Instruction Bulletin

48040-940-03
03/01
Cedar Rapids, IA, USA
K279

PE and PX Electronic Trip Circuit Breakers with MICROLOGIC® Trip System

Series 6B

Retain for future use.

SQUARE D
Schneider Electric

NOTICE

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 serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

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.

Table of Contents

Section 1—General Information

IDENTIFICATION

PE and PX circuit breakers with MICROLOGIC® Trip Systems conform to UL, CSA and IEC standards for electronic trip molded case circuit breakers. They provide adjustable tripping functions and characteristics on ac systems. PE and PX circuit breakers are not applicable for use on dc systems.

SENSOR

The circuit breaker sensor size is the maximum current rating possible for a specific circuit breaker. It is based on the size of the current sensor inside the circuit breaker. (Current sensors are integral to the circuit breaker and cannot be removed or replaced.) PE and PX circuit breaker sensors are available in four sizes: 1200, 1600, 2000 and 2500 amperes.

FRAME SIZE

The maximum current rating a circuit breaker family can carry is called the frame size. All PE and PX circuit breakers have a 2500 A frame size and are the same physical size.

INTERRUPTING RATINGS

The maximum amount of current the circuit breaker is designed to safely interrupt is called the interrupting rating. Interrupting ratings are shown on the faceplate (A) of the circuit breaker.

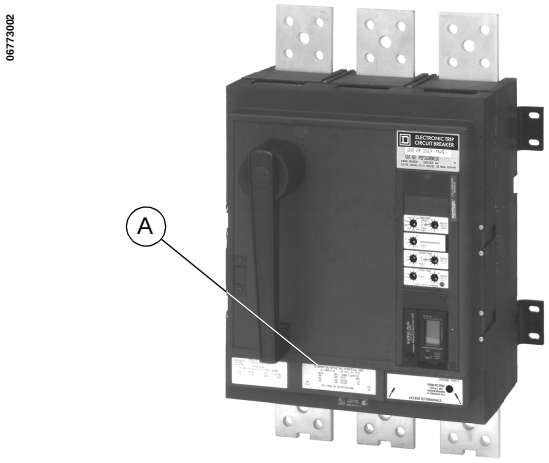

Figure 1: Interrupting Ratings

CIRCUIT BREAKERS RATED 100%

PE circuit breakers, except 2500 A, are 100% rated. Circuit breakers marked "100% Rated" can be continuously loaded to 100% of their rating as long as conditions marked on the circuit breaker case are met.

These conditions include conductor specifications and an enclosure size of at least 45 x 36 x 24 in. (1143 x 914 x 610 mm) with a minimum 37 sq. in. (23,871 mm^2) of ventilation on the top and 66 sq. in. (42,581 mm^2) of ventilation on the bottom of the enclosure. This marking does not prohibit using these circuit breakers in applications requiring only 80% continuous loading.

ACCESSORIES AND CONTROL WIRING

Accessories are available either factory installed or field installable. They can be installed in accessory slots (A) on either side of the circuit breaker.

Control wiring is connected to terminals located under the circuit breaker access cover (B). Section 4 gives instructions for connecting control wiring.

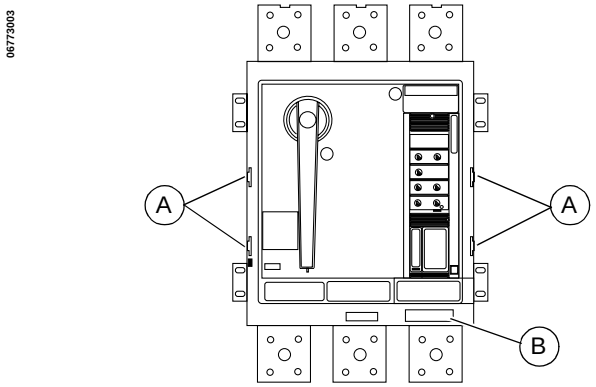

Figure 2: Accessories

TERMINAL PADS

Table 1: Terminal Pad Usage

Circuit Breaker	Connections	Terminal Pads Required
600–1600 A PE 600–2000 A PX	Bus	No
	Cable	Use terminal pad kit PALTB or equivalent bus structure.
1800–2500 A PE 2500 A PX	Cable or Bus	Use terminal pad kit supplied with circuit breaker or equivalent bus structure.

All PE and PX circuit breakers are individually mounted, using either cable or bus connections. Square D equipment for these circuit breakers provides the necessary electrical spacing for lugs and mounting hardware. For customer mounting, terminal pads (Table 1) may be necessary to provide this spacing.

RECEVING INSPECTION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Circuit breaker weighs approximately 75 lbs. (34 Kg.). Lift circuit breaker only by the case using proper lifting equipment. NEVER lift circuit breaker by its handle.

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

Inspect the circuit breaker visually for signs of damage when received and again before placing in service. If any damage is found, return circuit breaker to Square D.

The circuit breaker case is sealed and must not be opened for any reason. Opening voids all warranties and the UL Listing. No serviceable parts are located inside the case.

Section 2—Installation and Removal

600–1600 A PE AND 600–2000 A PX CIRCUIT BREAKER INSTALLATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- 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.
- 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.

NOTE: If any hardware is damaged during installation, see Appendix A for part information.

1. Disconnect all power to enclosure.
2. Turn off circuit breaker or trip circuit breaker before installation by pushing the push-to-trip button (A).

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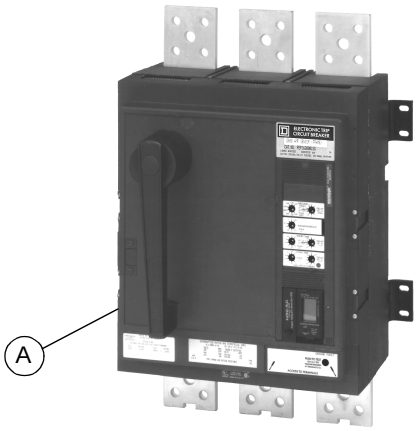

Figure 3: Tripping Circuit Breaker

Cable Connections

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE FROM OVERHEATING

Terminal pads are required to provide necessary electrical spacing for lugs.

DO NOT mount lugs directly on circuit breaker terminals.

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

If using cable connections and mounting circuit breaker in other than Square D equipment, terminal pads are required to provide electrical spacing for lugs and mounting hardware. (Square D equipment provides the necessary spacing.) Use Square D terminal pad kit, Cat. No. PALTB (Figure 4), or equivalent bus structure.

1. Use two PALTB terminal pad kits for mounting each circuit breaker (one for each end). Install terminal pads according to the instructions packed with kit. Refer to Appendix B for circuit breaker and terminal pad dimensions.

NOTE: If using equivalent bus structure, refer to Appendix B for bus structure dimensions.

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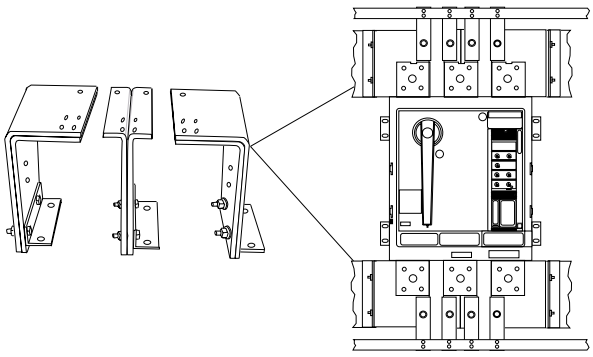

Figure 4: Adding Terminal Pads

2. Install lugs and conductors:

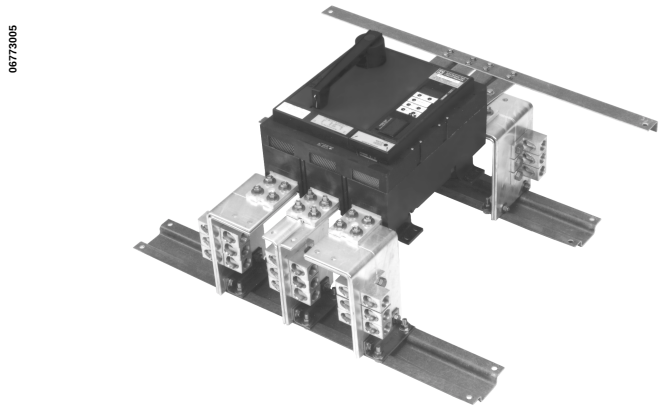

Figure 5: Adding Lugs

Table 2: Lug Data

Cat. Number	Conductors	
	No.	Size[1]
AL2500PA	1 2	1/0 AWG–750 kcmil (50–400 mm^2) 1/0 AWG–300 kcmil (50–150 mm^2)
VC2500PA7	1	500–750 kcmil (240–400 mm^2)
VC2500PA7	1	2/0 AWG–500 kcmil (70–240 mm^2)

[1] Conductor sizes apply to both aluminum and copper conductors.

Each terminal pad has three holes, and can mount up to three pairs of lugs. Acceptable lugs and wire ranges are indicated in Table 2. Install lugs and cables as directed in lug kit instructions.

Distribute conductors evenly on each side of each connector. The number of conductors on one side of a terminal pad must not exceed that on the opposite side by more than one. Mount AL2500PA lugs in pairs, even if one lug is not used, to assure proper hardware tightening. See Figure 5. Lugs can be rotated 180 degrees from position shown.

NOTE: Conductors running behind the circuit breaker must not be any closer to circuit breaker case than 1-1/2 in. (38 mm) from circuit breaker base.

Bus Bar Connections

1. If using bus bar connections and mounting circuit breaker in other than Square D equipment, check circuit breaker mounting hole pattern of bus.
2. Clean contact surfaces of circuit breaker terminals and terminal pads or bus bars using a nonabrasive cleaner. (An abrasive cleaner can remove plating, resulting in joint deterioration.)

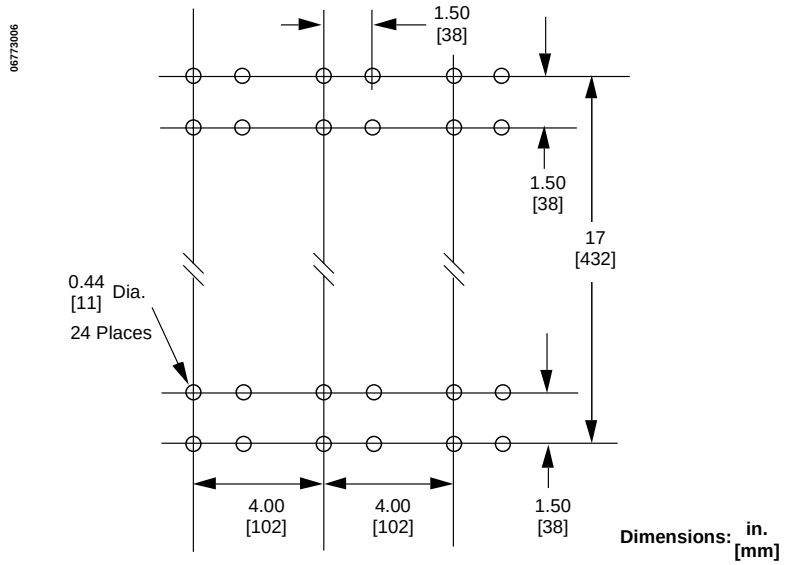

Figure 6: Mounting Hole Pattern of Bus

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE IF CIRCUIT BREAKER SHOULD FALL

Circuit breaker weighs approximately 75 lbs. (34 kg). Lift circuit breaker by case using proper lifting equipment. Do not remove lifting equipment until all mounting hardware is securely tightened. Never lift circuit breaker by its handle.

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

3. Install circuit breaker:

   Position circuit breaker against terminal pads. Insert four carriage bolts through rear of each upper, outside terminal pad (A) and circuit breaker terminal (B). Secure bolts with hex nut-washers, tightened only enough to hold circuit breaker in place. Square holes in terminal pads must engage square neck of carriage bolts.

4. Loosely attach three lower terminals (C) to terminal pads the same way.

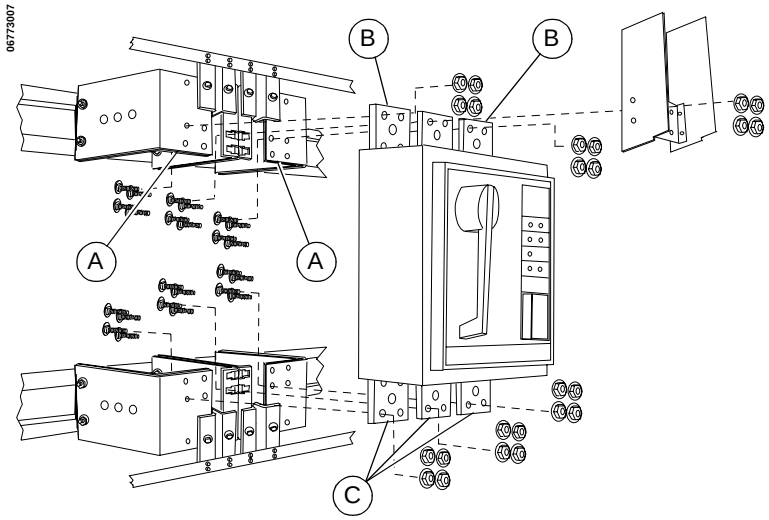

Figure 7: Installing Circuit Breaker onto Terminal Pads

CAUTION

HAZARD OF EQUIPMENT DAMAGE FROM OVERHEATING IF PHASE BARRIER IS BETWEEN CIRCUIT BREAKER TERMINAL AND TERMINAL PAD

Mount phase barrier assembly in front of circuit breaker terminal.

Failure to follow this instruction can result in equipment damage

5. Install phase barrier assembly:

   Install phase barrier assembly (A, below) on upper (on end), center-pole circuit breaker terminal (B), in front of circuit breaker terminal. Insert four carriage bolts through back of terminal pad, through circuit breaker terminal, and through phase barrier. Square holes in terminal pads must engage square neck of carriage bolts. Secure bolts with hex nut-washer.

6. Torque the 24 carriage bolts to 240 lb-in (27 N•m).

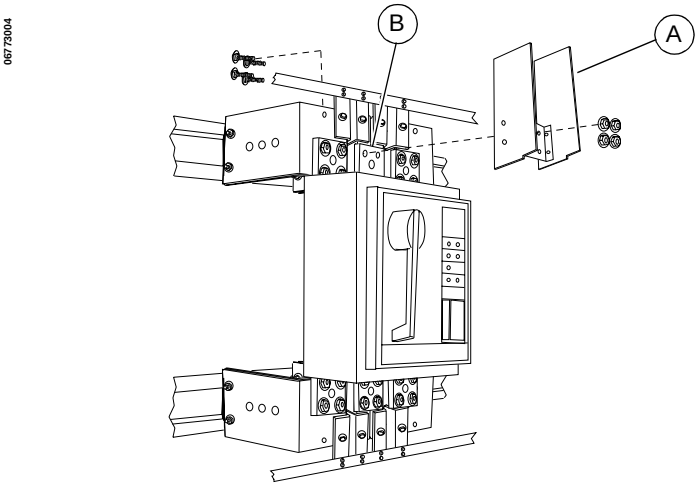

Figure 8: Installing Phase Barrier

1800–2500 A PE AND 2500 A PX CIRCUIT BREAKER INSTALLATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- 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.
- 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.

NOTE: If any hardware is damaged during installation, see Appendix A for part information.

1. Disconnect all power to enclosure.
2. Turn off circuit breaker or trip circuit breaker before installation by pushing push-to-trip button (A).

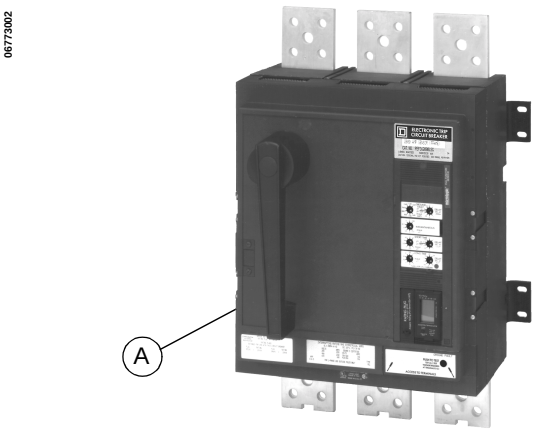

Figure 9: Tripping Circuit Breaker

If mounting circuit breaker in Square D equipment, go to Step 12. For mounting circuit breaker in other than Square D equipment, terminal pads are required to provide electrical spacing for bus bar or cable connections. (Square D equipment provides the necessary spacing.)

Use terminal pad kit supplied with circuit breaker (Figure 10) or an equivalent bus structure. (Dimensions of terminal pad bus and dimensions of circuit breaker with terminal pad kit installed are shown in Appendix B.)

