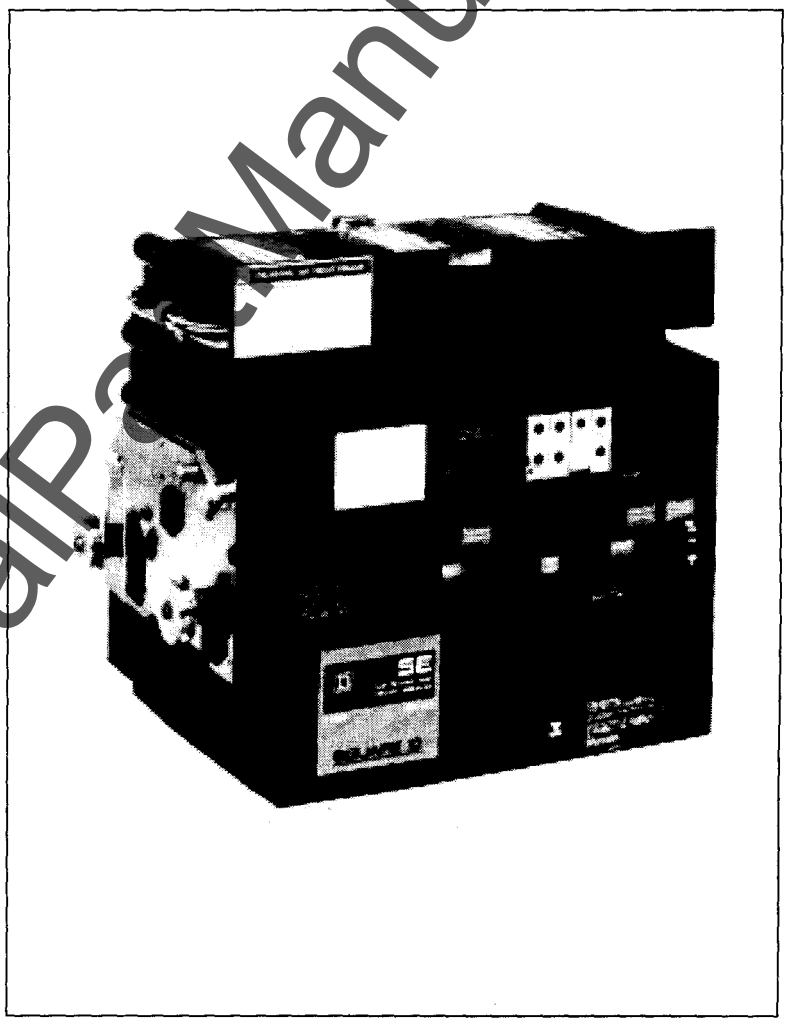
48040-495-06
October 1997
Cedar Rapids, IA, USA
H390

Instruction Bulletin

SE Electronic Trip Circuit Breaker with MICROLOGIC® Trip System

Series 3B



SQUARE D

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Section 1—General Information

SE electronic trip circuit breakers with MICROLOGIC® trip systems are available in either fixed-mounted (SEF) or drawout (SED) construction. For both constructions, the circuit breaker case is factory sealed and must not be opened for any reason. **Opening the case voids UL Listing and all warranties.** No user-serviceable parts are located inside the molded case.

SEF CIRCUIT BREAKERS

The SEF circuit breaker has rear-mounted power terminals which permit cable connections or bolted bus connections.

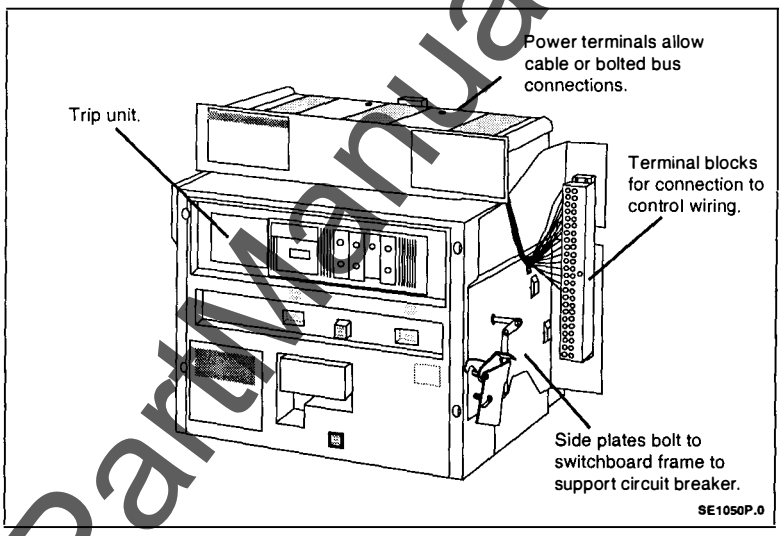


Figure 1 SEF Circuit Breaker

SED CIRCUIT BREAKERS

The SED circuit breaker is designed to mount in a drawout carriage inside an enclosure and uses a plug-on pressure connection to make the line and load connections.

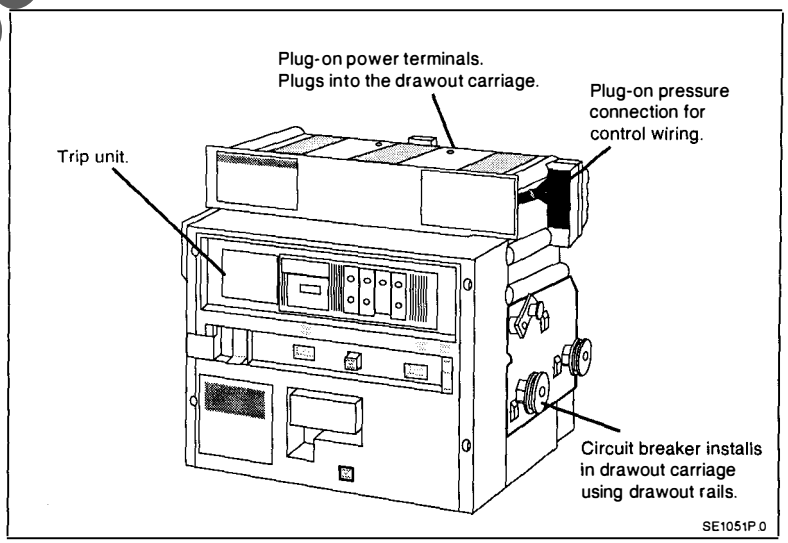


Figure 2 SED Circuit Breaker

The drawout carriage includes rails to install and withdraw the circuit breaker, copper bussing to provide the main electrical connections to the circuit breaker, and interlocks to ensure safe operation.

TRIP UNIT

The trip unit includes all the trip function adjustments and a receptacle for the rating plug. Indicators will show if a trip was due to an overload, short-circuit or ground-fault condition. The trip unit can be sealed to prevent tampering by unauthorized personnel.

AMPERE RATING

The maximum current that a circuit breaker can carry is called the ampere rating. It is determined by the mathematical equation:

Ampere Rating (P) = Sensor Size (S) x Rating Plug Multiplier %

SENSOR SIZE

The circuit breaker sensor size is the maximum ampere 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.)

SE circuit breakers are available in eight sensor sizes: 400, 800, 1200, 1600, 2000, 2500, 3000, and 4000 amperes. The sensor size is indicated on the faceplate on the front of the circuit breaker.

FRAME SIZE

The maximum ampere rating a circuit breaker *family* can carry is called the frame size. All SE circuit breakers have a 4000 A frame size and are the same physical size.

The rating plug applies a multiplier (ranging from 0.4 to 1.0) to the sensor size. The rating plug multiplier value is printed on the face of the rating plug along with the mathematical equation used to obtain the ampere rating. (The rating plug catalog number is ARPXXX, with XXX being the multiplier value stated as a percentage.)

CURRENT RATING

Continuous current carrying capacity of the circuit breaker is determined by multiplying the circuit breaker sensor size by the rating plug multiplier and the trip unit long-time pickup switch setting. All SE circuit breakers are rated for 100% continuous loading.

Sensor Size	x	Rating Plug Multiplier	x	Long-time Pickup Switch Setting	=	Current Rating
1200	x	100%	x	1.0	=	1200

INTERRUPTING RATINGS

The maximum amount of current the circuit breaker is designed to safely interrupt is called the ampere interrupting rating (AIR).

Table 1 Interrupting Ratings

Circuit Breaker	UL Listed Interrupting Rating*			30-cycle Short-time Rating
	240 Vac	480 Vac	600 Vac	
SEF, SED	150 000	100 000	85 000	50 000
SEHF, SEHD	200 000	150 000	100 000	65 000

* Interruption rating is value shown or interruption rating of switchboard, whichever is lower.

Section 2—Receiving and Lifting Circuit Breaker

RECEIVING CIRCUIT BREAKER

Immediately inspect all equipment for shipping damage. If damage is found or suspected, file a claim as soon as possible with carrier and notify nearest Square D representative.

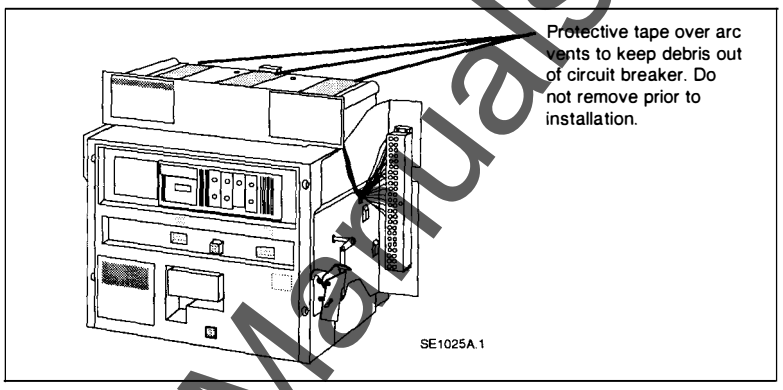


Figure 3 Protective Tape Over Arc Vents

Also inspect circuit breakers and equipment after installation BEFORE energizing switchboard.

If equipment must be stored before installation, store in a clean dry place, protected from dirt and water. Provide ample air circulation and heat, if necessary, to prevent condensation.

LIFTING CIRCUIT BREAKER

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

Circuit breaker weighs over 280 lbs. (127 kg) and must be lifted using lifting adapter and hoist capable of lifting 300 lbs. (136 kg).

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

Lift circuit breaker using supplied lifting adapter (A). Insert lifting adapter hooks into two holes at upper rear of circuit breaker and position adapter so hooks extend out through two holes (B) on top of circuit breaker.

Lifting must be done using a hoist capable of lifting 300 lbs. (136 kg) or more. Connect hoist to lifting adapter and lift circuit breaker slowly.

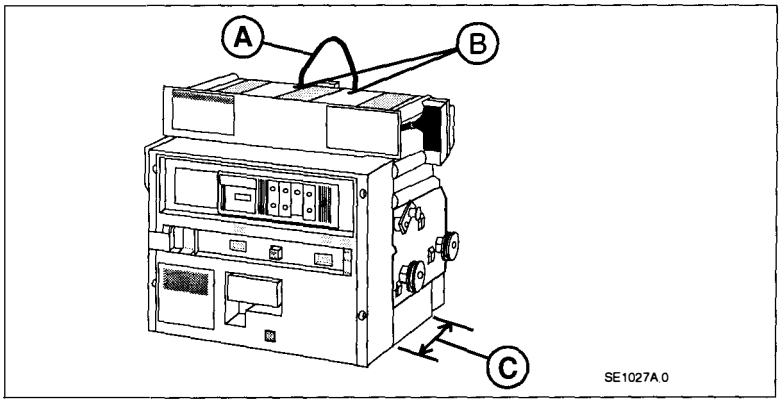


Figure 4 Lifting Circuit Breaker

Although not recommended, the circuit breaker can be lifted from below using a platform, supporting weight of circuit breaker in area (C). The auxiliary cover and current transformers can be damaged if used to support the weight of the circuit breaker.

Section 3—SEF Circuit Breaker

⚠ 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.

FACTORY-INSTALLED SEF CIRCUIT BREAKER

SEF circuit breakers are normally factory installed in switchboards. For factory-installed circuit breakers:

1. Disconnect all power to enclosure.
2. Inspect circuit breaker as instructed on Page 10.

FIELD-INSTALLED SEF CIRCUIT BREAKER

1. Disconnect all power to enclosure.
2. Check enclosure design. Conduct tests per UL 891 if:

   A. More than one device is mounted in a single enclosure.

   B. The enclosure does not meet the minimum enclosure requirements listed in this section.

Enclosure Size

Shaded area is minimum SE mounting area. DO NOT locate additional equipment or structural members in this area.

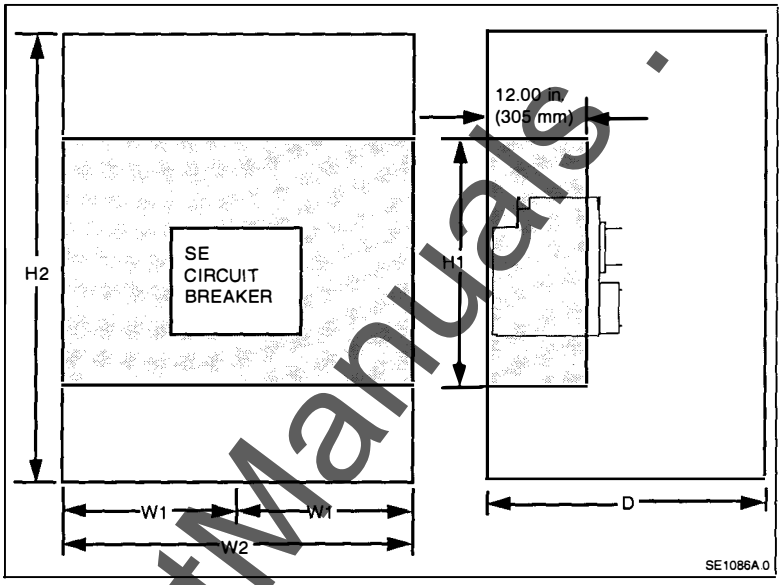


Figure 5 SE Mounting Area

Table 2 Enclosure Dimensions

Frame Size	Minimum Mounting			Minimum Enclosure		
	Half Width W1 In. (mm)	Width W2 In. (mm)	Height H1 In. (mm)	Height H2 In. (mm)	Depth D In. (mm)	Volume V In.³ (mm³)
400 A, 800 A, 1200 A, 1600 A	15 (381)	30 (762)	29.5 (749)	–	–	31 860 (809 244)
2000 A, 2500 A, 3000 A	18 (457)	36 (914)	29.5 (749)	–	–	38 232 (971 093)
4000 A in 3Ø3W system	21 (533)	42 (1067)	34.5 (876)	90 (2286)	48 (1219)	–
4000 A in 3Ø4W system	24 (608)	48 (1219)	34.5 (876)	90 (2286)	48 (1219)	–

Wire Bending Space

Refer to UL 891 and the National Electrical Code (NEC) for wire bending requirements. Adequate conduit entry area must be available.

NOTE: Terminal connector kit SEFM40CK is required for all 4000 A SEF circuit breaker mounting. Enclosure design must allow for installation of terminal connector kit. THE UL LISTING IS VOID UNLESS TERMINAL CONNECTOR KIT IS USED. See Appendix A for dimensions of terminal connector kit.

Ventilation

The SE circuit breaker requires unrestricted ventilation openings in the enclosure. See Table 3 for amount of opening required. These values are based on one SE circuit breaker per enclosure.

