU, QO-HID	30–40	120/240	2
QO-PL	30–40	120/240	2
QO, QOU	30–40	240	3
QO-SWN	30 & 40	120	2
QO-SWN	30 & 40	120/240	3

This curve is to be used for application and coordination purposes only. The EZ-AMP overlay feature at the bottom of the page should be used during coordination studies.

All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.

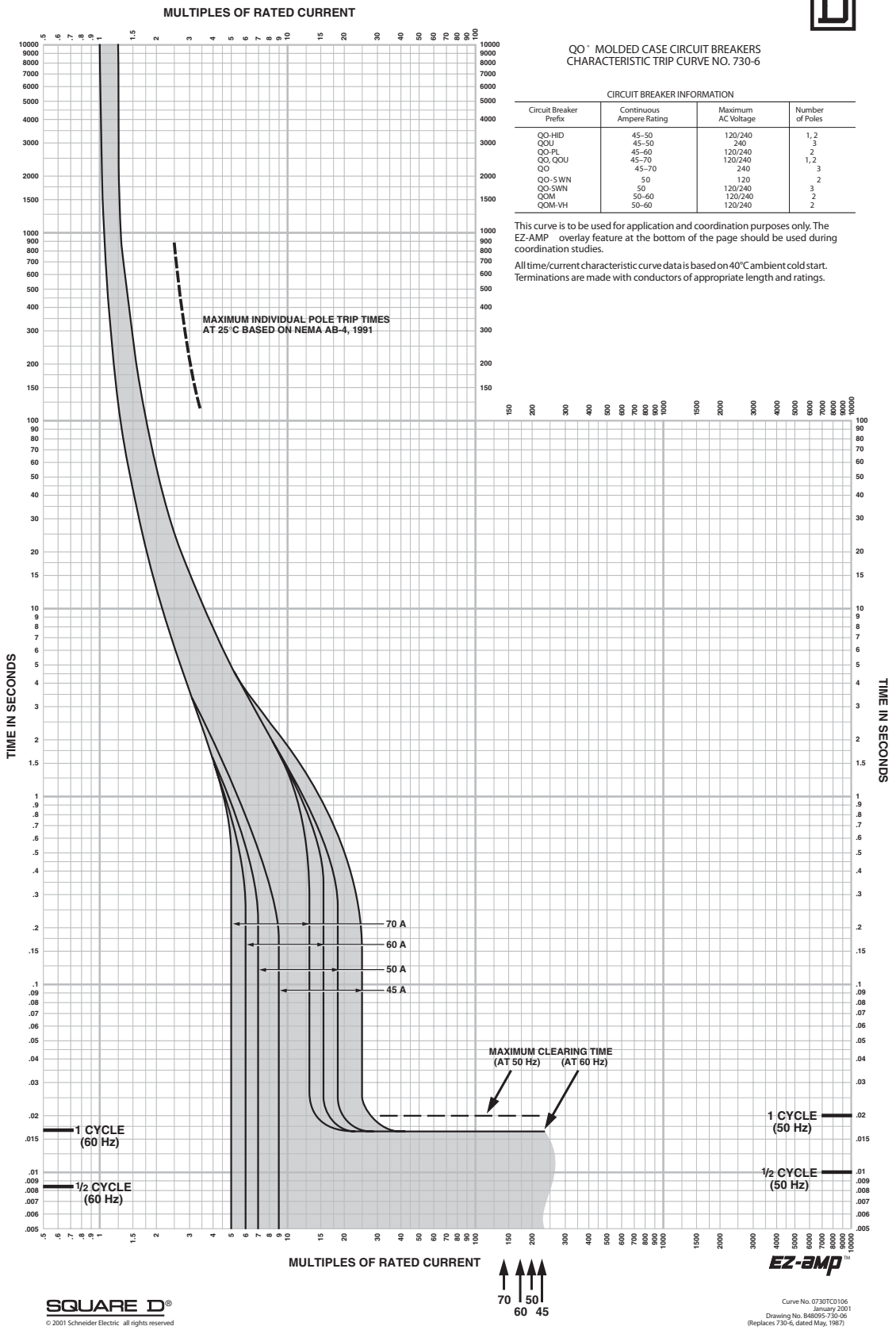
QO® MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 730-6

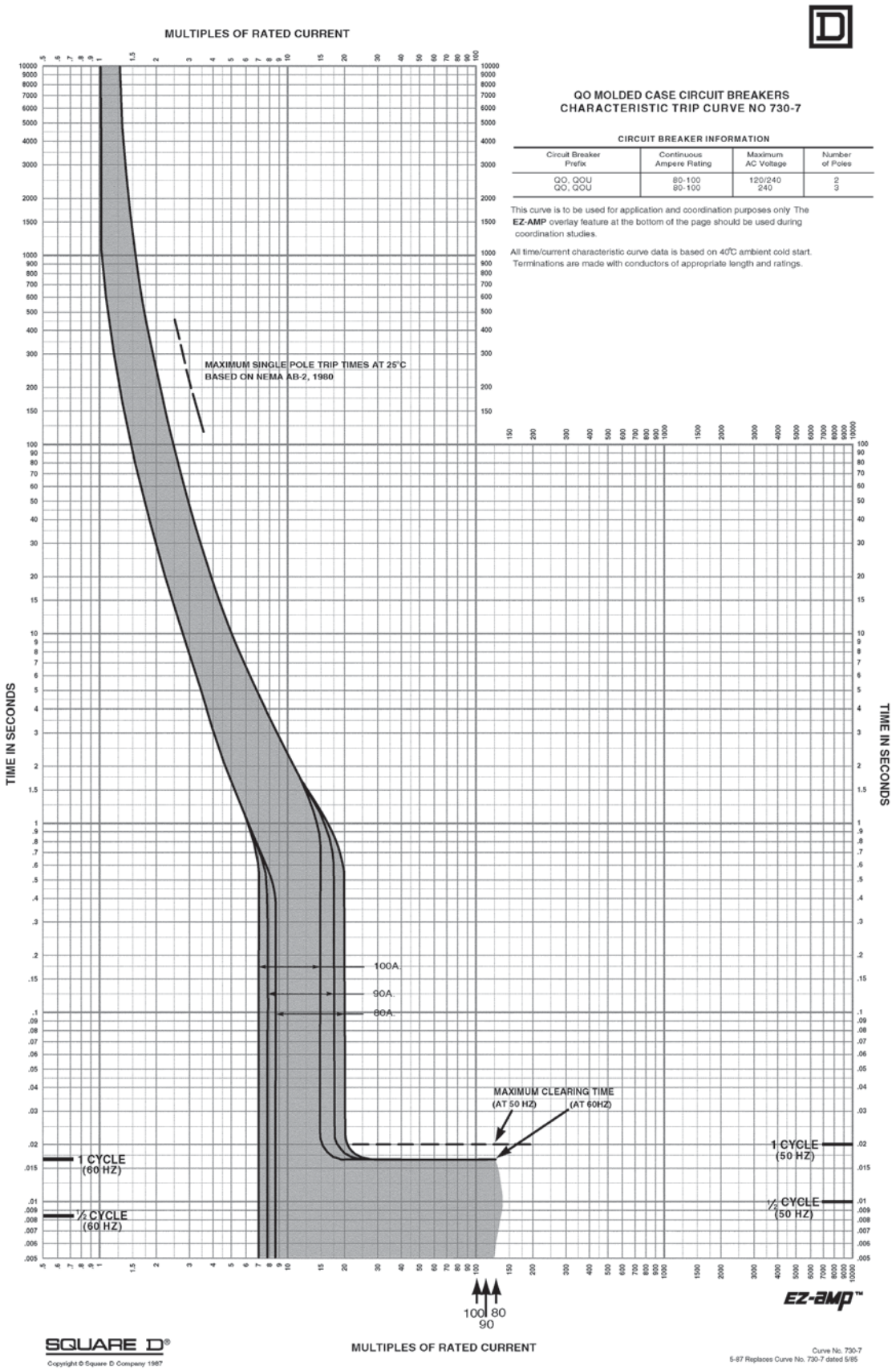
CIRCUIT BREAKER INFORMATION

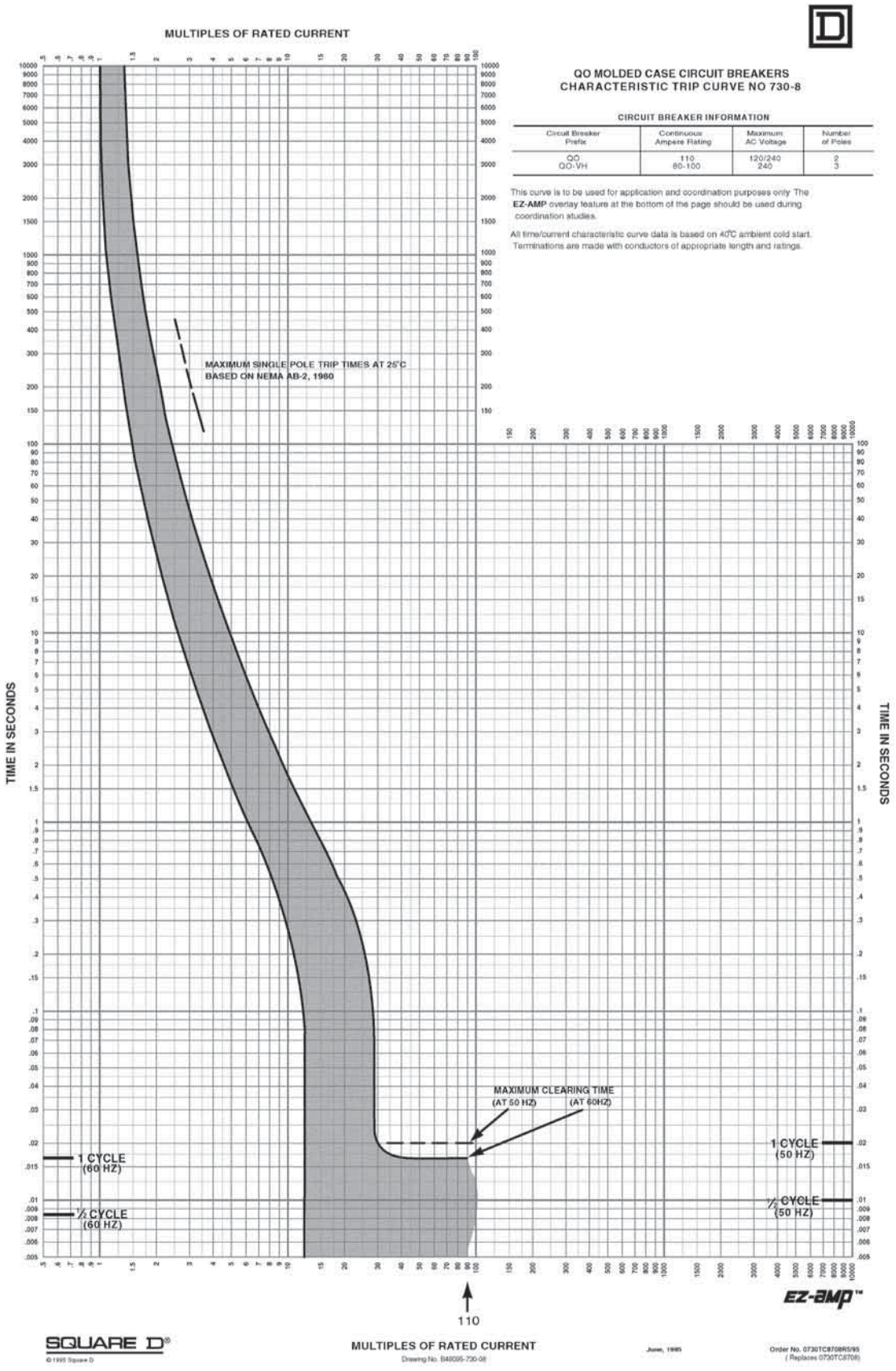
Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-HID	45–50	120/240	1, 2
QOU	45–50	240	3
QO-PL	45–60	120/240	2
QO, QOU	45–70	120/240	1, 2
QO	45–70	240	3
QO-SWN	50	120	2
QO-SWN	50	120/240	3
QOM	50–60	120/240	2
QOM-VH	50–60	120/240	2

