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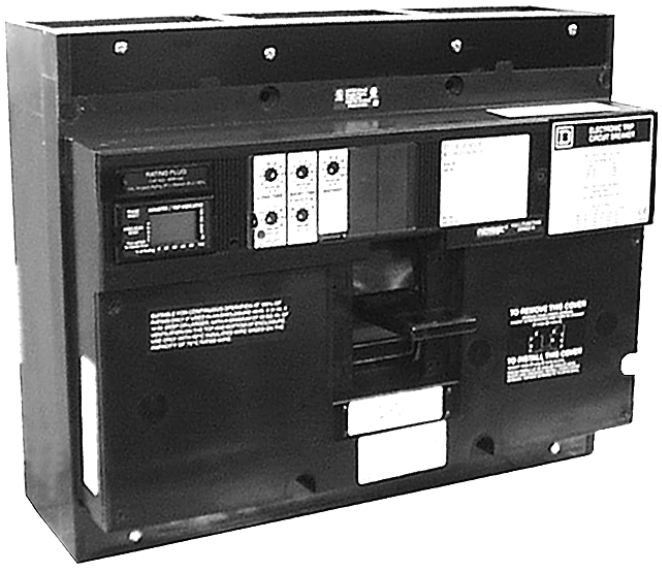
Cedar Rapids IA, USA
K279

Instruction Bulletin

NE and NX Electronic Trip Circuit Breakers with MICROLOGIC® Trip System

Series 3B

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.

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.

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

NE and NX 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. They 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.) NE and NX circuit breaker have 1200 A sensors.

FRAME SIZE

The maximum current rating a circuit breaker family can carry is called the frame size. All NE and NX circuit breakers have a 1200 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.

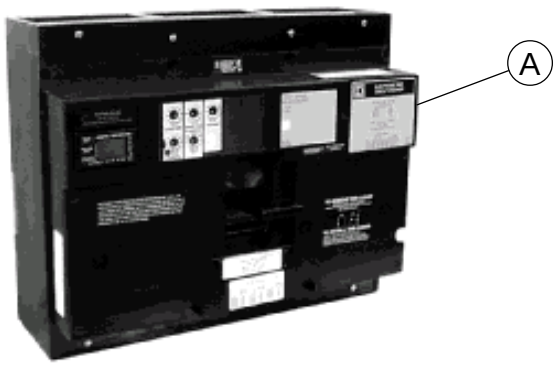


Figure 1: NE/NX Circuit Breaker

CIRCUIT BREAKER RATED 100%

All NE circuit breakers 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 enclosure size (Table 1) and conductor specifications. This marking does not prohibit using these circuit breakers in applications requiring only 80% continuous loading.

Table 1: Enclosure Size for 100% Rating

48 x 31 x 14 in. (1219 x 797 x 356 mm) deep

RECEIVING INSPECTION

⚠ DANGER

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

Circuit breaker weighs approximately 60 lbs. (27 kg). Lift circuit breaker by the case using proper equipment.

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

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE DUE TO OVERHEATING

Plug-on jaws on I-LINE® circuit breakers are factory set. Do not adjust. Do not remove joint compound from plug-on jaws.

Failure to follow this instruction can result in injury or equipment damage.

Inspect the circuit breaker visually for signs of damage when circuit breaker is received and again before placing circuit breaker 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 the circuit breaker case voids all warranties and the UL Listing. No serviceable parts are located inside the molded case.

Section 2—Circuit Breaker Installation and Removal

⚠ 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.

NE and NX circuit breakers can be individually mounted using either bus or cable connections, or group mounted in I-LINE® equipment. If any hardware is damaged during installation, see Appendix A for part information.

INDIVIDUALLY-MOUNTED CIRCUIT BREAKER

Installation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Mount circuit breaker only in equipment marked to accept it. Make sure all enclosure closing hardware is properly installed.
- Circuit breaker weighs 60 lbs. (27 kg) and must be supported during installation.

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

1. Disconnect all power supplying this equipment before working on or inside equipment.
2. Turn off circuit breaker or trip circuit breaker by pushing push-to-trip button (A).

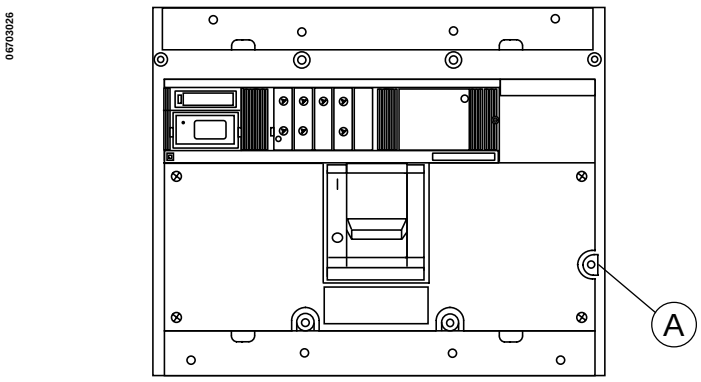


Figure 2: Individually-mounted Circuit Breaker

NEF, NXF, NEP or NXP Circuit Breakers Only

If pan-mounting NEF, NXF, NEP or NXP circuit breakers, remove factory-installed screws and inserts from those holes where mounting screws are to be used.

If not pan-mounting, clearance holes must be drilled in pan to allow clearance for P-screw heads (A).

1. Remove factory-installed screw (A, Fig. 3) from circuit breaker hole where mounting screw is to be used.
2. Remove hex nuts (B) from front of circuit breaker.

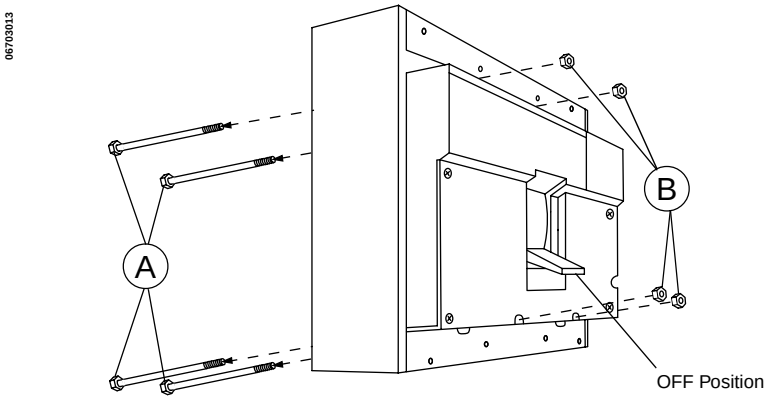


Figure 3: Removing Factory-installed Screws

All Circuit Breakers

⚠DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Mount circuit breaker as shown in these instructions to prevent cover separation under short-circuit conditions. All four mounting screw holes must be used.

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

1. Install circuit breaker in accordance with enclosure instructions using mounting screws (A, Fig. 4), provided. All four mounting holes must have mounting screws installed. See Appendix B for mounting hole spacing.

NOTE: If an NAL or NCL (lug) circuit breaker is converted to bus installation, all four mounting screw holes must still be used. Mount circuit breaker to pan using all four supplied mounting screws, or install P-screws into any mounting screw holes not used. Order P-screw kit NPSCREWKIT, available at no charge from Square D.

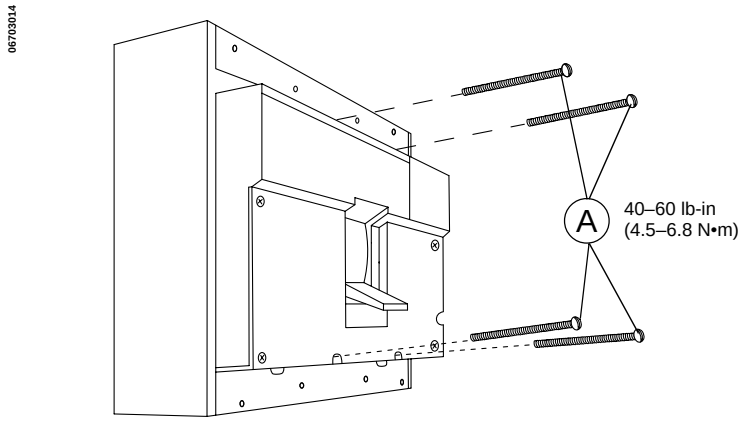


Figure 4: Installing Bus-connected Circuit Breaker

2. Install circuit breaker connections:

   A. Bus-connected circuit breaker

      Mount bus to circuit breaker terminals in accordance with enclosure instructions. Refer to Appendix B for dimensional information

   B. Cable-connected circuit breaker

      1. Remove lug covers (A, Fig. 5) by loosening the four lug cover screws on each lug cover and lifting off cover. Do not remove screws.

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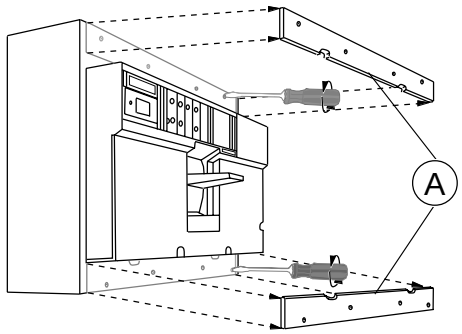

Figure 5: Installing Cable-connected Circuit Breaker

      2. Square 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.

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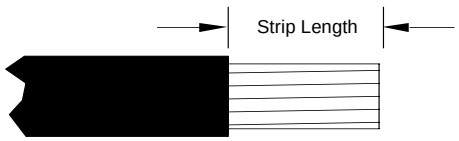

Figure 6: Preparing conductors

Table 2: Circuit Breaker Lug Information

Catalog Number	Conductors			Screw Torque	
	No.	Size[1]	Strip Length[2] in. (mm)	Wire Binding lb-in (N•m)	Lug Mounting lb-in (N•m)
AL1200NE6	4	#3/0 AWG–600 kcmil (95–300 mm²)	1-1/8 (29)	330 (37)	225 (25)
CU1200NE6	4	#3/0 AWG–600 kcmil (95–300 mm²) Cu	1-1/8 (29)	330 (37)	225 (25)
VC1200NE5	4	#2/0 AWG–500 kcmil (70–240 mm²)	2-1/16 (52)	----	600 (68)
CVC1200NE5	4	#2/0 AWG–500 kcmil (70–240 mm²) Cu	2-1/16 (52)	----	600 (68)
VC1200NE7	4	500–750 kcmil (240–400 mm²) Al	2-1/4 (57)	----	600 (68)
	4	500 kcmil (240 mm²) Cu	2-1/4 (57)	----	600 (68)
CVC1200NE7	4	500–750 kcmil Cu (240–400 mm²)	2-1/4 (57)	----	600 (68)

[1] Unless otherwise specified, conductor sizes apply to both aluminum and copper conductors.
[2] Conductors must be cut square for secure termination.

⚠ CAUTION

HAZARD OF FALSE TORQUE INDICATION FROM CONDUCTOR/SCREW INTERFERENCE

Do not allow conductor stranding to interfere with threads of wire binding screw.

Failure to follow this instruction can result in injury or equipment damage.

3. Insert stripped conductor into lug:

   A. Mechanical lugs

   Torque wire binding screws as specified on circuit breaker faceplate or Table 2. Complete all connections.

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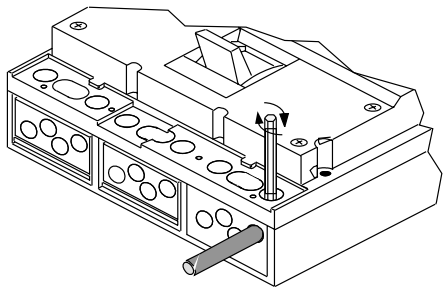

Figure 7: Torquing Wire Binding Screw

   B. Compression lugs

   Insert stripped conductor into lug and crimp according to lug kit instructions. Install compression lug into circuit breaker as specified in lug kit instructions.