3. Carefully unpack terminal pad kit and examine for damage.

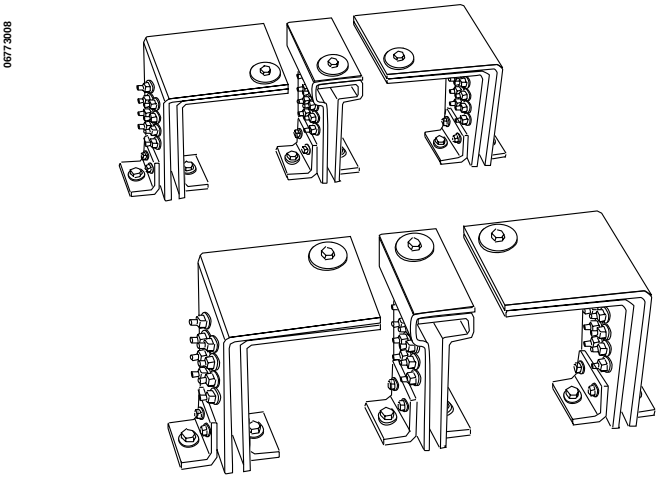

Figure 10: Terminal Pad Kit

CAUTION

HAZARD OF EQUIPMENT DAMAGE DUE TO STRESS

- A flat washer **must** be installed between bolt heads and any fiberglass parts.
- Mounting hardware **must** be left loose until otherwise instructed so terminal pad assemblies can shift.

Failure to follow these instructions can result in equipment damage.

4. Check mounting hole pattern (see Figure 11) on switchboard cross channels or other mounting base.

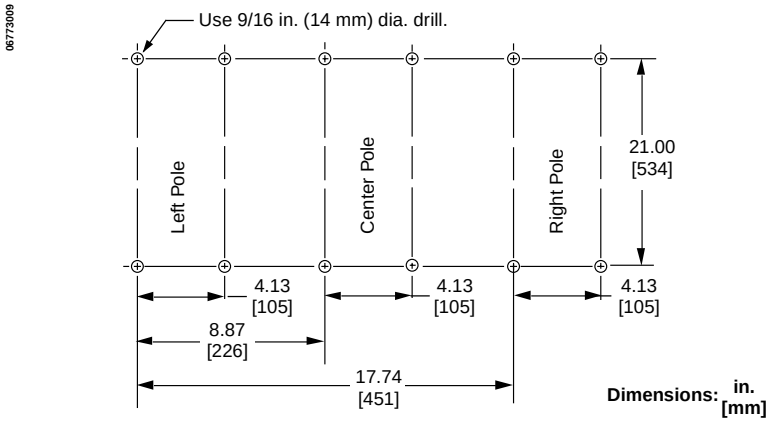

Figure 11: Mounting Hole Pattern

5. Loosely fasten terminal pad assemblies to mounting base, using hardware provided:
   - Align holes in fiberglass mounting brackets (A, below) with holes in mounting base (B).
   - Insert a hex-head bolt (C) with flat washer (D) through each fiberglass mounting bracket (A) and mounting base (B) hole.
   - Secure assembly with conical spring washer (E), concave side toward mounting base, and hex nut (F). Finger tighten nut to secure.

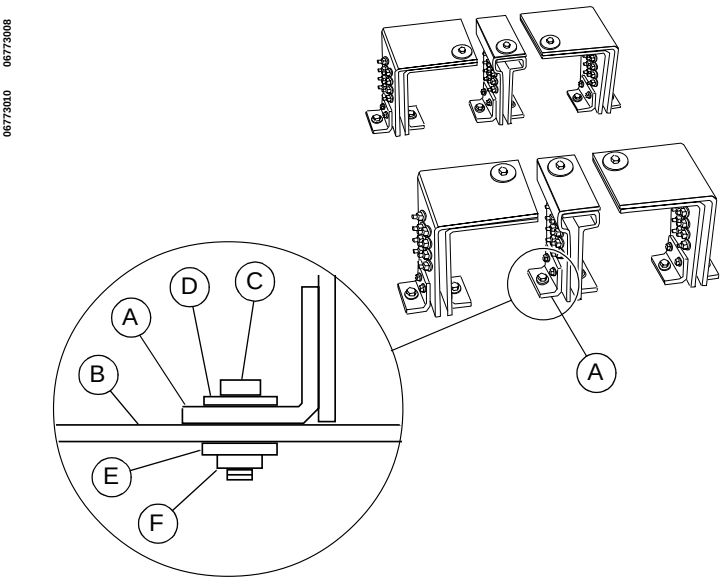

Figure 12: Fastening Terminal Pad Assemblies to Mounting Base

6. Remove circuit breaker mounting hardware (A) from each terminal pad assembly. Save parts for later use.

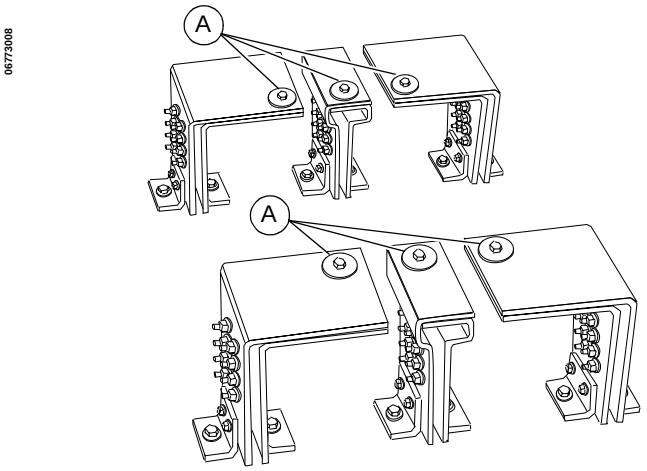

Figure 13: Removing Mounting Hardware

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE IF CIRCUIT BREAKER SHOULD FALL

Circuit breaker weighs approximately 75 lbs. (34 kg). Lift circuit breaker by case using proper lifting equipment. Do not remove lifting equipment until all mounting hardware is securely tightened. Never lift circuit breaker by its handle.

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

7. Temporarily fasten circuit breaker to terminal pads, using previously removed hardware.
   - Position circuit breaker against terminal pad assemblies.
   - Insert 2 in. long hex head bolt (A) with conical spring washer (B), concave side toward connection, through each circuit breaker top outside pole terminal (C) and terminal pad (D).
   - Secure each bolt with conical spring washer (E) and nut (F). Finger tighten nuts onto bolts.

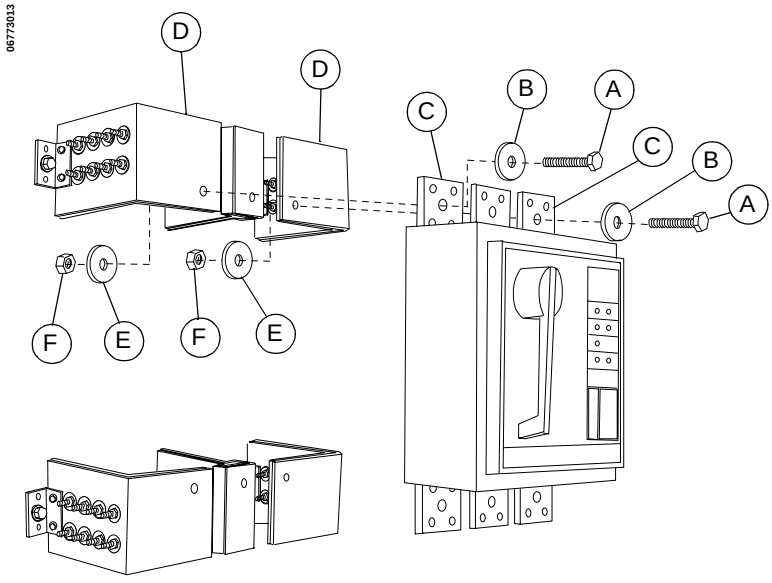

Figure 14: Temporarily Fastening Circuit Breaker to Terminal Pads

8. Shift terminal pads until terminal pad holes line up with holes in circuit breaker terminals.

9. Torque the 12 factory-installed bolts (A) securing the fiberglass mounting brackets to the terminal pads to 180 lb-in (20 N•m).
10. Torque the 12 hex-head bolts (B) securing the fiberglass mounting brackets to the mounting base to 50 lb-ft (68 N•m).
11. For easier installation of lugs and conductors, or bus, remove circuit breaker after tightening terminal pad mounting hardware.

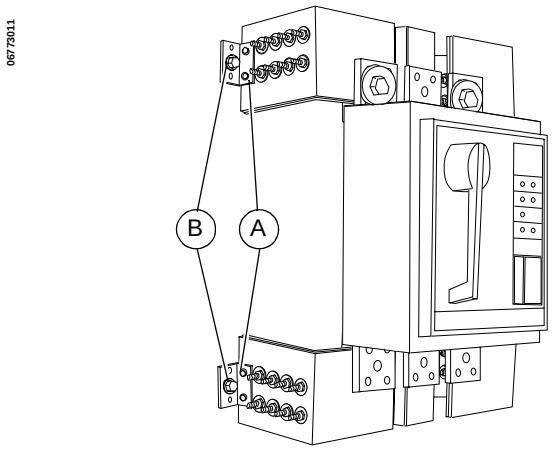

Figure 15: Torquing Bolts

Table 3: Lug Data

	Conductors	
Cat. Number	**No.**	**Size[1]**
AL2500PA	1 2	1/0 AWG–750 kcmil (50–400 mm^2) 1/0 AWG–300 kcmil (50–150 mm^2)
VC2500PA7	1	500–750 kcmil (240–400 mm^2)
VC2500PA7	1	2/0 AWG–500 kcmil (70–240 mm^2)

[1]Conductor sizes apply to both aluminum and copper conductors.

12. Install lugs and conductors according to instructions packed with the lugs. Acceptable lug and conductor ranges are indicated in Table 3. Use the hardware provided on each terminal pad (A, below) to mount up to eight lugs. Discard hardware packed in lug kits. Distribute lugs evenly on each side of terminal pad (Figure 16). Lugs can be rotated 180 degrees from position shown.

Install bus using the hardware provided on each terminal pad.

NOTE: Circuit breaker trip characteristics can be affected if conductor or other metal parts are closer than 1-1/2 in. (38 mm) from back surface of circuit breaker base.

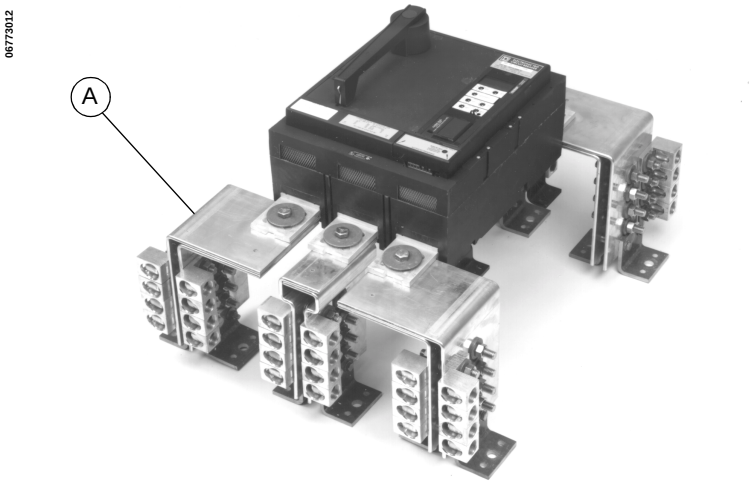

Figure 16: Installing Lugs and Conductors

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE IF CIRCUIT BREAKER SHOULD FALL

Circuit breaker weighs approximately 75 lbs. (34 kg). Lift circuit breaker by case using proper lifting equipment. Do not remove lifting equipment until all mounting hardware is securely tightened. Never lift circuit breaker by its handle.

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

13. Clean contact surfaces of terminal pads and circuit breaker terminals using a nonabrasive cleaner. (An abrasive cleaner can remove plating, resulting in joint deterioration.)
14. Position circuit breaker against terminal pad assemblies (A). Insert a 2 in. long hex head bolt (B) with conical spring washer (C), concave side toward connection, through each circuit breaker top outside pole terminal (D) and terminal pad (A). Secure each bolt with conical spring washer (E), concave side toward connection, and nut (F). Finger tighten nut onto bolts.
15. Attach the lower outside terminals to their terminal pads the same way using 2 in. hex head bolts.
16. Attach the lower (off end) center terminal to its terminal pad using a 1-1/2 in. long hex head bolt (G) with conical spring washer (H), concave side toward terminal, through center pole circuit breaker terminal and into clinch nut supplied on each center pole terminal pad.

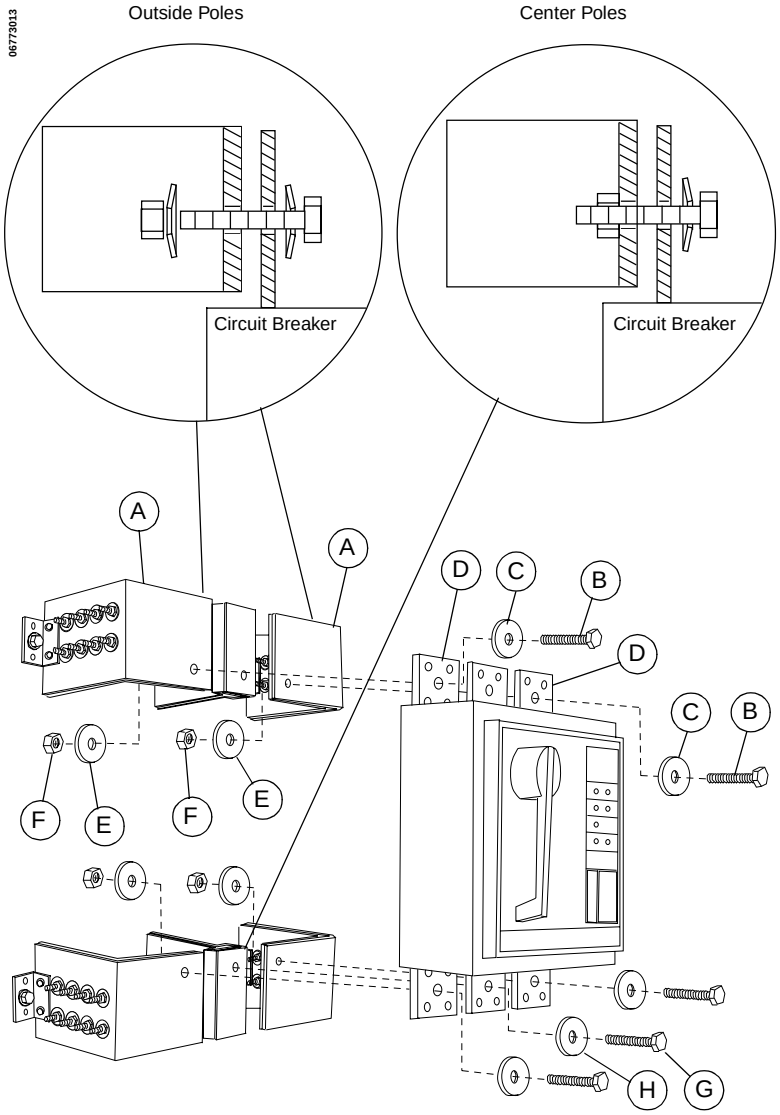

Figure 17: Fastening Circuit Breaker to Terminal Pads

CAUTION

HAZARD OF EQUIPMENT DAMAGE FROM OVERHEATING IF PHASE BARRIER IS BETWEEN CIRCUIT BREAKER TERMINAL AND TERMINAL PAD

Mount phase barrier assembly in front of circuit breaker terminal.

Failure to follow this instruction can result in equipment damage.

17. Install phase barrier assembly (A) on top (ON end) center pole circuit breaker terminal (B), in front of terminal pad.
18. Secure assembly using a 1-1/2 in. (38 mm) long bolt (C) with conical spring washer (D), concave side toward terminal, through circuit breaker terminal (B) and into clinch nut supplied on each center pole terminal pad.
19. Torque the six bolts to 70 lb-ft (95 N•m).

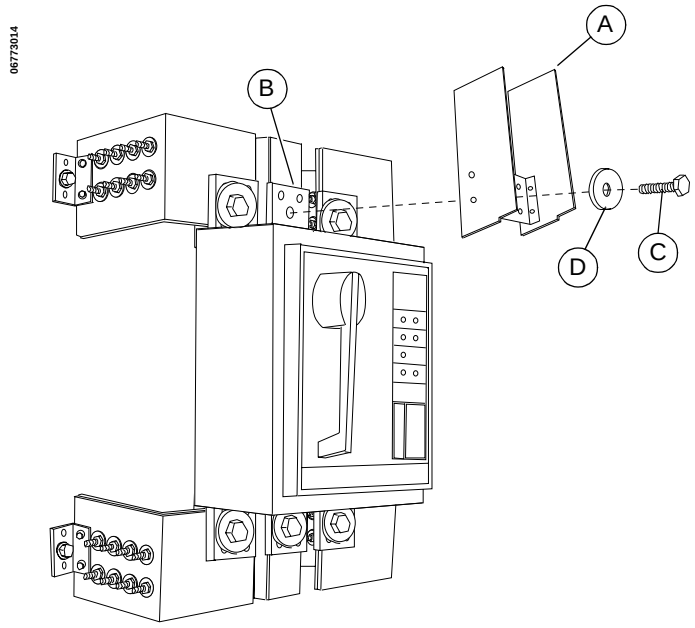

Figure 18: Installing Phase Barrier

CIRCUIT BREAKER REMOVAL

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE IF CIRCUIT BREAKER SHOULD FALL

Circuit breaker weighs approximately 75 lbs. (34 kg). Lift circuit breaker by case using proper lifting equipment. Do not remove lifting equipment until all mounting hardware is securely tightened. Never lift circuit breaker by its handle.