Table 3 Enclosure Ventilation

Frame Size	Ventilation Required
400 A, 800 A, 1200 A, 1600 A	NONE
2000 A	154 in.² (99 355 mm²) on front of enclosure, place equal amounts at top and bottom of enclosure front.
2500 A	308 in.² (198 710 mm²) in back of enclosure, place equal amounts at top and bottom of enclosure back.*
3000 A	308 in.² (198 710 mm²) in back of enclosure, place equal amounts at top and bottom of enclosure back, with 6 in. (152 mm) of clearance behind enclosure.* If there is less than 6 in. (152 mm) of clearance behind enclosure, add an additional 308 in. (198 710 mm²) of ventilation to enclosure front.
4000 A	388 in.² (250 323 mm²) in back of enclosure, place equal amounts at top and bottom of enclosure back.

* Ventilation can be located on front. However, available circuit breaker mounting space will be reduced.

Enclosure Door/Cover

An SE circuit breaker cover must have at least three 1/4-20 securing screws on each side or at least three 1/4-20 securing screws on one side and a minimum of three hinges on opposite side.

Table 4 Minimum Door Dimensions

Frame Size	H1	H2
400-3000 A	7.13 in. (181 mm)	26.45 in. (672 mm)
4000 A	10.13 in. (257 mm)	32.45 in. (824 mm)

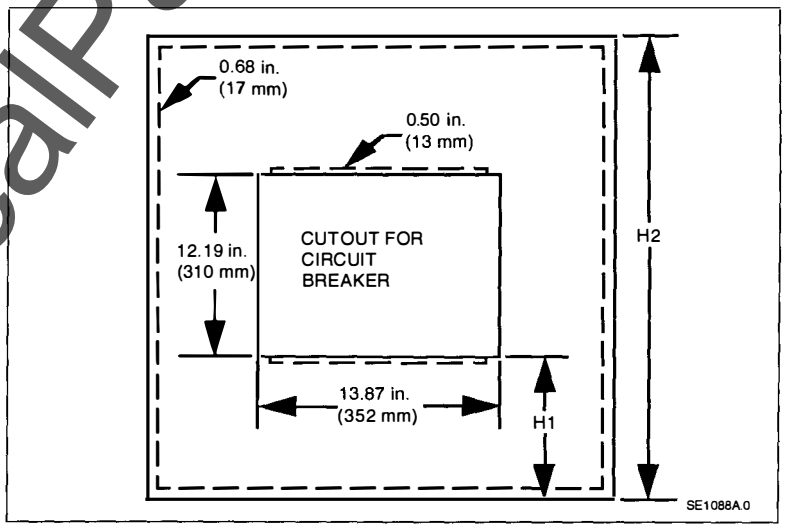


Figure 6 SE Enclosure Door Dimensions

Bussing

⚠ CAUTION

HAZARD OF CIRCUIT BREAKER DAMAGE

The SEF circuit breaker is not designed to support bussing. All bussing MUST be supported by means other than circuit breaker tangs.

Failure to follow these instructions can result in equipment damage.

A. 400–2000 A Circuit Breaker

- Size bussing per UL 891.
- Install cables using 75°C insulated wire per NEC Table 310-16.

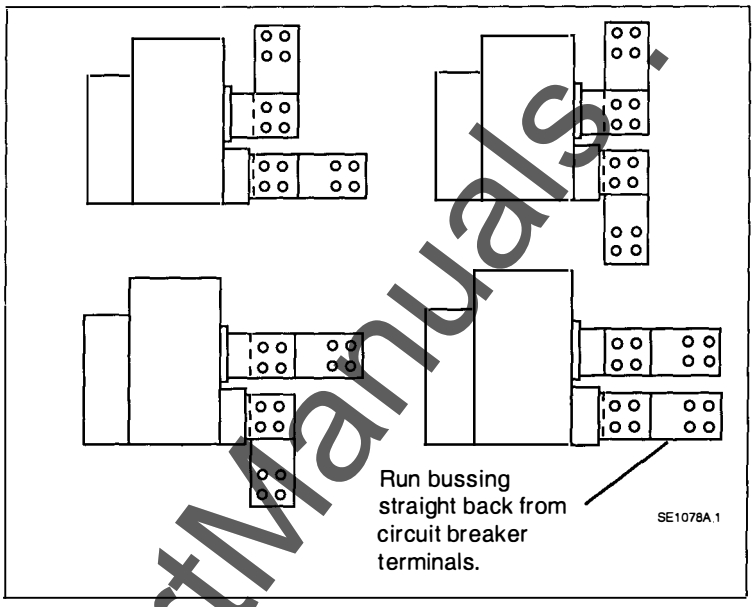


Figure 7 400–2000 A Circuit Breaker Bussing Method

B. 2500–3000 A Circuit Breaker

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE FROM OVERHEATING

Do not mount both line and load extensions so they extend straight back.

Failure to follow these instructions can result in equipment damage.

Table 5 Extension Sizes

Frame Size	Copper Terminal Extensions No.	Size
2500 A	3	0.25 x 4.00 x 10.70 in. (6 x 102 x 272 mm) long
3000 A	4	0.25 x 4.00 x 10.70 in. (6 x 102 x 272 mm) long

1. Add terminal extensions.
2. Mount extensions as shown in Figure 8.

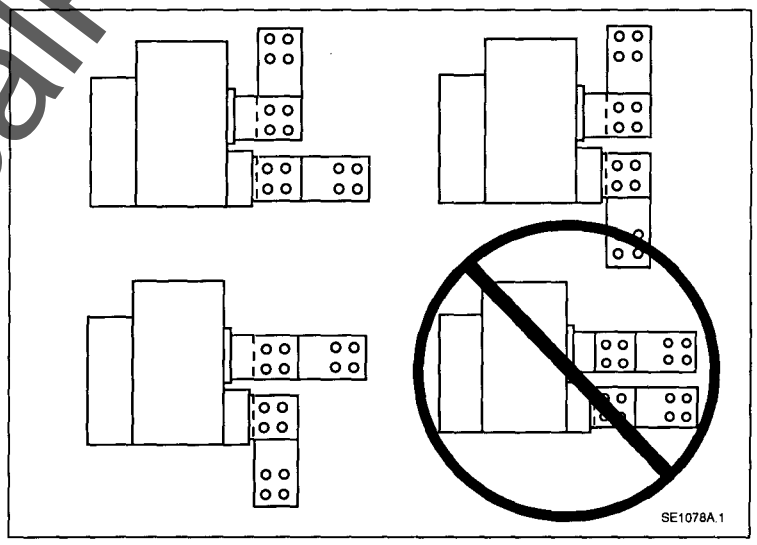


Figure 8 2500–3000 A Circuit Breaker Bussing Methods

NOTE: The supply terminal extensions must have 1/4 in. (6.4 mm) minimum spacing between bus bars. See Figure 9.

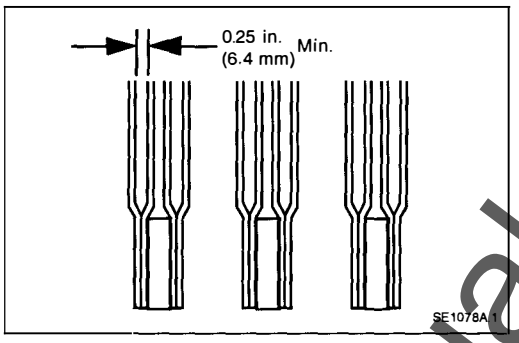


Figure 9 Minimum Bus Bar Spacing

Cable the 2500 A SEF circuit breaker using 75°C insulated wire per NEC Table 310-16. Cable the 3000 A SEF circuit breaker using 90°C insulated wire based on ampacity of 75°C wire per NEC Table 310-16.

C. 4000 A Circuit Breaker

NOTE: Terminal connector kit SEFM40CK (A, Fig. 10) must be used. The UL Listing is void unless terminal connector kit is used.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

The SEF circuit breaker is not designed to support terminal connector kit. The terminal connector kit weighs approximately 260 lbs. (118 kg). All bussing MUST be supported by means other than circuit breaker tangs.

Failure to follow these instructions can result in equipment damage.

1. Mount four terminal connectors (B) per phase to circuit breaker.
2. Install hex head bolts, Belleville washers and hex nuts (provided)(C). Tighten bolts to 70 lb-ft (95 N•m).
3. Tighten KEPS nuts (D) to 225 lb-in (25 N•m).

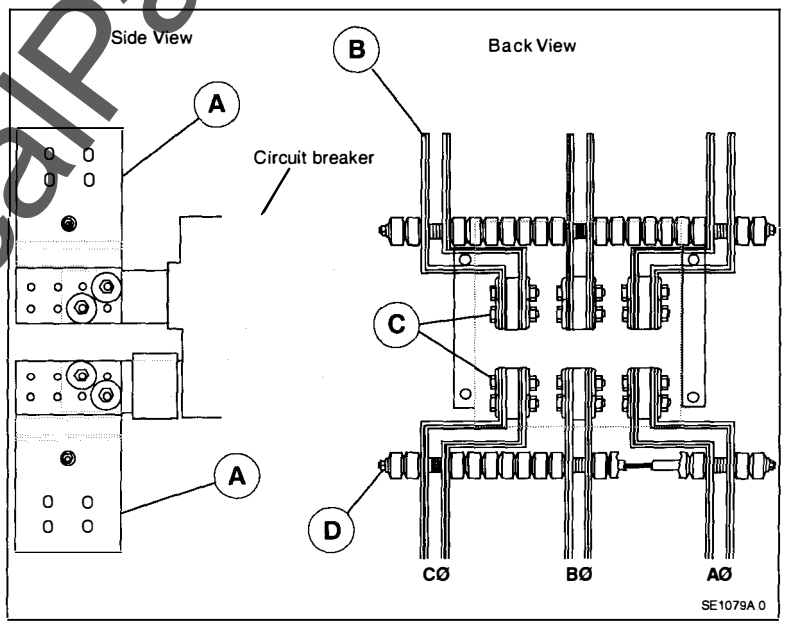


Figure 10 4000 A Circuit Breaker Bussing

See Appendix A for dimensional drawings of SEFM40CK kit.

Continue bussing with four 1/4 x 6 in. (6 x 152 mm) copper bus bars per phase or copper bus of equivalent cross-sectional area. If aluminum bus is desired, perform tests per UL 891 for acceptability.

If cabling, use 90°C insulated wire based on ampacity of 75°C wire per NEC Table 310-16.

INSTALL SEF CIRCUIT BREAKER

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

- Install circuit breaker ONLY when switchboard section is secured to avoid tipping.
- Circuit breaker weighs over 280 lbs. (127 kg) and must be lifted using lifting adapter and hoist capable of lifting 300 lbs. (136 kg).

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

Energizing the circuit breaker with lifting adapter installed could result in a cross-phase condition. The lifting adapter must be removed from the circuit breaker before proceeding with installation.

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

1. Insert hooks of the supplied lifting adapter (A) into the two holes at upper rear of circuit breaker and position adapter so hooks extend out through two holes (B) on top of circuit breaker. Connect hoist capable of lifting 300 lbs. (136 kg) or more to lifting adapter and lift circuit breaker slowly.

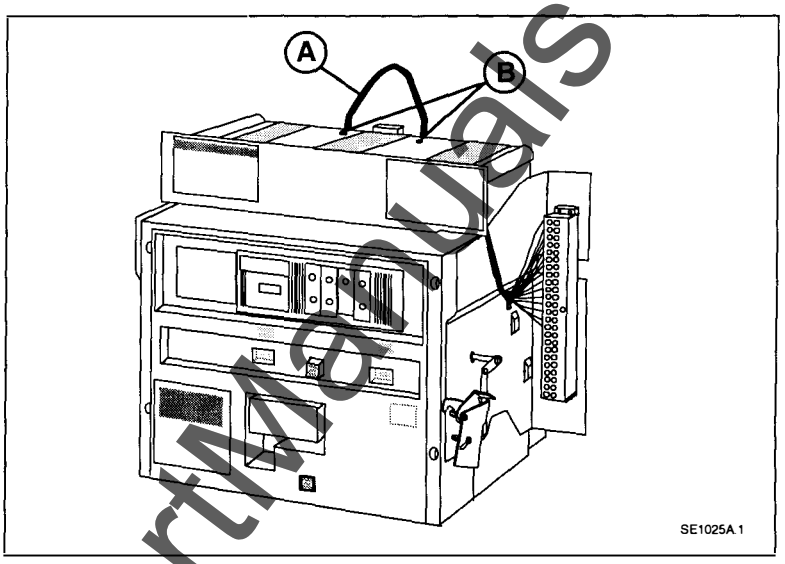


Figure 11 SE Circuit Breaker Lifting Adapter

2. Install circuit breaker into enclosure. Make sure circuit breaker is secure.
3. Remove hoist and lifting adapter. Store lifting adapter outside of the switchboard.

INSTALL ARC BARRIERS

Table 6 Barrier Length

Sensor Size	Minimum Barrier Length L
400 A, 800 A, 1200 A, 1600 A	30 in. (762 mm)
2000 A, 2500 A, 3000 A	36 in. (914 mm)
4000 A	42 in. (1067 mm)

Install front (A), top (B) and rear (C) arc barriers around circuit breaker. Make arc barriers from 0.188 in. (5 mm) thick insulating material with a UL 94V-0 Flammability Rating.

Support rear arc barrier (C) with a nonmagnetic barrier support angle (D) at least 0.125 in. (3 mm) thick with 2 in. (51 mm) flanges and length as shown in Table 6. Rigidly mount support to enclosure frame members.

Mount top arc barrier (B) to rear arc barrier with four angle brackets (E). The top arc barrier must extend to front of enclosure.

Mount front arc barrier behind circuit breaker behind the gas shield. Mount front arc barrier to top arc barrier with four angle brackets.

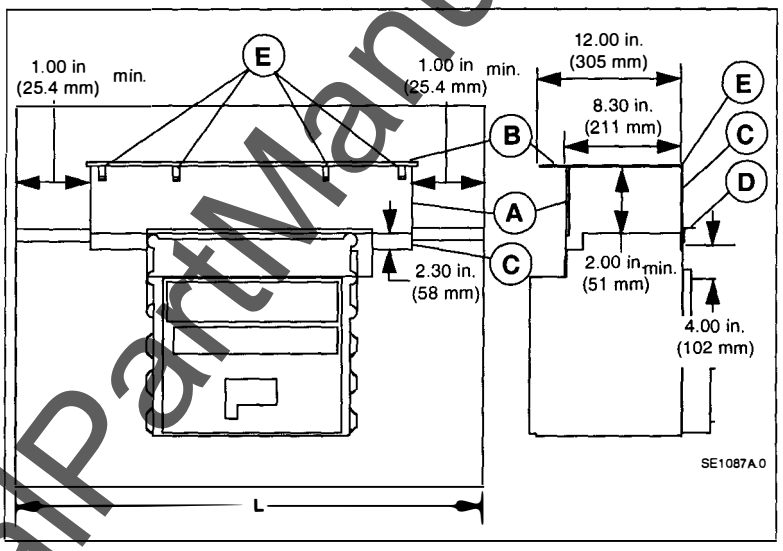


Figure 12 Arc Barrier Clearances

INSPECT SEF CIRCUIT BREAKER

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE
Install circuit breaker ONLY when switchboard section is secured to avoid tipping.

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

Inspect circuit breaker when equipment is first installed and again before placing circuit breaker in service. If damage such as loose power terminals, distorted connectors or any loose parts in switchboard section is found, contact Square D.

Make sure all bus and circuit breaker connections are properly torqued. Refer to Switchboard Installation/Maintenance Manual for torque values.

CHECK SEF CIRCUIT BREAKER OPERATION

Charge Closing Springs

SE circuit breakers have a two-step stored energy mechanism: closing spring charging and contact closing are two distinct operations. Closing springs must be fully charged to close circuit breaker.

SE circuit breakers can be provided with an electrical operation system to automatically charge closing springs and permit remote circuit breaker operation. Refer to Section 8 for more information.