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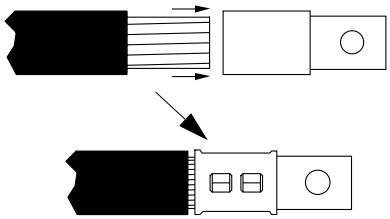

Figure 8: Crimping Compression Lugs

4. Replace circuit breaker lug covers (A, Fig. 9). Torque the four lug cover screws to 10 lb-in (1 N•m).

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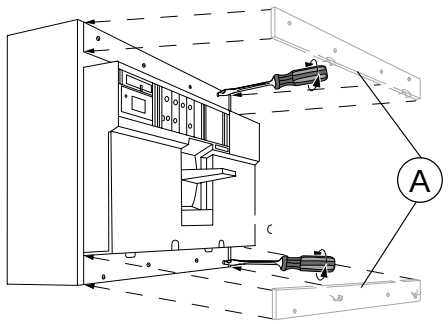

Figure 9: Replacing Lug Covers

Cable Restraint—Installations Rated 50 kA and Above

⚠ CAUTION

HAZARD OF CONDUCTOR MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain circuit breaker conductors in installations where available fault current exceeds 50 kA and distance from end of circuit breaker to enclosure exceeds 8.5 in. (216 mm).

Failure to follow this instruction can result in injury or equipment damage.

Restrain circuit breaker conductors in installations where available fault current exceeds 50 kA and distance from end of circuit breaker to enclosure (A, Fig. 10) exceeds 8.5 in. (216 mm).

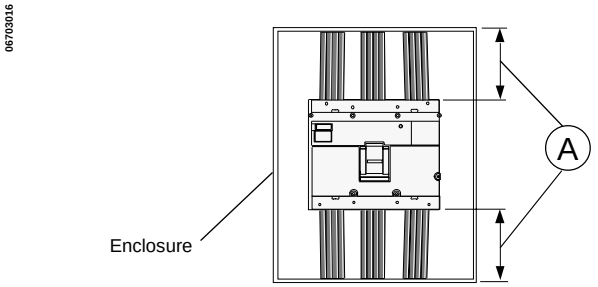

Figure 10: Installations Needing Cable Restraint

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

1. Begin wrapping conductors (A, Fig. 11) 8.5 in. (216 mm) above circuit breaker. Wrap conductors four times as shown, leaving 3 feet (1 m) of excess rope at the first end (B). Pull rope (C) taut.

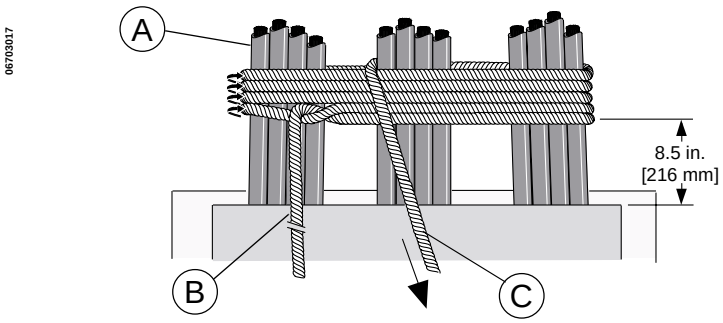

Figure 11: Begin Wrapping Conductors

2. Wrap rope several times until space between conductors (A, Fig. 12) is completely filled. Weave final rope loop underneath previous loop (B). Bring rope through right-hand space (C). Pull rope taut.

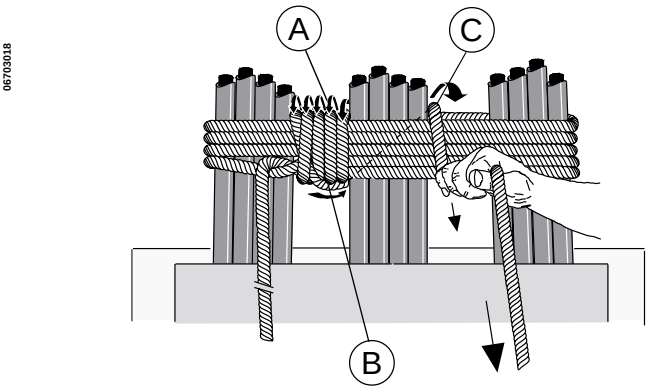

Figure 12: Wrap Conductors

3. Wrap rope several times until space between cables (A, Fig. 13) is completely filled. Weave final rope loop (B) underneath previous loop as shown. Pull rope taut.

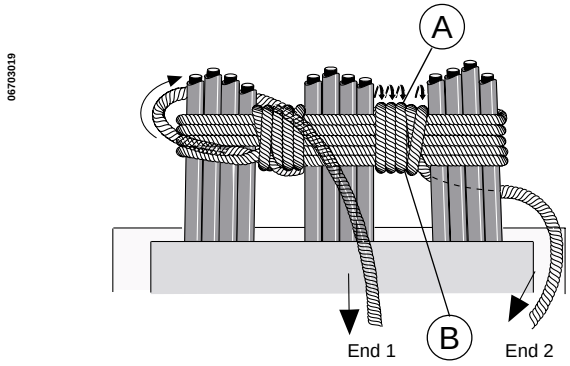

Figure 13: Finish Wrapping Conductors

4. Tie rope end 1 and end 2 together as shown. Rope must be taut. Cut off excess rope and tape ends (A, Fig. 14) to prevent fraying.
5. Recheck torques of wire binding screws after securing cables.

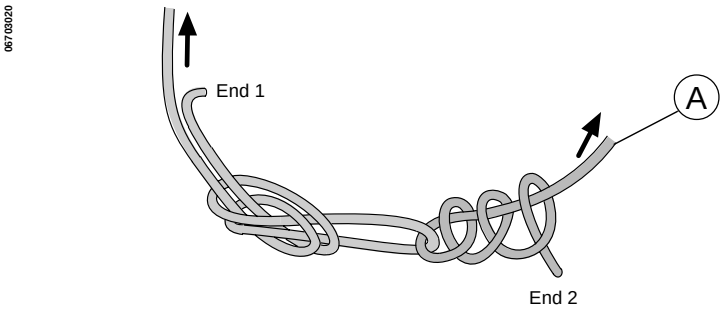

Figure 14: Tie Rope Ends

Removal

1. Disconnect circuit breaker from all power sources.
2. Turn circuit breaker off (O) or trip circuit breaker by pushing push-to-trip button (A, Fig. 15).
3. Remove trim.
4. Remove lug covers (B) from circuit breaker by loosening the four lug cover screws on each and lifting off cover. Do not remove screws.

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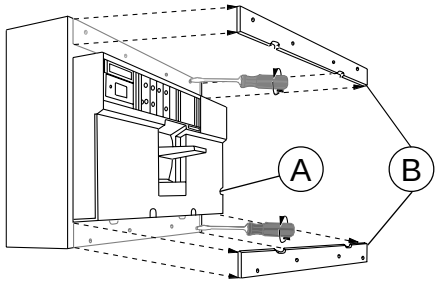

Figure 15: Removing Lug Covers

5. Remove conductors from connectors.

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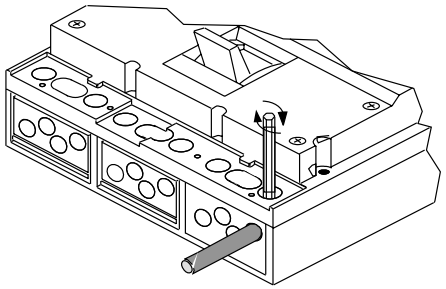

Figure 16: Removing Conductors

⚠WARNING

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

Circuit breaker weighs 60 lbs. (27 kg) and must be supported during installation.

Failure to follow this instruction can result in death, serious injury or equipment damage.

6. Remove the four mounting screws (A, Fig. 17) and remove circuit breaker from enclosure.

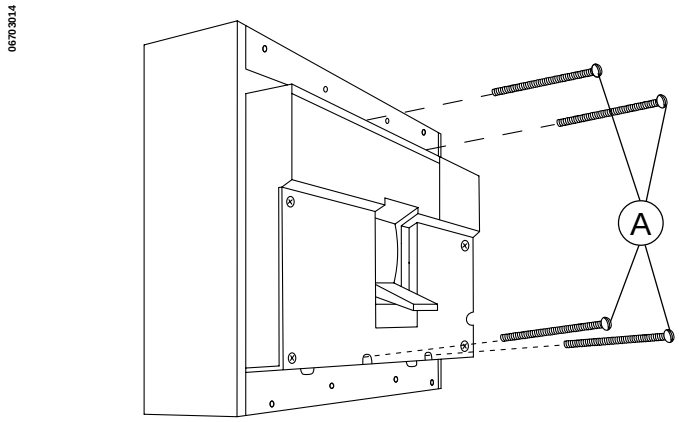

Figure 17: Removing Mounting Screws

7. Replace circuit breaker lug covers (A, Fig. 18).

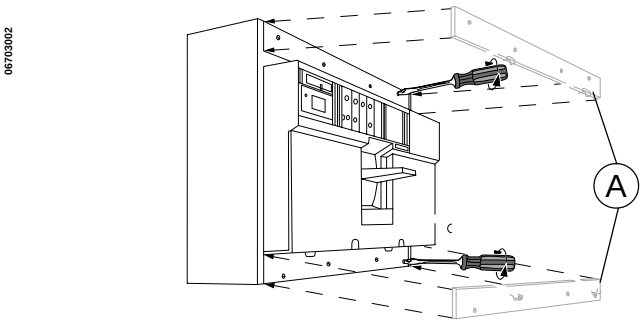

Figure 18: Replacing Lug Covers

Circuit breaker removal is now complete.

I-LINE® CIRCUIT BREAKER

Installation

⚠WARNING

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- Mount circuit breaker only in equipment marked to accept it. Make sure all enclosure closing hardware is properly installed.
- Circuit breaker weighs 60 lbs. (27 kg) and must be supported during installation.

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

CAUTION

HAZARD OF EQUIPMENT DAMAGE DUE TO OVERHEATING

Plug-on jaws on I-LINE® circuit breakers are factory set. Do not adjust. Do not remove joint compound from plug-on jaws.

Failure to follow these instructions can result in equipment damage.

NOTE: If circuit breaker is to be the main circuit breaker, attach "MAIN" label to circuit breaker cover. (The main circuit breaker is installed adjacent to the main lugs.)

1. Disconnect power to panelboard or switchboard.
2. Remove enclosure trim.
3. Turn circuit breaker off (O) or trip circuit breaker by pushing push-to-trip button (A, Fig. 19).

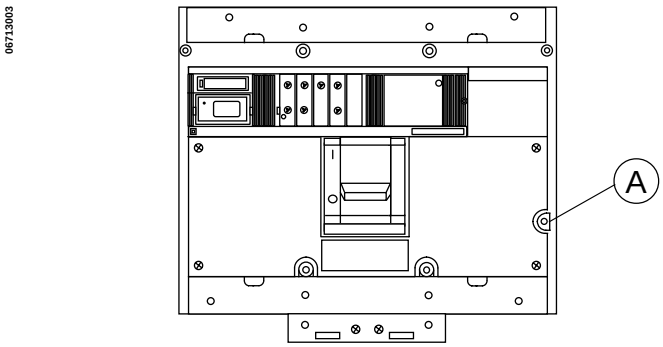

Figure 19: Tripping Circuit Breaker

4. Lift circuit breaker into place on I-LINE® pan. Fit fingers of mounting bracket (A, Fig. 20) into key slots (B) in pan. Push circuit breaker as far toward bus as possible, shifting jaw end (C) against bus insulator base until guiding bosses (D) on bottom of circuit breaker at jaw end align with alignment grooves (E) in bus insulator base.