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

1. Disconnect all power to enclosure, circuit breaker, and accessories.
2. Turn off circuit breaker or trip circuit breaker by pushing the push-to-trip button before removal.
3. Remove circuit breaker in reverse order of installation.

Section 3—Trip Unit Operation

PX circuit breakers are equipped with the MICROLOGIC® Standard Trip System (A, below). PE circuit breakers are equipped with the MICROLOGIC Full-function Trip System (B). Both trip systems provide adjustable tripping functions and characteristics using true root-mean-square (rms) current sensing.

Adjustable rotary switches (C) on the trip unit allow the user to set the proper overcurrent or ground current protection required in the electrical system. If trip currents and time delays exceed set values, the trip system trips the circuit breaker.

NOTE: The fiber optic communications port (D) will occasionally flicker. This is not an indication of circuit breaker performance.

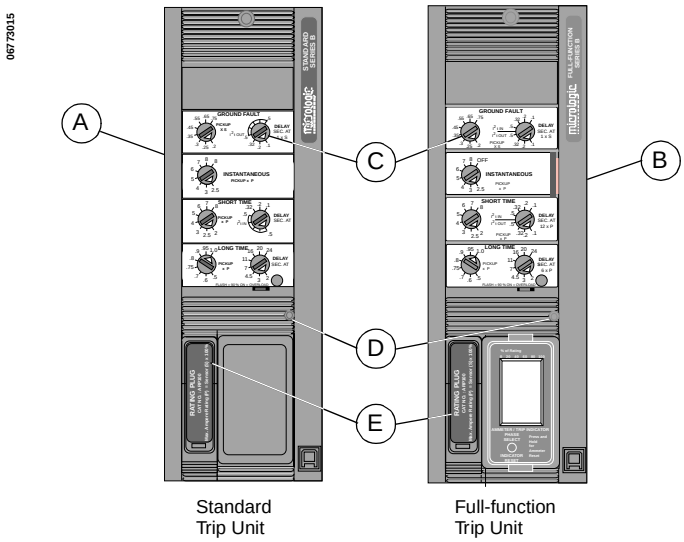

Figure 19: MICROLOGIC Trip System

CURRENT RATING

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Rating plug and ammeter/trip indicator are subject to damage from static charge. Do not handle these devices by their contacts. If either device is removed, hold it against the metal circuit breaker enclosure at least two seconds before reinstalling.

Failure to follow this instruction can result in equipment damage.

Determine current rating by multiplying the circuit breaker sensor size by the rating plug multiplier and the trip unit LONG-TIME pickup switch setting. For example:

Sensor Size	x	Rating Plug Multiplier	x	Long-time Pickup Switch Setting	=	Current Rating
2000	x	0.75	x	0.8	=	1200

Rating plugs (E) are available with multipliers ranging from 0.40 to 1.00. If the rating plug is not installed, the circuit breaker will operate safely, but the rating plug multiplier will default to 0.40

The label on the circuit breaker marked “Configuration as Shipped” gives the circuit breaker configuration as it left the factory. See Appendix A for available field-installable rating plug kits.

NOTE: Ground-fault values are based on the sensor size of the circuit breaker and are not affected by changing the rating plug.

AMMETER/TRIP INDICATOR

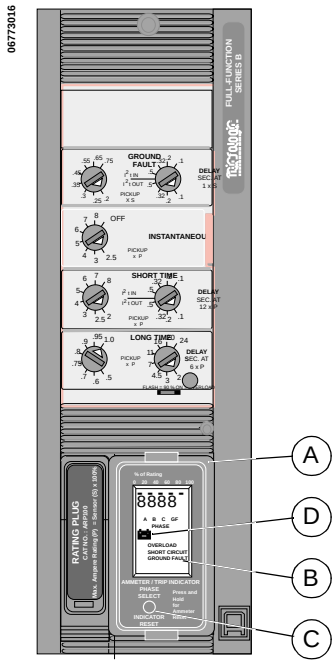

Figure 20: Ammeter/ Trip Indicator

The ammeter/trip indicator (A) is standard on the PE circuit breaker and is optional on the PX circuit breaker. The indicator monitors current in phases A, B and C, and ground-fault current flowing in the circuit. Each value can be viewed one at a time in the ammeter/trip indicator window (B) using the phase select/indicator reset button (C). (Phase values are displayed in true rms. Ground-fault current values are displayed in calculated rms based on measured peak current.) A bar graph is provided indicating the level of operating current as a function of the programmed ampere rating of the circuit breaker.

The window also displays "OVERLOAD," "SHORT CIRCUIT," or "GROUND FAULT" when the circuit breaker trips. It must be manually reset by pushing the phase select/indicator reset button (C).

The phase select/indicator reset button (C) can be pressed at any time to test that the ammeter/trip indicator is functioning. The window will display a battery symbol (D). If battery symbol does not appear, contact Square D for a replacement ammeter/trip indicator.

MEMORY FEATURE

MICROLOGIC trip systems feature a memory circuit for intermittent overload or ground-fault conditions. This allows the circuit breaker to respond to a series of on and off overload conditions which could cause conductor overheating, but go undetected in a conventional electronic trip device.

If the circuit breaker trips due to an overload or ground-fault condition, wait at least one minute before resetting the circuit breaker. This allows the memory to clear itself sufficiently for circuit breaker to be turned on (I).

NOTE: If checking trip times, wait 15 minutes after circuit breaker trips before resetting to allow memory to reset completely to zero.

GROUND-FAULT DETECTION

Circuit breakers with integral ground-fault detection provide ground-fault protection or alarm on grounded neutral systems. They can be applied on three-phase four-wire circuits, on three-phase three-wire circuits where the neutral is grounded but not carried throughout the system, or on grounded delta systems. These circuit breakers utilize a residual sensing scheme for ground-fault detection.

Circuit breakers with integral ground-fault protection provide equipment ground-fault protection.

Circuit breakers with integral ground-fault alarm provide ground-fault monitoring and alarm through a POWERLOGIC® system. This feature meets NEC Sections 700-7(d) and 700-26 for emergency systems. To provide ground-fault alarm without a POWERLOGIC system, the ground-fault restraint signal must be processed by a RIM32 restraint interface module and delivered to a special AROMAT® relay, which provides contacts for ground-

fault annunciation. In either case the restraint signal exists until the ground fault is removed. Ground-fault alarm is available on PE circuit breakers only.

NOTE: Circuit breakers with ground-fault alarm DO NOT provide ground-fault protection.

Circuit breakers with either ground-fault feature are equipped with an internal ground-fault test feature. The ground-fault test system is built into the circuit breaker and eliminates the need for any additional test equipment, such as monitor panels. See Appendix C for wiring diagrams.

TRIP CHARACTERISTICS

Trip settings are used to obtain a coordinated system in which a downstream circuit breaker will trip before an upstream circuit breaker. Figure 21 shows the various parts of the trip curve affected by the trip settings for a PX (standard trip unit) circuit breaker and a PE (full-function trip unit) circuit breaker. Properly adjusting the MICROLOGIC trip settings will result in a characteristic trip curve that falls above and to the right of the branch circuit breaker characteristic curve. Under overload or short-circuit conditions, the branch circuit breaker will trip first.

For more information on a system coordination study, contact the local Square D Field Office.

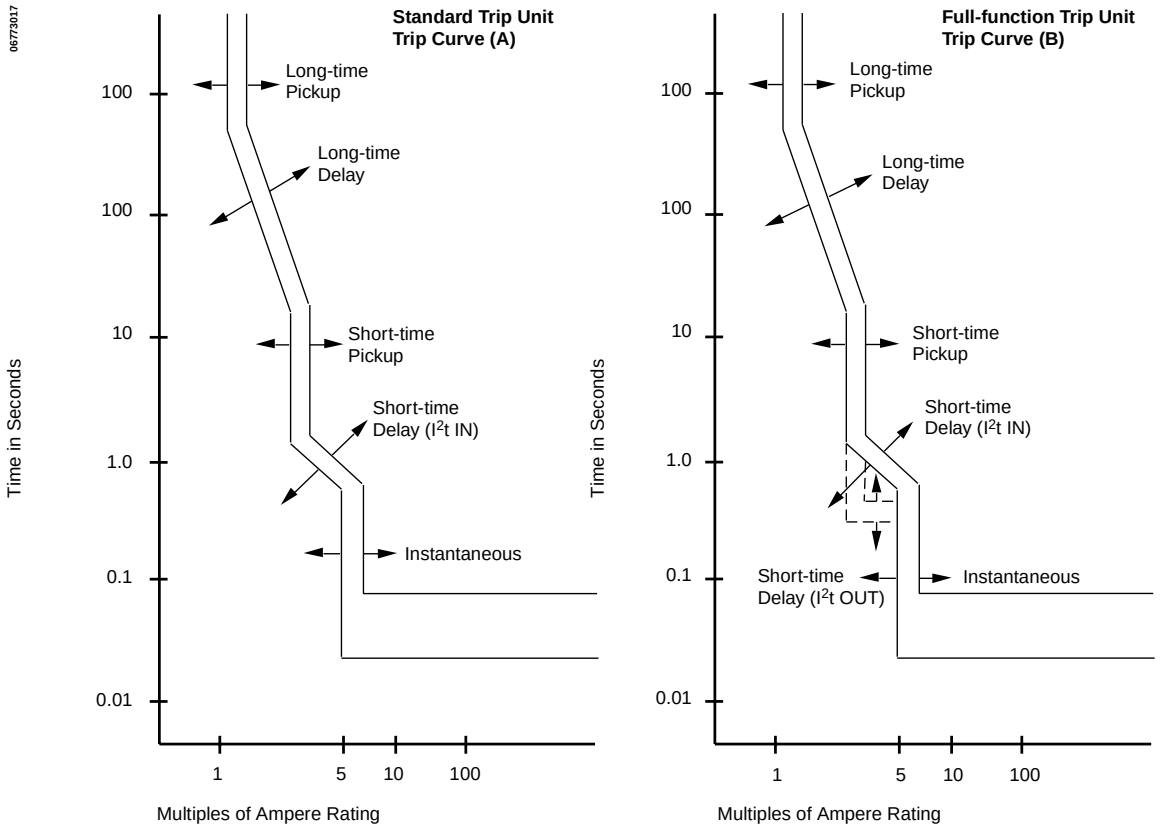

Figure 21: Trip Curves

STANDARD TRIP UNIT FUNCTIONS

NOTE: Turn circuit breaker off (O) before adjusting trip unit switches.

Long-time Trip Function

LONG-TIME PICKUP Switch—sets maximum current level (based on circuit breaker ampere rating) which circuit breaker will carry continuously. If current exceeds this value, circuit breaker will trip after the preset delay time.

LONG-TIME DELAY Switch—sets length of time that circuit breaker will carry a sustained overcurrent below the SHORT-TIME PICKUP current level before tripping. Delay bands are labeled in seconds of overcurrent at six times the ampere rating. For maximum coordination, there are eight delay bands.

Indicator—the trip unit includes an indicator (A) that will flash at 90% of the LONG-TIME PICKUP level and will be lit continuously above 100% of the pickup level.

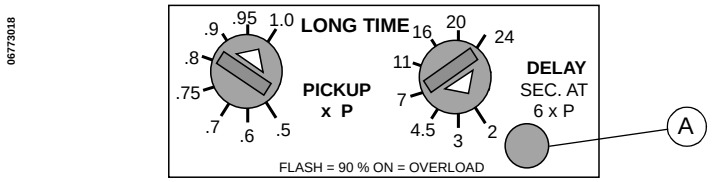

Figure 22: Long-time Pickup and Delay Switch

Short-time Trip Function

SHORT-TIME PICKUP Switch—sets current level (based on circuit breaker ampere rating) between the LONG-TIME PICKUP level and the INSTANTANEOUS PICKUP level at which circuit breaker will trip after the preset short-time delay.

SHORT-TIME DELAY Switch—sets length of time circuit breaker will carry an overcurrent which exceeds the SHORT-TIME PICKUP level but is less than the INSTANTANEOUS PICKUP level. The delay can be set to four positions of I^2t ramp function (I^2t IN).

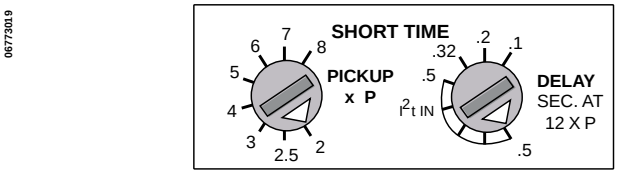

Figure 23: Short-time Pickup and Delay Switch

Instantaneous Trip Function

INSTANTANEOUS PICKUP Switch—sets current level (based on circuit breaker ampere rating) at which circuit breaker will trip with no intentional time delay.

The instantaneous trip will override the short-time function if INSTANTANEOUS PICKUP is adjusted at the same or lower setting than SHORT-TIME PICKUP.

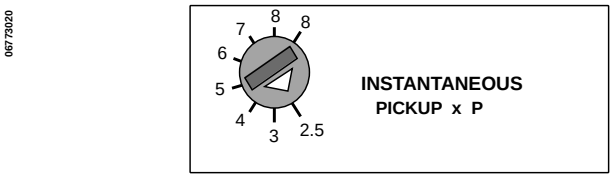

Figure 24: Instantaneous Pickup Switch

Ground-fault Trip Function

GROUND-FAULT PICKUP Switch—sets current level (based on circuit breaker sensor size) at which circuit breaker will trip after the preset ground-fault delay.

GROUND-FAULT DELAY Switch—sets length of time circuit breaker will carry ground-fault current which exceeds GROUND-FAULT PICKUP level before tripping. Delay can be adjusted with four positions of fixed time delays (I^2t OUT).

NOTE: Ground-fault values are based on circuit breaker sensor size only, not rating plug multiplier. Changing rating plug multiplier has no effect on ground-fault values.

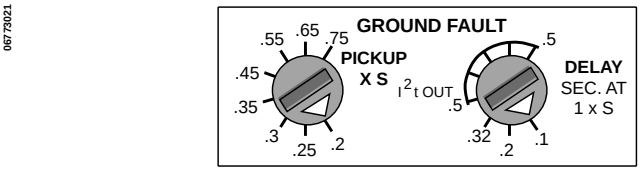

Figure 25: Ground-fault Pickup and Delay Switch

FULL-FUNCTION TRIP UNIT FUNCTION

NOTE: Turn circuit breaker off (O) before adjusting trip unit switches.

Long-time Trip Function

LONG-TIME PICKUP Switch—sets maximum current level (based on circuit breaker ampere rating) which circuit breaker will carry continuously. If current exceeds this value, circuit breaker will trip after the preset delay time.

LONG-TIME DELAY Switch—sets length of time that circuit breaker will carry a sustained overcurrent below the SHORT-TIME PICKUP current level before tripping. Delay bands are labeled in seconds of overcurrent at six times the ampere rating. For maximum coordination, there are eight delay bands.

Indicator—the trip unit includes an indicator (A) that will flash at 90% of the LONG-TIME PICKUP level and will be lit continuously above 100% of the pickup level.

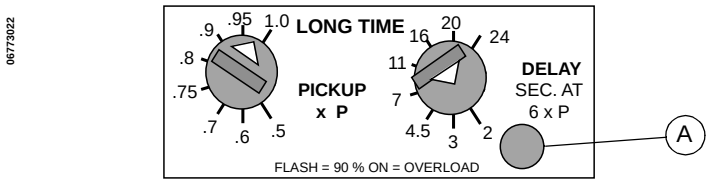

Figure 26: Long-time Pickup and Delay Switch

Short-time Trip Function

SHORT-TIME PICKUP Switch—sets current level (based on circuit breaker ampere rating) between the LONG-TIME PICKUP level and the INSTANTANEOUS PICKUP level at which circuit breaker will trip after the preset short-time delay.

SHORT-TIME DELAY Switch—sets length of time circuit breaker will carry an overcurrent which exceeds the SHORT-TIME PICKUP level but is less than the INSTANTANEOUS PICKUP level. The delay can be set to four positions of I^2t ramp function (I^2t IN) or four positions of fixed time delays (I^2t OUT).

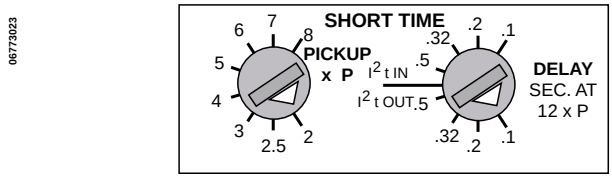

Figure 27: Short-time Pickup and Delay Switch

Instantaneous Trip Function

⚠ DANGER

HAZARD OF PERSONAL INJURY, DEATH OR PROPERTY DAMAGE

Turning the instantaneous trip to OFF can cause the electrical system to carry overcurrents for longer than design capabilities allow. Turning instantaneous trip to OFF must be done only by qualified personnel.