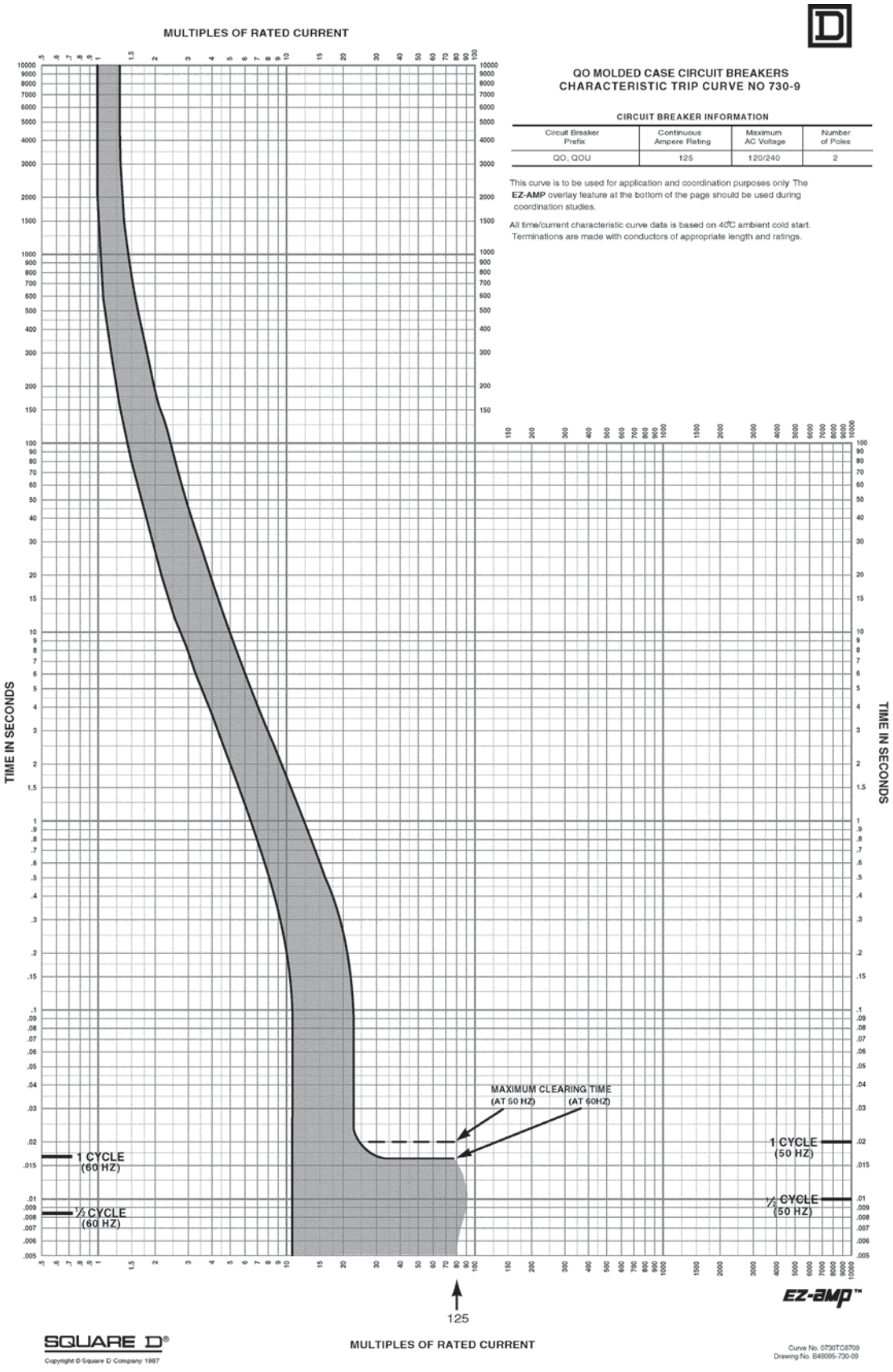
This curve is to be used for application and coordination purposes only. The EZ-AMP overlay feature at the bottom of the page should be used during coordination studies.

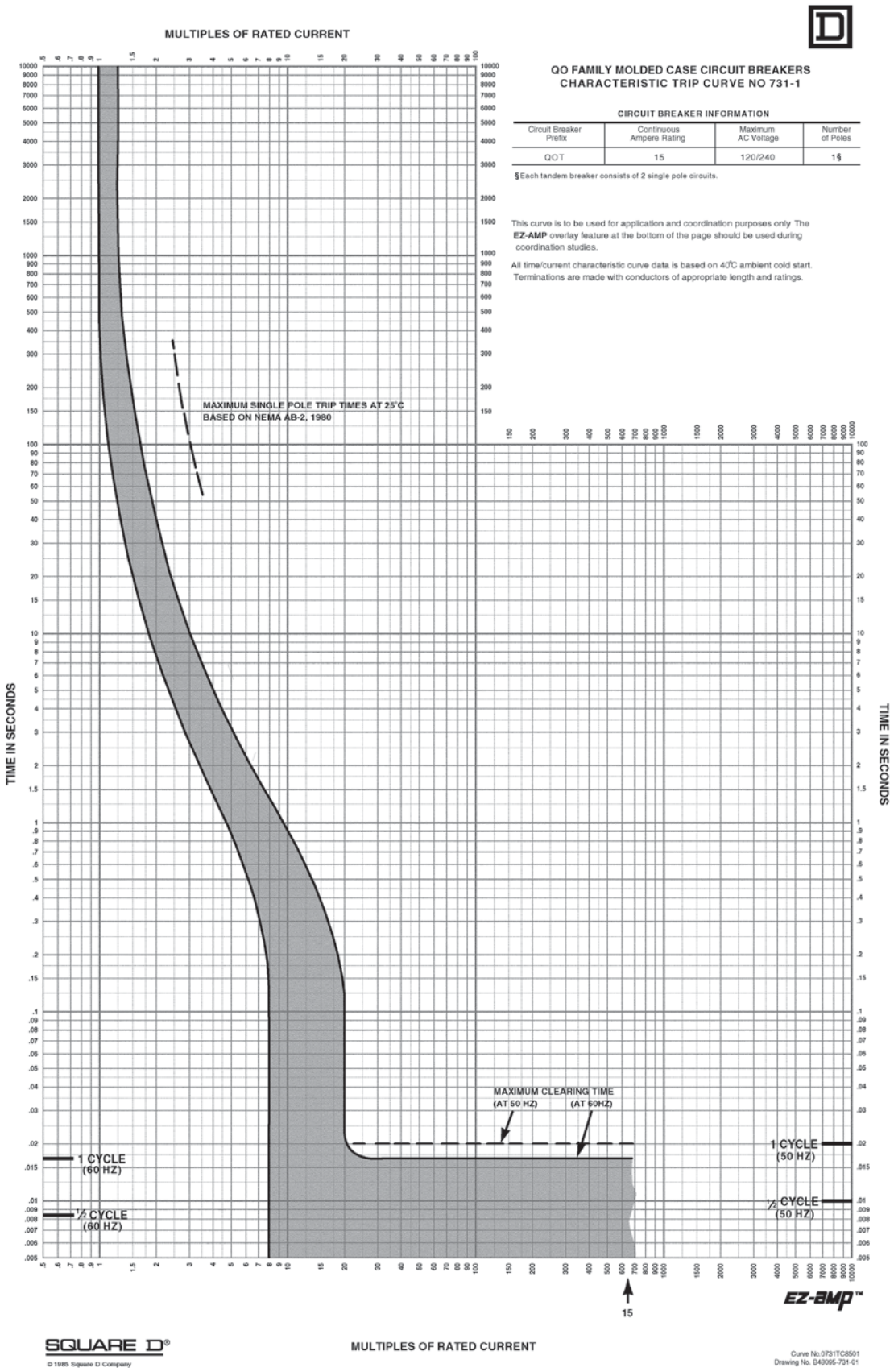
All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.