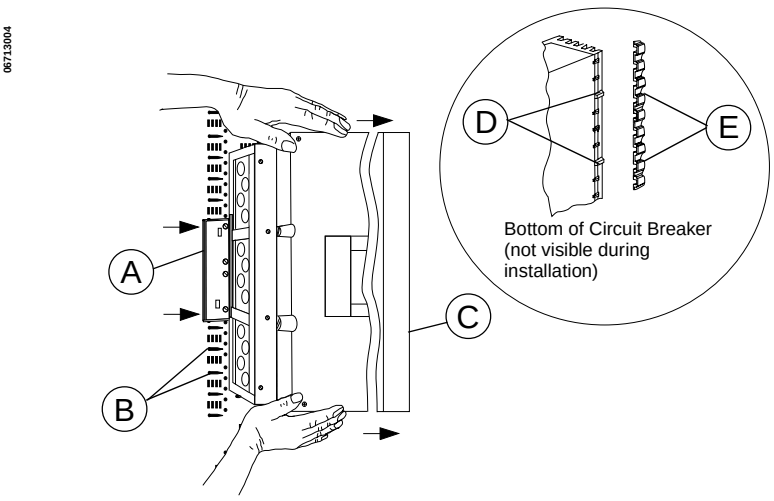

Figure 20: Placing Circuit Breaker on I-LINE® Pan

5. Rack circuit breaker into place.
   - Hold circuit breaker in position with one hand.
   - Insert screwdriver through upper slot in mounting bracket (A, Fig. 21) and into slot in pan.

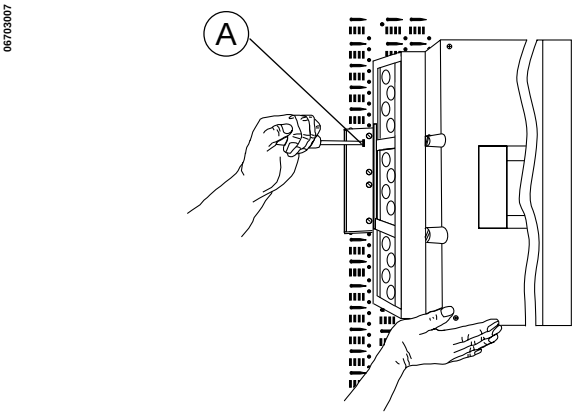

Figure 21: Inserting First Screwdriver

   - Apply pressure to screwdriver (A, Fig. 22) to hold circuit breaker securely against bus bars.
   - Insert second screwdriver through lower slot (B) in mounting bracket and into slot in pan.

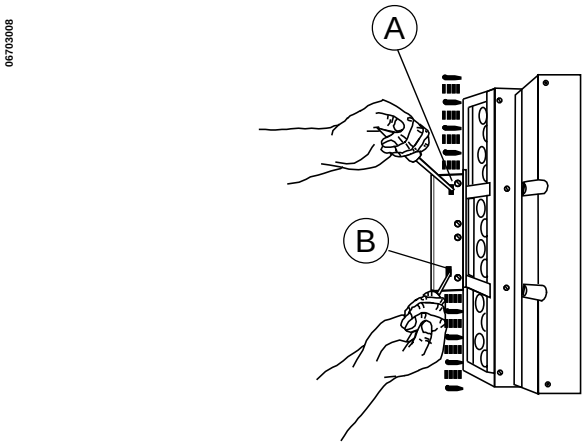

Figure 22: Inserting Second Screwdriver

- Rack circuit breaker onto bus bar by levering upper screwdriver (A, Fig. 23) toward bus bar.
- Rack circuit breaker further onto bus bar by levering lower screwdriver (B) toward bus bar.
- Continue to alternate between screwdrivers, until circuit breaker jaws completely engage bus and the four mounting bracket retaining screws (C) align with holes in pan.

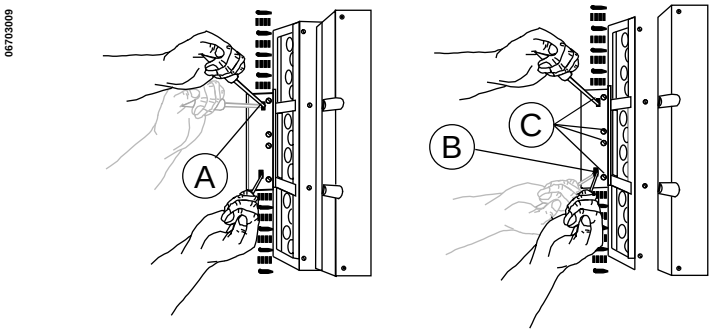

Figure 23: Racking Circuit Breaker Onto Bus

- Tighten retaining screws (A, Fig. 24) through mounting bracket and holes in pan until screw heads are firmly against bracket.

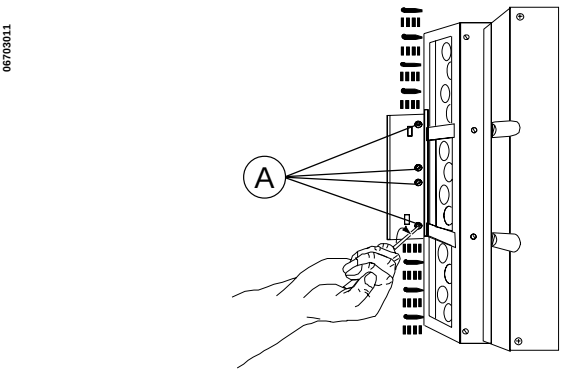

Figure 24: Tightening Retaining Screws

6. Loosen the four lug cover screws and remove lug cover (A, Fig. 25) from circuit breaker. Do not remove screws.

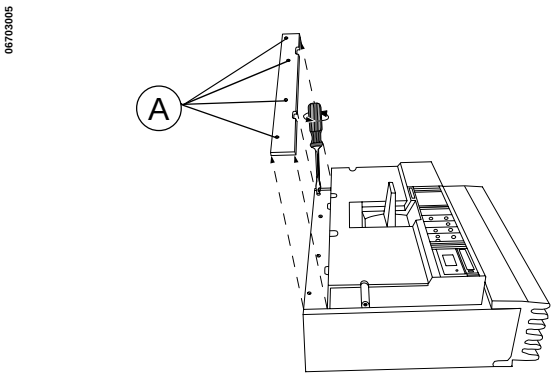

Figure 25: Removing Lug Cover

7. Square conductor ends and preform conductors to final configuration. Strip conductor ends as recommended in Table 3. Do not nick strands.

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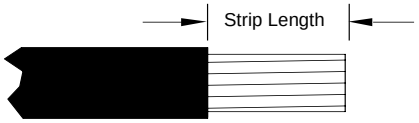

Figure 26: Stripping Conductors

8. Insert stripped conductors into lug:

   A. Mechanical lugs

   Insert stripped conductor into lug. Torque wire binding screws as specified on circuit breaker faceplate or in Table 3. Complete all connections.

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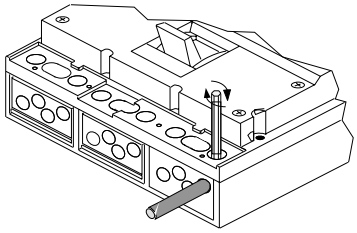

Figure 27: Inserting Conductor Into Mechanical Lugs

Table 3: Catalog Numbers

Catalog Number	Conductors			Screw Torque	
	No.	Size[1]	Strip Length[2] in. (mm)	Wire Binding lb-in (N•m)	Lug Mounting lb-in (N•m)
AL1200NE6	4	#3/0 AWG–600 kcmil (95–300 mm²)	1-1/8 (29)	330 (37)	225 (25)
CU1200NE6	4	#3/0 AWG–600 kcmil (95–300 mm²) Cu	1-1/8 (29)	330 (37)	225 (25)
VC1200NE5	4	#2/0 AWG–500 kcmil (70–240 mm²)	2-1/16 (52)	----	600 (68)
CVC1200NE5	4	#2/0 AWG–500 kcmil (70–240 mm²) Cu	2-1/16 (52)	----	600 (68)
VC1200NE7	4	500–750 kcmil (240–400 mm²) Al	2-1/4 (57)	----	600 (68)
	4	500 kcmil (240 mm²) Cu	2-1/4 (57)	----	600 (68)
CVC1200NE7	4	500–750 kcmil Cu (240–400 mm²)	2-1/4 (57)	----	600 (68)

[1] Unless otherwise specified, conductor sizes apply to both aluminum and copper conductors.
[2] Conductors must be cut square for secure termination.

B. Compression lugs

Insert stripped conductor into lug and crimp according to lug kit instructions. Install compression lug into circuit breaker as specified in lug kit instructions.

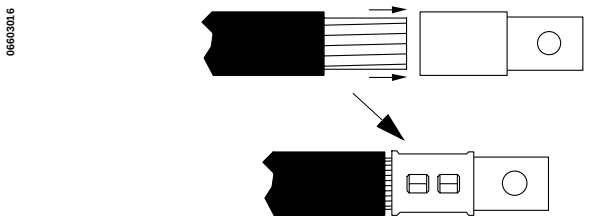

Figure 28: Crimping Compression Lugs

9. Replace lug cover (A, Fig. 29). Torque the four lug cover screws (B) to 10 lb-in (1 N•m).
10. Replace enclosure trim.

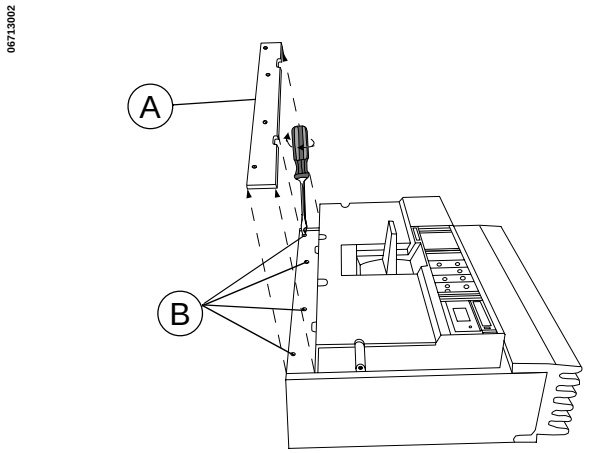

Figure 29: Replacing Lug Cover

Removal

⚠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.

1. Disconnect power to panelboard.
2. Turn circuit breaker off (O) or trip circuit breaker by pushing push-to-trip button (A, Fig. 30).
3. Remove enclosure trim.
4. Loosen the four lug cover screws and remove lug cover (B) from circuit breaker. Do not remove screws.

06713005

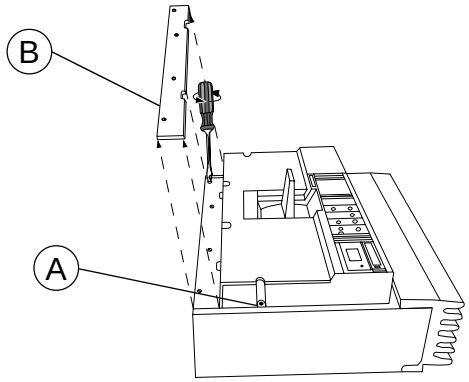

Figure 30: Removing Lug Cover

5. Remove conductor:

   A. Mechanical lugs

   Loosen wire binding screws and remove wires from connectors.