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

INSTANTANEOUS PICKUP Switch—sets current level (based on circuit breaker ampere rating) at which circuit breaker will trip with no intentional time delay.

In circuit breakers with both short-time and instantaneous trip, the instantaneous trip will override the short-time function if the INSTANTANEOUS PICKUP is adjusted at the same or lower setting than the SHORT-TIME PICKUP.

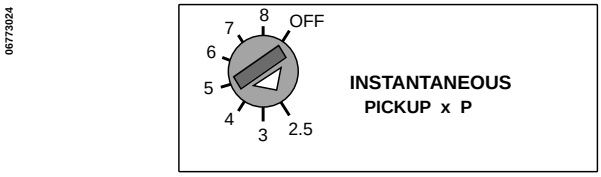

Figure 28: Instantaneous Pickup Switch

In circuit breakers with both short-time and instantaneous trip, the adjustable instantaneous trip can be disabled by setting INSTANTANEOUS PICKUP to OFF. A high-level instantaneous override remains in effect.

Ground-fault Trip Function

GROUND-FAULT PICKUP Switch—sets current level (based on circuit breaker sensor size) at which circuit breaker will trip after the preset ground-fault delay.

GROUND-FAULT DELAY Switch—sets length of time circuit breaker will carry ground-fault current which exceeds GROUND-FAULT PICKUP level before tripping. Delay can be adjusted with four positions of I^2t ramp function (I^2t IN) or four positions of fixed time delays (I^2t OUT).

NOTE: Ground-fault pick-up values are based on circuit breaker sensor size only, not rating plug multiplier. Changing rating plug multiplier has no effect on ground-fault values.

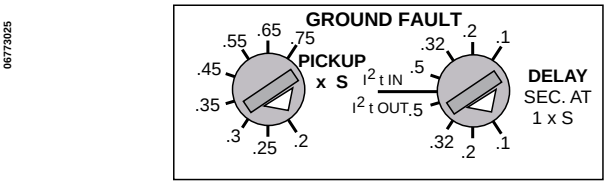

Figure 29: Ground-fault Pickup and Delay Switch

Ground-fault Alarm Function

GROUND-FAULT ALARM Switch—sets current level (based on circuit breaker sensor size) at which circuit breaker will signal that a ground fault is present. The signal exists until the ground fault is removed and the reset button is pressed.

NOTE: Ground-fault pick-up values are based on circuit breaker sensor size only, not rating plug multiplier. Changing rating plug multiplier has no effect on ground-fault values.

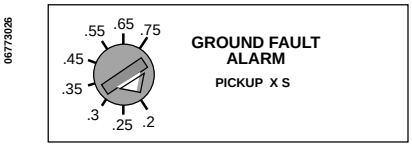

Figure 30: Ground-fault Alarm Pickup Switch

Section 4—Trip Unit Adjustments and Control Wiring

TRIP UNIT ADJUSTMENT

Circuit breakers are shipped with trip unit adjustments set at their lowest settings, except for the long-time pickup switch, which is set at 1.0. Actual settings for a specific application must be determined by a qualified consultant or plant engineer to provide proper coordination with other circuit breakers in the distribution system. For a detailed description of trip unit operation and available trip functions, refer to Section 3.

NOTE: Turn circuit breaker off (O) before adjusting switches.

1. Remove clear plastic cover by placing a small straight-blade screwdriver in slot in cover and exerting pressure upward and outward.

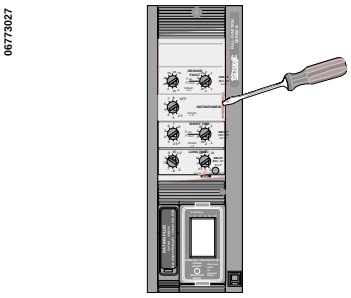

Figure 31: Removing Trip Unit Cover

2. Set switches to desired level using a small straight-blade screwdriver.

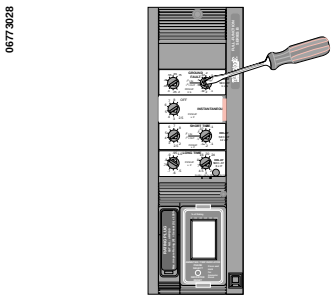

Figure 32: Setting Function Switches

3. Replace clear plastic cover.

DO NOT seal trip unit cover at this time.

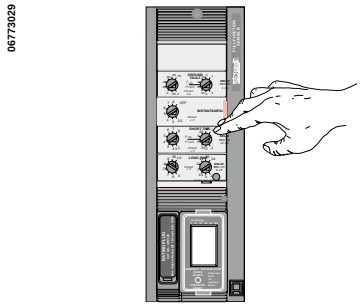

Figure 33: Replacing Trip Unit Cover

CONTROL WIRING

Terminal Location

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Disconnect all power to circuit breaker and accessories before installing control wiring.

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

CAUTION

HAZARD OF EQUIPMENT DAMAGE FROM OVERVOLTAGE

Do not hi-pot test control wiring.

Failure to follow this instruction can result in equipment damage.

Control wiring is connected to terminals located under the circuit breaker terminal block cover. If any control wiring is necessary, remove circuit breaker terminal block cover:

Disconnect all power to circuit breaker.

1. Turn off (O) circuit breaker or press push-to-trip button (A).
2. Place small straight-blade screwdriver in right screwdriver slot (B) on terminal block cover and twist.
3. Place small straight-blade screwdriver in left screwdriver slot (C) on terminal block cover and twist.
4. Lift off terminal block cover.

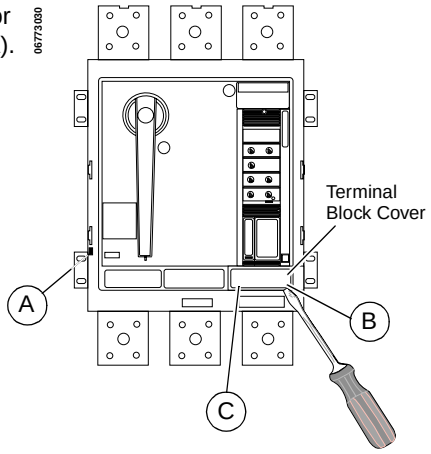

Figure 34: Removing Terminal Block Cover

Lift “DANGER” tag to expose terminal block.

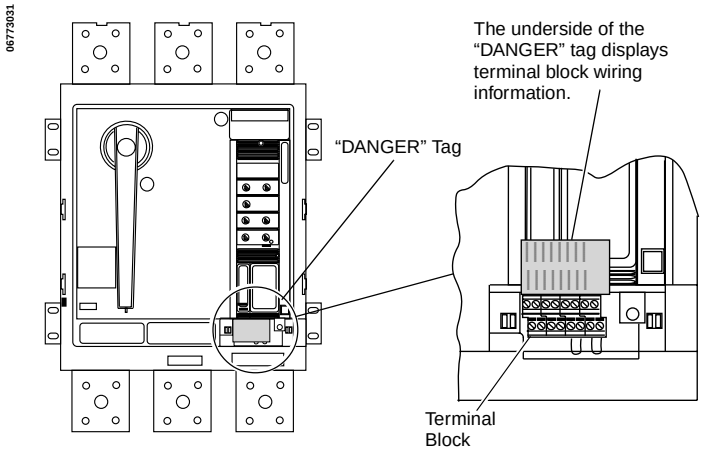

Figure 35: Lifting the “DANGER” Tag

Circuit Breaker Accessories

Circuit breaker accessories are available either factory installed or field installable in accessory slots on either side of the circuit breaker. Accessory installation does not require use of the terminal block. Wire factory-installed accessories according to wiring diagrams in Appendix C. Wire field-installable accessories according to instructions supplied with them.

Ground-fault Protection or Ground-fault Alarm

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Disconnect all power supplying the neutral CT primary circuit before working on neutral CT terminals.

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

CAUTION

HAZARD OF DAMAGE TO TRIP UNIT IF 120 VAC IS APPLIED TO TERMINALS OTHER THAN GROUND-FAULT TEST CIRCUIT

Connect 120 Vac only to terminals 3 and 4 of the terminal block.

Failure to follow this instruction can result in equipment damage.

CAUTION

HAZARD OF LOSS TO ELECTRICAL SERVICE

Testing circuit breaker under loaded conditions can cause unnecessary wear and result in loss of electrical service to critical loads. Always perform ground-fault test with minimum possible load.

Failure to follow this instruction can result in equipment damage.

Table 4: Terminal Block Numbering

No.	PX Terminal Name	PE Terminal Name
1	Neutral CT (to X1)	Neutral CT (to X1)
2	Neutral CT (to X2)	Neutral CT (to X2)
3	Ground-fault Test 120 Vac	Ground-fault Test 120 Vac
4	Ground-fault Test 120 Vac	Ground-fault Test 120 Vac
5	Reserved	ST Restraint IN
6	Reserved	ST Restraint OUT
7	Reserved	GF Restraint IN or GF Alarm Reserved
8	Reserved	GF Restraint OUT or GF Alarm Reserved
9	Reserved	Restraint COM
10	Reserved	CIM3F-RED
11	Reserved	CIM3F-BLACK
12	Reserved	Reserved
13	Reserved	CIM3F-BLUE
14	Reserved	CIM3F-ORANGE
15–16	Reserved	Reserved

Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m).
Use one or two #18 AWG (1 mm^2) wires or one #14 AWG (2.5 mm^2) wire.

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

Three-phase four-wire circuits require a neutral current sensor (CT). See Appendix A for appropriate neutral CTs and Appendix B for CT dimensions. All ground-fault circuit breakers include an integral ground-fault test feature which requires external 120 Vac (100 VA) power. Refer to Appendix C for an example of a ground-fault wiring diagram.

1. For ground-fault alarm, link circuit breaker into a POWERLOGIC® system, using a MICROLOGIC Communications Adapter, Cat. No. CIM3F. Install communications adapter per the installation instructions which come with the adapter kit. To provide ground-fault alarm without using a POWERLOGIC system, use a Restraint Interface Module, Cat. No. RIM32, with an AROMAT® relay as described in Square D Product Bulletin 0602PD9701.
2. Connect neutral CT, if needed:
   A. Primary

      If load is connected to off end of circuit breaker, connect load neutral to H1 terminal of neutral CT.

      If supply power is connected to off end of circuit breaker, connect supply neutral to H1 terminal of neutral CT.

   B. Secondary

      Connect terminals X1 and X2 of neutral CT to terminals 1 and 2 respectively of the circuit breaker terminal block (A), using no more than 25 ft. (7.6 m) of No. 14 AWG (2.5 mm^2) wire.
3. Connect ground-fault test power by connecting a 120 Vac power source to terminals 3 and 4 of the terminal block.

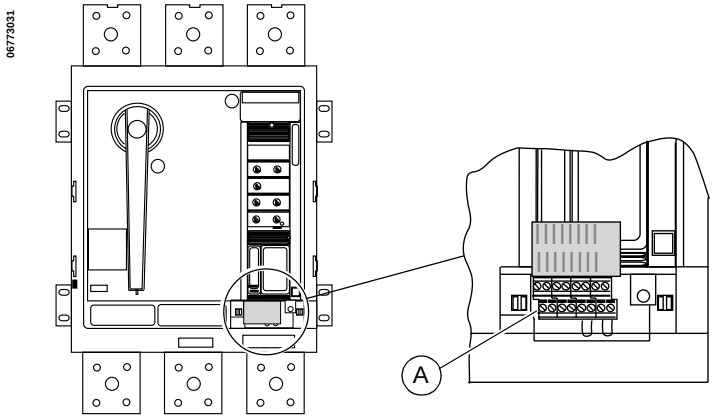

Figure 36: Terminal Block

POWERLOGIC® System (PE Circuit Breaker Only)

To link a PE circuit breaker to a POWERLOGIC® System, use a MICROLOGIC® Communications Adapter, Cat. No. CIM3F. Install communications adapter per the installation instructions which come with the adapter kit. PX circuit breakers cannot be linked to POWERLOGIC systems.

Zone-selective Interlocking (PE Circuit Breaker Only)

Zone-selective interlocking (ZSI) allows electronic trip circuit breakers to communicate fault information with each other. This permits faster tripping and reduces switchboard or panelboard stresses without a loss of circuit breaker coordination.

Circuit breakers must be coordinated for ZSI to work effectively. This requires a system coordination study. For more information on a system coordination study, contact the local Square D Field Office.

Coordination is done by adjusting the MICROLOGIC® trip settings to obtain a coordinated system in which a downstream circuit breaker will trip before an upstream circuit breaker under overload, short-circuit, or ground-fault conditions.

During a short-circuit or ground-fault condition on a ZSI system, the circuit breaker directly ahead of the fault sends a signal upstream via control wiring to restrain upstream devices from tripping and then trips with no intentional time delay to clear the fault. Upstream devices which receive a restraint signal obey their short-time and/or ground-fault delay settings to maintain coordination in other areas of the system. Upstream devices which do not receive a restraint signal trip with no intentional time delay.

Allowable ZSI combinations are shown in Table 5. (Series numbers for current design circuit breakers end in B, for example PE Series 6B.) For double-ended or larger systems, or systems which contain circuit breakers from different columns in Table 5, contact the local Square D Field Office for combination information.

Short-time delay and ground-fault delay can be interlocked either simultaneously or independently. Refer to Appendix C for an example of a zone-selective interlocking wiring diagram.

The circuit breaker may be self-restrained by connecting its input terminal to its own output terminal. This allows devices downstream to trip and clear the fault. Self-restrain the circuit breaker if:

- the circuit breaker is feeding another panel

and

- there are no electronic trip circuit breakers or type GC Ground Fault Sensing Systems downstream from the circuit breaker being installed.

The circuit breaker may be unrestrained by not connecting its input terminal to any output terminal. This results in the circuit breaker ignoring its programmed delay values and tripping with no intentional delay to clear the fault. An electronic trip circuit breaker is left unrestrained only if:

- there are no other overcurrent protection devices between it and the load that it is feeding

and

- the load requires no intentional delay time before the circuit breaker trips.

Table 5: ZSI Combinations

Upstream Device (receives input from RIM) → / Downstream Device (sends output to RIM) ↓	MICROLOGIC #.0x Trip Units	Square D MICROLOGIC Series B Trip Units	Square D GC-100 Ground-fault Relay for Equipment Protection	Square D GC-200 Ground-fault Relay for Equipment Protection	Merlin Gerin STR58 Trip Units	Federal Pioneer USRC and USRCM Trip Units
MICROLOGIC #.0x Trip Units	15	R	R	15	15	R
Square D MICROLOGIC Series B Trip Units	R	26	R	R	R	15
Square D GC-100 Ground-fault Relay for Equipment Protection	R	R	7	R	R	R
Square D GC-200 Ground-fault Relay for Equipment Protection	15	R	R	15	15	R
Merlin Gerin STR58 Trip Units	15	R	R	15	15	R
Merlin Gerin STR53 Trip Units	15	R	R	15	15	R
Federal Pioneer USRC and USRCM Trip Units	R	15	R	R	R	15
Square D Add-on Ground Fault Module for Equipment Protection	R	5	R	R	R	R

R—RIM module is required to restrain any devices.
Numerical References—Maximum number of upstream circuit breakers which can be restrained without requiring a RIM Module.

Table 6: Terminal Block Numbering

No.	PX Terminal Name	PE Terminal Name
1	Neutral CT (to X1)	Neutral CT (to X1)
2	Neutral CT (to X2)	Neutral CT (to X2)
3	Ground-fault Test 120 Vac	Ground-fault Test 120 Vac
4	Ground-fault Test 120 Vac	Ground-fault Test 120 Vac
5	Reserved	ST Restraint IN
6	Reserved	ST Restraint OUT
7	Reserved	GF Restraint IN or GF Alarm Reserved
8	Reserved	GF Restraint OUT or GF Alarm Reserved
9	Reserved	Restraint COM
10	Reserved	CIM3F—RED
11	Reserved	CIM3F—BLACK
12	Reserved	Reserved
13	Reserved	CIM3F—BLUE
14	Reserved	CIM3F—ORANGE
15–16	Reserved	Reserved

Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m). Use one or two #18 AWG (1 mm^2) wires or one #14 AWG (2.5 mm^2) wire.

To activate short-time zone-selective interlocking:

1. If system design requires circuit breaker to be self-restrained, self-restrain it by leaving factory-installed jumper between terminals 5 and 6. Otherwise, remove factory-installed jumper (A) from short-time terminals 5 and 6 (Figure 37).