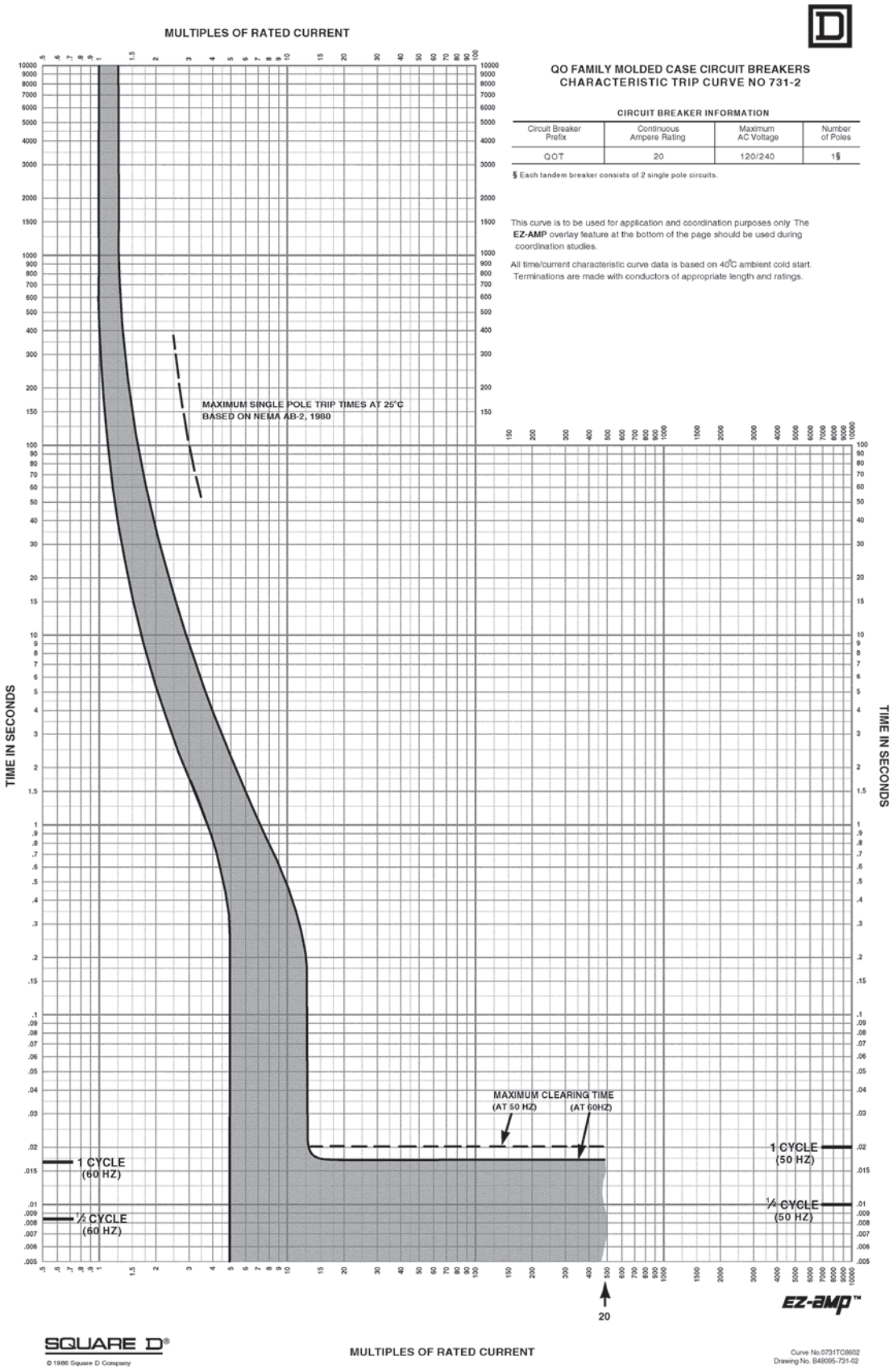


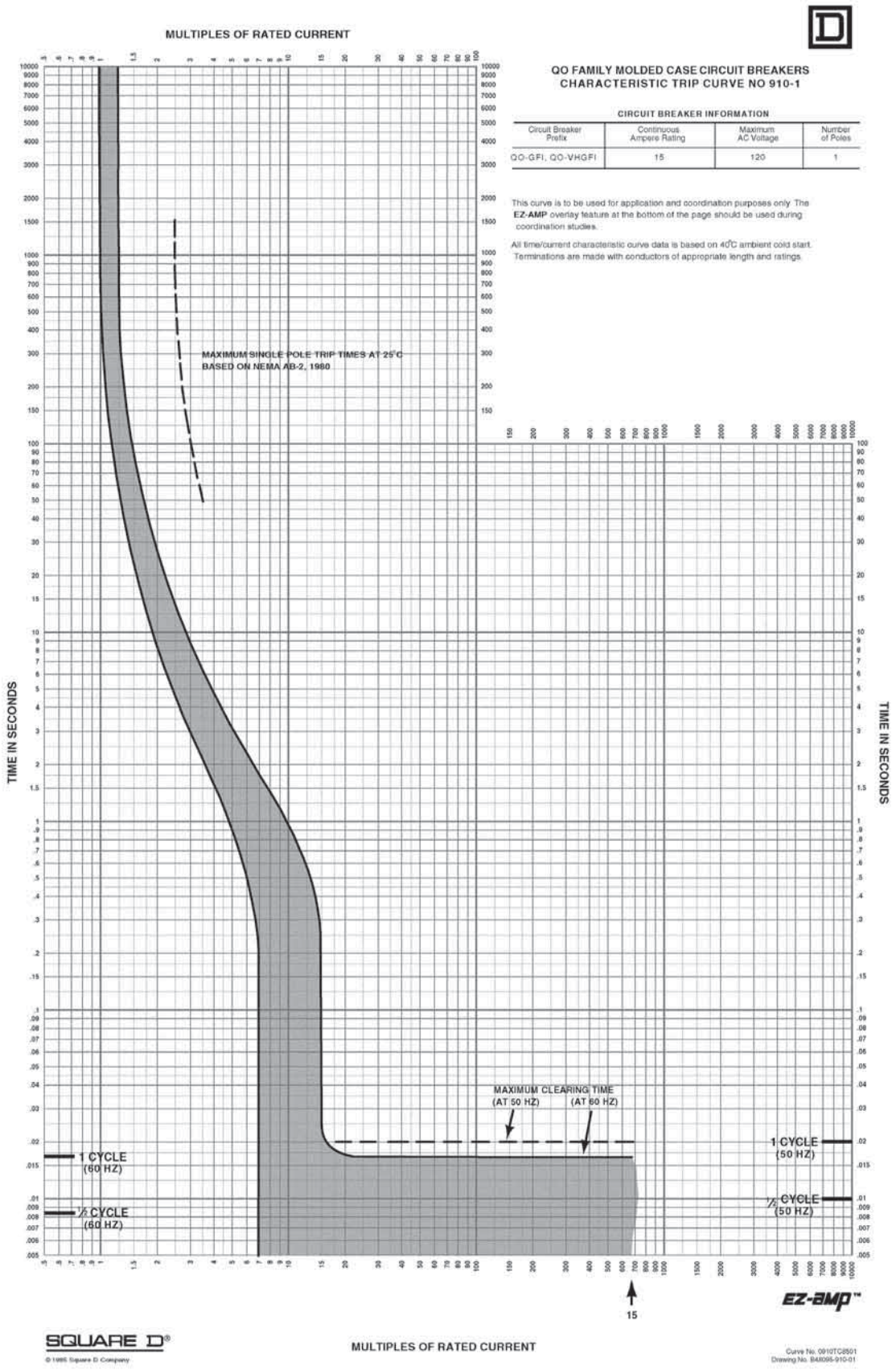


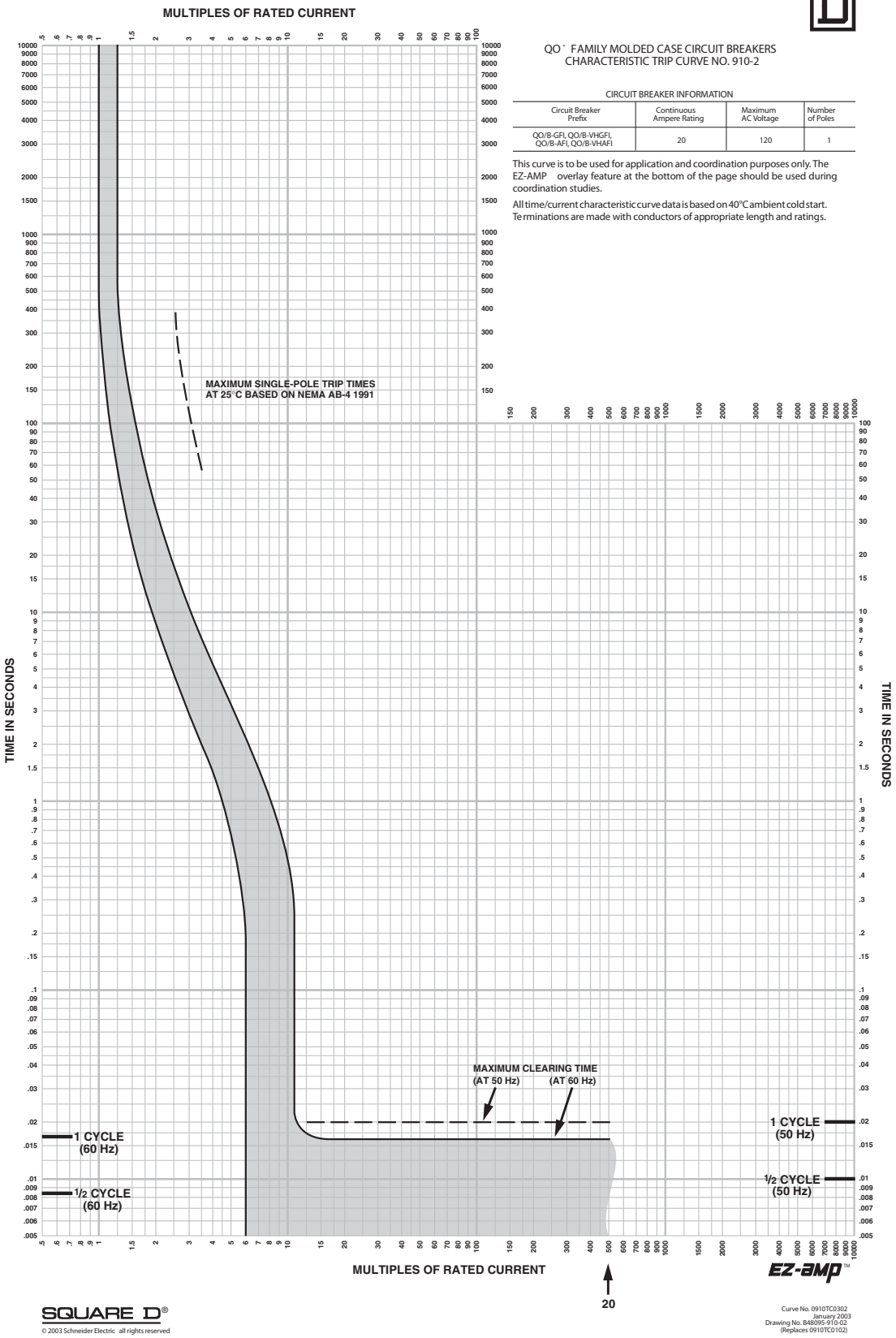












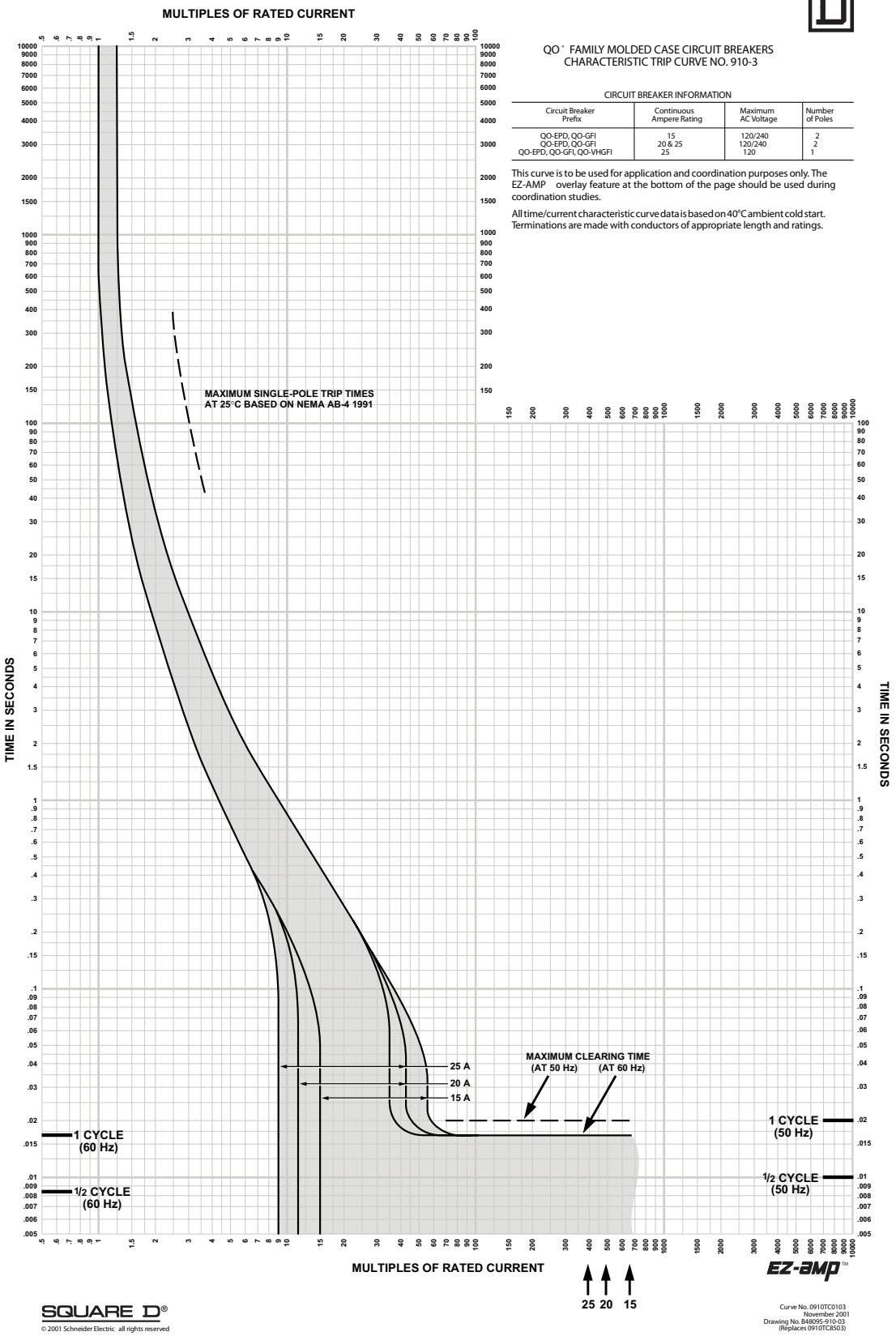
QO® FAMILY MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 910-2

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO/B-GFI, QO/B-VHGFI, QO/B-AFI, QO/B-VHAFI	20	120	1

This curve is to be used for application and coordination purposes only. The EZ-AMP overlay feature at the bottom of the page should be used during coordination studies.

All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.



QO® FAMILY MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 910-3

CIRCUIT BREAKER INFORMATION

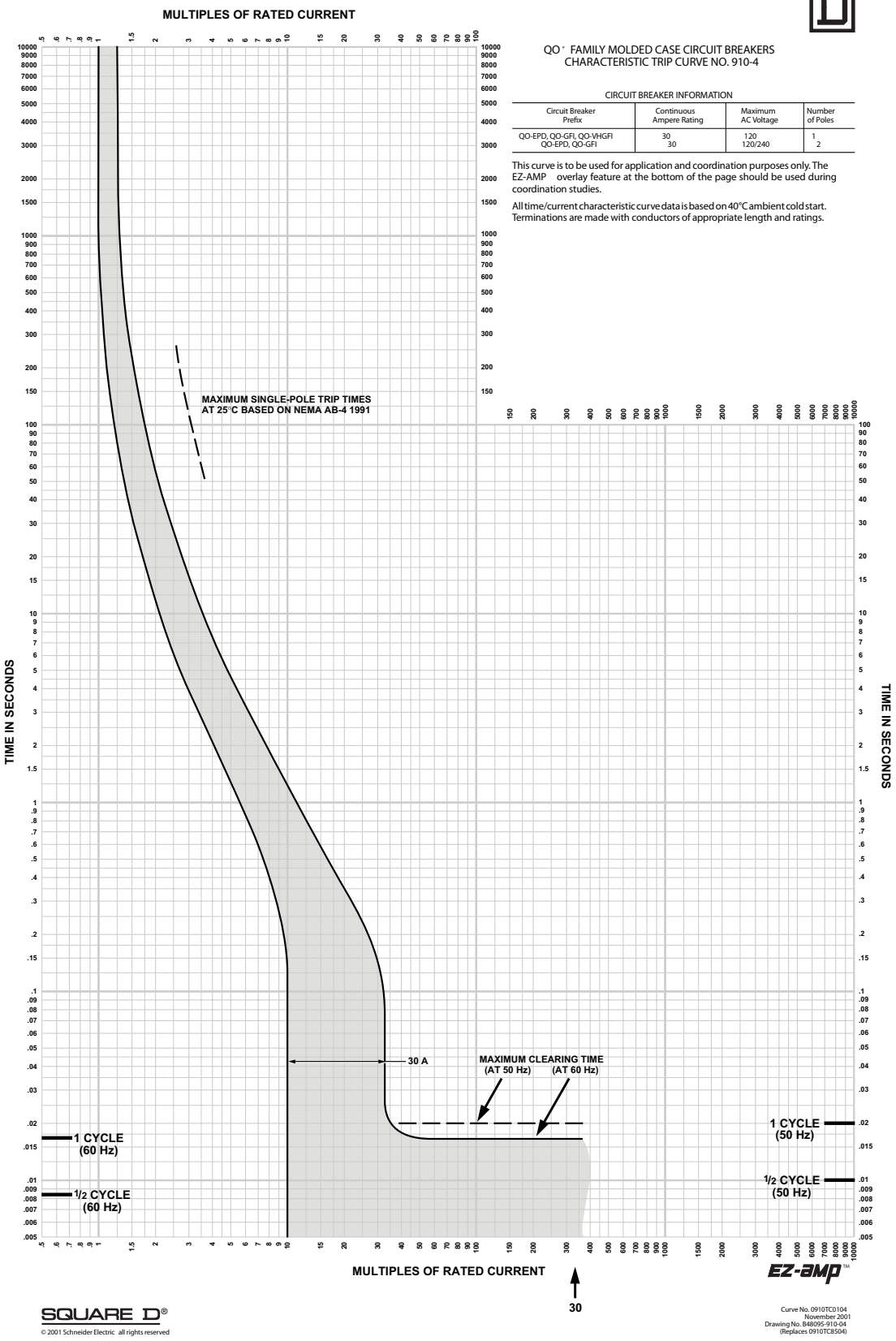
Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-EPD, QO-GFI	15	120/240	2
QO-EPD, QO-GFI	20 & 25	120/240	2
QO-EPD, QO-GFI, QO-VHGFI	25	120	1

This curve is to be used for application and coordination purposes only. The EZ-AMP® overlay feature at the bottom of the page should be used during coordination studies.

All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.

SQUARE D®

Curve No. 0910TC0103
November 2001
Drawing No. B48095-910-03
(Replaces 0910TC8503)



QO® FAMILY MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 910-4

CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-EPD, QO-GFI, QO-VHGFI QO-EPD, QO-GFI	30 30	120 120/240	1 2

This curve is to be used for application and coordination purposes only. The EZ-AMP overlay feature at the bottom of the page should be used during coordination studies.

All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.