06703025

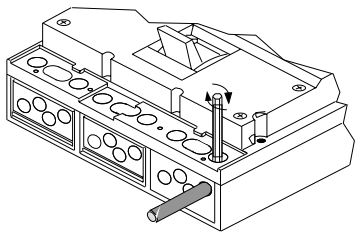

Figure 31: Removing Conductors from Mechanical Lugs

   B. Compression lugs

   Remove lugs according to lug kit instructions.

6. Replace circuit breaker lug cover (A, Fig. 32).

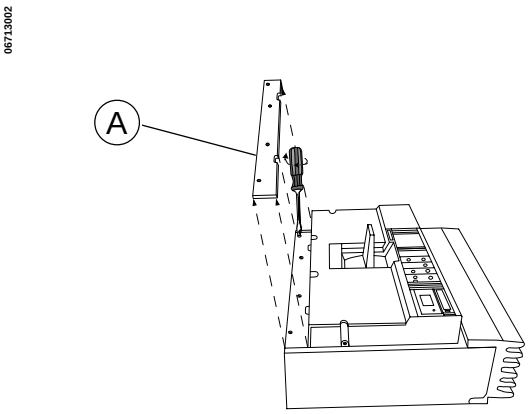

Figure 32: Replacing Lug Covers

⚠WARNING

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

Circuit breaker weighs 60 lbs. (27 kg) and must be supported during installation.

Failure to follow this instruction can result in death, serious injury or equipment damage.

7. Remove circuit breaker from I-LINE bus:
   - Loosen four retaining screws (A, Fig. 33) in mounting bracket. Be sure screws completely clear positioning holes in pan.

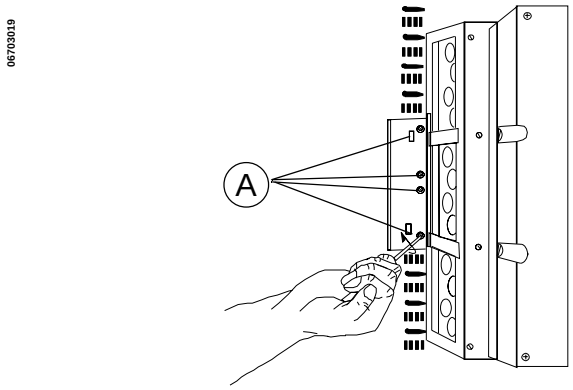

Figure 33: Loosening Restraint Screws

   - Insert screwdriver through upper slot (A, Fig. 34) in mounting bracket and into slot in pan. Insert second screwdriver through lower slot (B) in mounting bracket and into slot in pan.

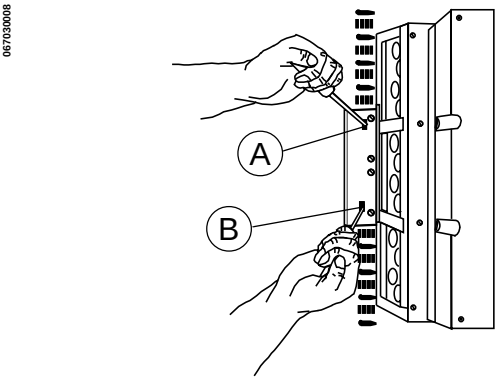

Figure 34: Inserting Screwdrivers for Racking Circuit Breaker

- Rack circuit breaker away from bus bar by levering upper screwdriver (A) away from bus driver.
- Rack circuit breaker further from bus bar by levering lower screwdriver (B) away from bus bar.
- Continue to rack circuit breaker away from bus, alternating between screwdrivers until circuit breaker jaws are free of pan.
- Lift circuit breaker out and away from bus bars.

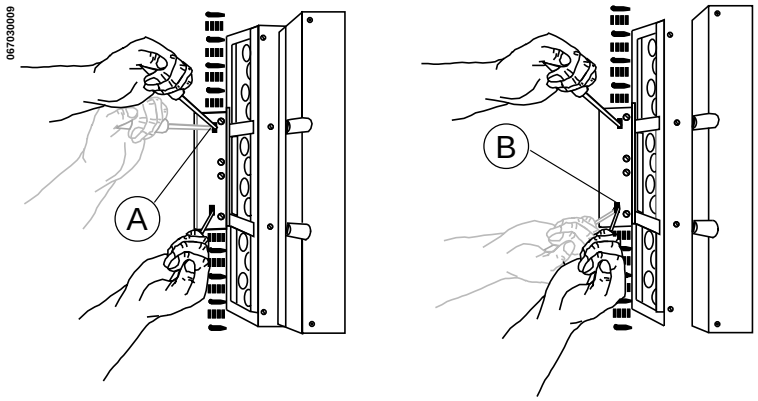

Figure 35: Racking Circuit Breaker Away From Bus

8. If not immediately replacing circuit breaker, install blanks to fill circuit breaker space in panel.
9. Replace enclosure trim.

Circuit breaker removal is now complete.

Section 3—Trip Unit Operation

NX circuit breakers are equipped with the MICROLOGIC® Standard Trip System (A). NE 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.

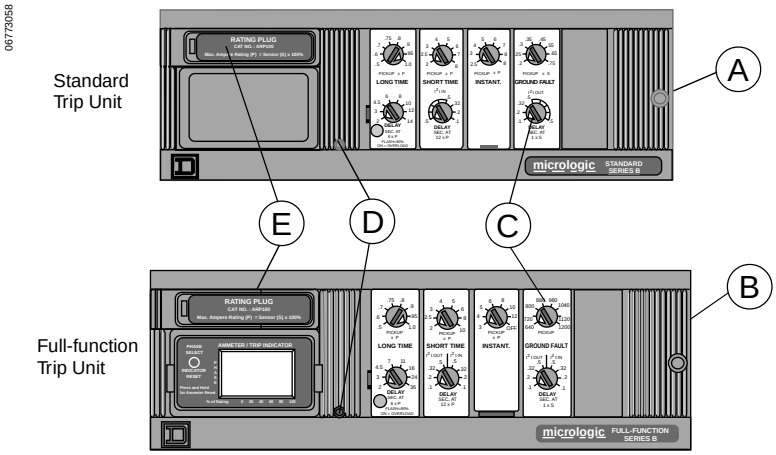

Figure 36: Standard and Full-function Trip Units

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 these instructions 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
1200	x	0.75	x	0.5	=	450

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

The ammeter/trip indicator (A) is standard on the NE circuit breaker and is available as an accessory on the NX circuit breaker. It monitors current in phases A, B and C and ground-fault current. Each value can be viewed one at a time using the phase select/indicator reset button (B). (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 ammeter/trip indicator window displays "OVERLOAD," "SHORT CIRCUIT" or "GROUND FAULT" when the circuit breaker trips. The indicator must be manually reset by pushing the phase select/indicator reset button (B).

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

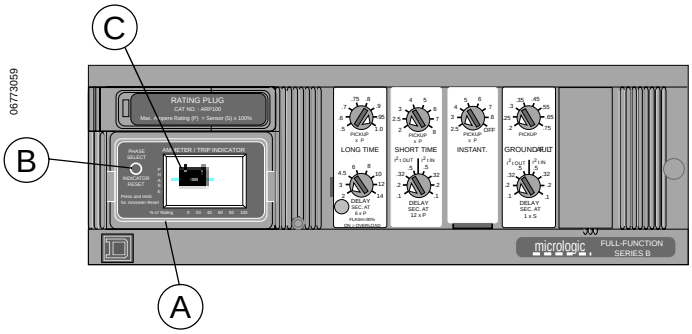

Figure 37: Ammeter/Trip Indicator

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 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.

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 the POWERLOGIC® system. This feature meets NEC Sections 700-7(d) and 700-26 for emergency systems. To provide ground-fault alarm without the 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 NE circuit breakers only and may be implemented with or without tripping the circuit breaker. See Square D Bulletin No. 0602PD9701 for full details.

NOTE: Circuit breakers with ground-fault alarms 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 38 shows the various parts of the trip curve affected by the trip settings for NX (standard trip unit) circuit breakers and for NE (full-function trip unit) circuit breakers. 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.

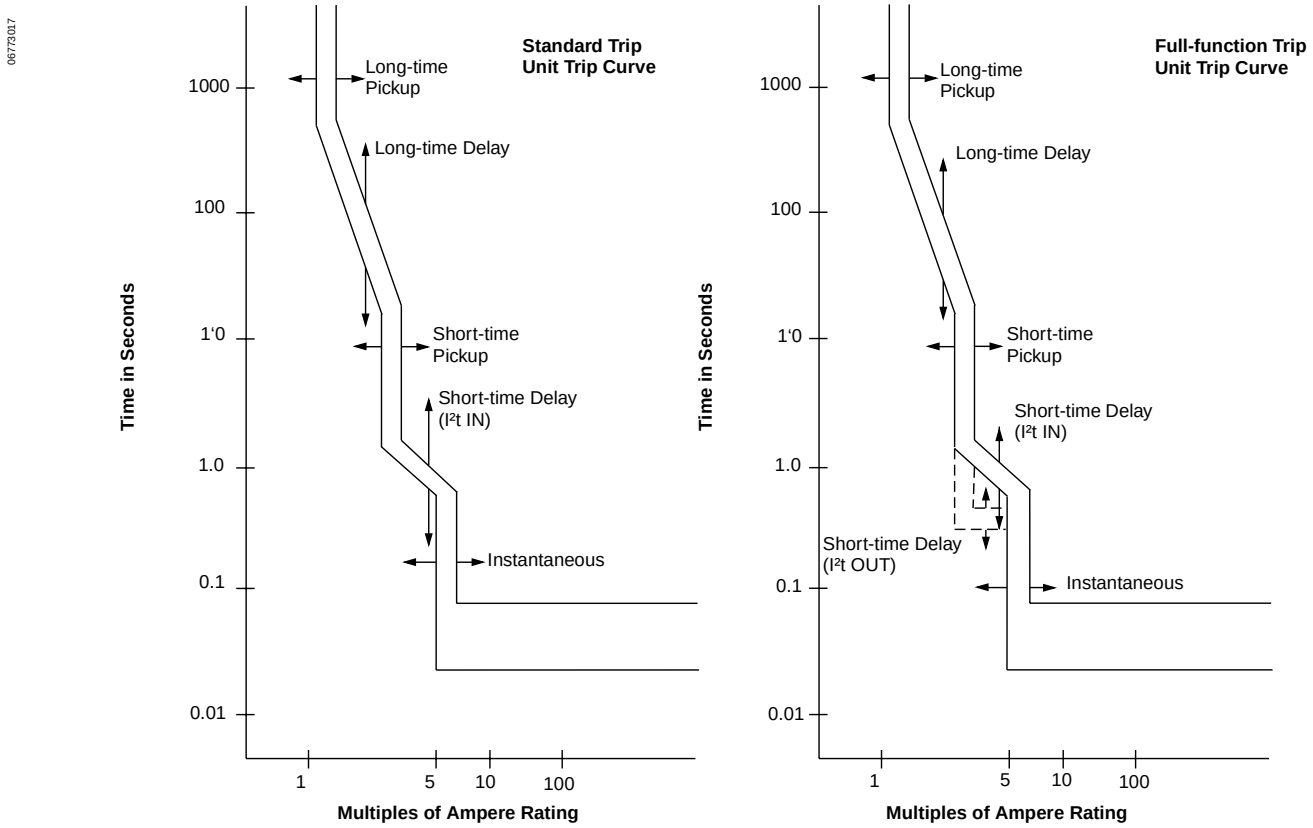

Figure 38: Trip Curves

STANDARD TRIP UNIT FUNCTIONS

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

Long-time Trip Function

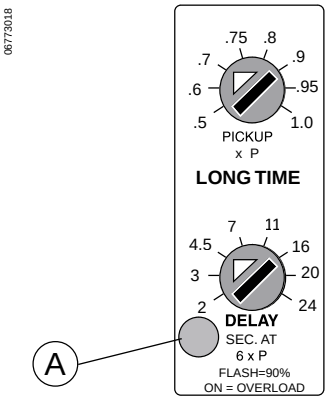

Figure 39: Long-time Trip Switches

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.