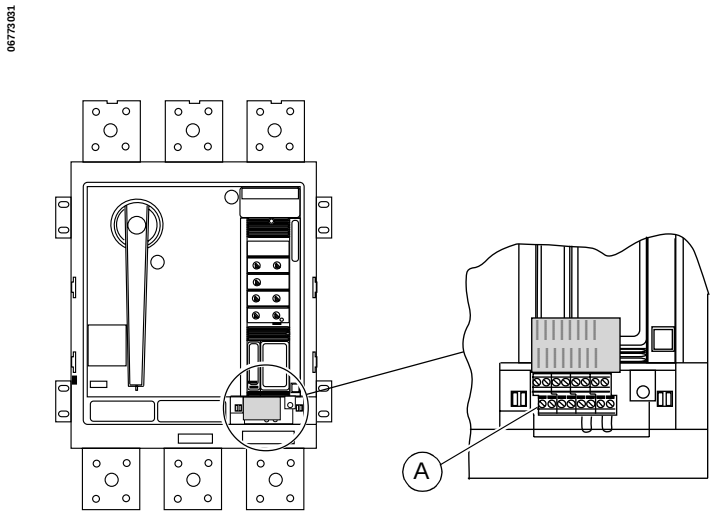

Figure 37: Terminal Block

2. To restrain other circuit breakers, connect short-time output (terminal 6) and common (terminal 9) of circuit breaker to short-time inputs and commons of circuit breakers to be restrained. Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m).
3. To restrain this circuit breaker, connect short-time input (terminal 5) and common (terminal 9) of circuit breaker to short-time outputs and equipment grounds (commons) from circuit breakers doing restraining. Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m).

To activate ground-fault zone-selective interlocking repeat steps 1–3 above, using ground-fault terminals 7 and 8 and common terminal 9.

If the distance between any two circuit breakers exceeds 1000 ft. (305 m), a restraint interface module will be required. See Section 5—Accessories for more information.

NOTE: Jumpers to self-restrain circuit breakers must be in place unless zone-selective interlocking is activated. If jumpers are removed and zone-selective interlocking is not activated, circuit breaker will ignore its programmed delay and trip with no intentional delay.

Route Control Wiring

1. Route wires out of wire exit (A).
2. Fold “DANGER” tag (B) down over terminal block.
3. Place terminal block cover (C) back in place and press down to snap into place.

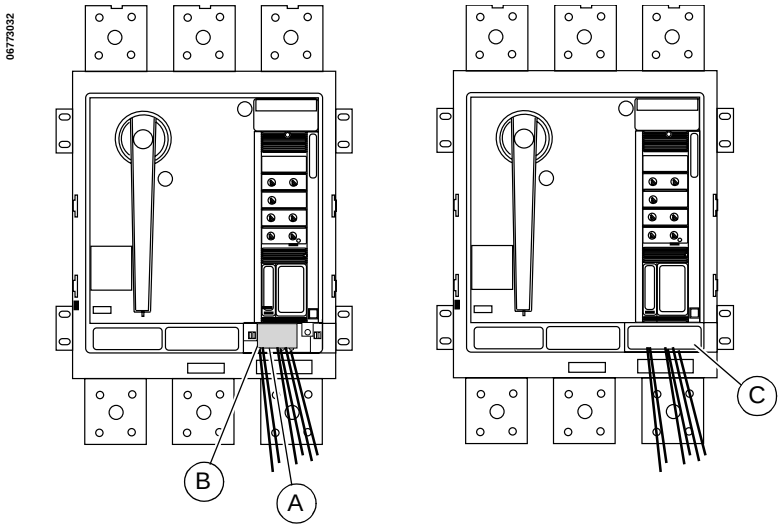

Figure 38: Control Wire Routing

Test Ground-fault Feature

> **CAUTION**
>
> **HAZARD OF LOSS TO ELECTRICAL SERVICE**
>
> Testing circuit breaker under loaded conditions can cause unnecessary wear and result in loss of electrical service to critical loads. Always perform ground-fault test with minimum possible load.
>
> **Failure to follow this instruction can result in equipment damage.**

Test ground-fault protection or alarm, if installed:

1. Energize 120 Vac power source connected to ground-fault test circuit.
2. Depress ground-fault push-to-test button (A, below).
   A. Circuit breakers with integral ground-fault protection will trip in less than a second and ammeter/trip indicator (B) will read “GROUND FAULT.”

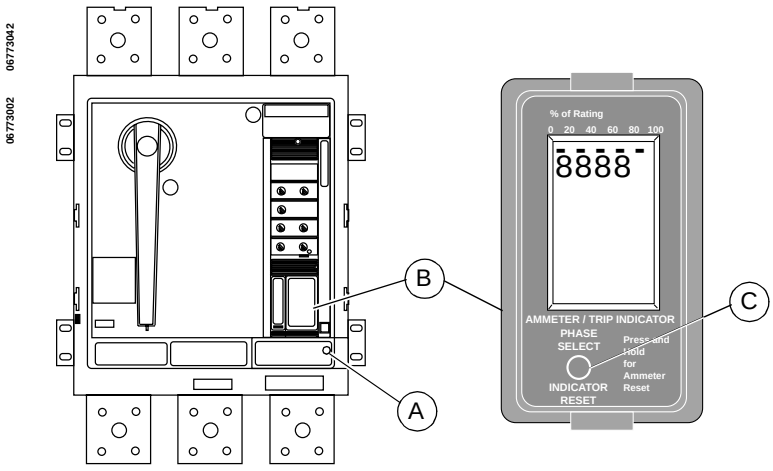

Figure 39: Testing Ground-fault Feature

After circuit breaker trips:

1. Reset circuit breaker by rotating handle down, through the OFF position, to the RESET position.
2. Reset ammeter/trip indicator (B) by pushing the indicator reset button (C).

   If the circuit breaker does not trip, refer to Section 6—Troubleshooting.

B. Circuit breakers with integral ground-fault alarm will send an alarm signal indicating that a ground fault is present.

NOTE: Circuit breakers with ground-fault alarm will not trip or indicate a trip. While the push-to-test button is depressed, the ammeter in the circuit breaker will indicate a ground-fault current value and the circuit breaker will signal a ground fault.

If an alarm signal is not sent, refer to Section 6—Troubleshooting.

For detailed instructions on testing the integral ground-fault system, refer to *Ground-fault Field Test Procedure* supplied with circuit breaker.

CHECK INSTALLATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- The initial energizing of the equipment is potentially hazardous.
- Overcurrent conditions can result from damage undetected during receiving inspection or from improper installation.
- Qualified electrical personnel must be present during energizing. Beware of potential hazards, wear personal protective equipment and take adequate safety precautions.

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

Before placing the circuit breaker in service, verify that it has been checked and installed according to this instruction manual. As a last check, make sure all covers and barriers, such as the trip unit cover, terminal block cover and phase barrier are in place.

Circuit breaker installation is now complete.

SEAL TRIP UNIT

After circuit breaker has been placed in service and is operating correctly, the trip unit cover can be sealed to prevent tampering. The rating plug and the clear plastic cover over the switches each have one sealing location. To seal trip unit, put clear plastic cover in place and insert seals (A) through holes in sealing posts (B). If seals are not available locally, contact Square D.

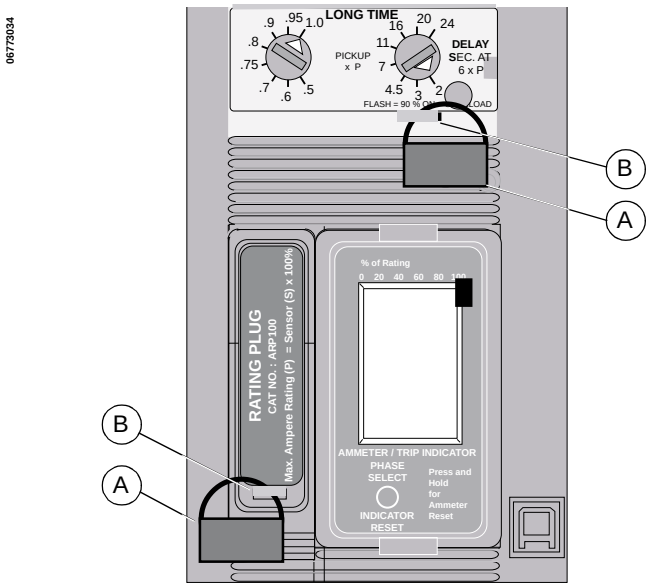

Figure 40: Sealing the Trip Unit

Section 5—Accessories

UL Listed accessories are available for either factory or field installation. This section provides a brief description of each accessory. Wiring diagrams can be found in Appendix C.

SHUNT TRIP

The shunt trip (Figure 41) provides a means of tripping the circuit breaker electrically from a remote location using an external voltage source. A coil clearing contact opens the shunt trip coil circuit when the circuit breaker opens.

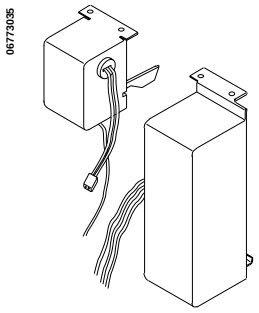

Figure 41: Shunt Trip

UNDERVOLTAGE TRIP

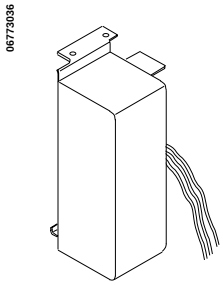

Figure 42: Undervoltage Trip

The undervoltage trip accessory (Figure 42) trips a circuit breaker when the voltage drops below a preset level. The preset level is 35% to 70% of the control voltage. The undervoltage trip prevents the circuit breaker from being reset until 85% of the control voltage is restored. The monitored circuit voltage can be wired in series with an externally-mounted normally-closed contact which opens the circuit breaker from a remote location.

An optional adjustable time delay unit, Cat. No. 690UVTD or 690UVTDI, provides a time delay to avoid nuisance circuit breaker tripping due to momentary dips in the monitored voltage source. The time delay is adjustable from 0.1 seconds to 0.5 seconds. The time delay unit works only with the 120 Vac undervoltage trip accessory.

AUXILIARY SWITCH

An auxiliary switch (Figure 43) is a single-pole, double-throw switch, operated by the movable contact arm assembly. It is used to remotely monitor the position of the circuit breaker contacts, whether open or closed. The auxiliary switch indicates the position of the circuit breaker main contacts as follows:

Type “A” contacts are closed when the circuit breaker is closed.

Type “B” contacts are open when the circuit breaker is closed.

Auxiliary switches can be used to operate indicator lights, relays, or other accessories.

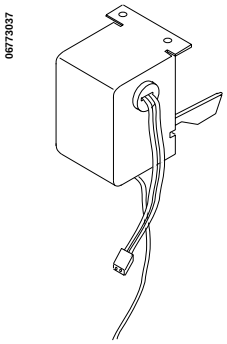

Figure 43: Auxiliary Switch

ALARM SWITCH

An alarm switch indicates any automatic circuit breaker opening or tripping due to overload, short-circuit, ground-fault or undervoltage conditions, or a push-to-trip operation. An alarm switch is actuated by the tripping mechanism. It is not actuated when the circuit breaker is manually opened or closed. The alarm switch is available factory installed only.

COMMUNICATIONS ADAPTER (PE CIRCUIT BREAKER ONLY)

The field-installable communications adapter, Cat. No. CIM3F (Figure 44), allows the circuit breaker trip unit to communicate with a Square D POWERLOGIC® Communications Network. This allows PE circuit breakers to be networked in a POWERLOGIC system. The communications adapter cannot be used with the PX circuit breaker.

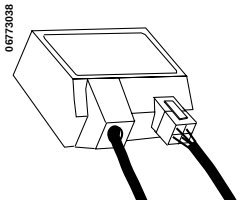

Figure 44: Communications Adapter CIM3F

RESTRAINT INTERFACE MODULE (PE CIRCUIT BREAKER ONLY)

The restraint interface module, Cat. No. RIM32 (Figure 45), is required for zone-selective interlocking when

- Distance between any two circuit breakers in the restraint system exceeds 1000 ft. (305 m).
- Interlocking circuit breakers and/or ground-fault modules need assistance to communicate. See Table 5, Section 4 for combinations requiring RIM32.

The restraint interface module cannot be used with the PX circuit breaker.

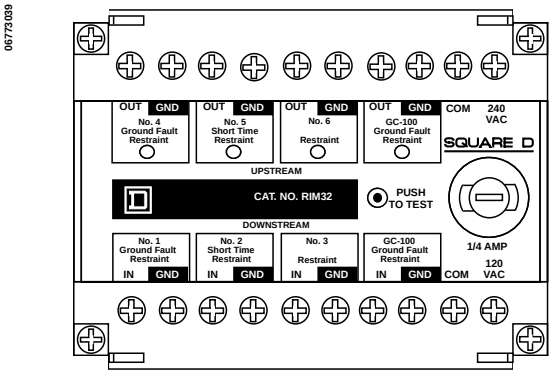

Figure 45: Restraint Interface Module RIM32

UNIVERSAL TEST SET

The Universal Test Set, Cat. No. UTS3 (Figure 46), is available to test Square D circuit breakers with MICROLOGIC trip units. It runs trip unit tests automatically with prompts to the user for initial information. Testing can be done with the circuit breaker installed in the switchboard, following the directions shipped with the test set.

Individual test modules are used to store data necessary for automatic tests for each frame. MICROLOGIC trip units require test module CBTMB, which is included with the Universal Test Set. If an older Universal Test Set without a CBTMB test module is used, a CBTMB test module must be obtained.

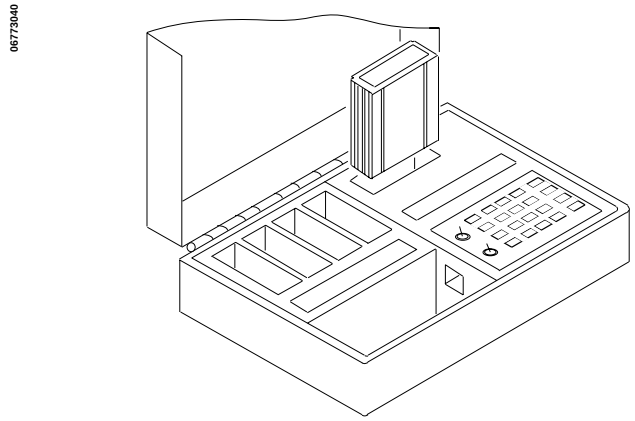

Figure 46: Universal Test Set UTS3

TRIP INDICATOR

The trip indicator, Cat. No. ALTIP (Figure 47), displays "OVERLOAD," "SHORT CIRCUIT," or "GROUND FAULT" when the circuit breaker has experienced a trip condition. After the circuit breaker has cleared the fault and is reset, the trip indicator must be manually reset by pushing the indicator reset button (A).

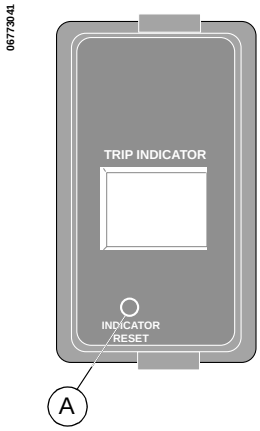

Figure 47: Trip Indicator, ALTIP

AMMETER/TRIP INDICATOR

The ammeter/trip indicator, Cat. No. ALAMP (Figure 48), is standard on the PE circuit breaker and is available as an option on the PX circuit breaker. It monitors true root-mean-square (rms) current in phases A, B and C, and peak ground-fault current flowing in the circuit.

Each value can be viewed one at a time using the phase select/indicator reset button (A). (Phase values are displayed in true rms. Ground-fault current values are displayed in calculated rms based on measured peak current.) A bar graph (B) is provided indicating the level of operating current as a function of the programmed ampere rating of the circuit breaker.

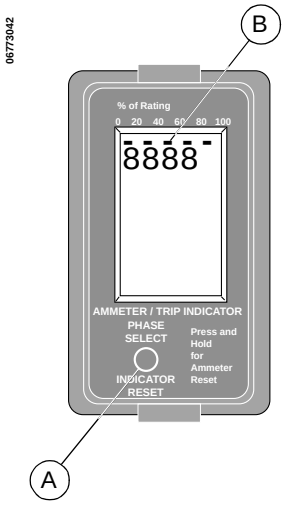

Figure 48: Ammeter/Trip Indicator, ALAMP

Section 6—Troubleshooting

If problems occur during installation, refer to the information below. If trouble persists, contact the local Square D Field Office.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- 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.
- 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.
- 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. Undervoltage trip not energized. 2. Shunt trip energized. 3. Circuit breaker reclosed too soon after long-time trip. 4. Short circuit, overload or ground fault exists on system.	1. Energize undervoltage trip (see Section 5 and Appendix C). 2. De-energize shunt trip (see Section 5 and Appendix C). 3. Wait one minute after trip before reclosing circuit breaker. 4. Check system for overload, short circuit or ground fault.
Circuit breaker trips, but no overload is evident.	1. Rating plug not installed. 2. Improper rating plug installed. 3. Trip unit improperly adjusted. 4. Ground-fault condition exists. 5. Trip unit switch settings were adjusted while circuit breaker was feeding loads.	1. Install rating plug. 2. Check that rating plug is correct.* 3. Check trip unit adjustments.* 4. Check circuit for ground fault. 5. Turn off all power to circuit breaker before adjusting trip unit switches.
Circuit breaker ground fault trips, but no ground fault is evident.	1. Neutral CT leads reversed or neutral CT installed backwards. 2. Improper neutral CT used.	1. Check neutral CT installation (see Section 4 and Appendix C). 2. Check if correct neutral CT installed (see Section 5 and Appendix A).
Ground-fault test button will not trip circuit breaker with ground-fault protection.	1. No control power on terminals 3 and 4 of circuit breaker terminal block. 2. Terminals 1 and 2 of circuit breaker or X1 and X2 of neutral CT are shorted.	1. Turn control power on. 2. Check neutral CT installation (see Section 4 and Appendix C).
Ground-fault test button does not signal ground-fault alarm.	1. No control power on terminals 3 and 4 of circuit breaker terminal block. 2. Terminals 1 and 2 of circuit breaker or X1 and X2 of neutral CT are shorted. 3. CIM3F communications adapter not connected. (PE circuit breaker only.)	1. Turn control power on. 2. Check neutral CT installation (see Section 4 and Appendix C). 3. Check CIM3F communications adapter connections (see Section 4).
Trip indicator does not show cause of trip.	1. Very high fault levels in the circuit breaker caused the magnetic override circuit to trip rather than the electronic trip unit. 2. Push-to-trip or circuit breaker accessory tripped circuit breaker.	1. Contact Square D Field Office. 2. Check if accessory tripped circuit breaker.
Circuit breaker opens too soon on long-time trip.	Circuit breaker was reclosed before memory had reset all the way to zero.	Wait 15 minutes after trip before reclosing circuit breaker.
Circuit breaker handle broken.	Excessive force applied to handle.	Contact Square D field office for replacement handle.