SQUARE D®

Curve No. 0910TC0104
November 2001
Drawing No. B48095-910-04
(Replaces 0910TC8504)

QO™ FAMILY MOLDED CASE CIRCUIT BREAKERS
CHARACTERISTIC TRIP CURVE NO. 910-5

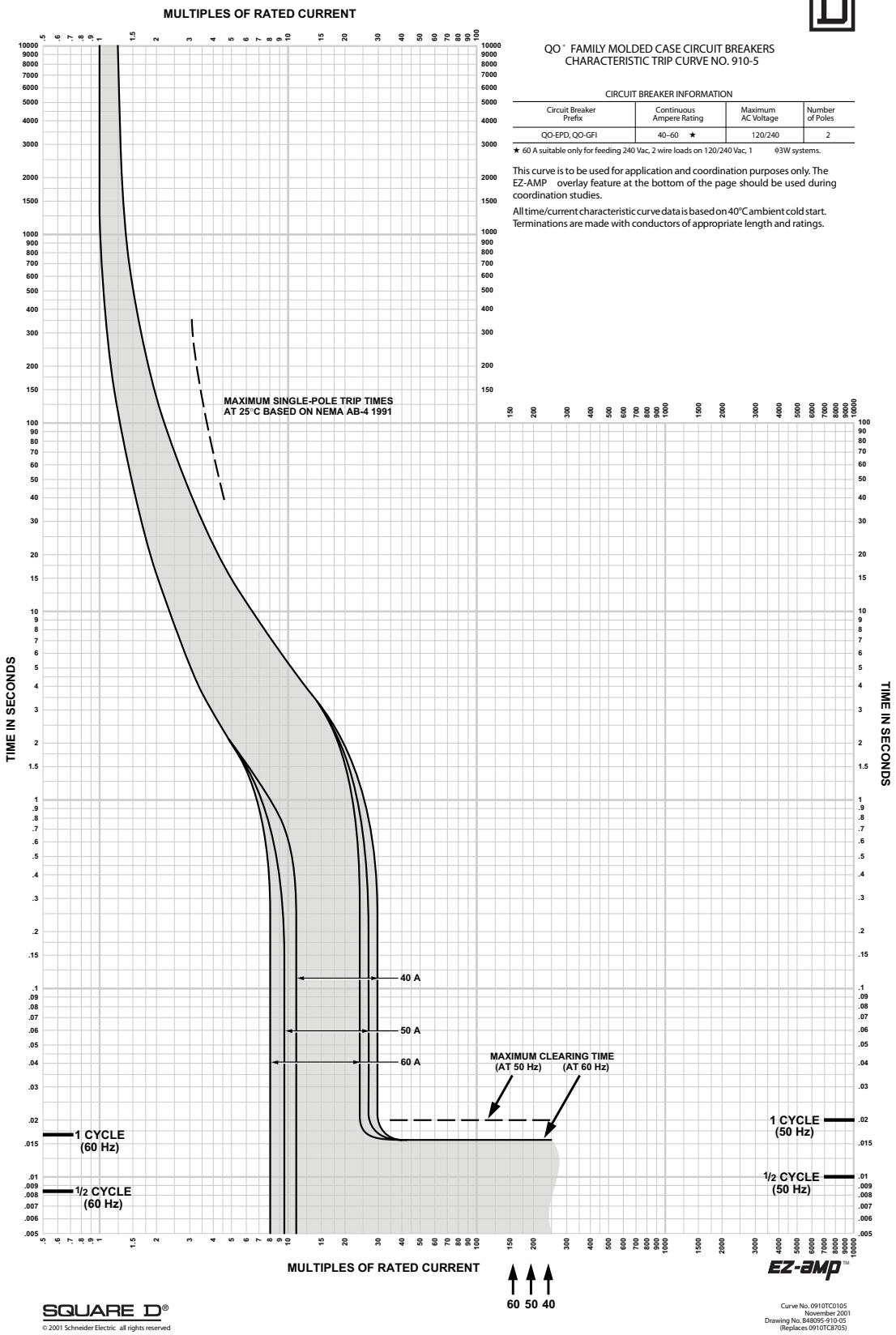
CIRCUIT BREAKER INFORMATION

Circuit Breaker Prefix	Continuous Ampere Rating	Maximum AC Voltage	Number of Poles
QO-EPD, QO-GFI	40–60 ★	120/240	2

★ 60 A suitable only for feeding 240 Vac, 2 wire loads on 120/240 Vac, 1 ϕ3W systems.

This curve is to be used for application and coordination purposes only. The EZ-AMP overlay feature at the bottom of the page should be used during coordination studies.

All time/current characteristic curve data is based on 40°C ambient cold start. Terminations are made with conductors of appropriate length and ratings.



SQUARE D®

Curve No. 0910TC0105
November 2001
Drawing No. B48095-910-05
(Replaces 0910TC8705)