Short-time Trip Function

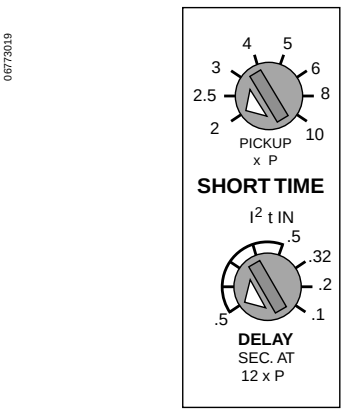

Figure 40: Short-time Trip Switches

SHORT-TIME PICKUP Switch—sets current level (based on circuit breaker ampere rating) between the LONG-TIME PICKUP level and the INSTANT. 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 INSTANT. PICKUP level. The delay can be set to four positions of I^2t ramp function (I^2t IN).

Instantaneous Trip Function

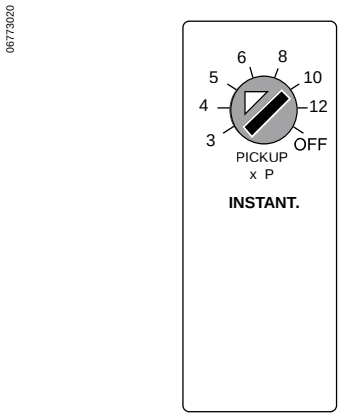

Figure 41: Instantaneous Trip Switch

INSTANT. 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 INSTANT. PICKUP is adjusted at the same or lower setting than SHORT-TIME PICKUP.

Ground-fault Trip Function

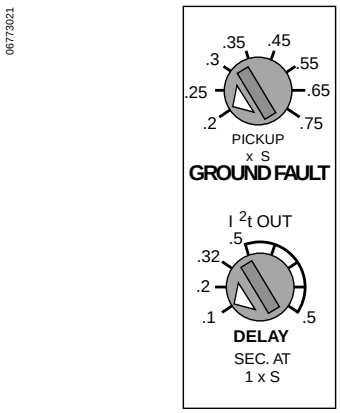

Figure 42: Ground-fault Trip Switches

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 a ground-fault current which exceeds the 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 the rating plug multiplier has no effect on ground-fault values.

FULL-FUNCTION TRIP UNIT FUNCTIONS

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

Long-time Trip Function

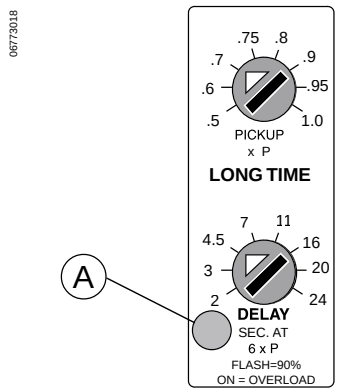

Figure 43: Long-time Trip Switches

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.

NOTE: 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.

Short-time Trip Function

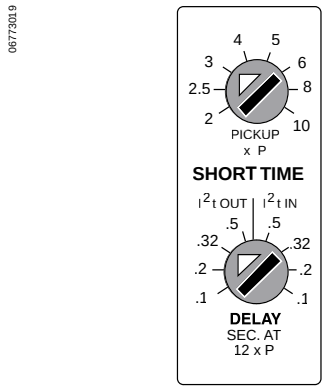

Figure 44: Short-time Trip Switches

SHORT-TIME PICKUP Switch—sets current level (based on circuit breaker ampere rating) between the LONG-TIME PICKUP level and the INSTANT. 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 INSTANT. 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).

Instantaneous Trip Function

⚠DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

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.

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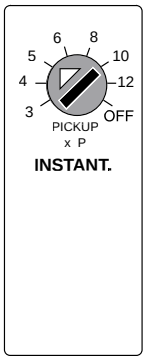

Figure 45: Instantaneous Trip Switch

INSTANT. 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 INSTANT. PICKUP is adjusted at the same or lower setting than the SHORT-TIME PICKUP.

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

Ground-fault Trip Function

06773021

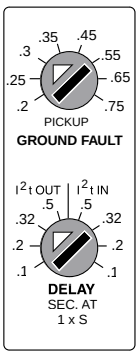

Figure 46: Ground-fault Trip Function

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 I²t ramp function (I²t IN) or four positions of fixed time delays (I²t OUT).

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

Ground-fault Alarm Function

06773022

Figure 47: Ground-fault Alarm switch

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

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 of this manual.

NOTE: Turn circuit breaker OFF before adjusting switches.

1. Remove clear plastic cover by placing small straight-blade screwdriver in slot (A, Fig.48) in cover and exerting pressure upward and outward.

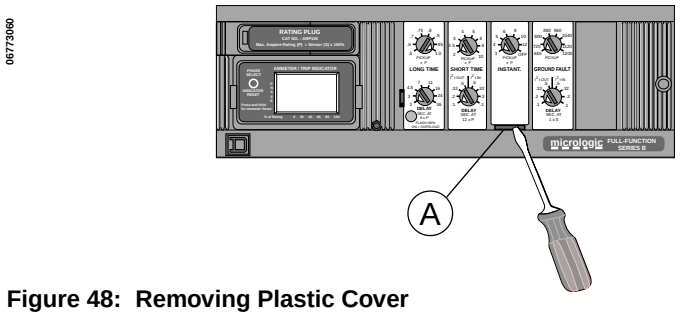

Figure 48: Removing Plastic Cover

2. Set appropriate rotary switches (A, Fig. 49) to desired level using small straight-blade screwdriver.

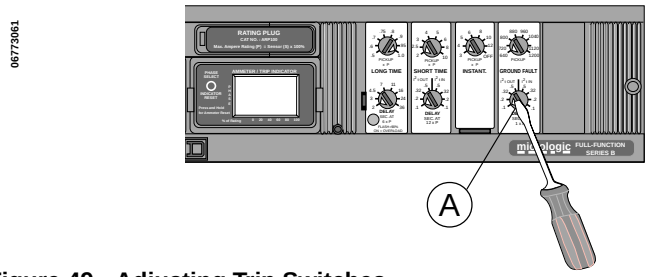

Figure 49: Adjusting Trip Switches

3. Replace clear plastic cover. DO NOT seal trip unit cover at this time.

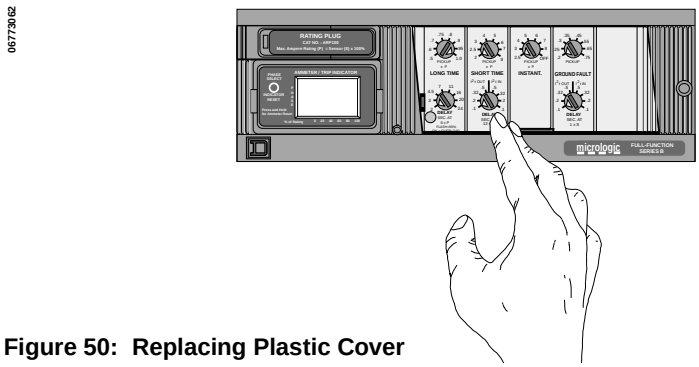

Figure 50: Replacing Plastic Cover

CONTROL WIRING

Terminal Location

⚠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.

⚠CAUTION

HAZARD OF EQUIPMENT DAMAGE FROM OVERVOLTAGE

Do not hi-pot test control wiring.

Failure to follow this instruction can result in injury or equipment damage.

Control wiring is connected to terminals located under the circuit breaker access cover. If any control wiring is necessary or accessories are installed, remove circuit breaker access cover:

1. Disconnect all power to circuit breaker.
2. Turn circuit breaker off (O) or trip circuit breaker by pushing push-to-trip button (A, Fig. 51).

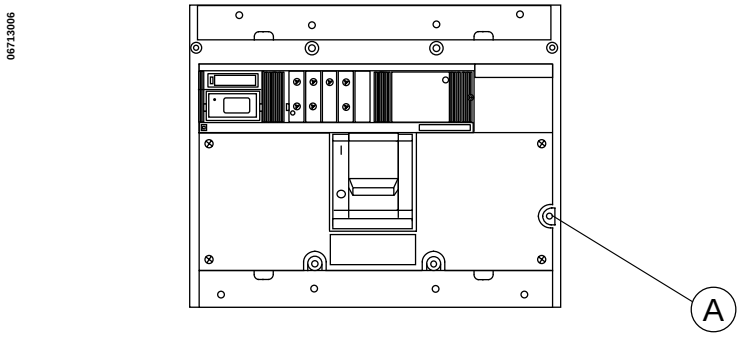

Figure 51: Tripping Circuit Breaker

3. Remove OFF end lug cover (A, Fig. 52) by loosening the four lug cover screws (B) on each lug cover and lifting off cover. Do not remove screws.

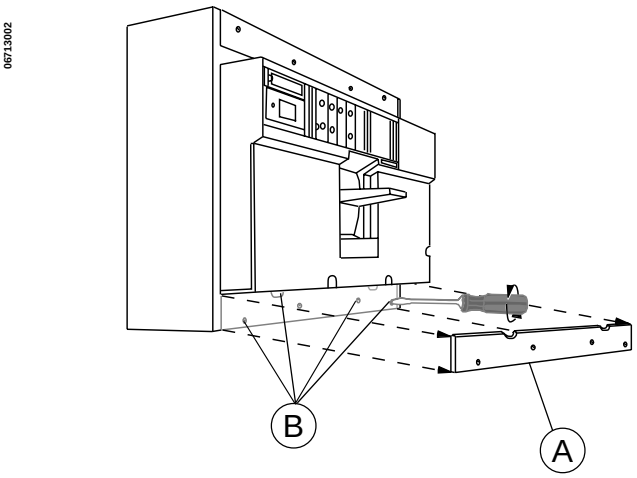

Figure 52: Removing Lug Cover

Circuit Breaker Accessories

4. Remove access cover.

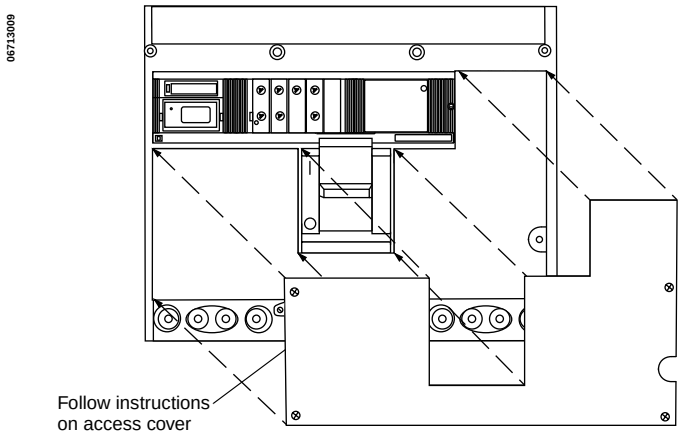

Figure 53: Removing Access Cover

5. Lift the "DANGER" tag (A, Fig. 54) to expose terminal block. Underside of tag displays terminal block wiring information.