*Contact consulting engineer or designer for correct rating plug and trip unit adjustments.

Appendix A—Parts Lists

CIRCUIT BREAKER WITH TERMINAL PADS

600–1600 A PE and 600–2000 A PX Circuit Breakers

Table 7: Circuit Breaker and Terminal Pads Hardware

Item	Description	Quantity
A	Circuit Breaker	1
B	PALTB Terminal Pad Kit	2
C	Phase Barrier Assembly (Provided with circuit breaker)	1
D	Bolts, round head, square neck, 3/8-16 x 1-1/2 in. (Provided with PALTB kit)	24
E	Nut Washer, 3/8-16 (Provided with PALTB kit)	24

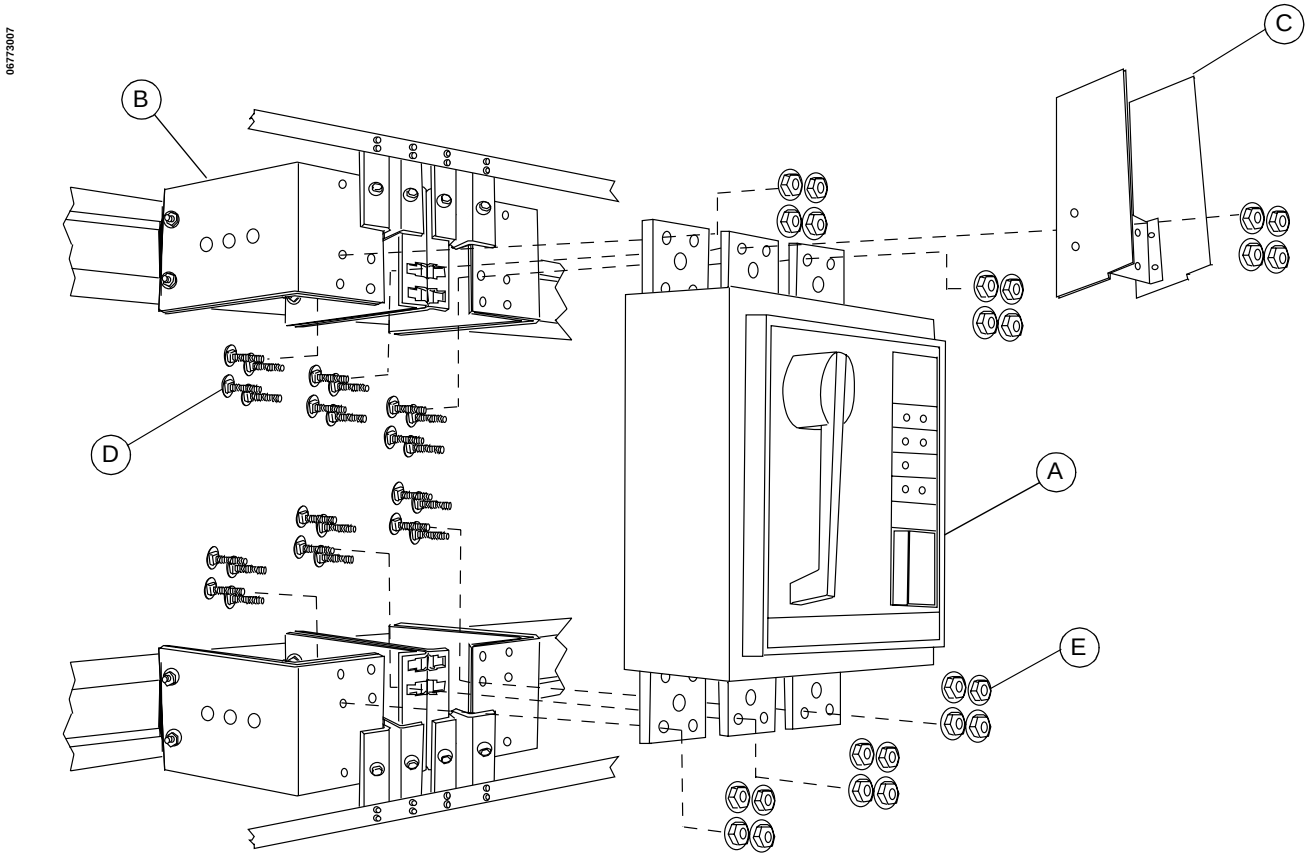

Figure 49: Mounting Hardware, Circuit Breaker and Terminal Pads

CIRCUIT BREAKER WITH TERMINAL PADS

1800–2500 A PE and 2500 A PX Circuit Breakers

Table 8: Circuit Breaker and Terminal Pads Hardware

Item	Description	Quantity
A	Circuit Breaker	1
B	Terminal Pad Kit	1
C	Phase Barrier Assembly (Provided with circuit breaker)	1
D	Bolts, mounting, outer pole, hex head, 1/2-13 x 2 in. (Provided with terminal pad kit)	4
E	Washer, mounting, 2-1/4 in. O.D. (Provided with terminal pad kit)	10
F	Nut 1/2-13 in. (Provided with terminal pad kit)	4
G	Bolts, center pole, hex head, 1/2-13 x 1-1/2 in. (Provided with terminal pad kit)	2

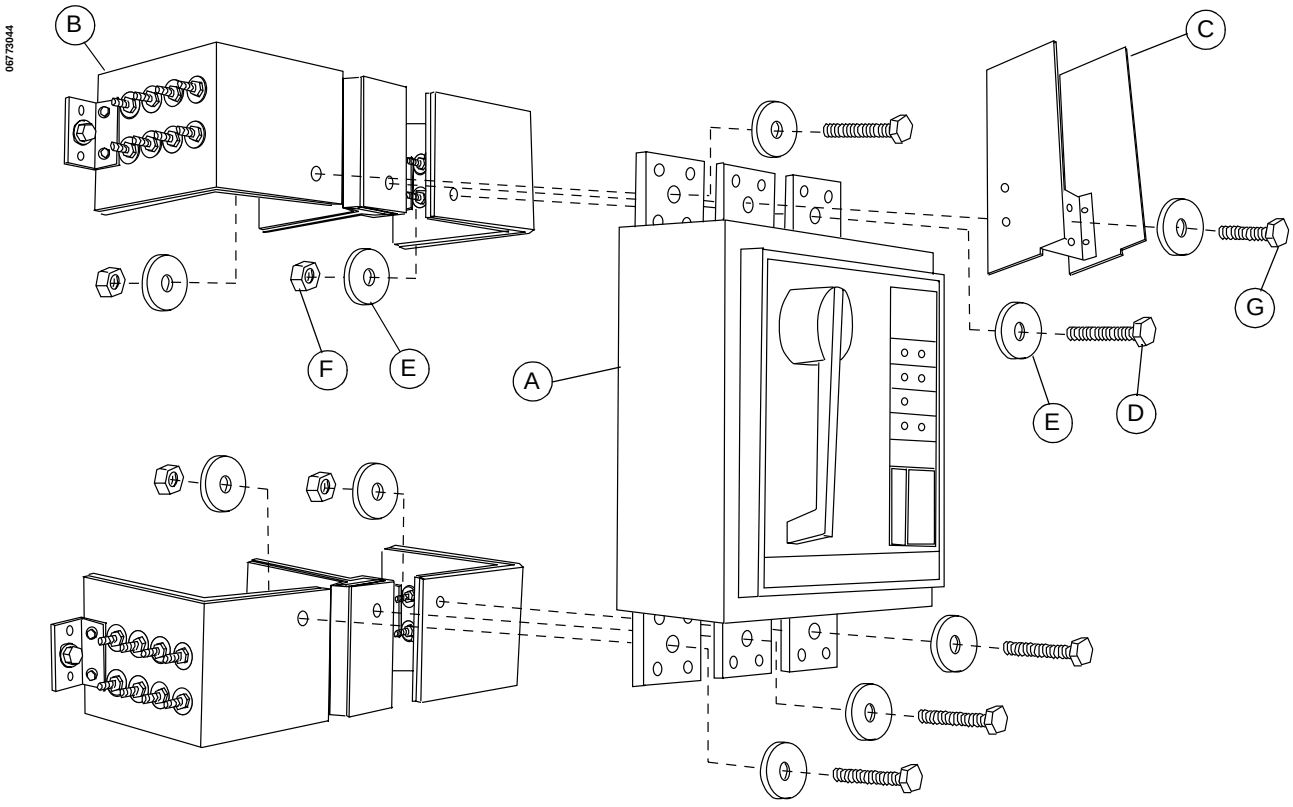

Figure 50: Mounting Hardware, Circuit Breaker and Terminal Pads

CIRCUIT BREAKER WITH TERMINAL PADS

1800–2500 A PE and 2500 A PX Circuit Breakers

Table 9: Terminal Pad Parts

Item	Description	Quantity
A	Terminal Pad, outer pole	2
B	Terminal Pad, outer pole	2
C	Terminal Pad, center pole	2
D	Mounting Bracket, fiberglass	12
	Bracket Mounting Hardware	
E	Bolt, Bracket Mounting, 1/2-13 x 1-3/8 in. hex head	12
F	Washer, Bracket, flat, 1-3/8 in. O.D.	12
G	Washer, Bracket, conical spring, 1-3/8 in. O.D.	12
H	Nut, Bracket, hex, 1/2-13	12
	Lug Mounting Hardware	
I	Bolt, Lug Mounting, 1/3-13 x 1-1/2 in.	48
J	Washer, Lug Mounting, conical spring, 1/2-13	48
K	Nut, Lug Mounting, hex, 1/2-13	48
	Circuit Breaker Mounting Hardware	
L	Bolt, Mounting, outer pole, 1/2-13 x 2 in.	4
M	Bolt, Mounting, center pole, 1/2-13 x 1-1/2 in.	2
N	Washer, Mounting, 2-1/4 in. O.D.	10
O	Nut, Mounting, 1/2-13	4

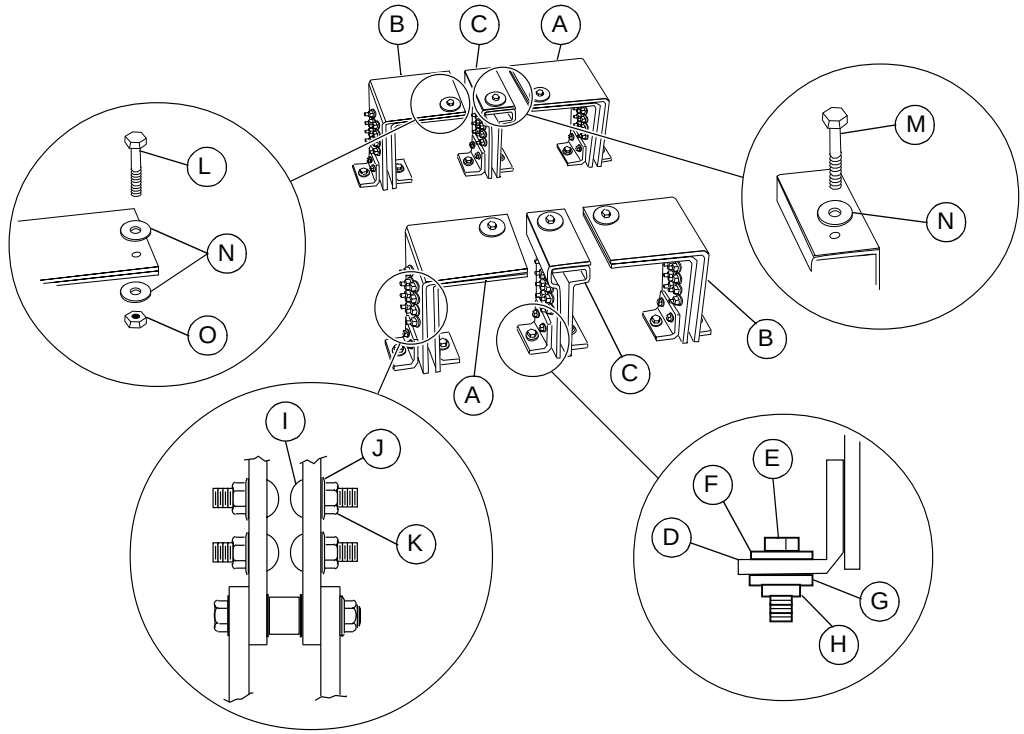

Figure 51: Terminal Pads Assembly

CATALOG NUMBERS

Table 10: Neutral Current Transformers

Circuit Breaker Frame Rating	Neutral Current Transformer Catalog Number
1200 Ampere	PE12CT2 Series 3
1600 Ampere	PE16CT2 Series 3
2000 Ampere	PE20CT2 Series 3
2500 Ampere	PE25CT2 Series 3

Table 11: Rating Plugs

Catalog Number	Multiplier
ARP040	0.400
ARP050	0.500
ARP056	0.563
ARP058	0.583
ARP060	0.600
ARP063	0.625
ARP067	0.667
ARP070	0.700
ARP075	0.750
ARP080	0.800
ARP083	0.833
ARP088	0.875
ARP090	0.900
ARP100	1.000