Manually Charge Closing Springs

> **⚠ CAUTION**
>
> **HAZARD OF HANDLE DAMAGE**
>
> Do not apply excessive force to handle.
>
> **Failure to follow these instructions can result in equipment damage.**

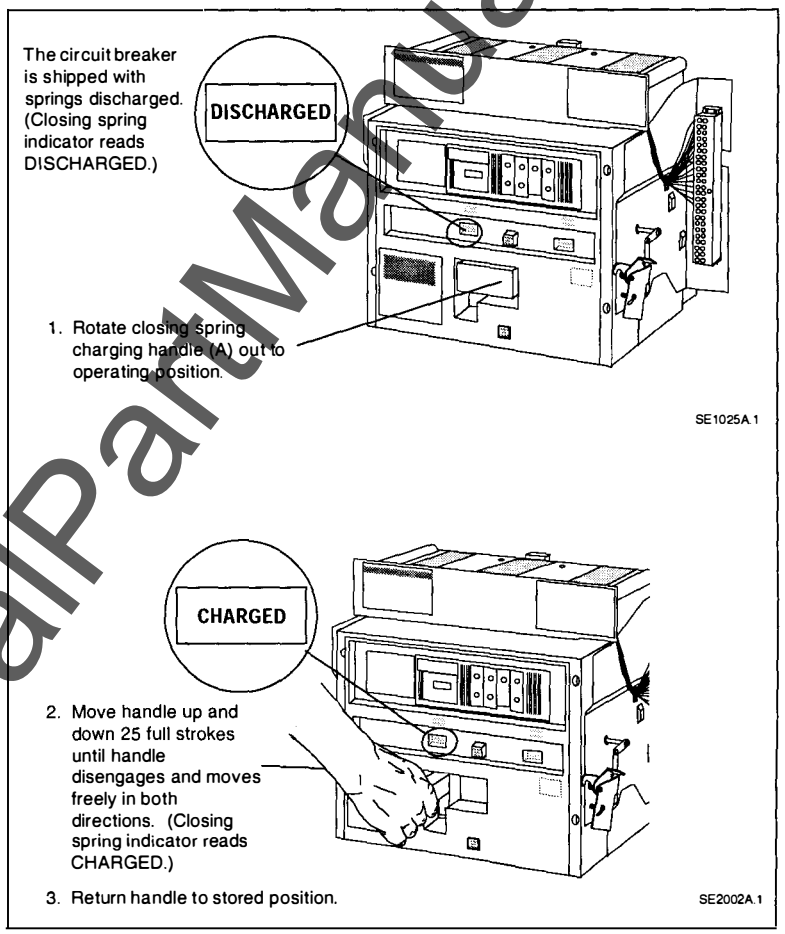


Figure 13 Charging Closing Spring

Close Circuit Breaker

NOTE: Safety interlocks prevent closing of circuit breaker if certain conditions are not met. Refer to Section 10—Troubleshooting for information about these interlocks.

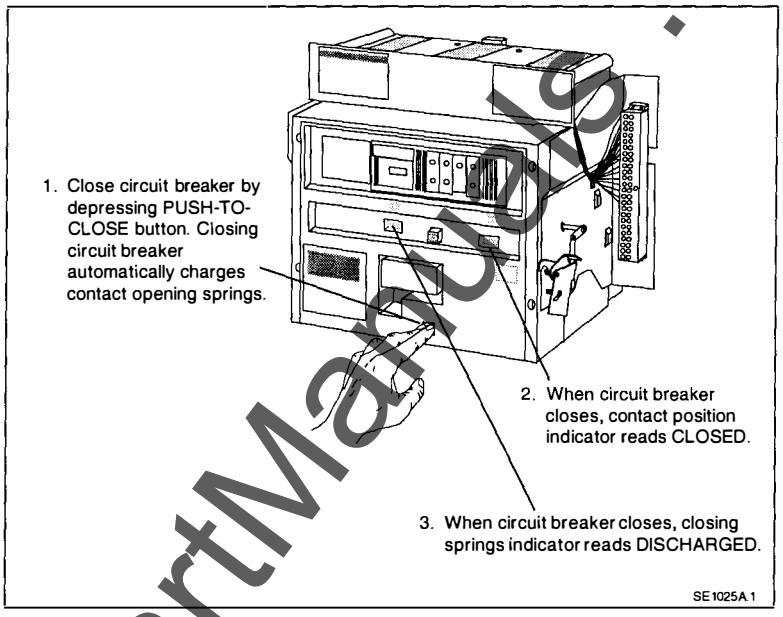


Figure 14 Close Circuit Breaker

The circuit breaker can be manually recharged when circuit breaker is closed. If an electrical operation system is provided and connected to a power source, closing springs start charging automatically when circuit breaker is closed.

Open Circuit Breaker

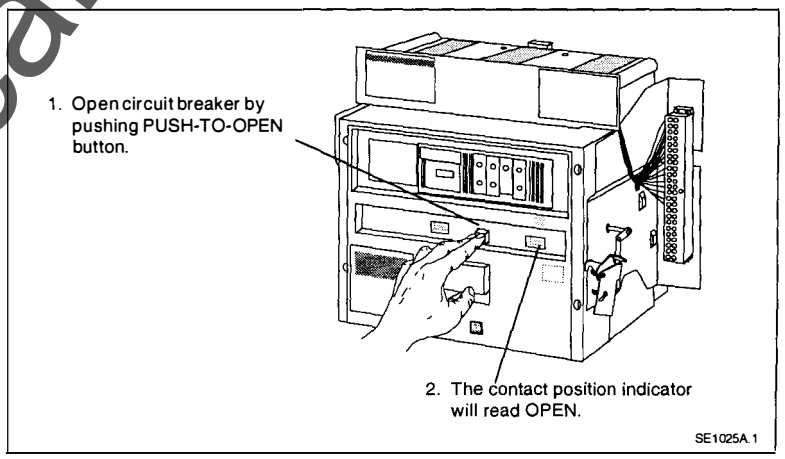


Figure 15 Open Circuit Breaker

Remove SEF Circuit Breaker

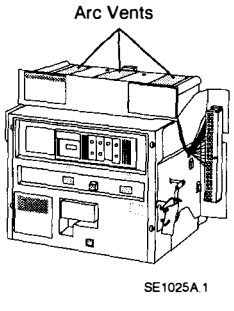
⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

- Remove circuit breaker ONLY when switchboard section is secured to avoid tipping.
- Circuit breaker weighs over 280 lbs. (127 kg) and must be lifted using lifting adapter and hoist capable of lifting 300 lbs. (136 kg).

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

⚠ CAUTION



HAZARD OF CIRCUIT BREAKER DAMAGE

Arc vents must be covered with tape before moving or servicing circuit breaker. If any object drops into arc vents, return circuit breaker to Square D.

Failure to follow these instructions can result in equipment damage.

1. Disconnect all power supplying this equipment before working on or inside equipment.
2. Remove the circuit breaker in reverse order of installation.
3. If arc vents are not already covered with tape, cover them with tape at this time.

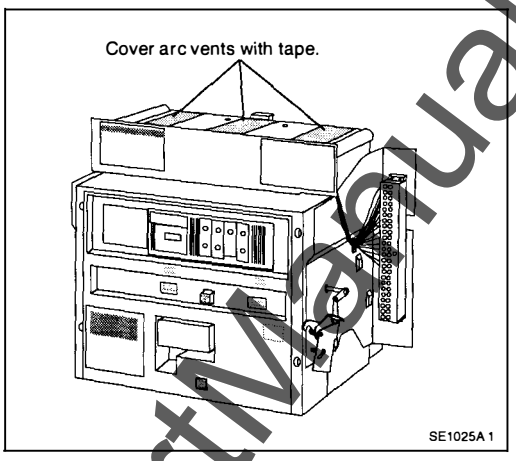


Figure 16 Cover Arc Vents

Section 4—SED Circuit Breaker

SED circuit breakers mount in carriage assemblies equipped with drawout rails and bussing specifically designed for them. Square D equipment has the carriage assembly already in the equipment. If installing SED circuit breaker in other than Square D equipment, a carriage assembly is required. Install carriage assembly according to the instructions shipped with it.

INSTALL SED CIRCUIT BREAKER

⚠ 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.

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

Install circuit breaker ONLY when switchboard section is secured to avoid tipping.

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

1. Disconnect all power to enclosure.
2. Inspect power connectors and main power terminals of the circuit breaker. With a lint-free cloth, remove any foreign material which can be stuck to the joint compound on the power connector. If joint compound has been removed, replace **only** with Square D joint compound PJC8311.
3. Pull out drawout rails.

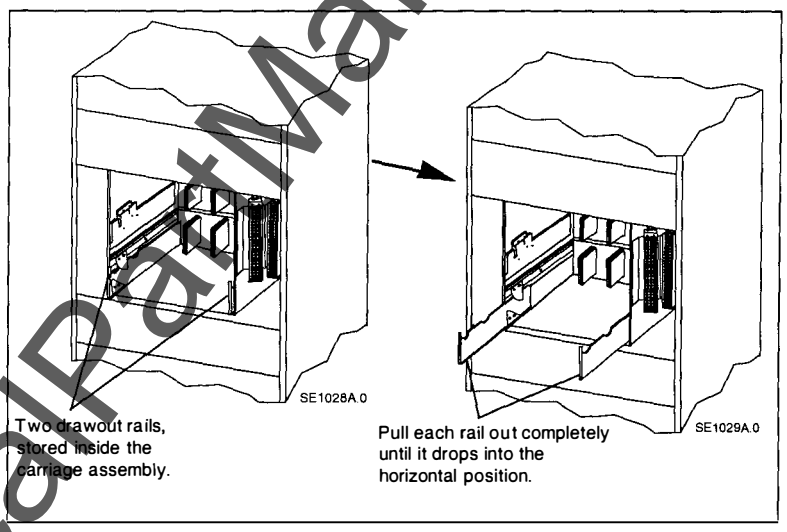


Figure 17 Drawout Rails

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

Circuit breaker weighs over 280 lbs. (127 kg) and must be lifted using lifting adapter and hoist capable of lifting 300 lbs. (136 kg)

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

4. Insert hooks of the supplied lifting adapter (A) into the two holes at upper rear of circuit breaker and position adapter so hooks extend out through two holes (B) on top of circuit breaker. Connect hoist capable of lifting 300 lbs. (136 kg) or more to lifting adapter and lift circuit breaker slowly.

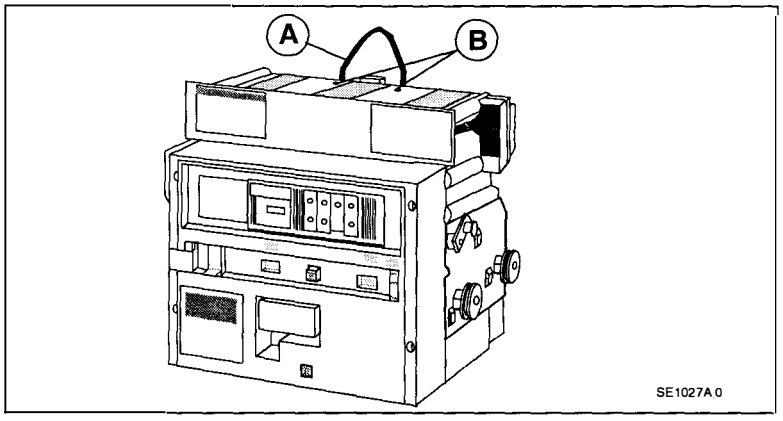


Figure 18 SE Circuit Breaker Lifting Adapter

5. Lower circuit breaker until all four drawout wheels are on the extended rails, positioning the front wheels as shown.

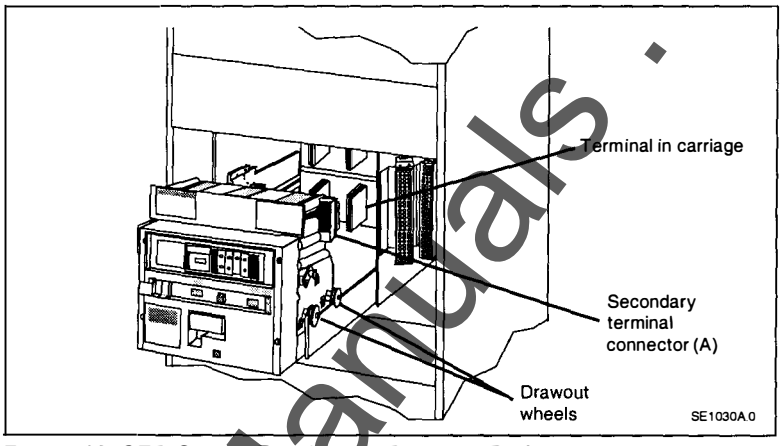


Figure 19 SED Circuit Breaker on Drawout Rails

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

Energizing the circuit breaker with lifting adapter installed could result in a cross-phase condition. The lifting adapter must be removed from the circuit breaker before proceeding with installation.

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

6. Remove hoist and lifting adapter. Store lifting adapter outside of the switchboard.

7. Inspect circuit breaker when equipment is first installed and again before placing circuit breaker in service. If damage such as loose power terminals, distorted connectors or any loose parts in switchboard section is found, contact Square D. Make sure all bus and circuit breaker connections are properly torqued. Refer to Switchboard Installation/Maintenance Manual.

8. Push circuit breaker toward carriage. Make sure the secondary terminal connector (A) is in alignment with the terminal in the carriage.

CHECK SED CIRCUIT BREAKER OPERATION

Charge Closing Springs

SE circuit breakers have a two-step stored energy mechanism: closing spring charging and contact closing are two distinct operations. Closing springs must be fully charged to close circuit breaker.

SE circuit breakers can be provided with an electrical operation system to automatically charge closing springs and permit remote circuit breaker operation. Refer to Section 8 for more information.

Manually Charge Closing Springs

> **⚠ CAUTION**
>
> **HAZARD OF HANDLE DAMAGE**
>
> Do not apply excessive force to handle.
>
> **Failure to follow these instructions can result in equipment damage.**

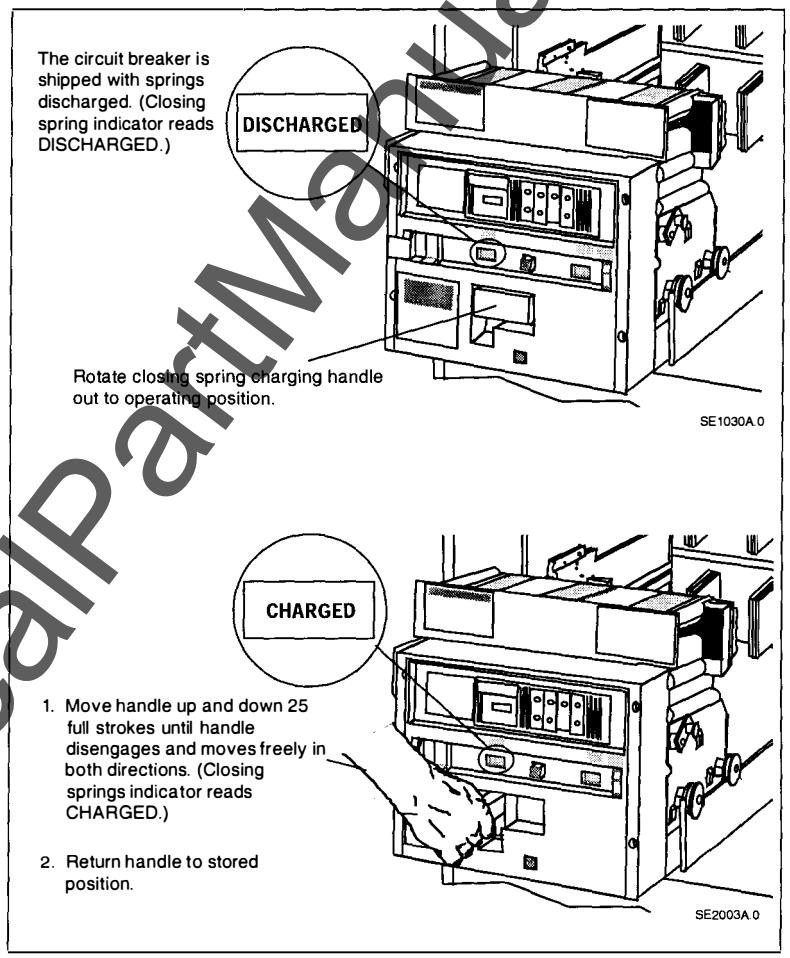


Figure 20 Charging Closing Springs

Close Circuit Breaker

NOTE: Safety interlocks prevent closing of circuit breaker if certain conditions are not met. Refer to Section 10—Troubleshooting for information about these interlocks.