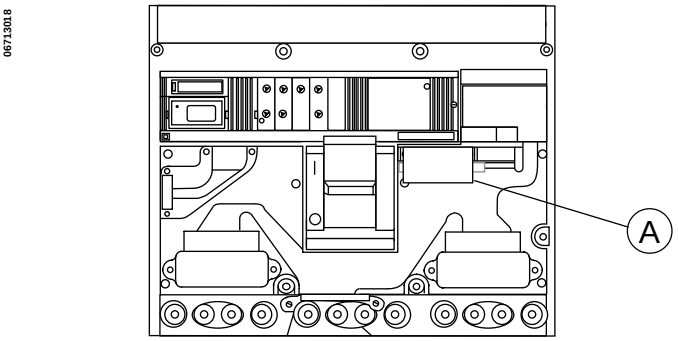

Figure 54: Lifting the "DANGER" Tag

Circuit breaker accessories are available either factory installed or field installable. Wire field-installable accessories according to instructions supplied with them. Wire factory-installed accessories as described below.

Accessories are installed in the circuit breaker accessory pockets (A, Fig. 55) located under circuit breaker access cover. Connect accessory control wires to accessory terminals. Wire according to wiring diagrams in Appendix C.

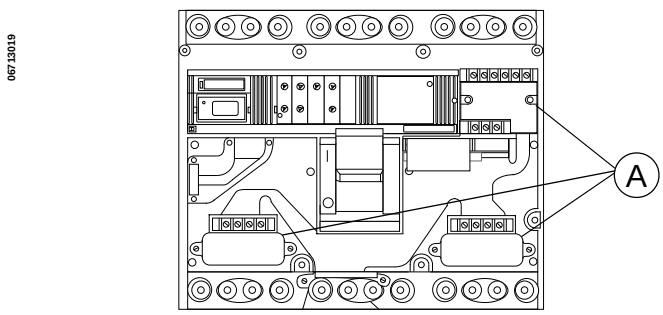

Figure 55: Circuit Breaker Accessory Pockets

Ground-fault Protection or 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.	NX Terminal Name	NE 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		ST Restraint OUT
7	Reserved	GF Restraint IN or GF Alarm
8		GF Restraint OUT or GF Alarm
9	Reserved	Restraint COMMON
10		CIM3F—RED
11	Reserved	CIM3F—BLACK
12		Reserved
13	Reserved	CIM3F—BLUE
14		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 wires or one #14 AWG 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 transformer (CT). See Appendix A for appropriate neutral CTs and Appendix B for CT dimensions and clearance requirements. 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 MICROLOGIC Communications Adapter, Cat. No. CIM3F. Install communications adapter per the installation instructions which come with 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 wire.
3. Connect ground-fault test power by connecting a 120 Vac power source to terminals 3 and 4 of the terminal block.

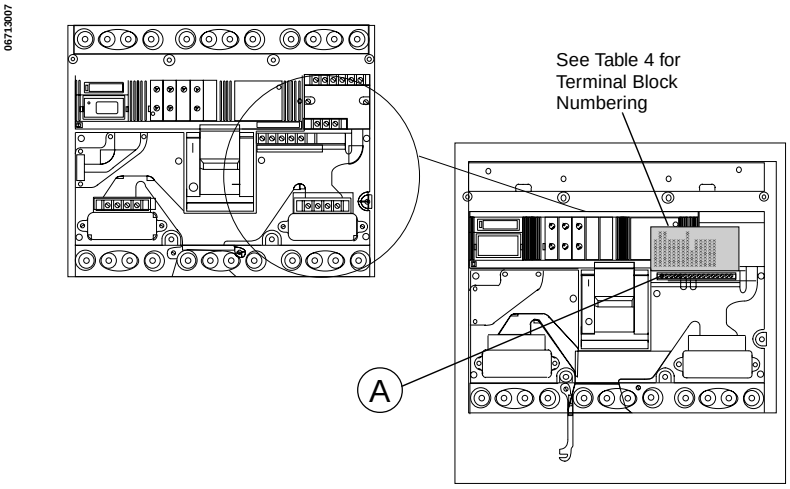

Figure 56: Terminal Block

POWERLOGIC® System (NE Circuit Breaker Only)

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

Zone-selective Interlocking (NE 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.

Table 5: ZSI Combinations (Where All Inputs Are Same Column)

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	R	R
Merlin Gerin STR58 Trip Units	15	R	R	R	15	R
Merlin Gerin STR53 Trip Units	15	R	R	R	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.

Allowable ZSI combinations are shown in Table 5. (Series numbers for current design circuit breakers end in B, for example, NE Series 3B.) 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.

To activate short-time zone-selective interlocking:

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

Table 6: Terminal Block Numbering

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

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

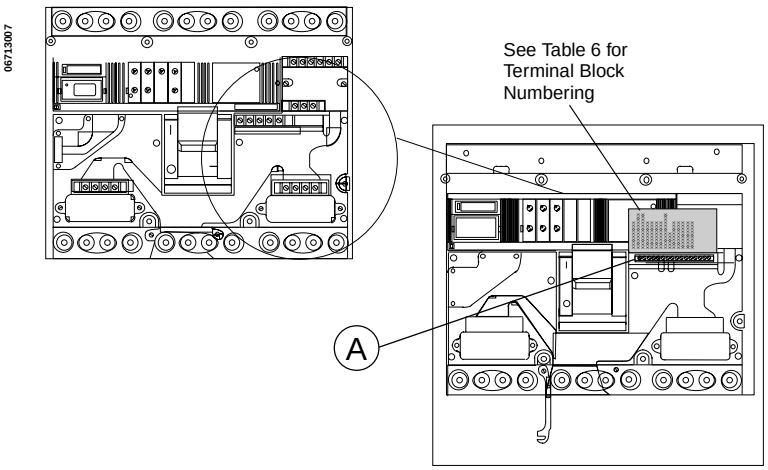

Figure 57: Terminal Block Jumpers

Route Control Wiring

1. Route wires out of circuit breaker:
   - Rotate strain relief bracket (A. Fig. 58) away from wire exit by loosening bracket screw and pivoting bracket clockwise 90°.
   - Form wires into wire channel (B). Route wires over top of lug screw access opening (C).
   - Reposition strain relief bracket by pivoting it back into place and retightening bracket screw.
2. Fold "DANGER" tag (D) down over terminal block.

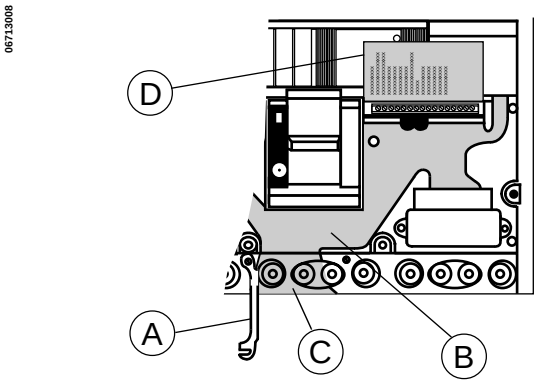

Figure 58: Routing Control Wires

3. Replace circuit breaker access cover.

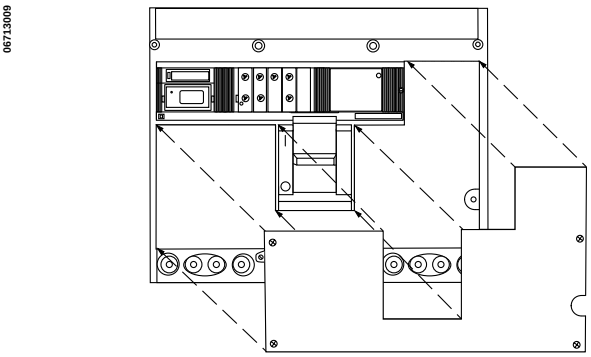

Figure 59: Replacing Access Cover

4. Replace circuit breaker lug cover.

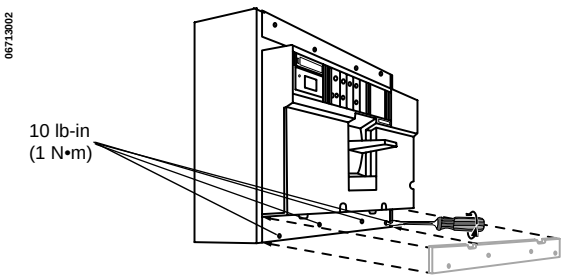

Figure 60: Replacing Lug Cover

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. With a small, blunt instrument, depress ground-fault push-to-test button (A) on front of circuit breaker.

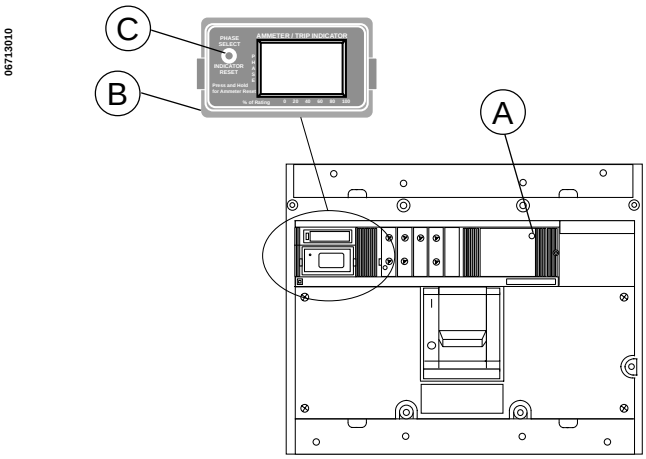

Figure 61: Testing Ground-fault Feature

A. Circuit breakers with integral ground-fault protection will trip in less than a second and ammeter/trip indicator (B), if installed, will read “GROUND FAULT."

After circuit breaker trips:

1. Reset circuit breaker by pushing handle toward off (O) end, through off position, to reset position.

2. Reset ammeter/trip indicator (B), if installed, 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 POWERLOGIC system will register a ground-fault alarm.

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

For detailed instructions on testing the integral ground-fault protection 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 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, access cover, lug cover, and any phase barriers needed for panelboard or switchboard applications are in place.

Circuit breaker installation is now complete.

SEAL TRIP UNIT

After circuit breaker is energized and 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.

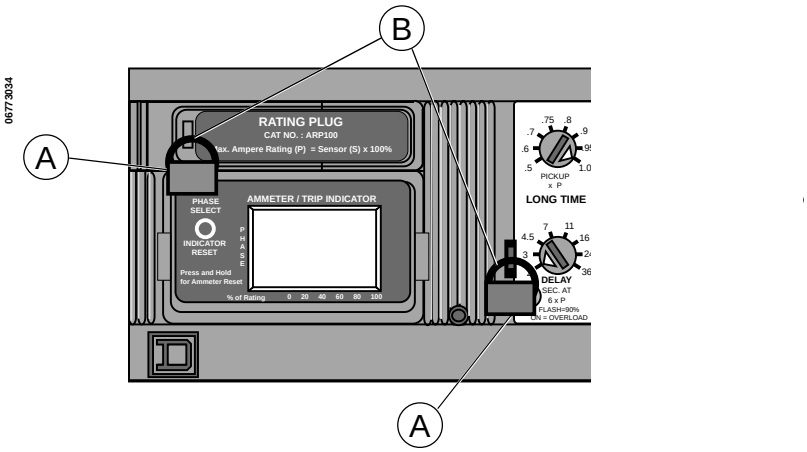

Figure 62: Sealing the Trip Unit

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 63) trips 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.

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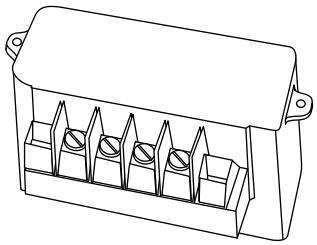

Figure 63: Shunt Trip, Undervoltage Trip and Alarm Switch

UNDERVOLTAGE TRIP

The undervoltage trip accessory (Figure 63) 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.