Dimensions

Figure 10: Type QO Plug-On Circuit Breaker

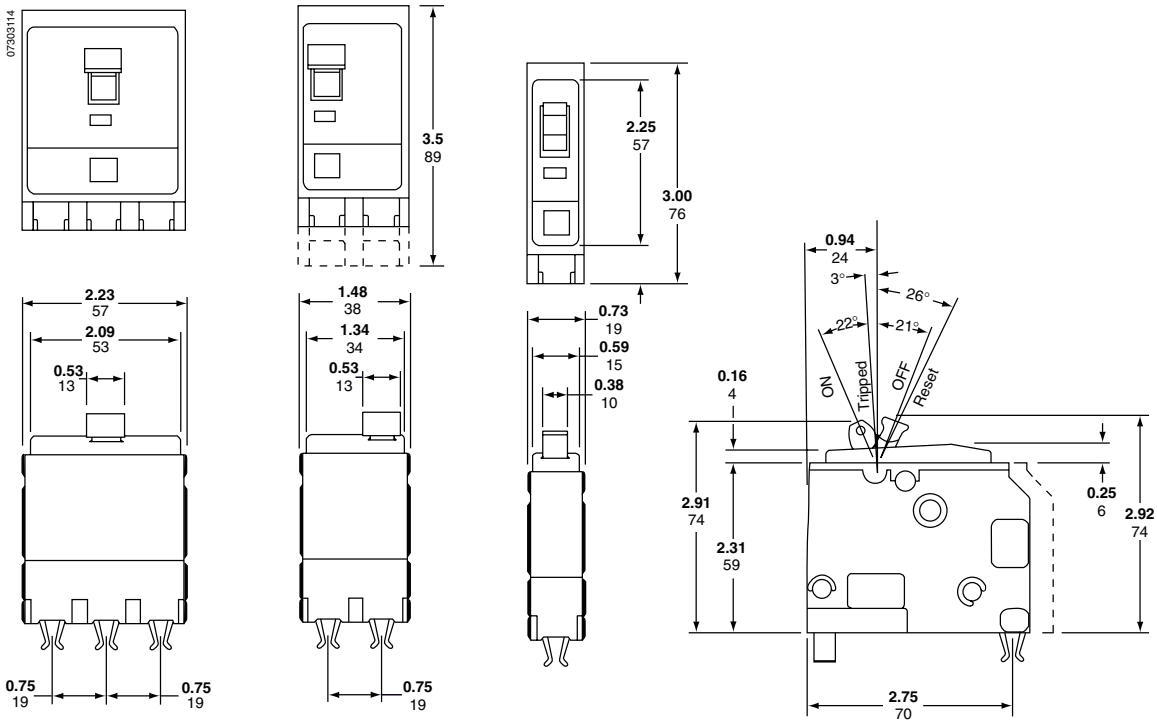


Figure 11: Type QOB Bolt-On Circuit Breaker

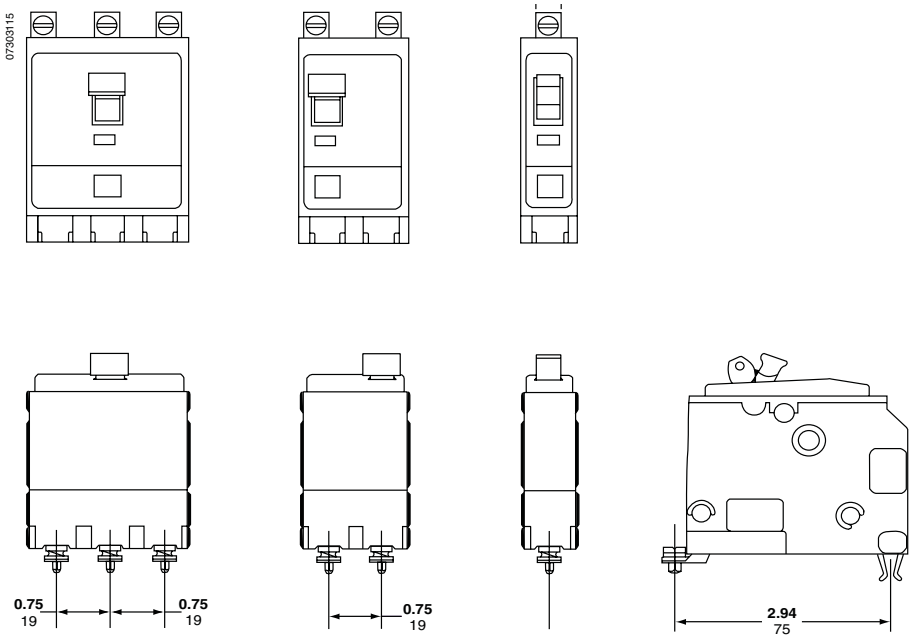


Figure 12: Type QO-GFI Circuit Breaker

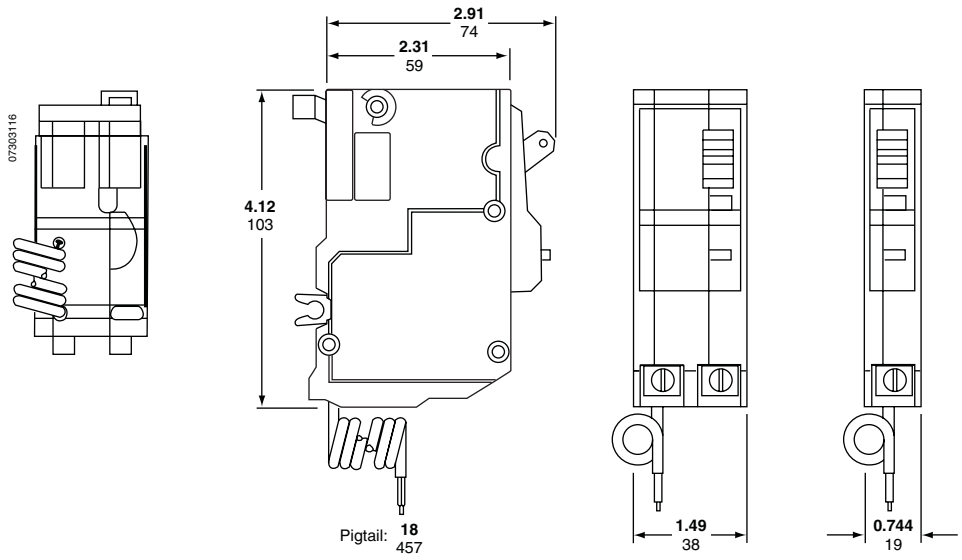


Figure 13: Type QO-AFI and QO-AFCI Circuit Breakers

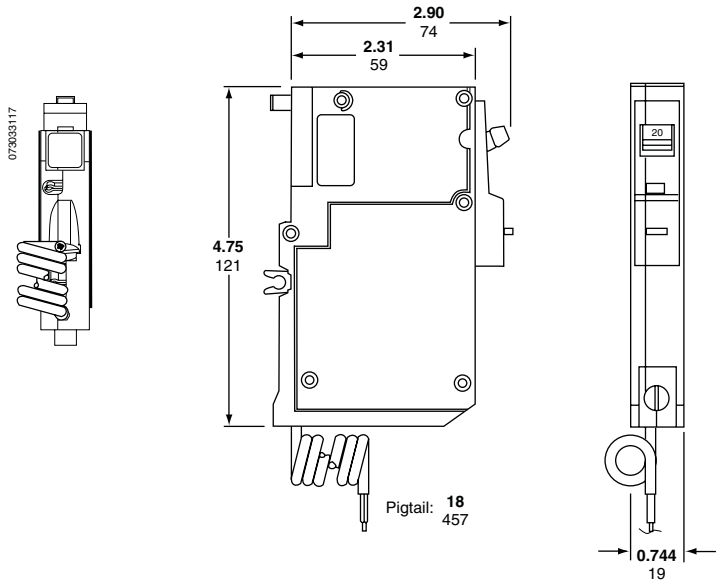
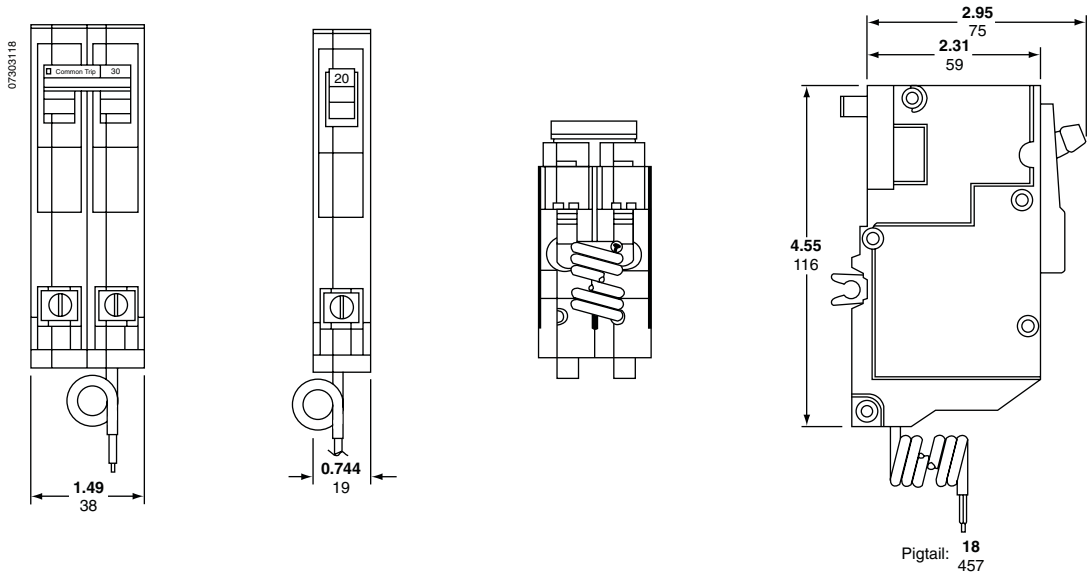


Figure 14: Type QO-PL Remote Control Circuit Breaker



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Replaces 0730CT9801

07/2008

Surgelogic®

IMA Surge Protective Device (SPD)
Dispositivo de protección contra sobretensiones transitorias IMA
Dispositif de protection contre les surtensions transitoires IMA

Instruction Bulletin
Boletín de instrucciones
Directives d'utilisation

8222-0050E

Retain for Future Use. /
Conservar para uso futuro. /
À conserver pour usage ultérieur.

SQUARE D
by Schneider Electric

ENGLISH

Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

LOSS OF BRANCH CIRCUIT POWER/LOSS OF SURGE SUPPRESSION

- Ensure that the branch circuit breaker or fuse trip characteristic has been coordinated with the overcurrent components inside the SPD (See Tables 1 and 2).
- Perform periodic inspection of the SPD status indicator lights as part of the preventative maintenance schedule.
- Promptly service the SPD when an alarm state exists.
- Use dry contacts to signal an alarm state to the central supervisory system for unmanned, inaccessible, or critical installations.
- Use multiple SPDs to achieve redundancy for critical applications.

Failure to follow these instructions can result in injury or equipment damage.

Surge Protective Devices (SPDs) can lose their ability to block power system voltage and attempt to draw excessive current from the line.This SPD is equipped with overcurrent and overtemperature components that will automatically disconnect the surge suppression elements from the mains should the surge suppression elements reach end of life. Tripping of the branch circuit breaker or fuse feeding the SPD can occur when the surge suppression elements reach end of life. Mitigate the tripping of the branch circuit breaker or fuse feeding the SPD by coordinating the surge suppression elements with the branch circuits.

For the purposes of coordination, the SPD is equipped with overcurrent components that will limit the per phase I2t, Iapparent, Ip, and Ith values to those listed in tables 1 and 2 when connected to a power system with a short-circuit current rating not exceeding 200,000 A.

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Table 1: SPD Without Optional Sine Wave Tracking Module

SPD Device	Per Phase I^2t	$I_{apparent}$	I_p	I_{th}
TVS_IMA12 through TVS_IMA24	175 kA^2 seconds	17,000 A RMS	40,000 A RMS	220 A
TVS_IMA32 through TVS_IMA48	700 kA^2 seconds	34,000 A RMS	80,000 A RMS	440 A

Table 2: SPD With Optional Sine Wave Tracking Module

SPD Device	Per Phase I^2t	$I_{apparent}$	I_p	I_{th}
TVS_IMA12 through TVS_IMA24 and	240 kA^2 seconds	21,500 A RMS	48,000 A RMS	260 A
TVS_IMA32 through TVS_IMA48	825 kA^2 seconds	37,500 A RMS	88,000 A RMS	480 A

⚠ CAUTION

LOSS OF SURGE SUPPRESSION

- Do not energize the SPDs until the electrical system is completely installed, inspected, tested, and all conductors connected and functional, including the neutral.
- Verify the voltage rating of the device and system before energizing the surge protective device.
- Perform high-potential insulation testing, or any other tests where SPD components will be subjected to voltages higher than their rated turn-on voltage, with the neutral and SPD disconnected from the power source.

Failure to follow these instructions can result in injury or equipment damage.

For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

ENGLISH

Operation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

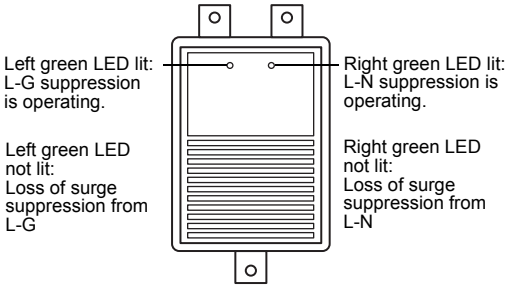
Failure to follow these instructions will result in death or serious injury.

LED Status Indicators

The SPD diagnostic display panel shows the status of each MA module with diagnostically controlled green/red LEDs. If a unit is operating correctly, all the phase LEDs will be illuminated green. To test the integrity of the diagnostics for each phase, push the button below the phase LEDs on the diagnostic display panel. The green LED will turn red and the alarm will sound, if the alarm is enabled. Releasing the test button will complete the test; the red LED will turn green and the alarm will shut off.

If an inoperable condition occurs on any phase, the audible alarm sounds and the corresponding phase LED on the diagnostic display panel is illuminated red. This indicates that the device needs service by qualified electrical personnel. The audible alarm can be silenced, until a qualified person is able to evaluate and service the SPD, by pressing the alarm enable/disable button. The alarm will silence and the green alarm LED will not be lit. The red phase LED will continue to be illuminated until the inoperative condition has been cleared.

Figure 1: MA Module LEDs



On an MA module (see Figure 1), if either LED is not lit, the module should be replaced. If both green LEDs are not lit and the diagnostic display panel has power, then power has been lost to that phase or the module should be replaced (refer to Table 4 on page 7). Refer to the final equipment instruction bulletin for MA module disconnection and access instructions.

When power is applied to the SPD and one or more of the diagnostic display panel LEDs are red, and one or more MA module LEDs are out, the appropriate MA module should be replaced. Refer to “Troubleshooting” on page 8 for proper troubleshooting procedures.

Surge Counter

The surge counter displays the number of transient voltage surges since the counter was last reset. The counter is battery powered to retain memory in the event of a power loss to the diagnostic display panel.

To reset the surge counter to zero:

1. Remove all power from this equipment.
2. Remove covers as necessary to gain access to the diagnostic circuit board.
3. Press the small switch located on the underside of the diagnostic circuit board (near the RJ45 connectors; see Figure 3:). This will reset the counter to zero.

For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

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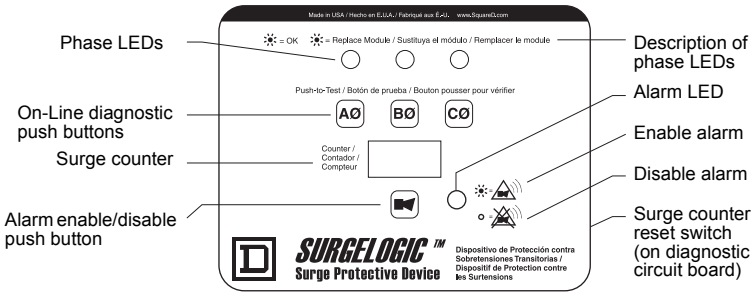
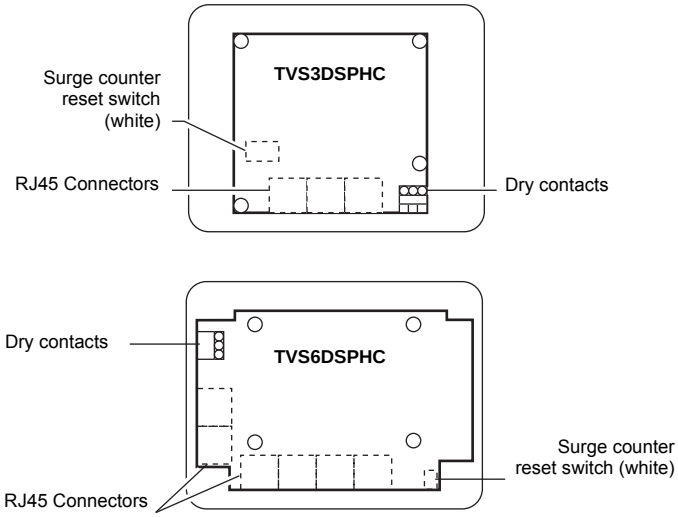
Figure 2: Three-Phase Diagnostic Display Panel with Surge Counter



NOTE: Phase B is not present on single-phase applications.