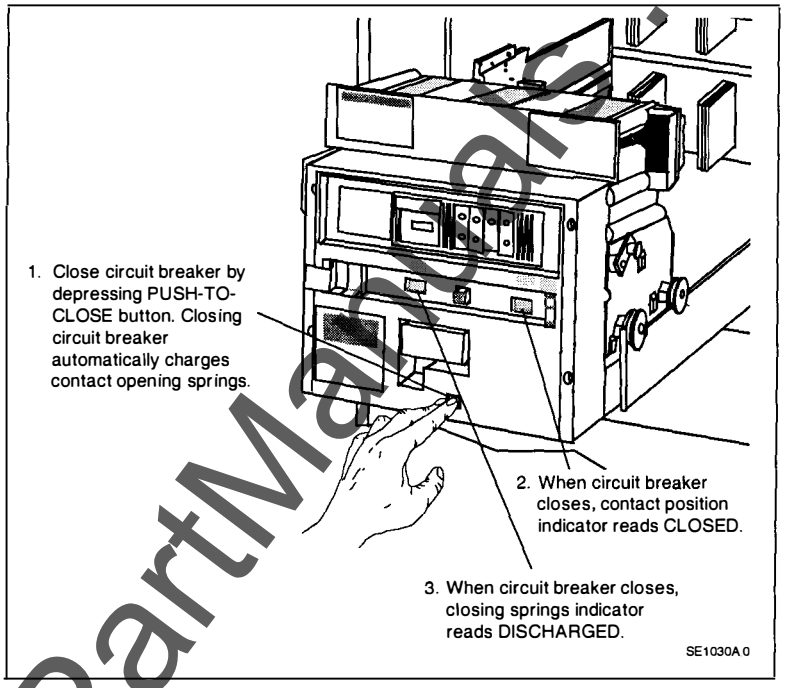


Figure 21 Close Circuit Breaker

The circuit breaker can be manually recharged when circuit breaker is closed. If an electrical operation system is provided and connected to a power source, closing springs start charging automatically when circuit breaker is closed.

Open Circuit Breaker

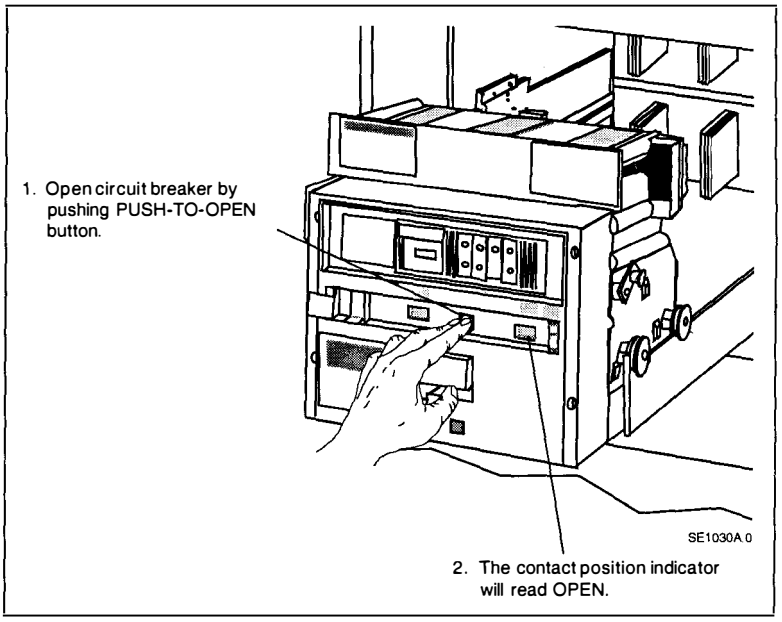


Figure 22 Open Circuit Breaker

Check Drawout Operation

NOTE: This check must be done with circuit breaker resting on the drawout rails in front of the carriage.

1. Insert drawout crank (Cat. No. SEDC).

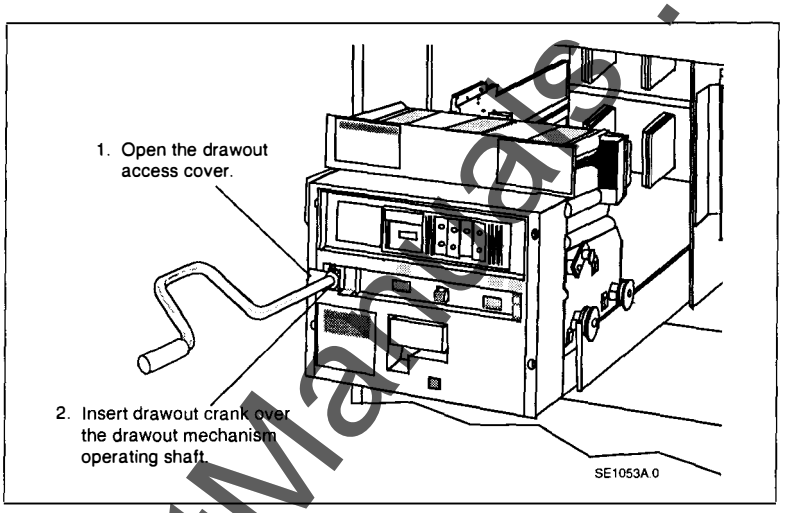


Figure 23 Insert Drawout Crank

2. Make sure drawout mechanism is in the disconnected (DISC) position.

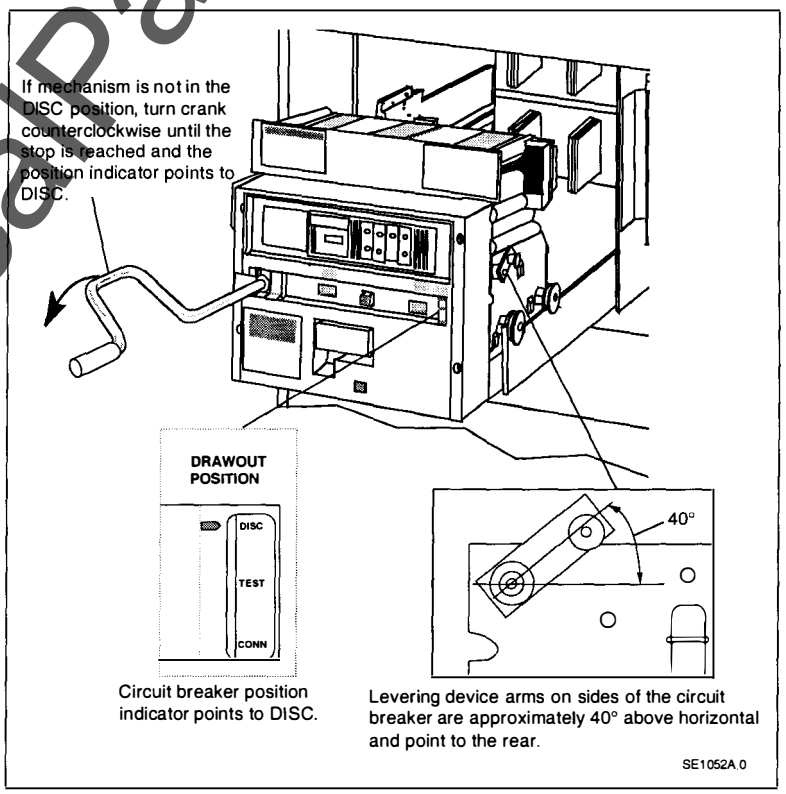


Figure 24 Disconnect Position

3. Place circuit breaker in TEST position.

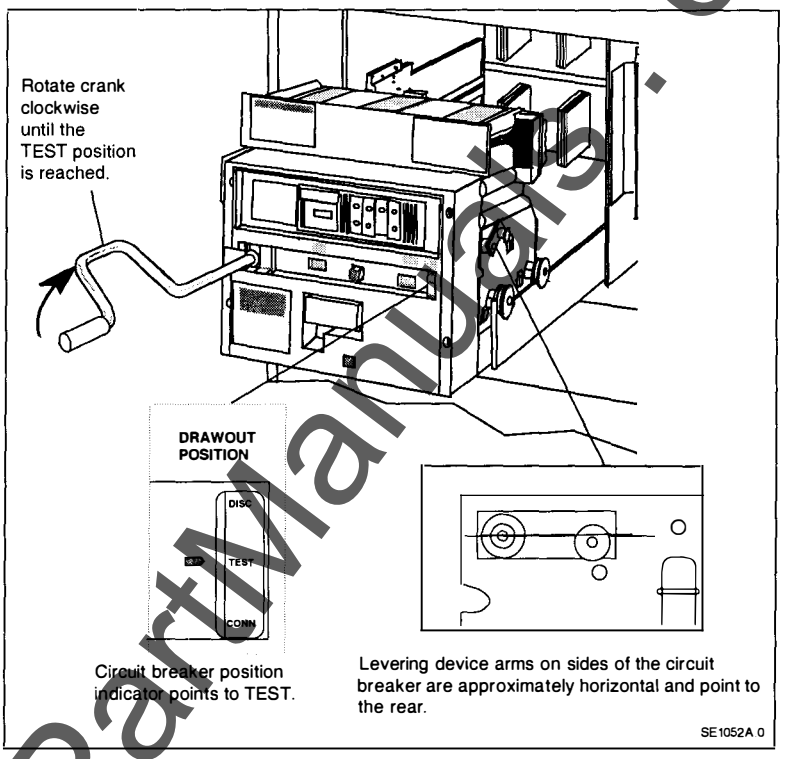


Figure 25 Test Position

4. Place circuit breaker in connected (CONN) position.

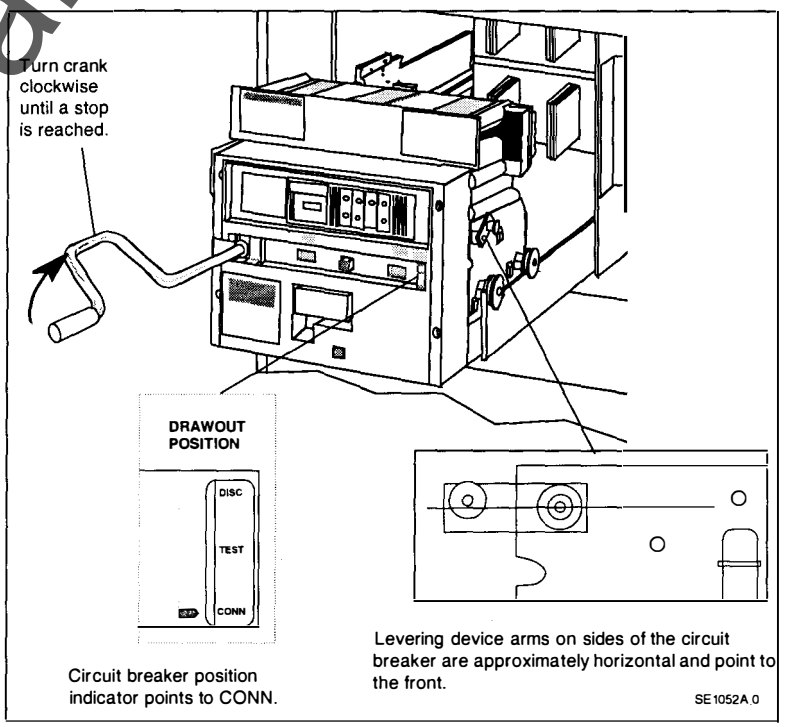


Figure 26 CONN Position

5. Return circuit breaker to disconnected position.

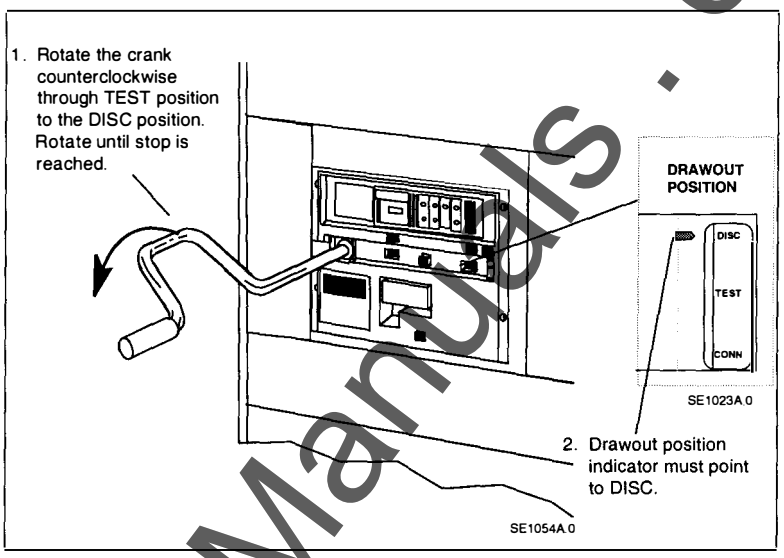


Figure 27 Place Circuit Breaker in DISC Position

6. Lift drawout access cover and remove crank. Allow drawout access cover to close.

Remove Circuit Breaker

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

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

- Remove circuit breaker ONLY when switchboard section is secured to avoid tipping.
- Circuit breaker weighs over 280 lbs. (127 kg) and must be lifted using lifting adapter and hoist capable of lifting 300 lbs. (136 kg).