NOTE: An undervoltage trip accessory in a circuit breaker must be energized prior to closing the circuit breaker either electrically or mechanically.

An optional adjustable time delay unit, Cat. No. 690UVTD or 690UVTDI, provides a time delay to avoid nuisance circuit breaker opening 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.

ALARM SWITCH

The alarm switch (Figure 63) indicates any automatic circuit breaker opening or tripping due to an overload, short-circuit, ground-fault or undervoltage condition, or a push-to-trip operation. The alarm switch is actuated by the tripping mechanism. It is not actuated when the circuit breaker is manually opened or closed.

AUXILIARY SWITCH

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

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

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

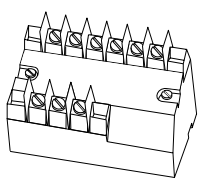

Figure 64: Auxiliary Switch

COMMUNICATIONS ADAPTER (NE CIRCUIT BREAKER ONLY)

The field-installable communications adapter, Cat. No. CIM3F, allows the NE circuit breaker trip unit to communicate with a Square D POWERLOGIC Communications Network. This allows NE circuit breakers to be networked in a POWERLOGIC system. The communications adapter cannot be used with the NX circuit breaker.

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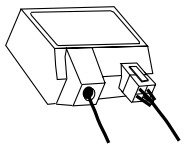

Figure 65: Communications Adapter

RESTRAINT INTERFACE MODULE (NE CIRCUIT BREAKER ONLY)

The restraint interface module, Cat. No. RIM32, is required on ZSI systems when:

- The 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 ZSI combinations requiring RIM32.

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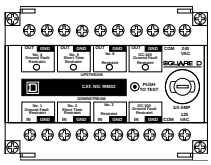

Figure 66: Restraint Interface Module

UNIVERSAL TEST SET

The Universal Test Set, Cat. No. UTS3, 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. 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.

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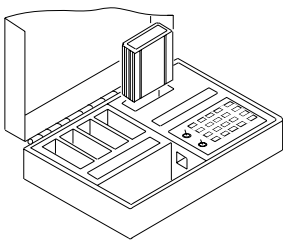

Figure 67: Universal Test Set

TRIP INDICATOR

The trip indicator, Cat. No. ALTI, 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, Fig. 68).

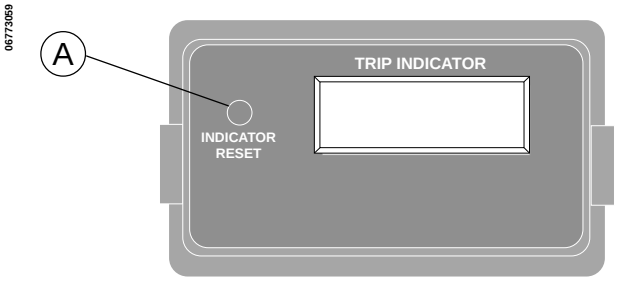

Figure 68: Trip Indicator

AMMETER/TRIP INDICATOR

The ammeter/trip indicator, Cat. No. ALAM, is provided with the full-function trip unit and is available as an option on the standard trip unit. 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, Fig. 69). (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.

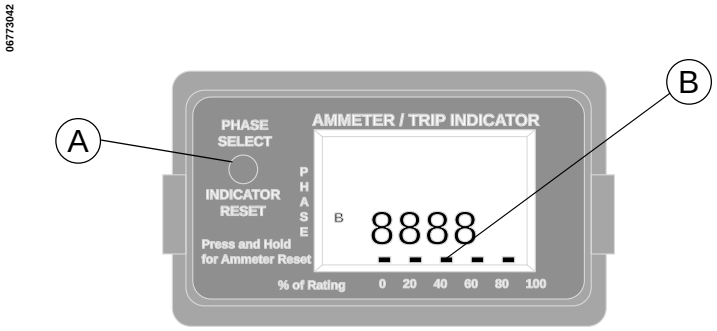

Figure 69: Ammeter/Trip Indicator

The ammeter/trip indicator 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 ammeter/trip indicator must be manually reset by pushing the phase select/indicator reset button (A).

HANDLE ACCESSORIES

A field-installable handle padlock attachment, Cat. No. HPANA, is available to lock the circuit breaker handle in the ON or OFF position with the use of a padlock.

A handle extension, Cat. No. MAHEX, is also available. It fits over the existing handle to ease movement.

Section 6—Troubleshooting

If problems occur during installation, refer to the following guide. 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.

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 in 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 4 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. (NE 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.

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

Appendix A—Parts Lists

CIRCUIT BREAKER HARDWARE

Table 7: Circuit Breaker Hardware

Item	Description	Quantity
A	Circuit Breaker	1
B	Screw, Mounting, slotted round head 1/4-20 x 4-1/2 in.	4
C	Access Cover	1
D	Lug Cover	2
E	Screw, Lug Cover, slotted pan head 6-32 x 1/4 in.	4 per lug cover

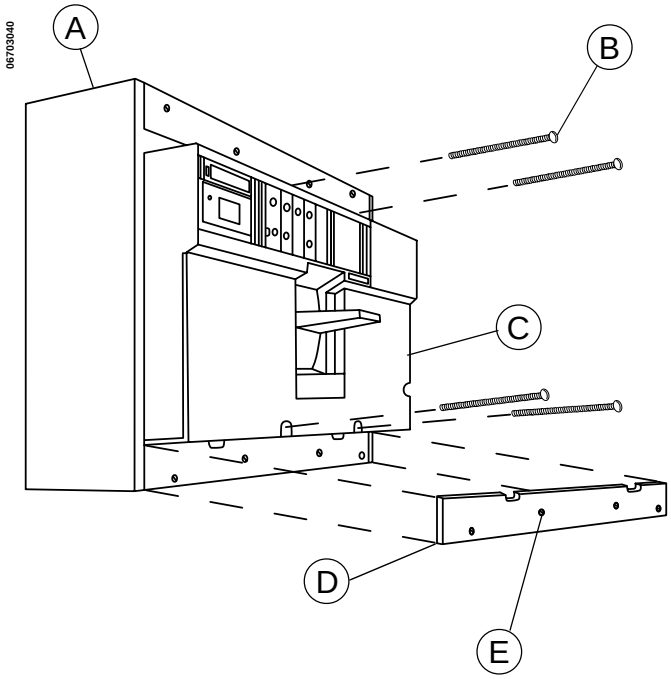

Figure 70: Circuit Breaker Hardware

CATALOG NUMBERS

Table 8: Neutral Current Transformers

Circuit Breaker Frame Rating	Neutral Current Transformer Catalog Number
250 Amp	NE25CT2
600 Amp	NE6CT2
1200 Amp	NE12CT2

Table 9: 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

CIRCUIT BREAKER DIMENSIONS

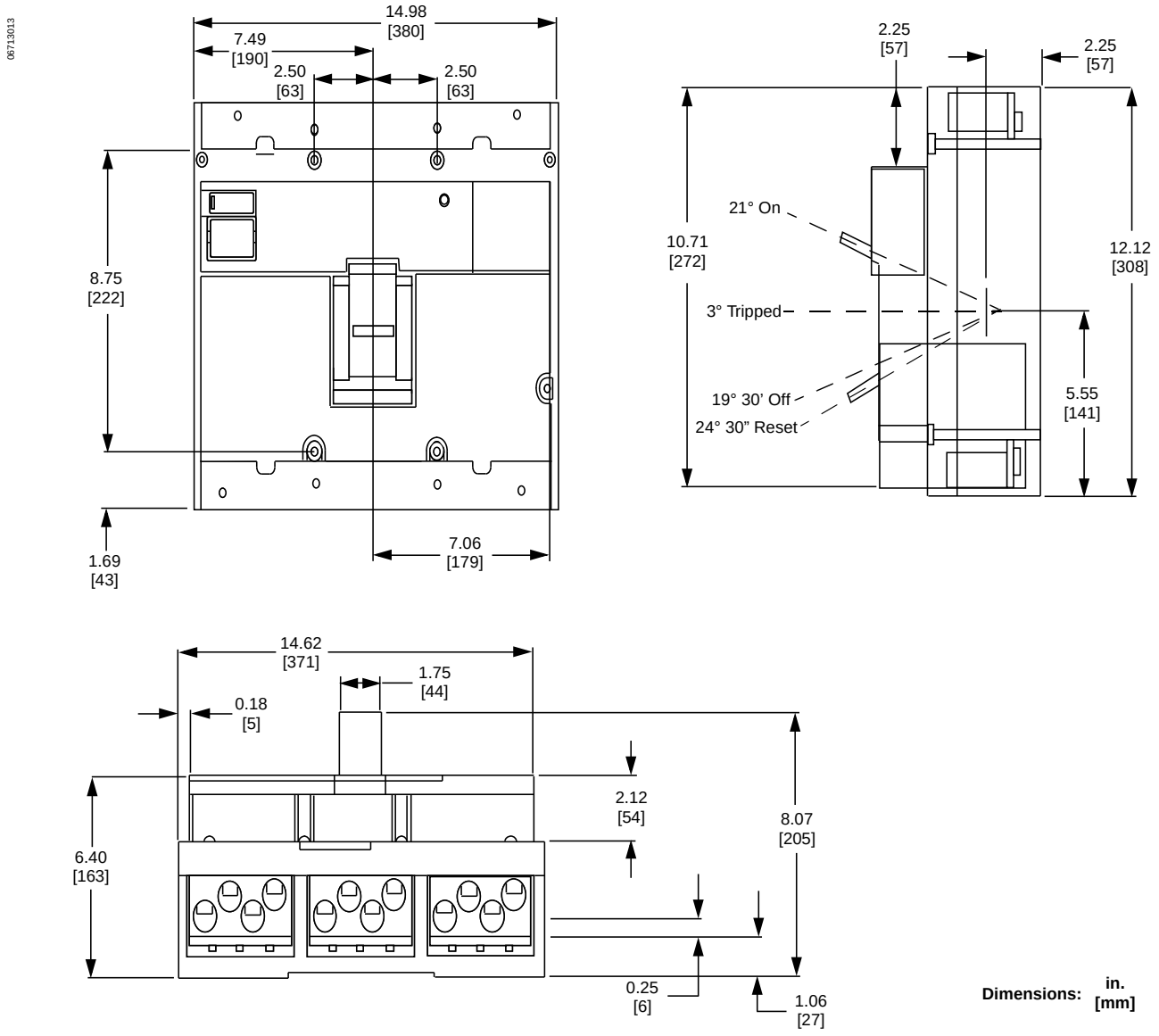

Figure 71: Circuit Breaker Dimensions

NEUTRAL CURRENT TRANSFORMER DIMENSIONS

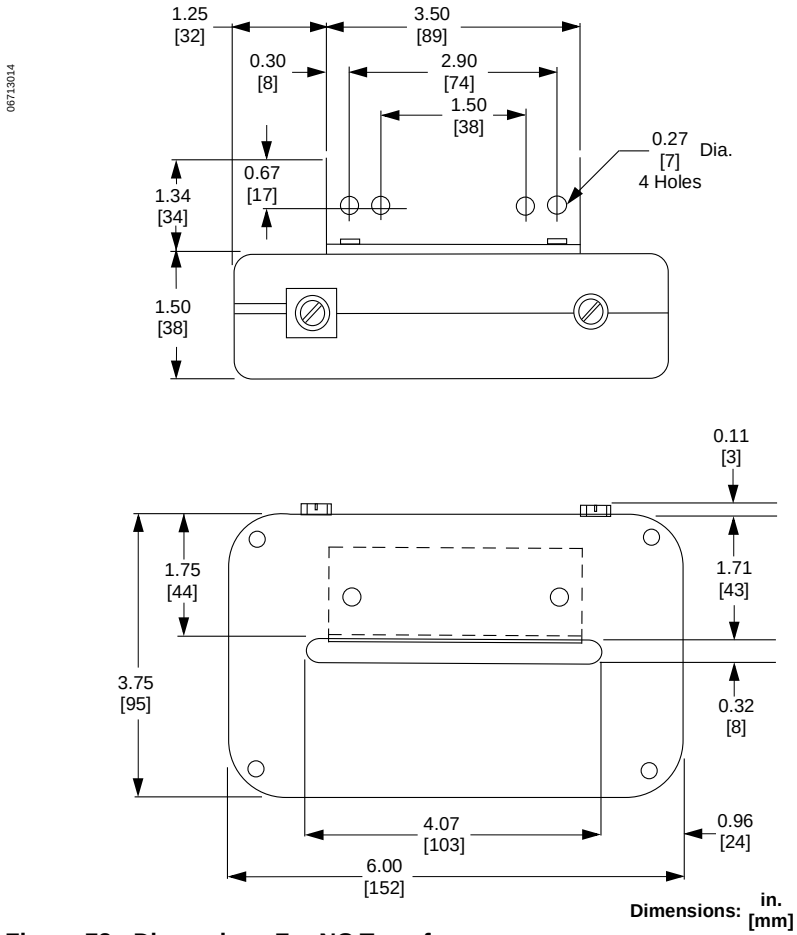

Figure 72: Dimensions For NC Transformer

NEUTRAL CURRENT TRANSFORMER BUS BAR NOTCHING

To ensure accurate current sensing in neutral conductor, a neutral bus wider than three inches must be notched as shown.