Appendix B—Dimensional Drawings

NEUTRAL CURRENT TRANSFORMER

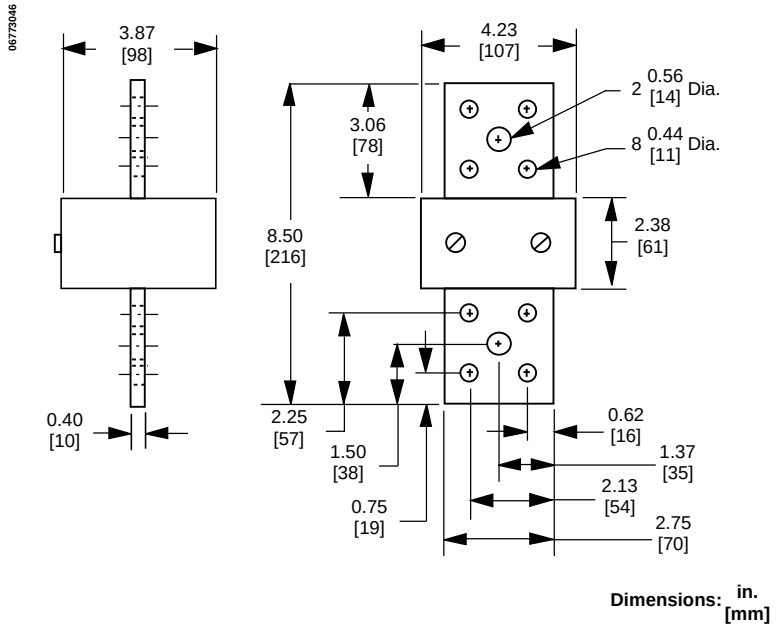

Figure 52: Neutral Current Transformer

CIRCUIT BREAKER DIMENSIONS

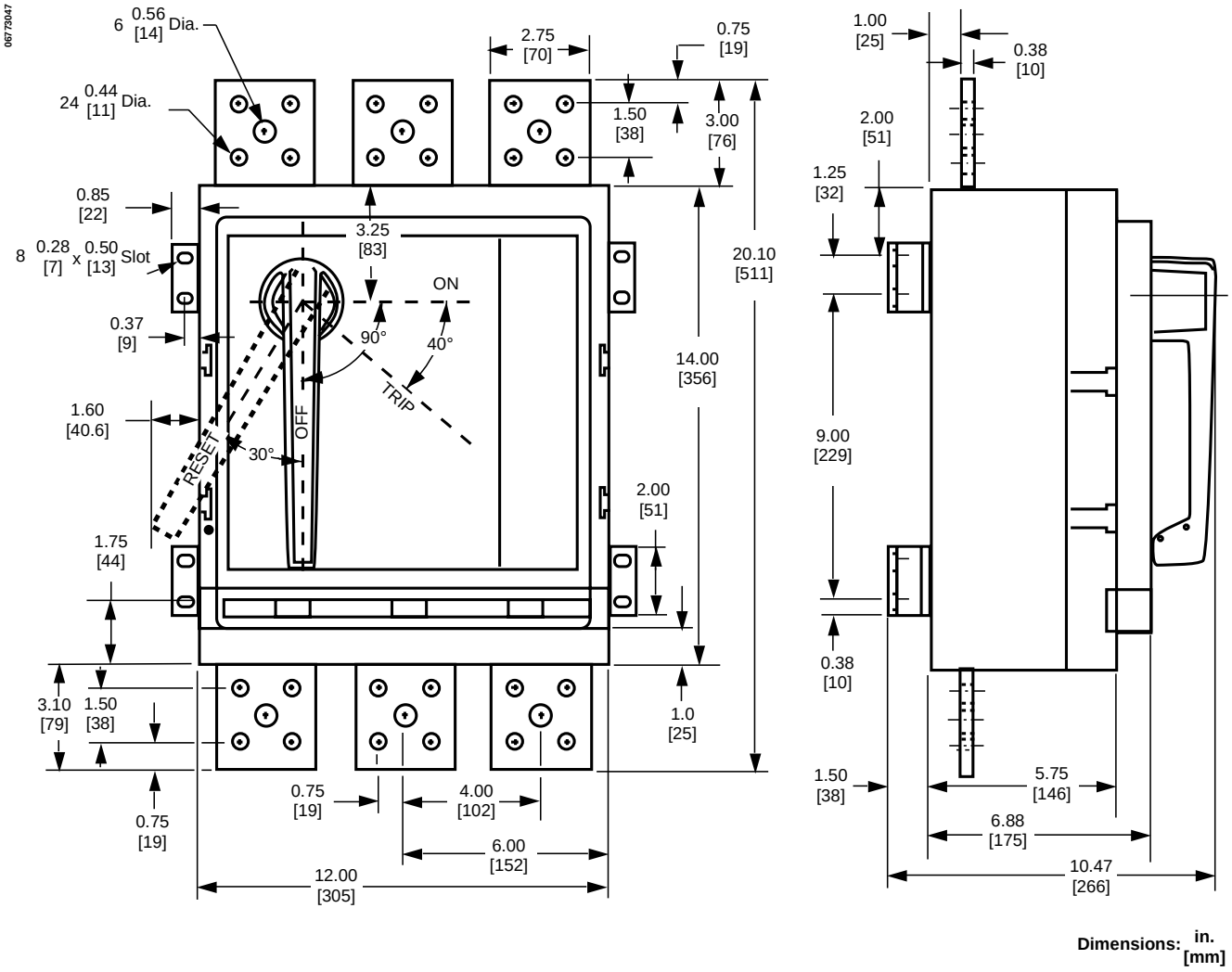

Figure 53: Circuit Breaker

CIRCUIT BREAKER WITH TERMINAL PADS

600–1600 A PE and 600–2000 A PX Circuit Breakers

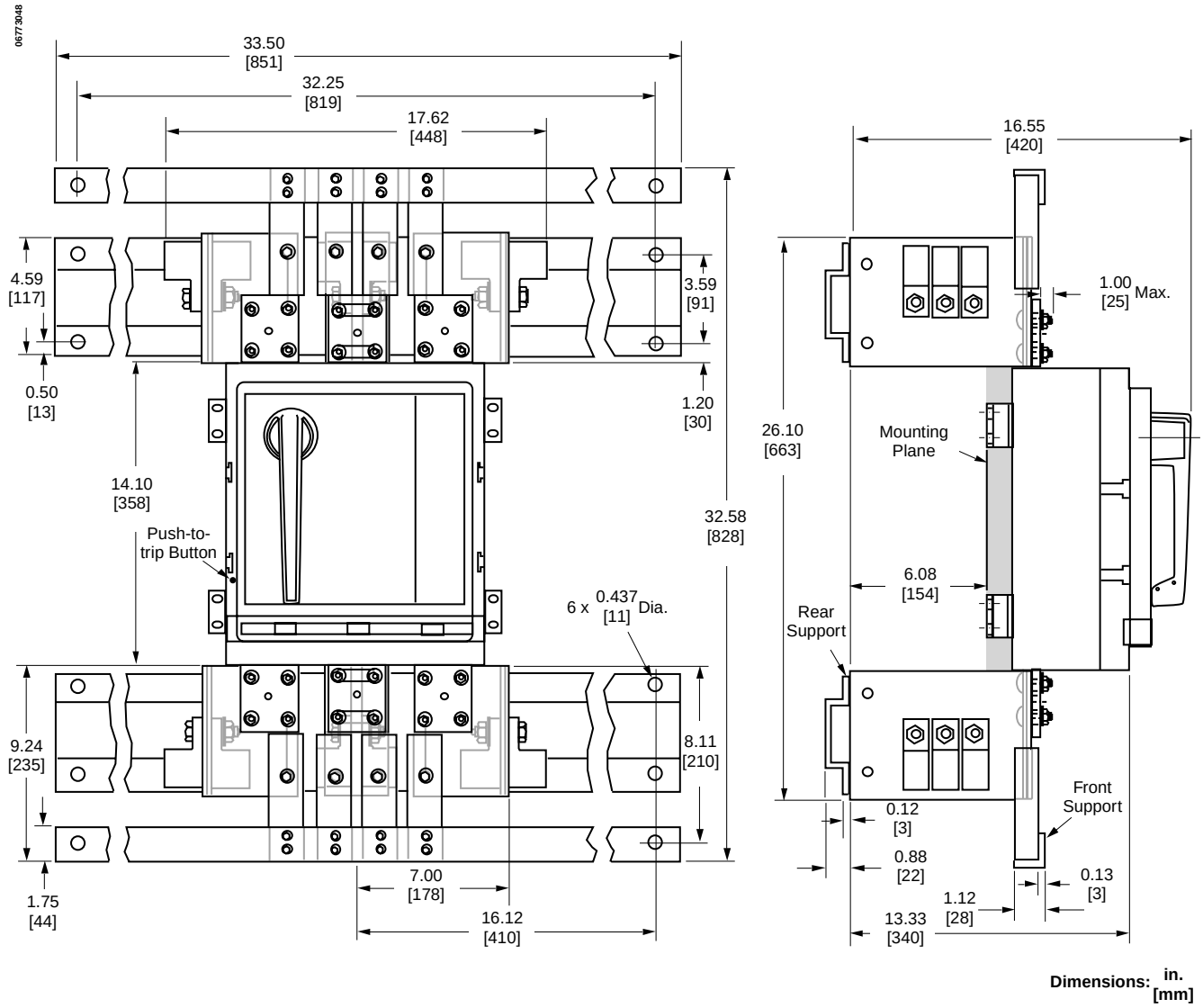

Figure 54: Circuit Breaker Mounted on Terminal Pads

CIRCUIT BREAKER WITH TERMINAL PADS

1800–2500 A PE and 2500 A PX Circuit Breakers

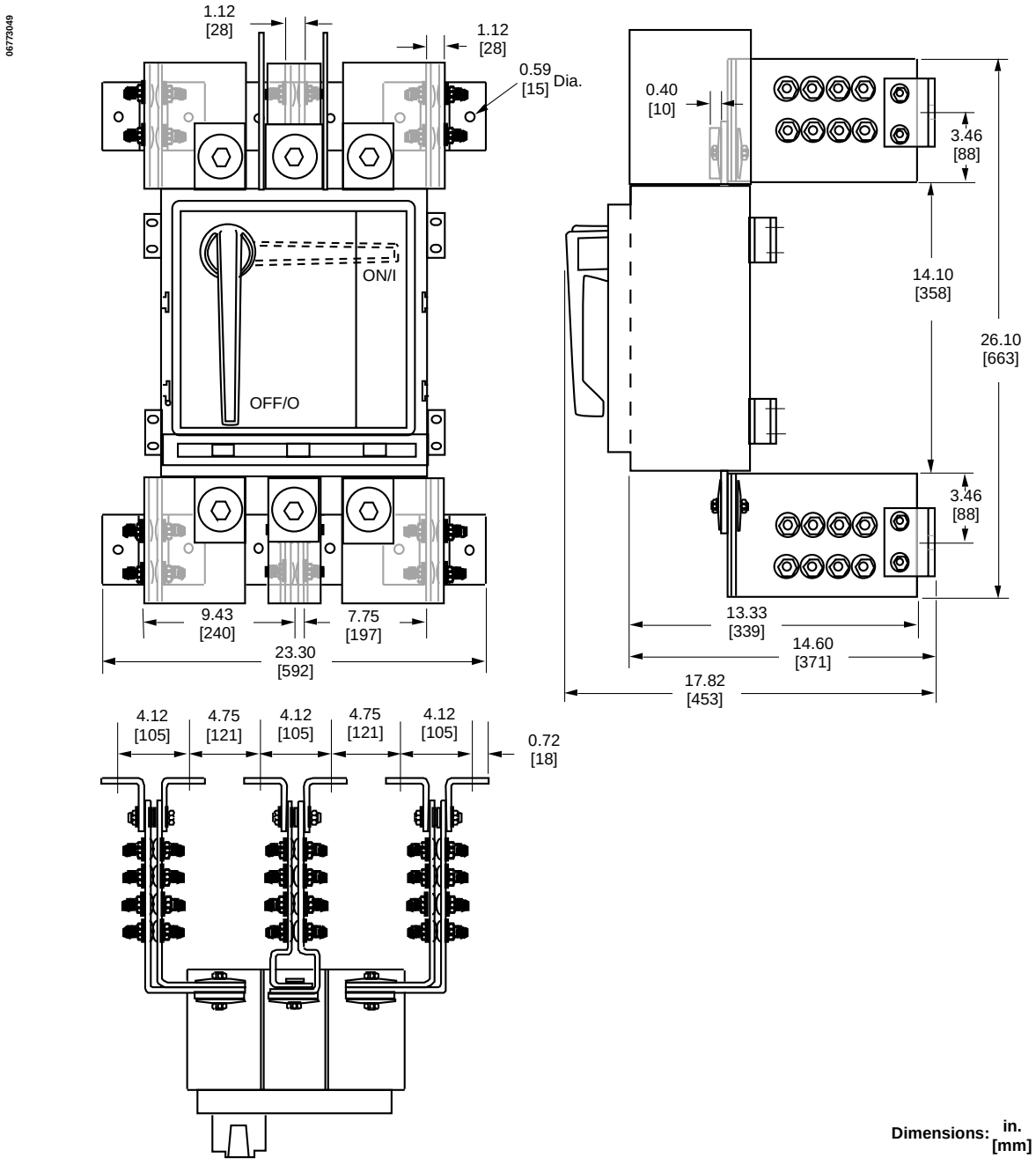

Figure 55: Circuit Breaker Mounted on Terminal Pads

TERMINAL PAD BUS (PALTB) DIMENSIONS

600–1600 A PE and 600-2000 A PX Circuit Breakers

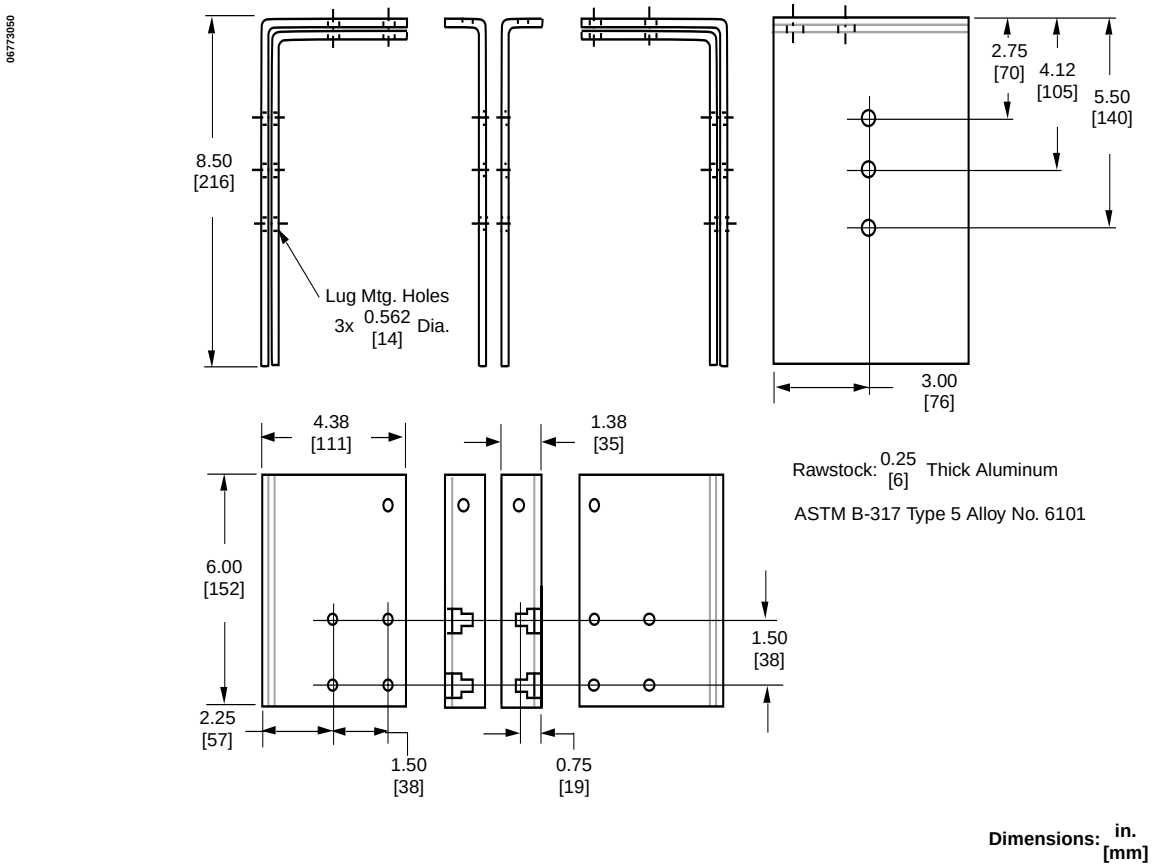

Figure 56: Terminal Pad Bus

TERMINAL PAD BUS (PALTB) DIMENSIONS

1800–2500 A PE and 2500 A PX Circuit Breakers

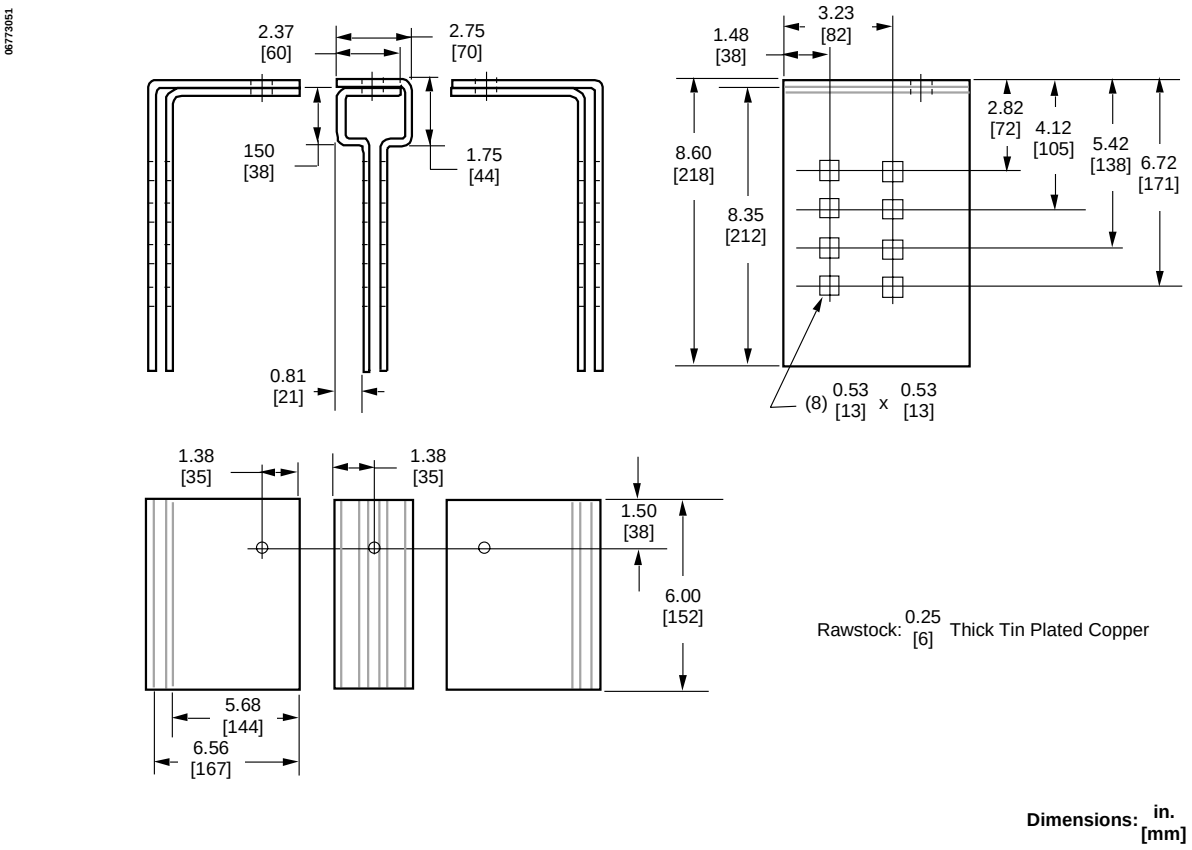

Figure 57: Terminal Pad Bus

Appendix C—Wiring Diagrams

SHUNT TRIP

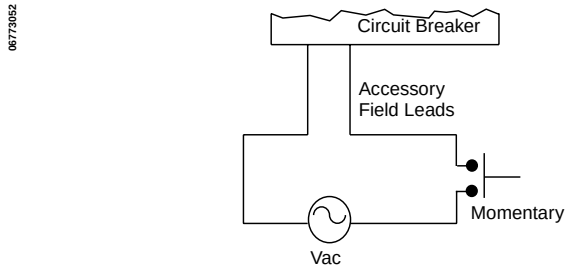

Figure 58: Shunt Trip

UNDERVOLTAGE TRIP

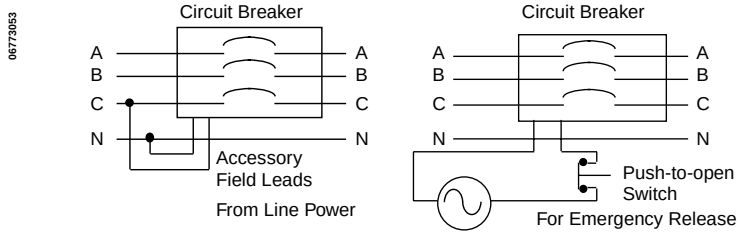

Figure 59: Undervoltage Trip

AUXILIARY SWITCH

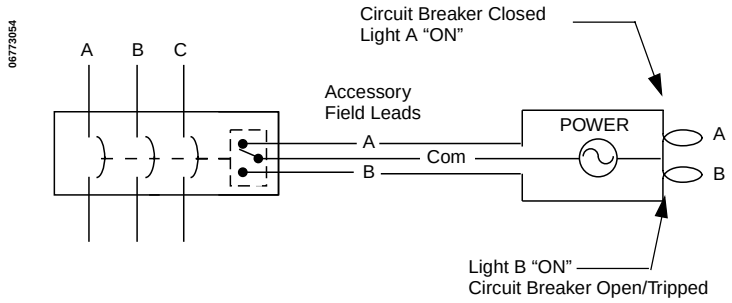

Figure 60: Auxiliary Switch

ALARM SWITCH

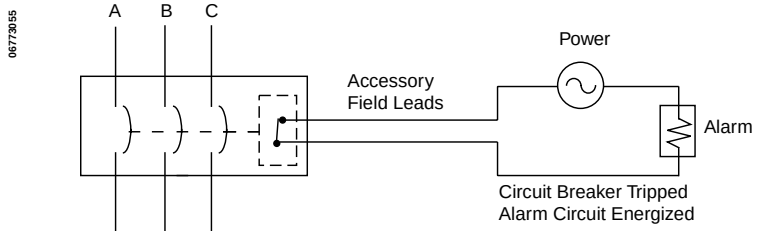

Figure 61: Alarm Switch

GROUND-FAULT SYSTEM

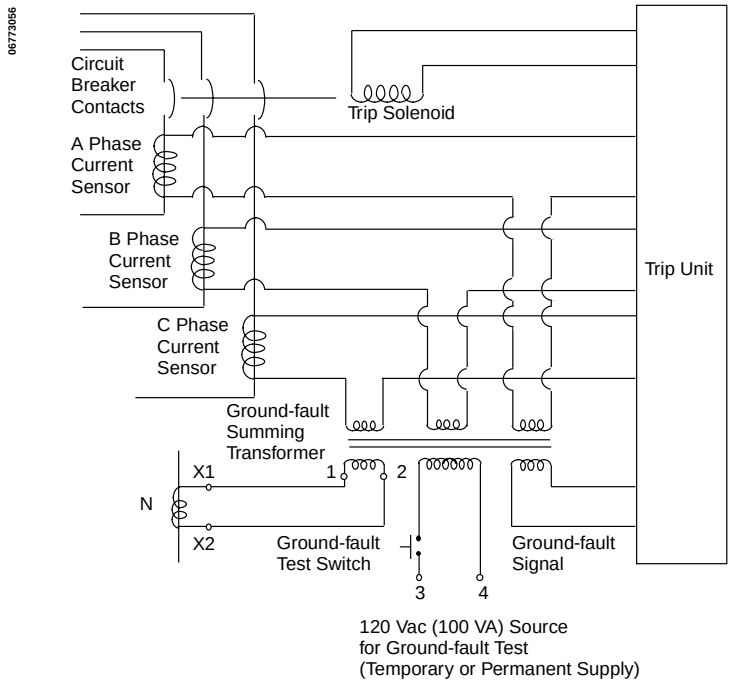

Figure 62: Ground-fault System

NOTE: Applying 120 Vac to other than designated terminals will damage trip unit. Check wiring carefully before applying power.

ZONE-SELECTIVE INTERLOCKING (PE CIRCUIT BREAKER ONLY)

CAUTION

HAZARD OF TRIP UNIT DAMAGE

Do not hi-pot test zone-select restraint input or output leads.

Failure to follow this instruction can result in equipment damage.

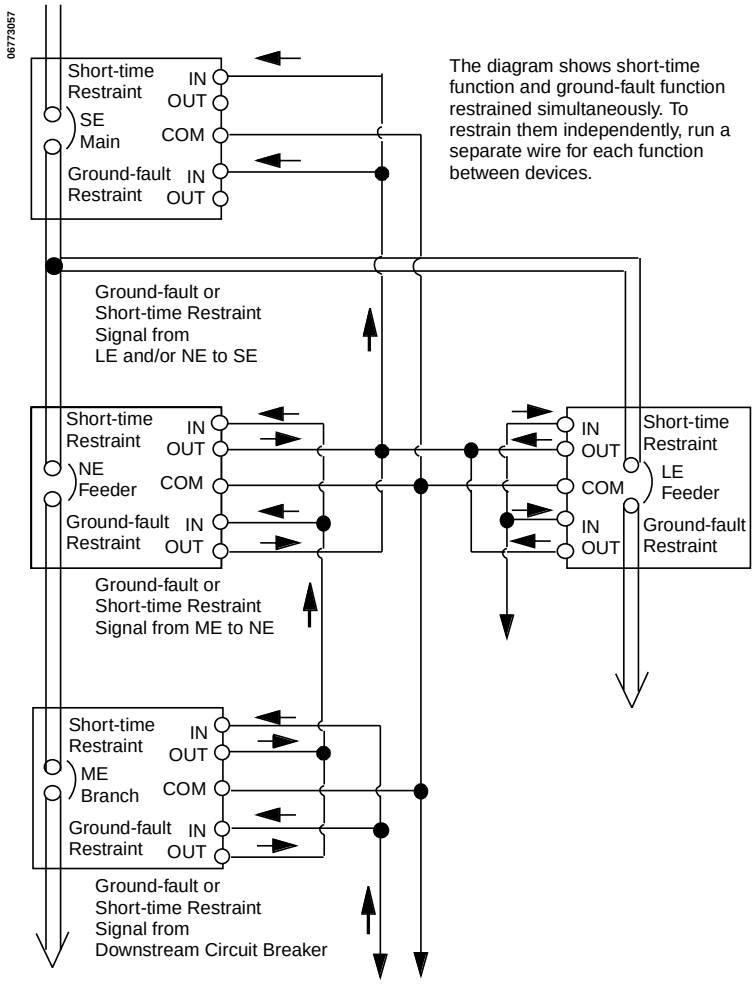

Figure 63: Zone-selective Restraint: LE, ME and NE Circuit Breakers

For maximum immunity to electrical noise:

1. Use shielded pair cable or twisted pair cable, 18–14 AWG wire (1–2.5 mm^2), approximately one turn per inch, between circuit breakers.
2. Route restraint lines away from power cable or other sources of electrical noise.
3. DO NOT exceed 1000 ft. (305 m) of restraint wires between circuit breakers without use of Restraint Interface Module (Cat. No. RIM32).

For terminal block wiring use one or two #18 AWG (1 mm^2) wires or one #14 AWG (2.5 mm^2) wire.

Torque wire binding screws to 5–10 lb-in (0.6–1.1 N•m).

NOTE: Thermal-magnetic circuit breakers with ground-fault module restrain only on ground-fault function. Restraint wiring on ground-fault module is the same as ground-fault restraint system shown above.

Use RIM32 to interface between MICROLOGIC trip unit and the ground sensor system relay.

Glossary of Terms and Acronyms

accessory (device) = an electrical or mechanical device that performs a secondary or minor function apart from overcurrent protection.

AIC (AIR) = see AIR.

AIR (ampere interrupting rating) = the highest current at rated voltage that an overcurrent protective device is intended to interrupt under specified test conditions (NEC).

alarm switch (bell alarm) = see overcurrent trip switch.

ambient temperature rating = temperature at which the continuous current rating (handle rating) of a circuit breaker is based; the temperature of the air immediately surrounding the circuit breaker which can affect the thermal (overload) tripping characteristics of thermal-magnetic circuit breakers. Electronic trip circuit breakers, however, are insensitive to normal (-20° to 50°C) ambient conditions.

ammeter/trip indicator (local current meter/trip indicator) = a module that mounts directly to the circuit breaker trip unit. The ammeter (current meter) reports rms phase and ground-fault current values as seen by the trip unit. Current values are displayed one phase at a time. The trip indicator displays whether the circuit breaker tripped due to an overload, short-circuit or ground-fault condition.

ampere rating = see continuous current rating.

auxiliary switch = a switch mechanically operated by the main device for signaling, interlocking, or other purposes.

bell alarm = see overcurrent trip switch.

branch circuit = the circuit conductor between the final overcurrent device protecting the circuit and the outlet(s).

circuit breaker = a device designed to open and close a circuit by non-automatic means and to open the circuit automatically on an overcurrent without damage to itself when properly applied within its rating.

circuit breaker frame = (1) the circuit breaker housing which contains the current carrying components, the current sensing components, and the tripping and operating mechanism. (2) that portion of an interchangeable trip molded case circuit breaker remaining when the interchangeable trip unit is removed.

coil clearing switch = a mechanically-operated switch in series with the coil of a shunt trip device which breaks the coil current when the circuit breaker opens.

continuous current rating (handle rating) = the designated rms alternating current in amperes which a device or assembly will carry continuously in free air without tripping or exceeding temperature limits.

continuous load = a load where the maximum current on the circuit is expected to continue.

CSA = Canadian Standards Association.

CT = current transformer.

current path (of a circuit breaker) = the current-carrying conductors within a circuit breaker between, and including, line and load terminations.

current rating = see continuous current rating.

current transformer (current sensor) (CT) = an instrument to measure current, encircling a conductor carrying the current to be measured or controlled.

electrical operator (motor operator) = an electrical controlling device which is used to open and close a circuit breaker or switch and reset a circuit breaker.

electronic trip circuit breaker = a circuit breaker which uses current sensors and electronic circuitry to sense, measure and respond to current levels.

frame size = the maximum continuous current which the circuit breaker frame is capable of carrying without exceeding allowable temperature rise.

frequency = the number of cycles per second for an alternating current system.

frequency rating = the range of frequencies within which a product can be applied.

ground fault = an unintentional current path, through ground, back to the source.

ground-fault delay = the length of time the circuit breaker trip unit will delay before initiating a trip signal to the circuit breaker after a ground fault has been detected.

ground-fault module = an electronic accessory used in combination with thermal-magnetic circuit breakers to provide branch circuit ground-fault protection and ground-fault indication.

ground-fault pickup = the level of ground-fault current at which the trip system begins timing.

handle rating = continuous current rating.

instantaneous pickup = the current level at which the circuit breaker will trip with no intentional time delay.

instantaneous trip = (as applied to circuit breakers) a qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker during short-circuit conditions.