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

2. Open the circuit breaker by pushing the PUSH-TO-OPEN button (A).

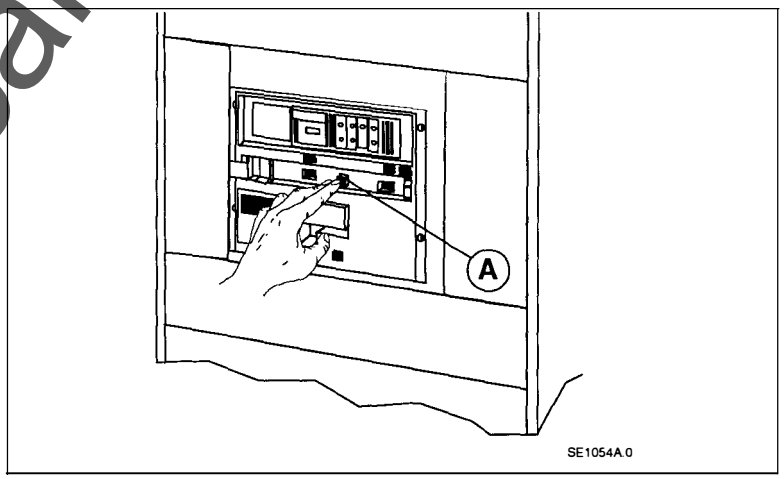


Figure 28 Open Circuit Breaker

3. Place circuit breaker in disconnect position.

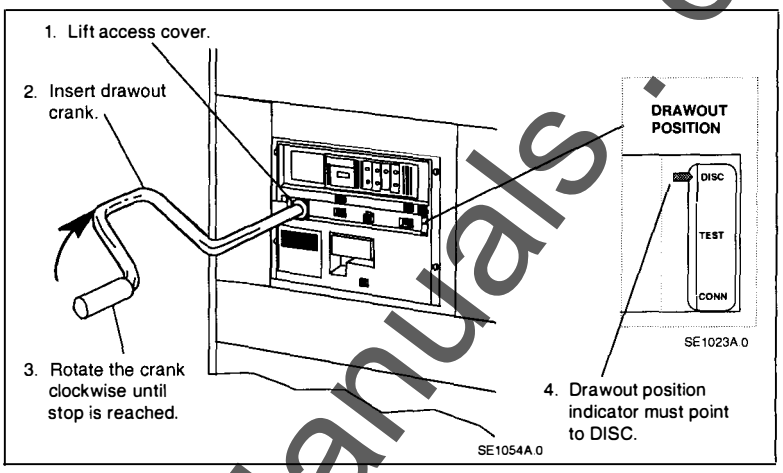


Figure 29 Place Circuit Breaker in DISC Position

4. Lift drawout access cover and remove crank. Allow drawout access cover to close.

5. Remove switchboard door retaining screws and open the door.

6. Pull out circuit breaker.

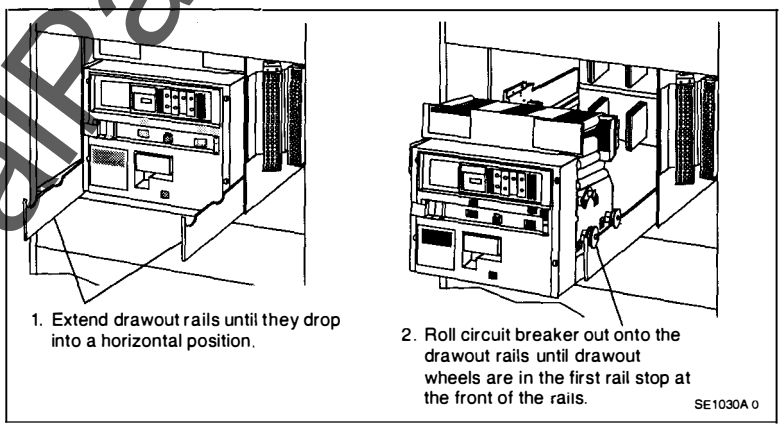
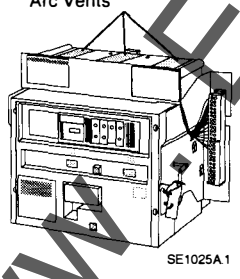


Figure 30 Pull Out Circuit Breaker

⚠ CAUTION

Arc Vents



HAZARD OF CIRCUIT BREAKER DAMAGE

Arc vents must be covered with tape before moving or servicing circuit breaker. If any object drops into arc vents, return circuit breaker to Square D.

Failure to follow these instructions can result in equipment damage.

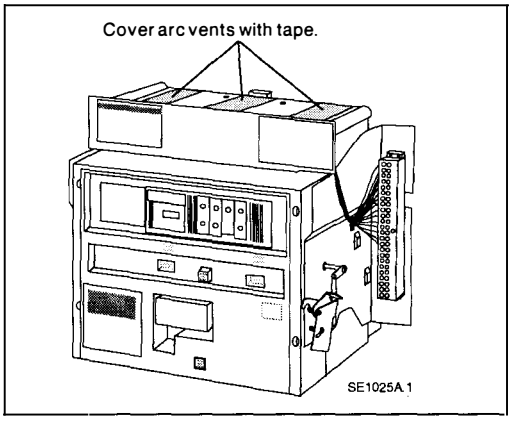


Figure 31 Cover Arc Vents

Section 5—Trip Unit Operation

SE circuit breakers are equipped with the MICROLOGIC Full-function Trip System (Fig. 32), which provides adjustable tripping functions and characteristics using true root-mean-square (RMS) current sensing.

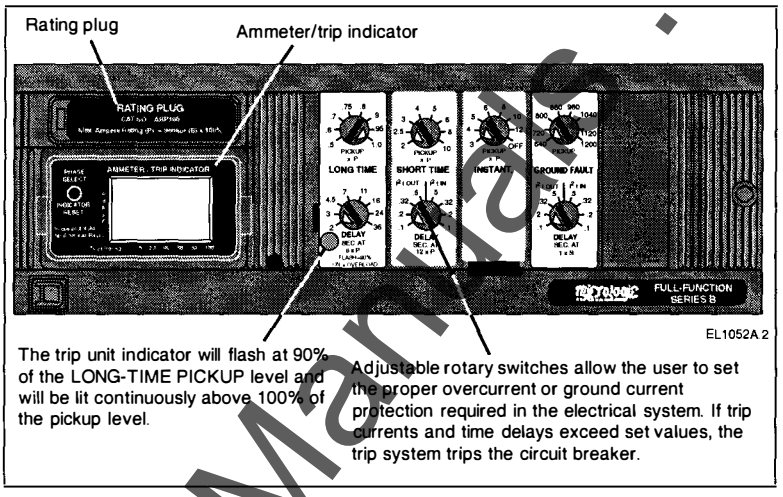


Figure 32 Full-function Trip System

CURRENT RATING

Determine ampere 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
3000	x	0.75	x	0.5	=	1125

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

RATING PLUG

Rating plugs 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.

⚠ CAUTION

HAZARD OF CIRCUIT BREAKER DAMAGE

Rating plug and ammeter/trip indicator are subject to damage from static charge. Do not handle these devices by their contacts. If either 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.

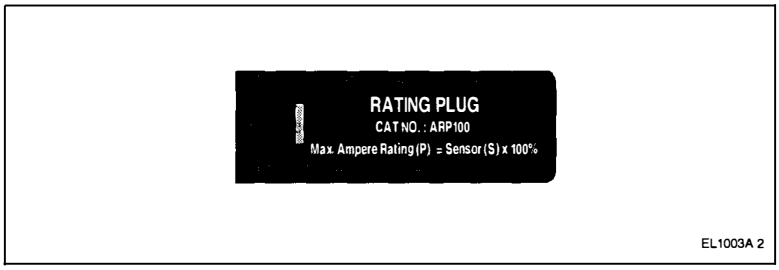


Figure 33 Rating Plug

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 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. (Phase values are displayed in true RMS. Ground-fault current values are displayed in calculated RMS based on measured peak current.)

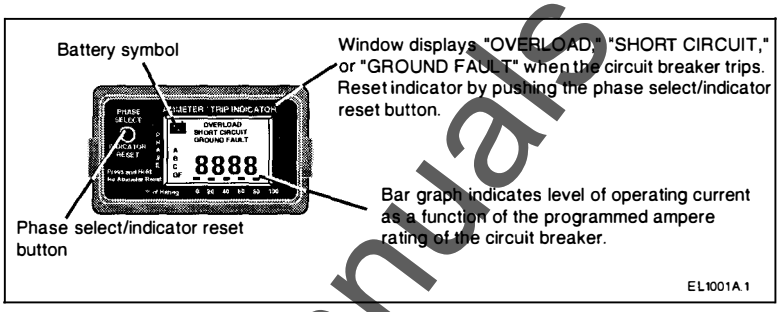


Figure 34 Ammeter/Trip Indicator

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. If this does not occur, contact Square D for a replacement ammeter/trip indicator. Ammeter/trip indicator must be installed in trip unit for test function to work.

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 the 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 tripping 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 tripping provide ground-fault protection for equipment.

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.

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 B for wiring diagrams.

NOTE: Circuit breakers with ground-fault alarm will not trip if a ground fault occurs.

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 35 shows the various parts of the trip curve affected by the trip settings.

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.

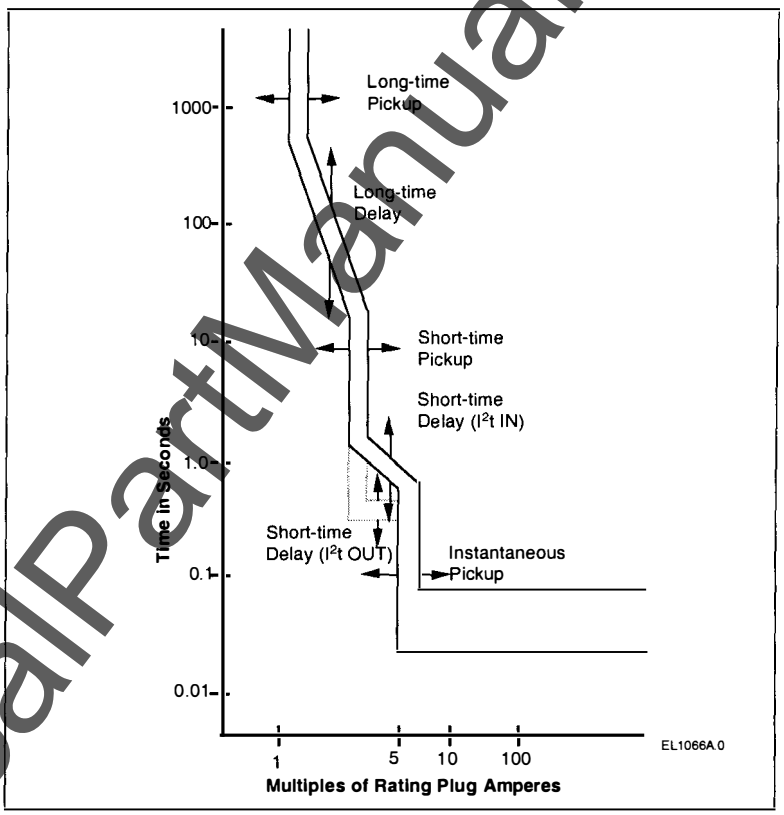


Figure 35 Trip Curve

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

TRIP UNIT FUNCTIONS

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

Long-time Trip Function

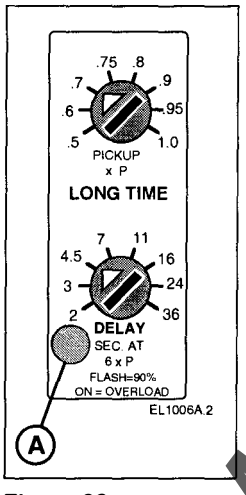


Figure 36 Long-time Trip Switches

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 indicator (A) 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

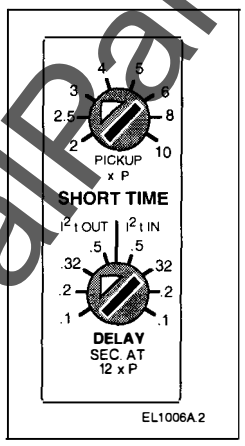


Figure 37 Short-time Trip Switches

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 OR BURN

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

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

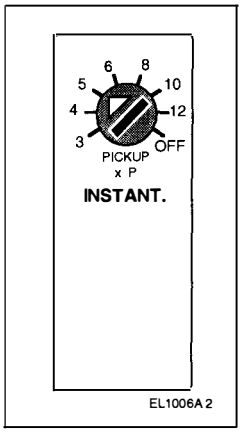


Figure 38 Instantaneous Trip Switch

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

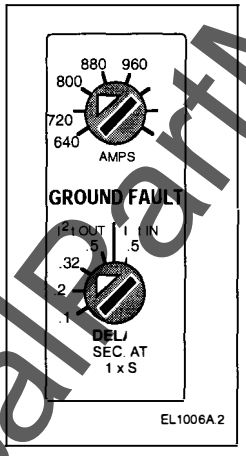


Figure 39 Ground-fault Trip Switches

GROUND-FAULT PICKUP Switch — sets current level (based on circuit breaker ampere rating) 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 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.

Ground-fault Alarm Function

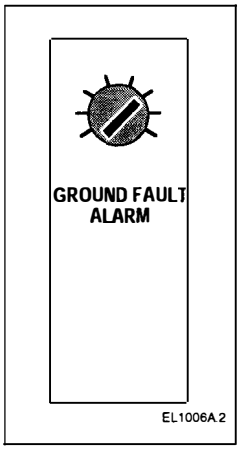


Figure 40 Ground-fault Alarm Switch

GROUND-FAULT ALARM Switch — sets current level (based on circuit breaker sensor size) at which circuit breaker will signal the POWERLOGIC system that a ground fault is present.

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.

Section 6—Trip Unit Adjustments and Control Wiring

TRIP UNIT ADJUSTMENTS

Trip Unit Settings

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 5—Trip Unit Operation.

NOTE: Turn circuit breaker OFF before adjusting switches.

Adjust Trip Unit

1. Remove plastic cover.

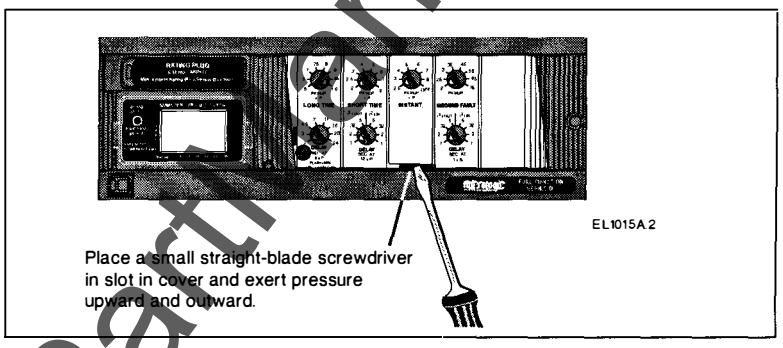


Figure 41 Remove Plastic Cover

2. Set switches.

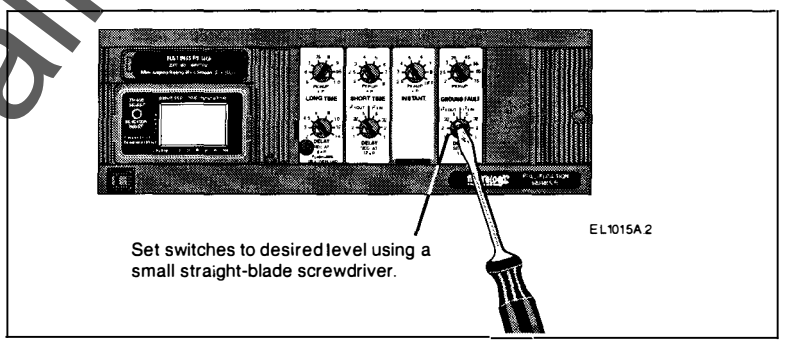


Figure 42 Set Switches

3. Replace plastic cover.

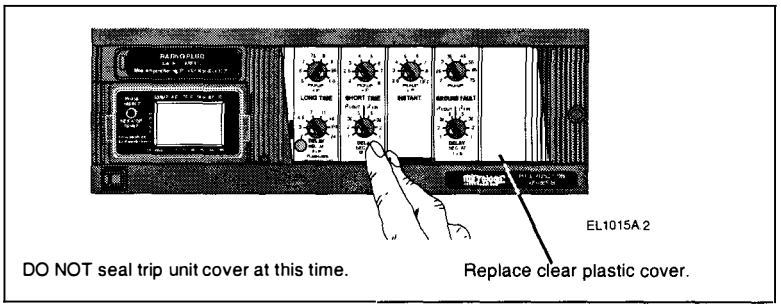


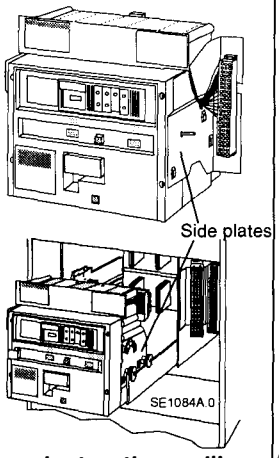
Figure 43 Replace Plastic Cover

CONTROL WIRING

⚠ 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.
- Ground the circuit breaker side plates whenever control power wiring such as test power is connected to a circuit breaker which is not mounted in the switchboard.



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 these instructions can result in equipment damage.