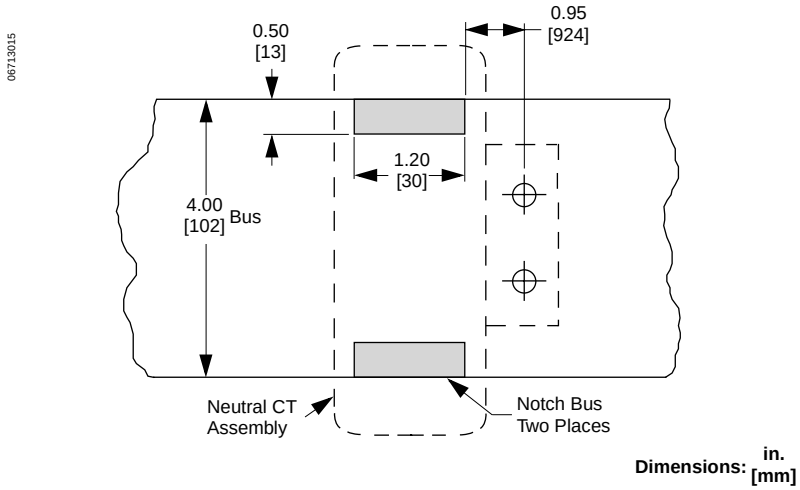

Figure 73: Bus Bar Notching

NEUTRAL CURRENT TRANSFORMER CLEARANCE REQUIREMENTS

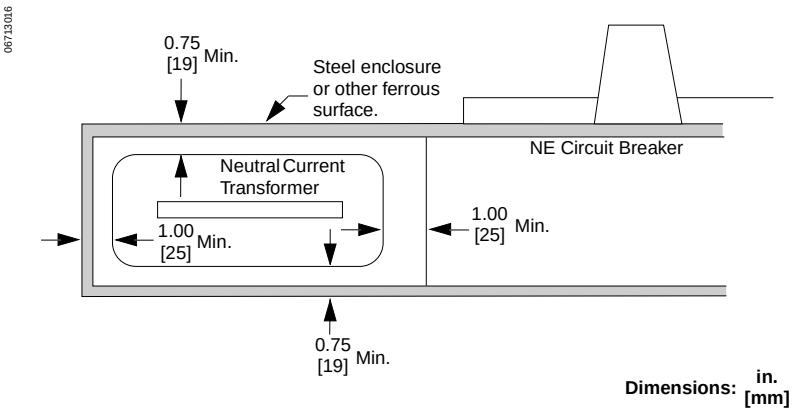

Figure 74: Clearances for Neutral Transformer

Appendix C—Wiring Diagrams

SHUNT TRIP

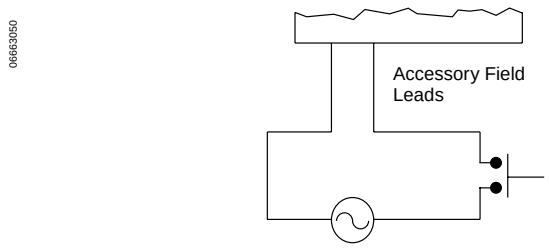

Figure 75: Shunt Trip

UNDERVOLTAGE TRIP

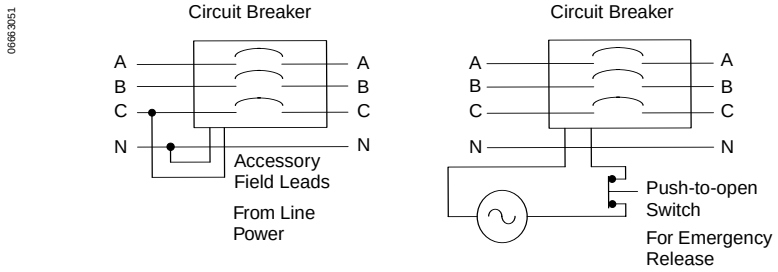

Figure 76: Undervoltage Trip

AUXILIARY SWITCH

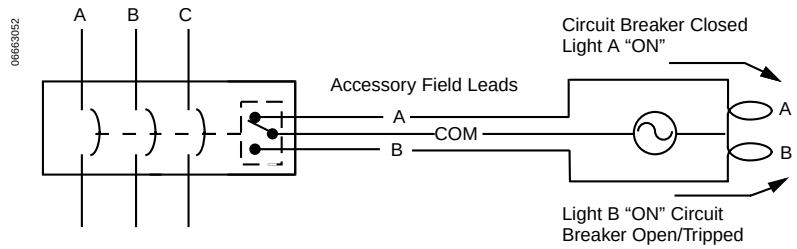

Figure 77: Auxiliary Switch

ALARM SWITCH

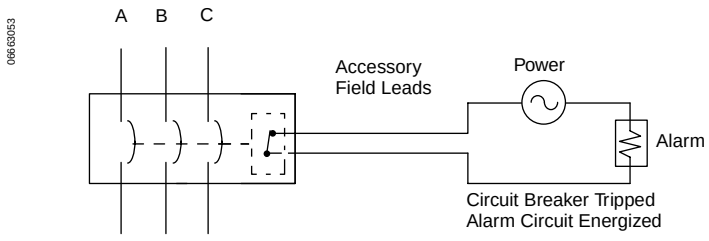

Figure 78: Alarm Switch

GROUND-FAULT SYSTEM

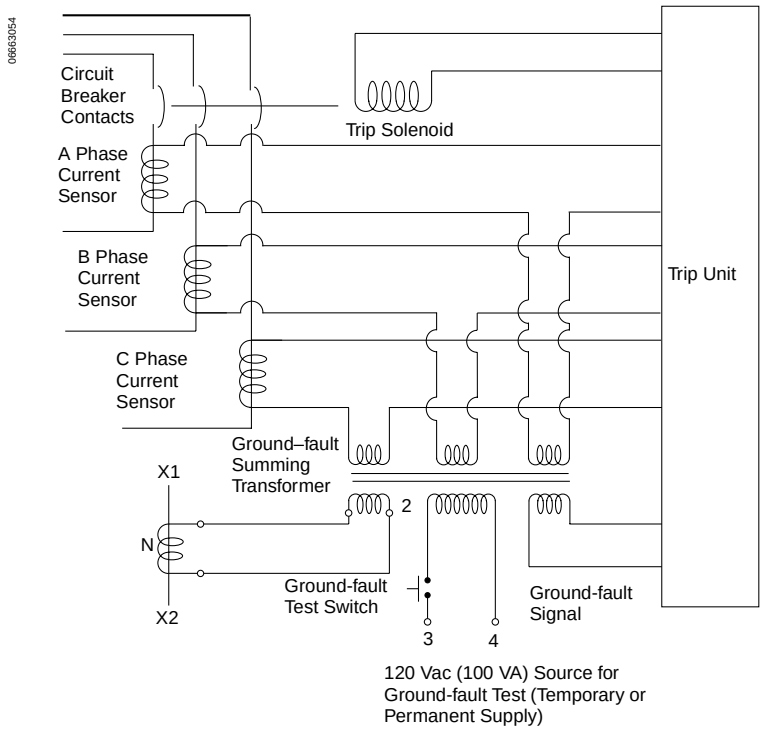

Figure 79: Ground-fault System

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

ZONE-SELECTIVE INTERLOCKING (NE 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.

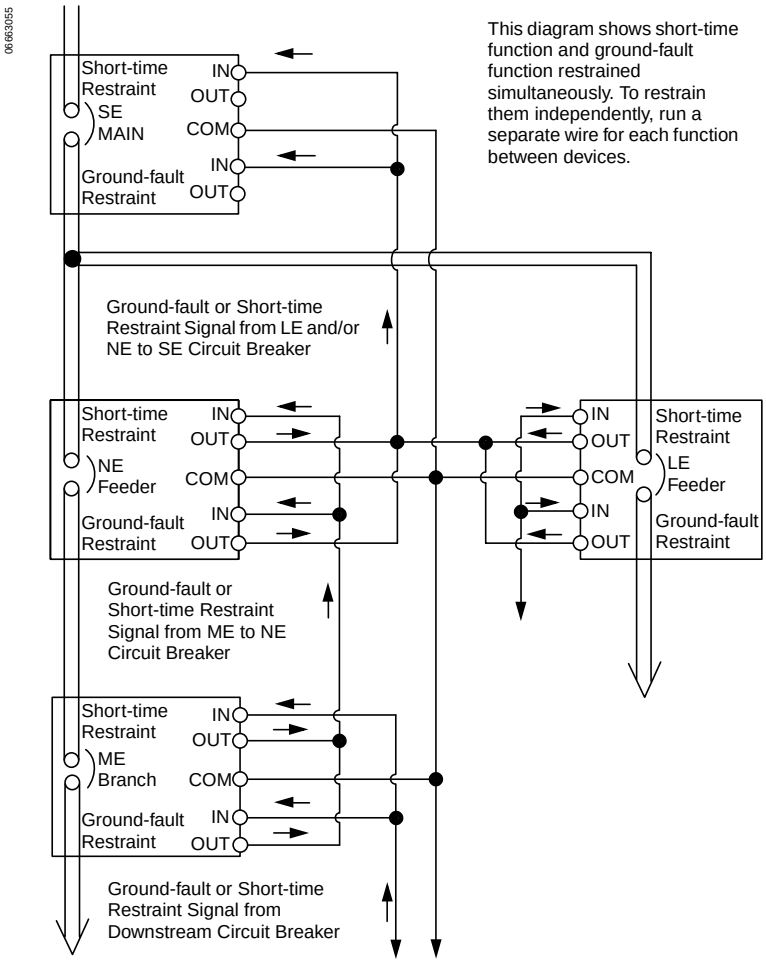

Figure 80: Zone-selective Restraint: LE, ME and NE Circuit Breakers Restraining SE Circuit Breaker

For maximum immunity to electrical noise:

1. Use shielded pair cable or twisted pair cable (#18–#14 AWG wire), 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 mm²) wires or one #14 AWG (2.5 mm²) 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 Restraint Interface Module 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.

POWERLOGIC = the Square D family of power monitoring equipment.

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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