Figure 3: Rear of Diagnostic Circuit Board



Dry Contacts

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Use 600 Vac rated dry contact wiring.
- Dry contact wiring must have less than 1/16 in. (1.6 mm) exposed wire from the dry contact block.
- Maintain at least 1.0 in. (25 mm) separation between dry contact wiring and the power wiring in the enclosure.

Failure to follow these instructions will result in death or serious injury.

The IMA series SPD is provided with dry contacts. The connection for the dry contacts is located on the back of the diagnostic display panel (lower right corner). The dry contacts are 3-position, Form “C” type with Normally Open, Normally Closed and Common connections. The unpowered state shall be closed between terminals NC and COM. This is also the alarm condition. The opposite state, closed between terminals NO and COM, indicates that power is on to the unit and that no alarm condition exists (See Table 3).

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Table 3: Dry Contact Configuration

Alarm Contact Terminals	Contact State with Power Removed
NC	Normally closed
COM	Common
NO	Normally open

These contacts can be used for remote indication of the SPD device's operating status to a computer interface board or emergency management system. Also, these contacts are designed to work with the SPD remote monitor option described below.

The contacts are designed for a maximum voltage of 24 Vdc / 24 Vac and a maximum current of 2 A. Higher energy applications may require additional relay implementation outside the SPD. Damage to the SPD's relay caused by use with energy levels in excess of those discussed in this instruction bulletin are not covered by warranty. For application questions, contact the Surgelogic Technical Assistance Group at 1-800-577-7353.

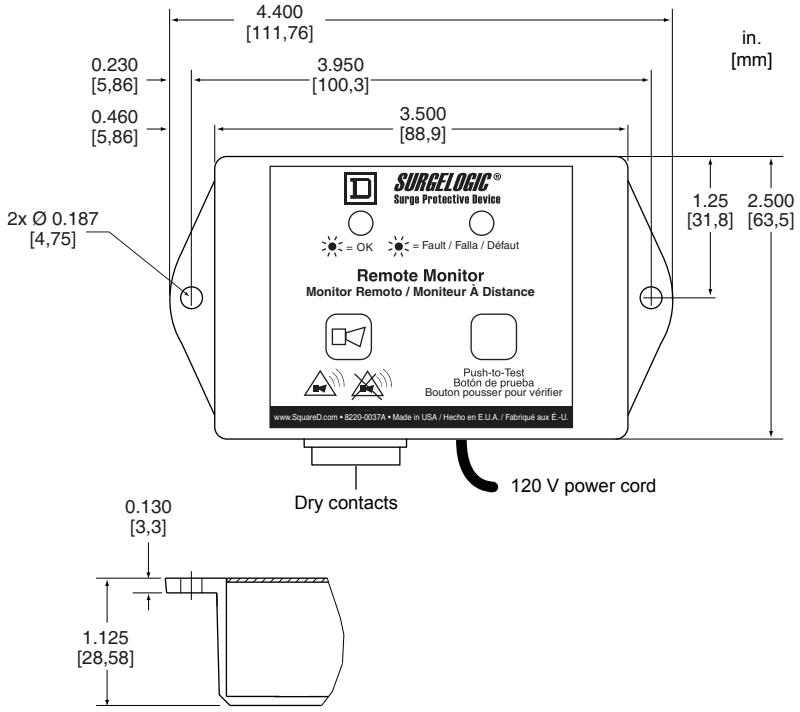
Remote Monitor Option

The option has two LEDs, one red and one green, and an audible alarm with an enable/disable switch. Normal status is a lit green LED, and no audible alarm. To test the integrity of the remote monitor, press the push-to-test switch.

The green LED will turn off, the red LED will turn on, and the alarm will sound, if the alarm is enabled. Releasing the switch will complete the test; the red LED will turn off, the green LED will turn on and the alarm will shut off. If suppression on any phase is lost, the green LED will turn off, the red LED will turn on and an alarm sounds. The audible alarm can be silenced by moving the alarm enable/disable switch to the disable position. The alarm will silence and the green alarm LED will not be lit. The red LED will continue to be illuminated until the inoperative condition had been cleared.

The remote monitor includes a 120 Vac to 12 Vdc adapter with a six-foot power cord. Connections are made to the SPD diagnostic display panel with Form "C", 3-position dry contacts (provided) and the appropriate length of solid or stranded 30 to 14 AWG wire (not provided).

Figure 4: Remote Monitor Option (TVS12RMU)



For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

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Maintenance and Troubleshooting

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

Failure to follow these instructions will result in death or serious injury.

Preventive Maintenance

Inspect the SPD periodically to maintain reliable system performance and continued transient voltage surge suppression. Periodically check the state of the diagnostic display panel LED status indicators. Routinely use the built-in diagnostics to inspect for inoperative modules.

Replacement Modules

Table 4: EMA Series Replacement Modules

System Voltage	Peak Surge Current Rating (kA)	Phase A	Phase B	Phase C
120/240 V, 1-phase, 3-wire	120	MA1IMA12	—	MA1IMA12
	160	MA1IMA16	—	MA1IMA16
	240	MA1IMA24	—	MA1IMA24
208Y/120 V, 3-phase, 4-wire [1]	120	MA1IMA12	MA1IMA12	MA1IMA12
	160	MA1IMA16	MA1IMA16	MA1IMA16
	240	MA1IMA24	MA1IMA24	MA1IMA24
120/240 V, 3-phase, 4-wire [2]	120	MA1IMA12	MA3IMA12	MA1IMA12
	160	MA1IMA16	MA3IMA16	MA1IMA16
	240	MA1IMA24	MA3IMA24	MA1IMA24
480Y/277 V, 3-phase, 4-wire [3]	120	MA4IMA12	MA4IMA12	MA4IMA12
	160	MA4IMA16	MA4IMA16	MA4IMA16
	240	MA4IMA24	MA4IMA24	MA4IMA24
600/347 V, 3-phase, 4-wire	120	MA8IMA12	MA8IMA12	MA8IMA12
	160	MA8IMA16	MA8IMA16	MA8IMA16
	240	MA8IMA24	MA8IMA24	MA8IMA24

1 208Y/120 series also applies to the following voltage 220Y/127.

2 High-leg delta (Phase B modules are different than Phase A and Phase C modules).

3 480Y/277 series applies to the following voltages 380Y/220, 400Y/230, and 415Y/240.

For troubleshooting, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

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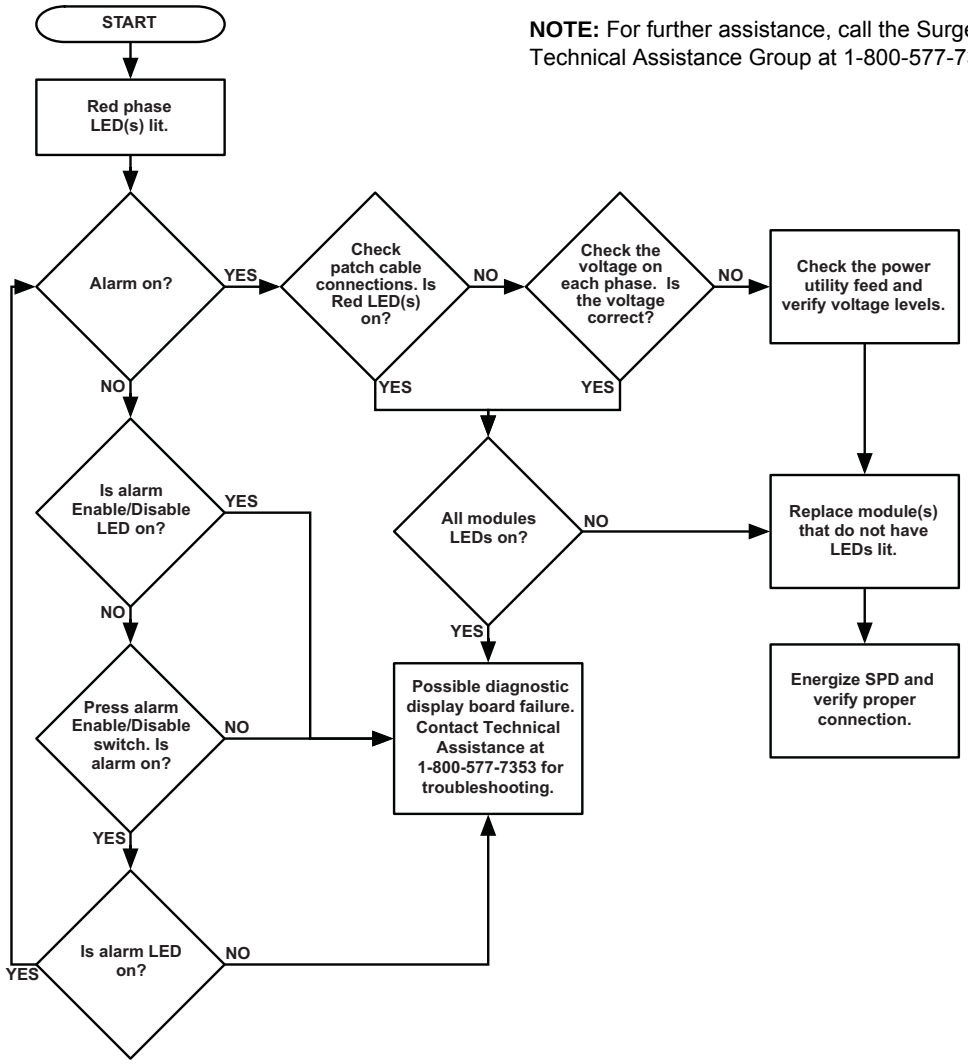
Troubleshooting

If a module shows two green indicator lights and the display panel shows a red phase indicator light, follow the Troubleshooting Flow Chart in Figure 5 below.

Figure 5: Troubleshooting Flow Chart



NOTE: For further assistance, call the Surgelogic Technical Assistance Group at 1-800-577-7353.

Replacement Parts

The following replacement parts are available. For ordering information please contact your local distributor or refer to the product catalog.

- MA modules. Replacement instructions are included with the replacement parts.
- Diagnostic display panel assemblies. Replacement instructions are included with the replacement parts.

ENGLISH

8222-0050E 11/2009
Replaces 8222-0050D, 10/2002

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Instruction Bulletin

Diagnostic Display Panel Replacement
IMA Series Transient Voltage Surge Suppressors (TVSS)
Class 1310

PRECAUTIONS

⚠ DANGER

HAZARDOUS VOLTAGE

- This equipment must be installed and serviced only by qualified electrical personnel.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.
- Disconnect all power supplying this equipment before working on or inside it.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace the barrier and the door/cover before energizing.