Control power wiring must be connected to provide power for proper operation of any internal electrical accessories. Use a control power transformer of sufficient size for the circuit breaker configuration (see Table 7). Wiring diagrams for individual accessories can be found in Appendix B—Wiring Diagrams.

Table 7 Control Power Transformer

Configuration	Minimum Size
Circuit breakers with ground-fault option but without accessories.	150 VA
Circuit breakers with accessories, with or without ground-fault option.	500 VA
Two or three circuit breaker throwover systems.	1000 VA

Terminal connectors are supplied on SE circuit breakers to permit connection of control wiring.

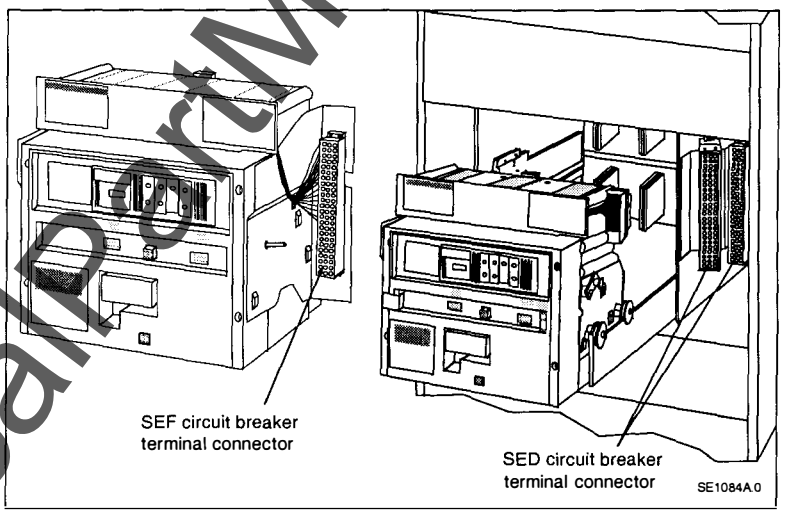


Figure 44 Terminal Connectors

Control wiring for circuit breakers which have been factory installed in switchboard is pre-wired. Any additional customer wiring must be made to the terminal connectors.

Circuit Breaker Accessories

Wire factory-installed accessories according to wiring diagrams in Appendix B.

Communicating with a POWERLOGIC® System

To network a circuit breaker to a POWERLOGIC® system, use a MICROLOGIC® Communications Adapter, Cat. No. CIM3F. Install the communications adapter according to the installation instructions that come with the adapter kit.

Zone-selective Interlocking

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 8. (Series numbers for current design circuit breakers end in B, for example SE Series 3B.)

Table 8 ZSI Combinations (All Inputs Driven Are Same Column)

Circuit Breaker Series: Inputs → / Output ↓	SE 2 (Ground Fault)	SE 2 (Short Time)	ME 3, NE1, PE 4	ME 4–5, NE 2–3, PE 5–6, SE 3	ME 5A, NE 3A, PE 6A, SE 3A	LE 1B, ME 5B, NE 3B, PE 6B, SE 3B	GC100	RIM32
SE 2 (Ground Fault)	50		R	R	R	R	R	50
SE 2 (Short Time)		1	R	R	R	R		50
ME 3, NE1, PE 4	50	R	15	2	13	47	R	50
ME 4, 5 & 5A, NE 2, 3 & 3A, PE 5, 6 & 6A, SE 3 & 3A	50	R	R	1	1	7	R	14
LE 1B, ME 5B, NE 3B, PE 6B, SE 3B	50	R	10	1	R	26	R	44
GC100	R		R	R	R	R	7	50
GFM*	50		2	1	1	5	R	10
RIM32	50	6	50	7	37	50	15	50

* GFM is an output device only.

[#] Maximum inputs without RIM32. Self-restraint counts as one input.

[R] RIM32(s) required to restrain any devices.

[ ] Present design.

[▨] Invalid combination.

For double-ended or larger systems, or systems which contain circuit breakers from different columns in Table 8, 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 B 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, self-restrain it by leaving factory-installed jumper between terminals 23 and 24. Otherwise, remove factory-installed jumper from short-time terminals 23 and 24.

2. To restrain other circuit breakers, connect short-time output (terminal 24) and equipment ground (common) (terminal 22) of circuit breaker to short-time inputs and equipment grounds (commons) of circuit breakers to be restrained.

3. To restrain this circuit breaker, connect short-time input (terminal 23) and common (terminal 22) of circuit breaker to short-time outputs and equipment grounds (commons) from circuit breakers doing restraining.

To activate ground-fault zone-selective interlocking repeat steps 1–3 above, using ground-fault terminals 20 and 21 and equipment ground (common) terminal 22.

If the distance between any two circuit breakers exceeds 1000 ft. (305 m), a restraint interface module will be required. See Section 8–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.

Ground-fault Protection

⚠ 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 these instructions 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 ground-fault test circuit terminals. See Appendix B for wiring diagram.

Failure to follow these instructions can result in equipment damage.

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

Three-phase, four-wire circuits require a neutral current transformer (CT). Connect neutral CT to circuit breaker control wiring terminals according to wiring diagrams in Appendix B, depending on type of ground-fault sensing required. All ground-fault circuit breakers include an integral ground-fault test feature which requires external 120 Vac (100 VA) power.

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.

2. Connect neutral CT, if needed:

   A. Primary

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

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

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

   B. Secondary

   Connect terminal X1 of the neutral CT to terminal 16 of the circuit breaker and terminal X2 of the neutral CT to terminal 17 of the circuit breaker, using no more that 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 13 and 14.

Test Ground-fault Feature

Test ground-fault feature as described in the Ground-fault Field Test Procedure supplied with circuit breaker.

CHECK INSTALLATION

1. Inspect circuit breaker mounting, connections and accessories.

2. Inspect any downstream equipment.

SED Circuit Breaker

Circuit breaker MUST be on drawout rails and in the disconnected (DISC) position. Refer to Section 4—SED Circuit Breaker.

1. Push circuit breaker into carriage until levering device arms (A) come into contact with the carriage assembly.

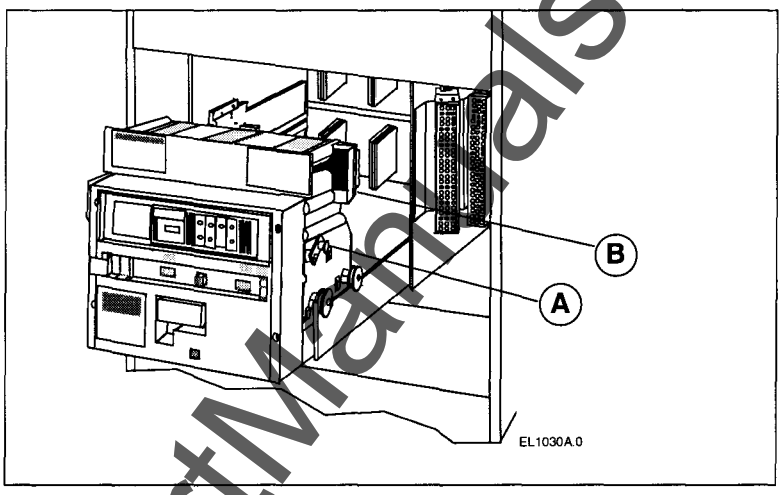


Figure 45 Levering Device Arms

2. Make sure the secondary terminal connector (B) is in alignment with the terminal in the carriage.
3. Push drawout rails into switchboard to their stored position.
4. Close and secure door using previously removed screws.
5. Place circuit breaker in TEST position.

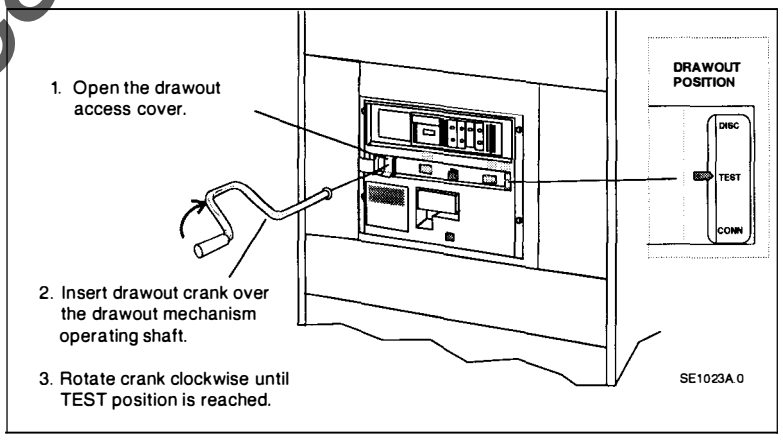


Figure 46 Place in TEST Position

6. Lift drawout access cover and remove drawout crank, allowing drawout access cover to close.

   NOTE: Drawout position indicator must be at midpoint in the TEST position before access cover will close.

7. Turn on control power. If circuit breaker is equipped with a spring charging motor and the closing springs are discharged, they will be charged automatically at this time.

8. Check operation of any accessories. Refer to Section 9—Accessories for details. Correct any improper operation before proceeding.

9. Place in CONN position.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not drive drawout mechanism beyond the connected position.

Failure to follow these instructions can result in equipment damage.

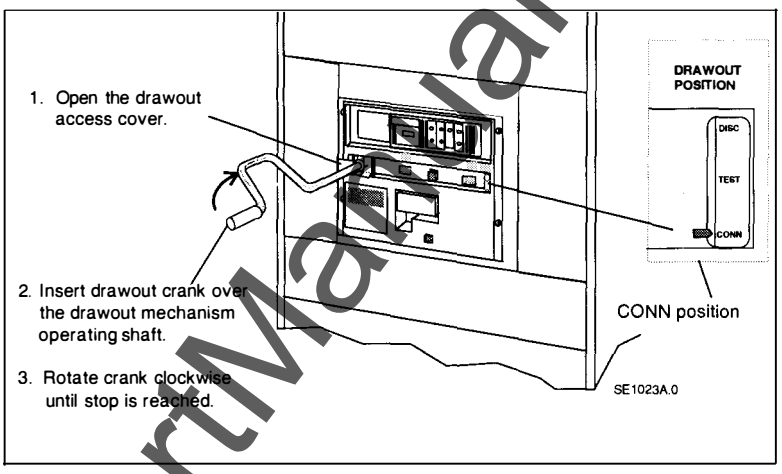


Figure 47. Place in CONN Position

10. Lift drawout access cover and remove crank, allowing drawout access cover to close.

NOTE: To reopen the SEF circuit breaker cell door,

1. *Open circuit breaker by pressing the PUSH-TO-OPEN button.*
2. *Remove screws securing door.*
3. *Press PUSH-TO-OPEN button while opening cell door.*

PLACE CIRCUIT BREAKER IN SERVICE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

Faults can result from damage or incorrect installation practices that were undetected during pre-energizing inspection. Allow only qualified electrical personnel to be present during initial energizing of equipment.

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

Place circuit breaker in service as described in the Switchboard Installation/Maintenance Manual.

SEAL TRIP UNIT

1. Put the clear plastic cover (A) in place.
2. Insert seals (B) through sealing posts (C).

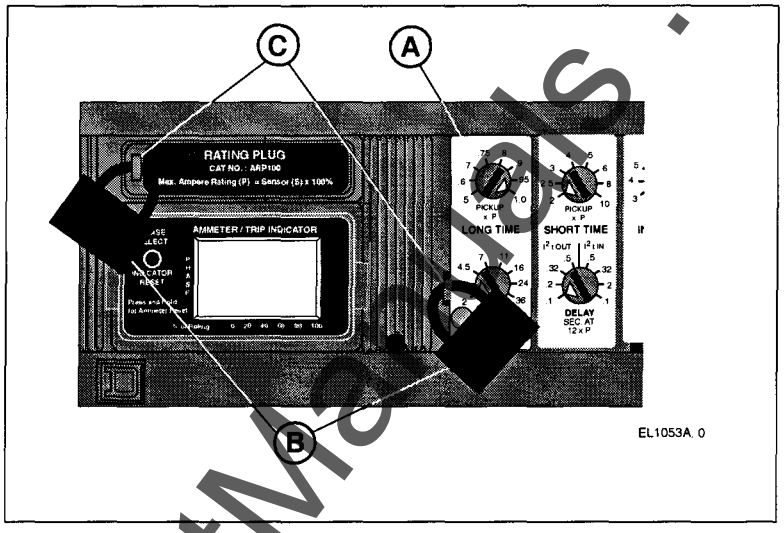


Figure 48 Sealing Trip Unit

Section 7—Maintenance

ROUTINE MAINTENANCE

Perform routine maintenance periodically and following any severe electrical fault.

⚠ 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 all power to circuit breaker and accessories.
2. Open the circuit breaker.

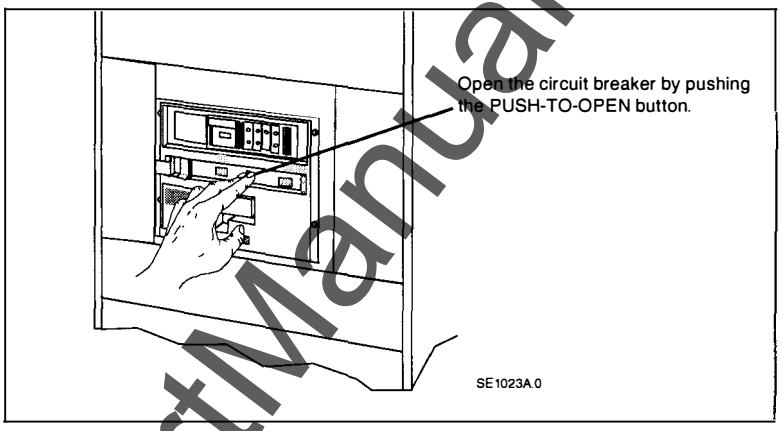


Figure 49 Opening the Circuit Breaker

SEF Circuit Breaker Only

Inspect the circuit breaker. If damage such as loose power terminals, distorted connectors or any loose parts in the switchboard section is found, contact Square D.

SED Circuit Breaker Only

1. Remove circuit breaker from enclosure:
   - Place circuit breaker in DISC position.

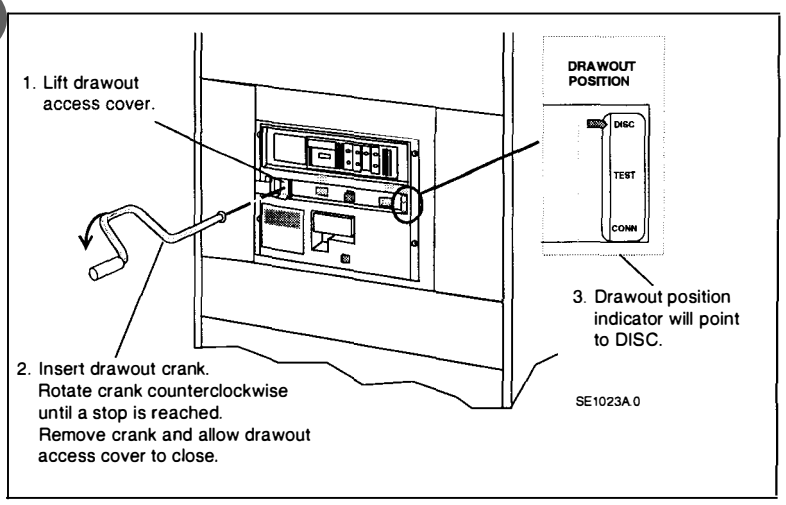


Figure 50 Place Circuit Breaker in DISC Position

- Remove switchboard door retaining screws and open door.
- Extend drawout rails.