integral ground-fault protection = equipment ground-fault protection on grounded neutral systems provided by components internal to the circuit breaker.

interrupting rating = the highest current at rated voltage available at the incoming terminals of the circuit breaker. When the circuit breaker can be used at more than one voltage, the interrupting rating will be shown on the circuit breaker for each voltage level. The interrupting rating of a circuit breaker must be equal to or greater than the available short-circuit current at the point at which the circuit breaker is applied to the system.

inverse time = a qualifying term indicating there is purposely introduced a delay in the tripping action of the circuit breaker, which delay decreases as the magnitude of the current increases.

I^2t IN = an inverse time delay characteristic.

I^2t OUT = a constant time delay characteristic.

let-through = an expression related to energy (measured in ampere-squared seconds) which passes through an overcurrent protective device during an interruption.

LI (dual trip device) = a combination of adjustable trip functions including long-time ampere rating, long-time delay, and instantaneous pickup.

LIG (dual with ground trip device) = a combination of adjustable trip functions including long-time ampere rating, long-time delay, instantaneous pickup, ground-fault pickup and ground-fault delay.

local current meter = ammeter/trip indicator.

long-time ampere rating = an adjustment which, in combination with the installed rating plug, establishes the continuous current rating of a full-function electronic trip circuit breaker.

long-time delay = the length of time the circuit breaker will carry a sustained overcurrent (greater than the long-time pickup) before initiating a trip signal.

long-time pickup = the current level at which the circuit breaker long-time delay function begins timing.

LS = a combination of adjustable trip functions including long-time ampere rating, long-time delay, short-time pickup, short-time delay and a defeatable instantaneous pickup.

LSG = a combination of adjustable trip functions including long-time ampere rating, long-time delay, short-time pickup, short-time delay, defeatable instantaneous pickup, ground-fault pickup and ground-fault delay.

LSIG = a combination of adjustable trip functions including long-time ampere rating, long-time delay, short-time pickup, short-time delay, defeatable instantaneous pickup, ground-fault pickup and ground-fault delay.

MICROLOGIC = the Square D family of electronic trip systems available on molded case circuit breakers, insulated case circuit breakers and low-voltage power circuit breakers.

molded case circuit breaker = a circuit breaker which is assembled as an integral unit in a supportive and enclosed housing of insulating material.

molded case switch = a device designed to open and close a circuit by non-automatic means that is not intended to provide overcurrent protection.

neutral current transformer = a current transformer which encircles the neutral conductor; required on circuit breakers with ground-fault protection, when applied on a grounded system.

OTS = overcurrent trip switch (alarm switch, bell alarm).

overcurrent = any current in excess of the rated continuous current of equipment or the ampacity of a conductor.

overcurrent trip element = a device which detects an overcurrent and transmits the energy necessary to open the circuit automatically.

overcurrent trip switch = a mechanically-operated switch which indicates when a circuit breaker has tripped due to overcurrent conditions.

overload delay = the length of time the circuit breaker will carry a sustained low-level overcurrent before initiating a trip signal.

peak current sensing = a method of determining the current by means of detecting the current peaks.

peak let-through = the maximum peak current in a circuit during an overcurrent condition.

push-to-trip button = a button for manually tripping the circuit breaker.

rating plug = a component which plugs into the full-function electronic trip unit, establishing the maximum continuous current rating of the circuit breaker.

residual ground-fault sensing = a means of providing equipment ground-fault protection utilizing sensors on each individual phase.

restraint interface module (RIM) = a component which allows zone-selective interlocking communication between Square D full-function electronic trip systems, add-on ground-fault modules and zero-sequence ground-fault relays.

RIM = restraint interface module.

rms = root-mean-square.

rms current sensing = a method of determining the true rms current of sinusoidal and non-sinusoidal waveforms.

sensor ampere rating = the size of the current transformer for rated output.

short-circuit delay = the length of time the circuit breaker will carry a short circuit (current greater than the short-circuit pickup) before initiating a trip signal.

short-circuit pickup = the current level at which the circuit breaker short-circuit delay function begins timing.

short-time delay = the length of time the circuit breaker will carry a short circuit (current greater than the short-time pickup) before initiating a trip signal.

short-time pickup = the current level at which the circuit breaker short-time delay function begins timing.

shunt trip = an accessory which trips the circuit breaker from a remote location using an external voltage source.

STD = short-time delay.

terminal block = the connections for control wiring.

thermal-magnetic circuit breaker = a general purpose term for circuit breakers that use bimetals and electromagnetic assemblies to provide both thermal and magnetic overcurrent protection.

trip button = a button used to manually trip the circuit breaker.

trip indicator = a module that mounts directly to the circuit breaker trip unit that displays whether the circuit breaker tripped due to an overload, a short-circuit or a ground-fault condition.

trip indicator reset = a button on the trip indicator module used to reset the trip indicator.

trip system = a system which consists of a MICROLOGIC trip unit and current transformers.

trip unit = a programmable microprocessor-based device which measures and times current flowing through the circuit breaker and initiates a trip signal when appropriate.

UL = Underwriters Laboratories Inc.

undervoltage trip (UVR) = an accessory which trips the circuit breaker automatically when the monitored circuit voltage falls below a predetermined percentage of its specified value.

UVR = undervoltage trip.

zero-sequence ground-fault sensing = a means of providing equipment ground-fault protection utilizing an external sensor (surrounding all phase and neutral conductors).

zone-selective interlocking (ZSI) = a communication capability between electronic trip systems and ground-fault relays which permits a short circuit or ground fault to be isolated and cleared by the nearest upstream device with no intentional time delay.

ZSI = zone-selective interlocking.

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