Failure to follow these instructions will result in death or serious injury.

INSTALLATION

1. Verify that the replacement diagnostic display has the correct catalog number. The catalog number is found on the back of the diagnostic display assembly. (See Table 1)
2. Mark the RJ45 patch cables (if they are not already marked) with the appropriate A, B and C phase. Unplug the RJ45 patch cables from the diagnostic display assembly (and dry contact wires if used).
3. Remove the 4 nuts holding the diagnostic display panel to the cover/door.
4. Carefully remove the old diagnostic display assembly.
5. Install the new diagnostic display assembly, using the new nuts that are provided. (See Figure 1)
6. Plug the RJ45 patch cables into the new diagnostic display assembly. Make sure that the patch cables labeled A, B and C are connected to the correct RJ45 jacks.
7. Check that all connections are secure.
8. Replace the barrier, cover/door, and/or trim to the equipment.
9. Equipment may be re-energized after all of the above steps are complete.

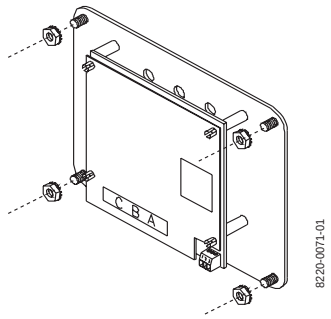

Figure 1: Diagnostic Display Assembly Installation

Table 1: Diagnostic Display Replacements

Catalog Number	System Voltage	Peak Surge Current/Phase	Option	Applications
TVS1DSPH	120/240 V, 1 phase, 3 wire	120 kA 160 kA 240 kA	None	Panelboards Switchboards Busway
TVS1DSPHC	120/240 V, 1 phase, 3 wire	120 kA 160 kA 240 kA	Surge Counter	Panelboards Switchboards Busway
TVS3DSPH	208Y/120 V, 3 phase, 4 wire 120/240 V, 1 phase, 3 wire high leg delta 480Y/277 V, 3 phase, 4 wire 347Y/600 V, 3 phase, 4 wire	120 kA 160 kA 240 kA	None	Panelboards Switchboards PZ4 Switchgear Busway
TVS3DSPHC	208Y/120 V, 3 phase, 4 wire 120/240 V, 1 phase, 3 wire high leg delta 480Y/277 V, 3 phase, 4 wire 347Y/600 V, 3 phase, 4 wire	120 kA 160 kA 240 kA	Surge Counter	Panelboards Switchboards PZ4 Switchgear Busway
TVS4DSPH	120/240 V, 1 phase, 3 wire	320 kA 480 kA	None	Switchboards
TVS4DSPHC	120/240 V, 1 phase, 3 wire	320 kA 480 kA	Surge Counter	Switchboards
TVS6DSPH	208Y/120 V, 3 phase, 4 wire 120/240 V, 1 phase, 3 wire high leg delta 480Y/277 V, 3 phase, 4 wire 347Y/600 V, 3 phase, 4 wire	320 kA 480 kA	None	Switchboards PZ4 Switchgear
TVS6DSPHC	208Y/120 V, 3 phase, 4 wire 120/240 V, 1 phase, 3 wire high leg delta 480Y/277 V, 3 phase, 4 wire 347Y/600 V, 3 phase, 4 wire	320 kA 480 kA	Surge Counter	Switchboards PZ4 Switchgear
TVS1DSPV	120/240 V, 1 phase, 3 wire	120 kA 160 kA 240 kA	None	I-LINE Plug-on Unit MCC
TVS1DSPVC	120/240 V, 1 phase, 3 wire	120 kA 160 kA 240 kA	Surge Counter	I-LINE Plug-on Unit MCC
TVS3DSPV	208Y/120 V, 3 phase, 4 wire 120/240 V, 1 phase, 3 wire high leg delta 480Y/277 V, 3 phase, 4 wire 347Y/600 V, 3 phase, 4 wire	120 kA 160 kA 240 kA	None	I-LINE Plug-on Unit MCC
TVS3DSPVC	208Y/120 V, 3 phase, 4 wire 120/240 V, 1 phase, 3 wire high leg delta 480Y/277 V, 3 phase, 4 wire 347Y/600 V, 3 phase, 4 wire	120 kA 160 kA 240 kA	Surge Counter	I-LINE Plug-on Unit MCC

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Instruction Bulletin

MA Module Replacement
IMA Transient Voltage Surge Suppressor (TVSS)
Class 1310

PRECAUTIONS

⚠ DANGER

HAZARDOUS VOLTAGE

- This equipment must be installed and serviced only by qualified electrical personnel.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.
- Disconnect all power supplying this equipment before working on or inside it.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace the barrier and the door/cover before energizing.

Failure to follow these instructions will result in death or serious injury.

INSTALLATION

1. Verify that all replacement modules have the correct catalog number. The catalog number is found on the nameplate of each existing and replacement module (see Figure 1) and on the TVSS device nameplate. Use Table 1 to determine the correct replacement catalog number based on the existing IMA TVSS system voltage and peak surge current rating.

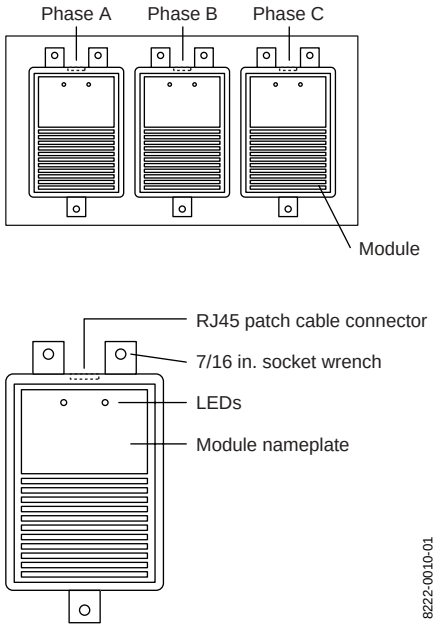

Figure 1: TVSS Device and Modules, Top View

Table 1: MA Module Replacements

System Voltage	Peak Surge Current Rating	Catalog Number		
		Phase A	Phase B	Phase C
120/240 V, 1 phase, 3 wire	120 kA	MA1IMA12	empty	MA1IMA12
	160 kA	MA1IMA16	empty	MA1IMA16
	240 kA	MA1IMA24	empty	MA1IMA24
208Y/120 V, 3 phase, 4 wire	120 kA	MA1IMA12	MA1IMA12	MA1IMA12
	160 kA	MA1IMA16	MA1IMA16	MA1IMA16
	240 kA	MA1IMA24	MA1IMA24	MA1IMA24
120/240 V, 3 phase, 4 wire, high-leg delta [1]	120 kA	MA1IMA12	MA3IMA12	MA1IMA12
	160 kA	MA1IMA16	MA3IMA16	MA1IMA16
	240 kA	MA1IMA24	MA3IMA24	MA1IMA24
480Y/277 V, 3 phase, 4 wire	120 kA	MA4IMA12	MA4IMA12	MA4IMA12
	160 kA	MA4IMA16	MA4IMA16	MA4IMA16
	240 kA	MA4IMA24	MA4IMA24	MA4IMA24
600Y/347 V, 3 phase, 4 wire	120 kA	MA8IMA12	MA8IMA12	MA8IMA12
	160 kA	MA8IMA16	MA8IMA16	MA8IMA16
	240 kA	MA8IMA24	MA8IMA24	MA8IMA24

[1] Phase B modules are different than Phase A and Phase C modules.

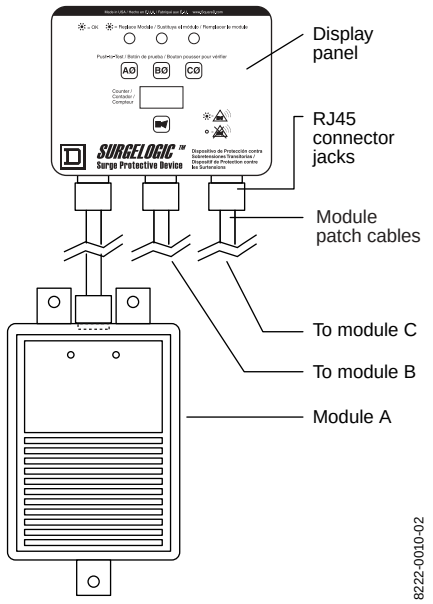

Figure 2: Display Panel and RJ45 Patch Cables

2. Mark the RJ45 patch cable and the phase cable for the module to be replaced (if it is not already marked) with the appropriate A, B, or C phase. Unplug the module RJ45 patch cable from the module.
3. Use a suitable tool to prevent each 1/2 in. hex standoff from turning (see Figure 3) and remove and discard the three 1/4-20 hex head bolts and the three corresponding internal tooth lock washers of the module. It is not necessary to remove the connecting phase cables from the lugs.
4. Carefully remove the module.
5. Install the new module, using the new hardware kit supplied (see Figure 3). Torque each 1/4-20 hex head bolt to 70 lb-in (8 N•m).
6. Attach the phase cable lug to the replacement module (A, B, or C phase as marked in step 4).
7. Plug the RJ45 patch cable into the new module. Make sure that the correct RJ45 patch cable labeled A, B, or C is connected.
8. Check that all connections are secure. Remove all tools and discarded hardware from the unit.
9. Ensure that the RJ45 patch cables are not touching any internal components.
10. Replace the barrier, cover/door, and/or trim to the equipment.
11. Equipment may be re-energized after all of the above steps are complete.

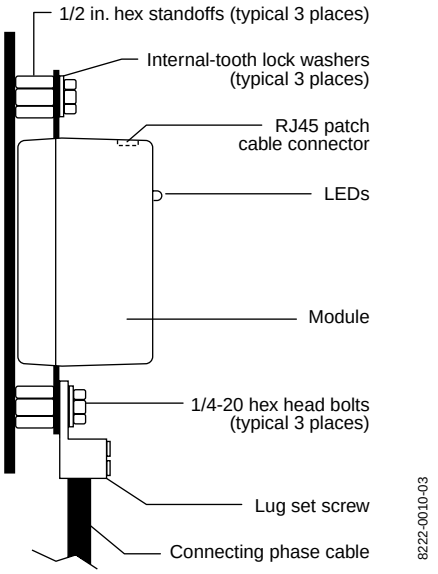

Figure 3: Module, Side View

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