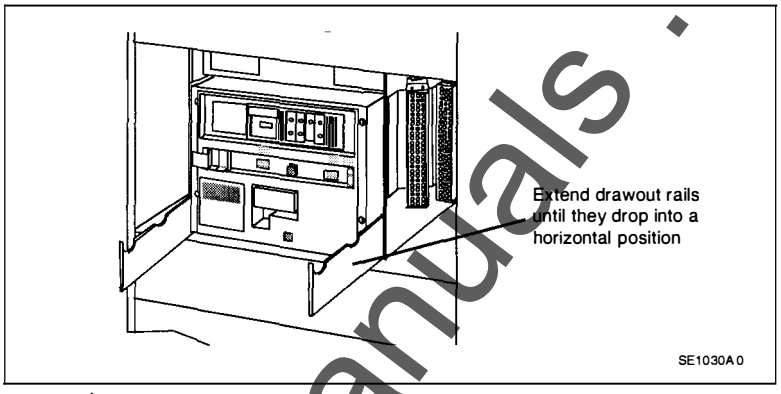


Figure 51 Extend Drawout Rails

- Roll circuit breaker out onto drawout rails.

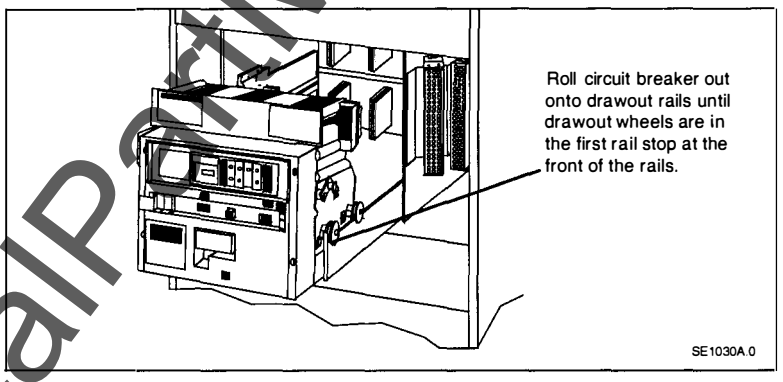
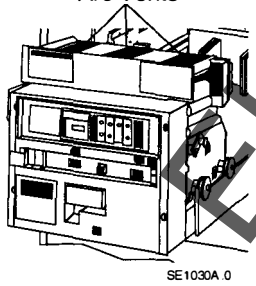


Figure 52 Circuit Breaker on Drawout Rails

⚠ CAUTION



HAZARD OF CIRCUIT BREAKER DAMAGE

Arc vents must be covered with tape before moving or servicing circuit breaker. If any object drops into arc vents, return circuit breaker to Square D.

Failure to follow these instructions can result in equipment damage.

NOTE: If shipping circuit breaker to another location, repack as instructed in Section 9—Repacking Circuit Breaker.

- Mount filler plate to the cell door to cover the circuit breaker opening.

2. Inspect the circuit breaker. If damage such as loose power terminals, distorted connectors or any loose parts in the switchboard section is found, contact Square D.

3. Inspect line and load power connectors:

   - Check power connectors. They must be clean, with their joint compound of a soft consistency with no caking or residue and white to tan in color. If compound no longer has a soft uniform consistency, but is discolored with oil separation or a caked residue, overheating may have occurred. Consult the local Square D Field Office.

   - Use joint compound, Cat. No. PJC8311, available from Square D, to relubricate the connectors following inspection.

NOTE: Use only Square D joint compound, Cat. No. PJC8311, for proper operation and longevity of drawout connectors.

SED 4000 A Circuit Breaker Only

4. Check cooling fan:

   The fan cooling system of the SED 4000A drawout circuit breaker produces air flow around the circuit breaker carriage connections as the circuit breaker nears full load.

   The fan cooling system contains an integral self-test feature. Test fan by means of a PUSH-TO-TEST button (A) on the front of the circuit breaker.

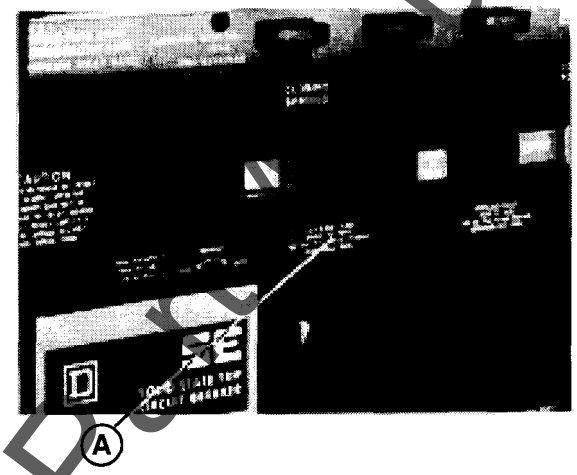


Figure 53 Cooling Fan Test

Primary Injection Testing

Before conducting any tests refer to the *National Electrical Manufacturers Association Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications* (NEMA Standards Publication AB-4). **This testing is to be done by qualified personnel only.**

Primary injection testing involves utilizing a high-current, low-voltage source to pass current through each pole of the circuit breaker. In order to properly perform primary injection testing, all of the secondary sensing wiring must be properly connected:

Jumper terminal 16 to terminal 19
Jumper terminal 17 to terminal 18
Jumper terminal 20 to terminal 21
} For ground-fault breakers.

Jumper terminal 23 to terminal 24 — Short-time delay self restraint.

SEF circuit breakers are jumpered at the terminal blocks on the side of the circuit breaker. SED circuit breakers require an adapter plug kit (Cat. No. SEPITK2) to perform testing safely.

To defeat ground-fault on SEF circuit breakers, place an additional jumper from terminal 16 to terminal 17.

To defeat ground-fault on SED circuit breakers, follow instructions with SEPITK2 to achieve the same jumpering configurations.

Section 8—Accessories

GENERAL

UL Listed accessories described in this section are available for factory installation and field replacement. Labels on the circuit breaker indicate which accessories are installed in a particular circuit breaker.

Customer wiring to internal electrical accessories is connected to the terminal blocks either on the SEF circuit breaker or in the switchboard cell for SED circuit breakers. Wiring diagrams can be found in Appendix B. Table 9 lists the minimum size control power transformer necessary for accessory operation.

Table 9 Control Power Transformer Requirements

Configuration	Minimum Size
Circuit breakers with ground-fault option but without accessories	150 VA
Circuit breakers with accessories, with or without ground-fault option	500 VA
Two or three circuit breaker throwover systems	1000 VA

If checking operation of internally-operated accessories, refer to Section 10—Troubleshooting. To replace an accessory, follow the instructions in the field-replaceable accessory kit.

SHUNT TRIP

The shunt trip opens the circuit breaker electrically from a remote location using an external voltage source. The shunt trip includes a coil clearing contact which opens the shunt trip coil circuit when the circuit breaker opens. The shunt trip mounts behind the auxiliary cover in the right side of the accessory section and is field installable.

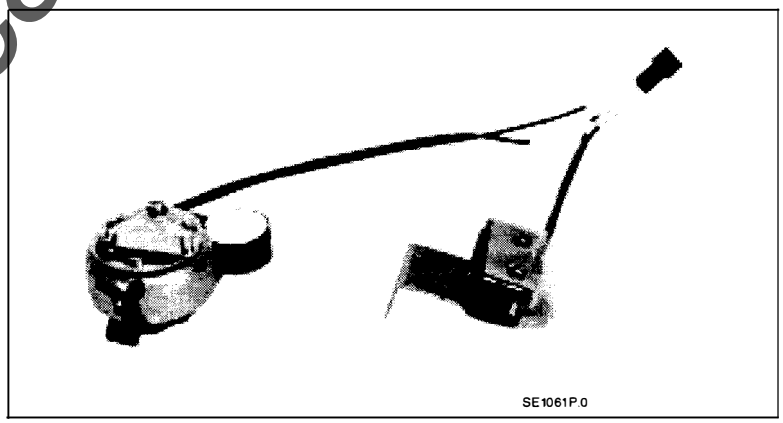


Figure 54 Shunt Trip

SHUNT CLOSE (REMOTE CLOSE) (CIRCUIT BREAKERS WITH SPRING-CHARGING MOTOR ONLY)

The shunt close closes the circuit breaker electrically from a remote location, using an external power source. If control voltage is continuously applied to the shunt close circuit, an integral anti-pump feature prevents automatic reclosing after opening. The shunt close contains a fuse for overcurrent protection. The shunt close mounts behind the auxiliary cover in the right side accessory section and is factory installed and field replaceable.

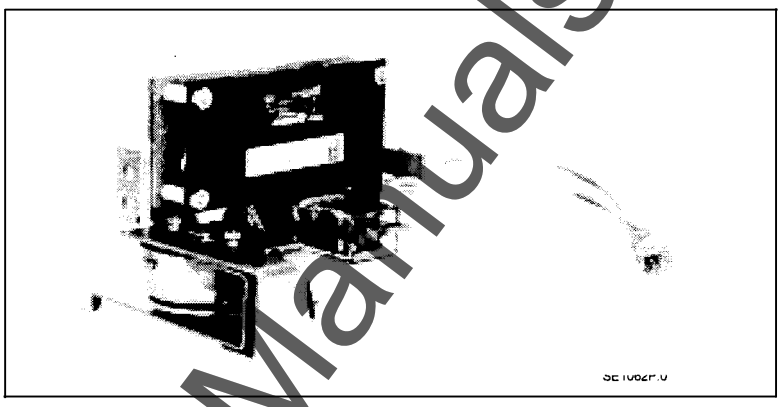


Figure 55 Shunt Close

NOTE: Attempting to electrically close a circuit breaker with an undervoltage trip without energizing the undervoltage trip first will cause the shunt close fuse to open.

ALARM SWITCH

The alarm switch indicates any automatic circuit breaker opening, whether due to an overload, short-circuit, ground-fault or undervoltage condition. It does not actuate when the circuit breaker opens due to a manual operation or a shunt trip. The alarm switch is reset by depressing the PUSH-TO-OPEN button. The alarm switch has two switches, which can be wired as two normally-open contacts, two normally-closed contacts or one normally-open and one normally-closed contact. Switches can be converted in the field. The alarm switch mounts behind the auxiliary cover in the right side of the accessory section and is field installable.

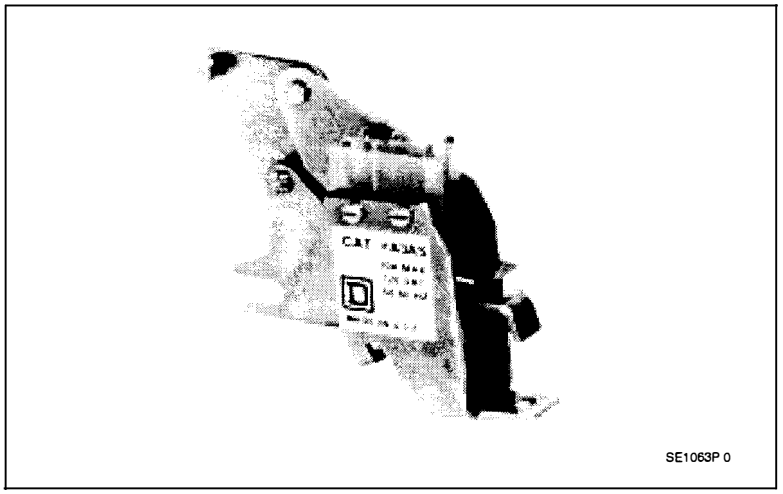


Figure 56 Alarm Switch

UNDERVOLTAGE TRIP

The undervoltage trip accessory (UVR) opens the circuit breaker when voltage in the monitored circuit drops below 35%–70% of nominal voltage. Reclosure of the circuit breaker can occur only when the UVR supply voltage is above 80%–90% of nominal voltage. The monitored circuit can be wired in series with an externally-mounted normally-closed contact to open the circuit breaker from a remote location.

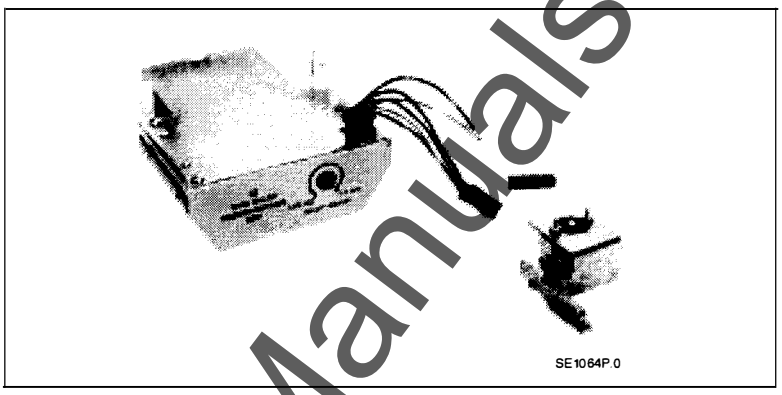


Figure 57 Undervoltage Trip

An integral adjustable delay feature provides the time delay necessary to avoid nuisance circuit breaker opening from momentary fluctuations in the monitored voltage source. The time delay is adjustable from 0.1 second to 1.5 seconds and is set by using a small screwdriver to rotate the adjusting screw (A, Fig. 58) on the time delay unit. An interlock prevents mechanical closing of the circuit breaker under a low-voltage condition. The undervoltage trip mounts behind the auxiliary cover in the right side accessory section and is field installable.

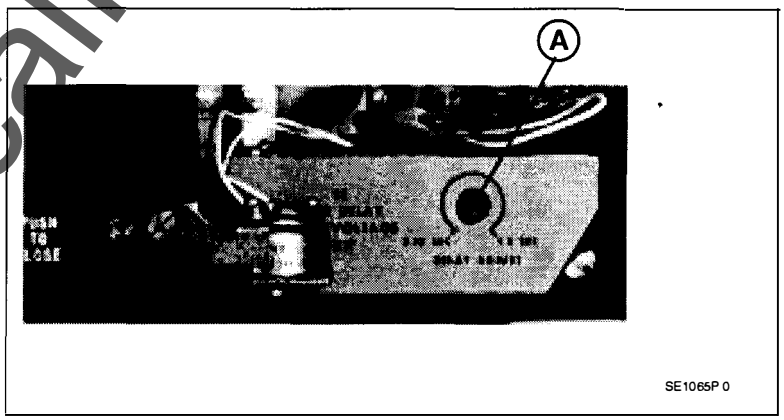


Figure 58 Time Delay Adjusting Screw

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

SED CIRCUIT BREAKER CELL SWITCH

The cell switch is employed when SE circuit breakers are used in transfer schemes. The switch mechanically detects circuit breaker movement from the CONN position to the TEST position and only permits operation of the transfer scheme when the circuit breaker is in the CONN position. The cell switch is mounted on the left side of the drawout carriage and is available with up to eight convertible contacts with ratings equal to Class 8501 Type X relays (10 amperes continuous at 120 Vac, 60 Hz).

Figure 59 SED Circuit Breaker Cell Switch

SPRING CHARGING MOTOR

The spring charging motor automatically charges the circuit breaker closing springs. A complete electrical operation system must include a spring charging motor and shunt close to close the circuit breaker and either a shunt trip or an undervoltage trip to electrically open the circuit breaker.

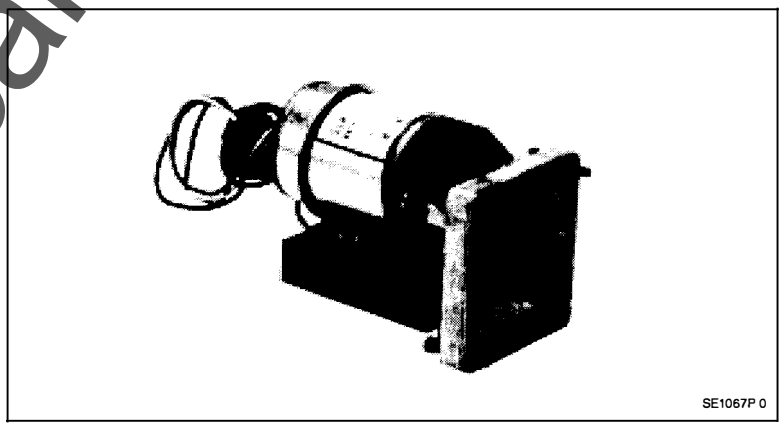


Figure 60 Spring Charging Motor

Spring charging is initiated automatically whenever the closing springs are discharged and power is supplied to the charging motor. When the springs are completely charged, the motor circuit is disconnected and the closing spring indicator reads CHARGED. The spring charged contacts (terminals 47 and 48) close at this time. If control power is not available, spring charging can be done manually. The spring charging motor is mounted behind the auxiliary cover in the left accessory section, behind the transformer mounting plate. The spring charging motor is factory installed and field replaceable.

AUXILIARY SWITCH

The auxiliary switch is generally used for control circuits and indicator lights associated with circuit breaker operation. The auxiliary switch indicates the position of the circuit breaker main contacts as follows:

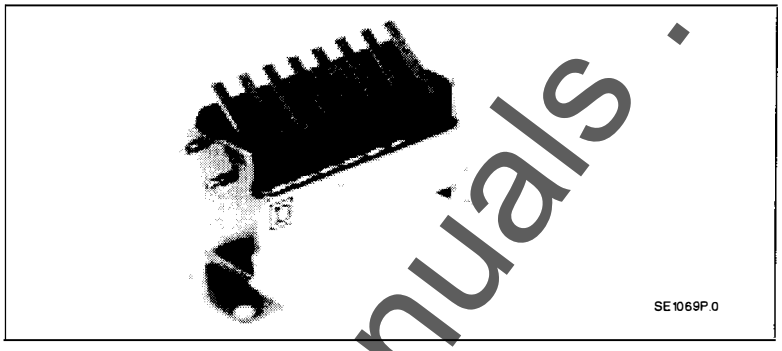


Figure 61 Auxiliary Switch–AC Rated

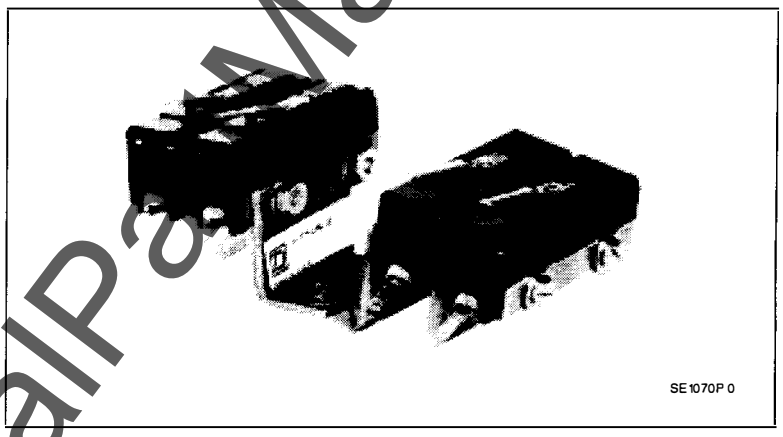


Figure 62 Auxiliary Switch–DC Rated

A contacts – open when circuit breaker is open and closed when circuit breaker is closed.

B contacts – closed when circuit breaker is open and open when circuit breaker is closed.

An auxiliary switch can be converted from type A to type B (and vice versa) in the field. Two kinds of auxiliary switches are available. The ac-rated switch (Fig. 61) is rated for ac use only. The dc-rated switch (Fig. 62) has an ac/dc rating and is primarily for use in dc control systems.

The auxiliary switch is mounted behind the auxiliary cover in the right side accessory section and is field installable.

CLOSE BUTTON COVER

The close button cover (A), Cat. No. SE1CBC, restricts manual closing of the circuit breaker. The circuit breaker can be closed in an emergency by inserting a small screwdriver through the hole in the cover and pushing the PUSH-TO-CLOSE button.

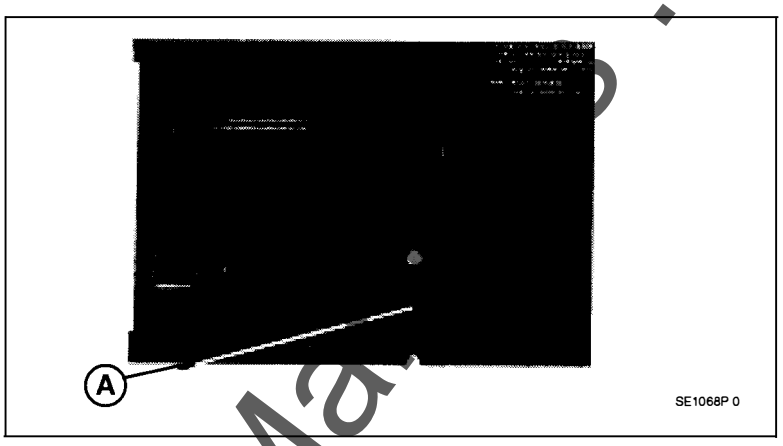


Figure 63 Close Button Cover

SEF CIRCUIT BREAKER PADLOCK ATTACHMENT

The padlock attachment, Cat. No. SE2PA, locks the SEF circuit breaker main contacts open. This field-installable accessory will accept up to three padlocks. Maximum shackle diameter is 3/8 in. (9.5 mm). The padlock attachment is mounted to the face of the circuit breaker as shown. When in use, it depresses the PUSH-TO-OPEN button.

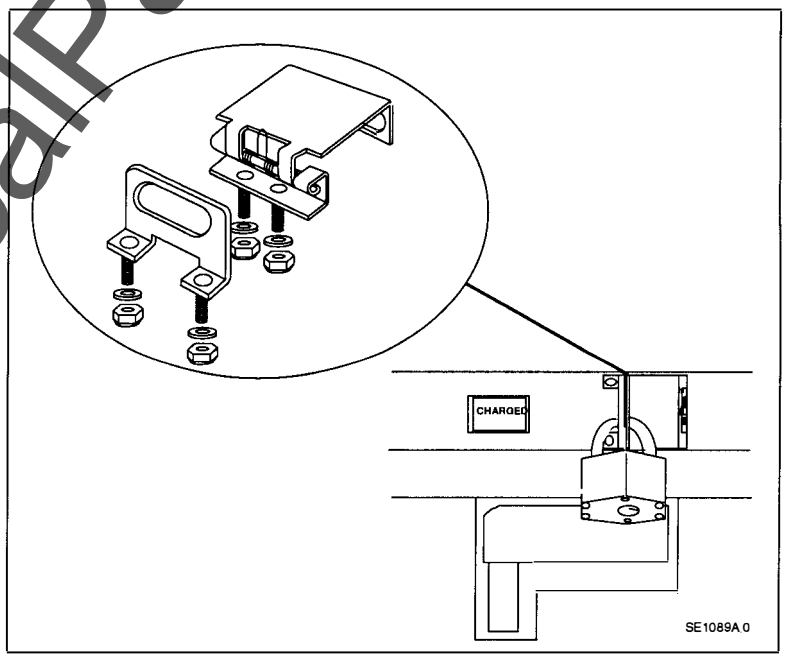


Figure 64 SEF Circuit Breaker Padlock Attachment

SED CIRCUIT BREAKER PADLOCK ATTACHMENT

Drawout circuit breakers can be padlocked open using the drawout mechanism lockout.

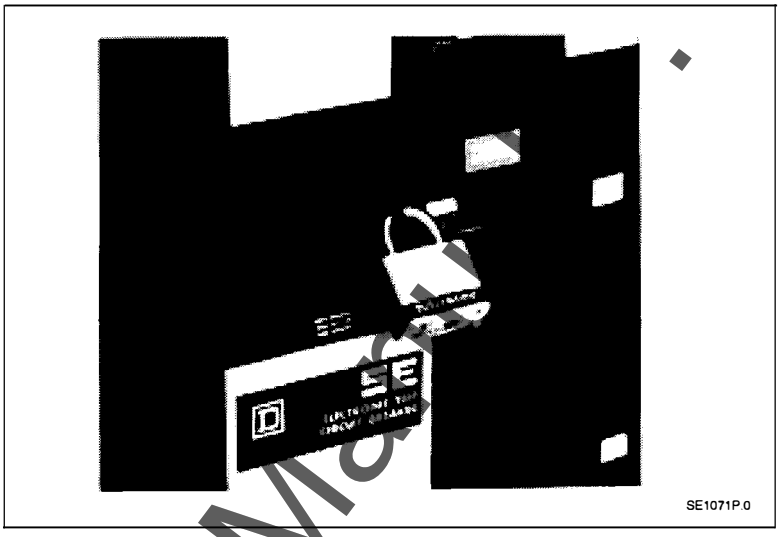


Figure 65 SED Circuit Breaker Padlock Attachment

To lock circuit breaker open, first move circuit breaker to the TEST position. (Circuit breaker cannot be padlocked in the DISC position.) Then, with access cover still open, move lockout over to hold the access cover open. The lockout will accept up to three padlocks with a maximum shackle diameter of 3/8 in. (9.5 mm). In addition, a drawout carriage padlock hasp is provided on all drawout carriage assemblies and can be padlocked to prevent the installation of a circuit breaker as shown below.

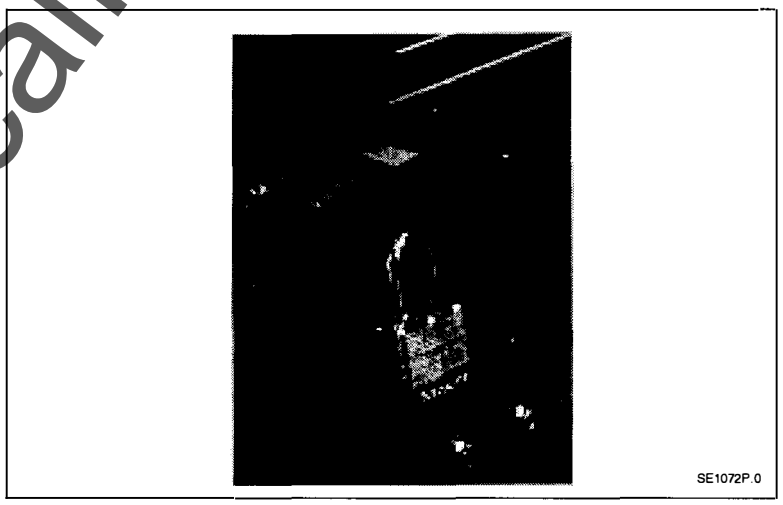


Figure 66 SED Circuit Breaker Padlocked

CIRCUIT BREAKER KEY INTERLOCK

The key interlock is used for coordinating circuit breaker operation with other keyed devices. The key interlock must be purchased separately. When the interlock bolt is extended, the circuit breaker is held open.

SEF Circuit Breaker Key Interlock

⚠ WARNING

HAZARD OF UNINTENDED EQUIPMENT ACTION

- The circuit breaker key interlock can be defeated.
- Do NOT attempt to use the key interlock as a circuit breaker lockout.
- Read and understand this bulletin before using the key interlock.

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

The SEF circuit breaker key interlock bracket with mounting hardware is supplied in a field-installable kit, Cat. No. SE1KI, and is designed for mounting on the right side plate above the cell door interlock. Key interlocks with up to three cylinder locks can be used. The PUSH-TO-OPEN button must be depressed before the interlock bolt can be extended.

Figure 67 SEF Circuit Breaker Key Interlock

SED Circuit Breaker Key Interlock

The SED circuit breaker key interlock mechanism mounts on the upper right side of the drawout carriage. The key interlock mounting bracket is factory installed and field replaceable.

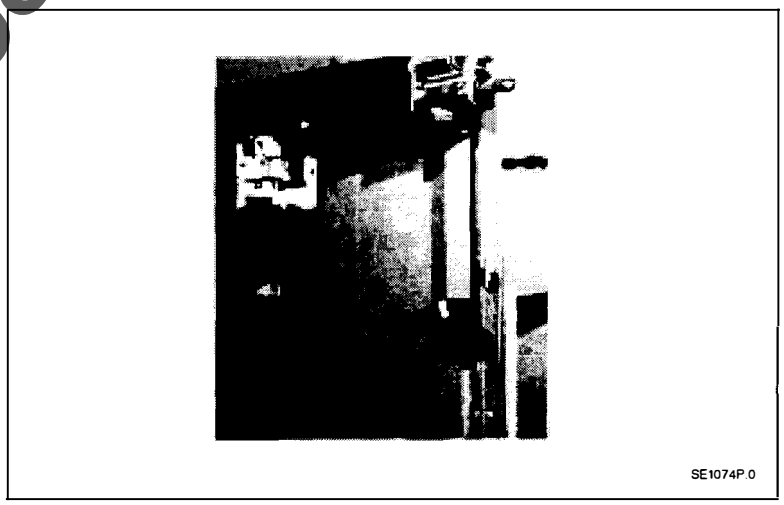


Figure 68 SED Circuit Breaker Key Interlock

COMMUNICATIONS ADAPTER

The field-installable communications adapter, Cat. No. CIM3F, is used to allow the circuit breaker trip unit to communicate with a Square D POWERLOGIC communications network. This allows an SE circuit breaker to be networked in a POWERLOGIC system. See Appendix B for CIM3F wiring instructions.

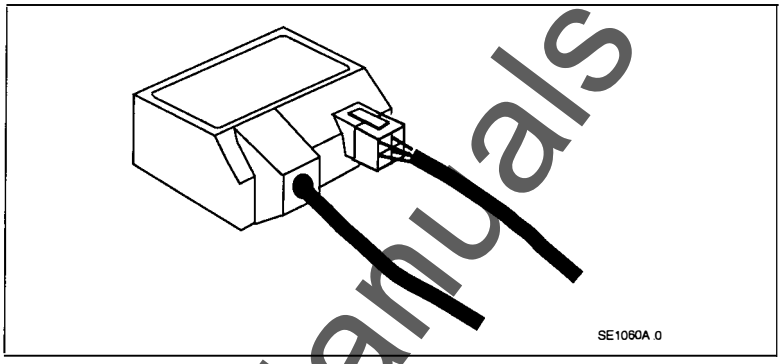


Figure 69 Communications Adapter

SED CIRCUIT BREAKER CELL KEYING KIT

The SED circuit breaker cell keying kit is installed on the SED circuit breaker and drawout carriage. It allows only a circuit breaker of a particular sensor size to be installed in the drawout carriage.

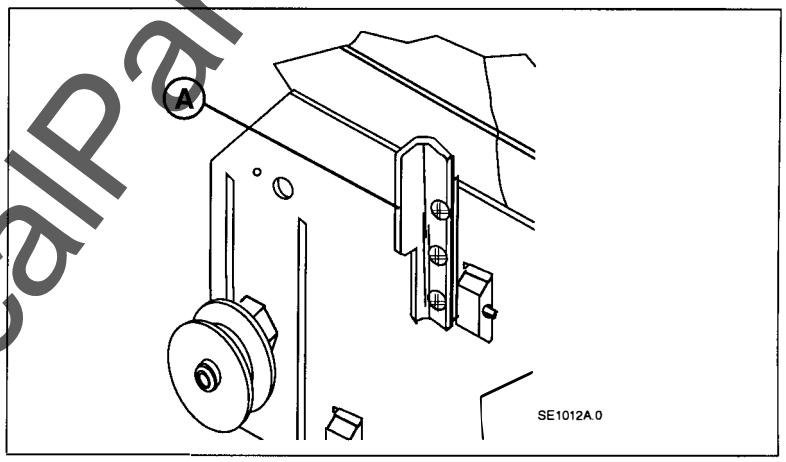


Figure 70 SED Circuit Breaker Cell Keying Kit

RESTRAINT INTERFACE MODULE

The restraint interface module, Cat. No. RIM32, is required on ZSI systems 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 8, Section 6 for ZSI combinations requiring RIM32.

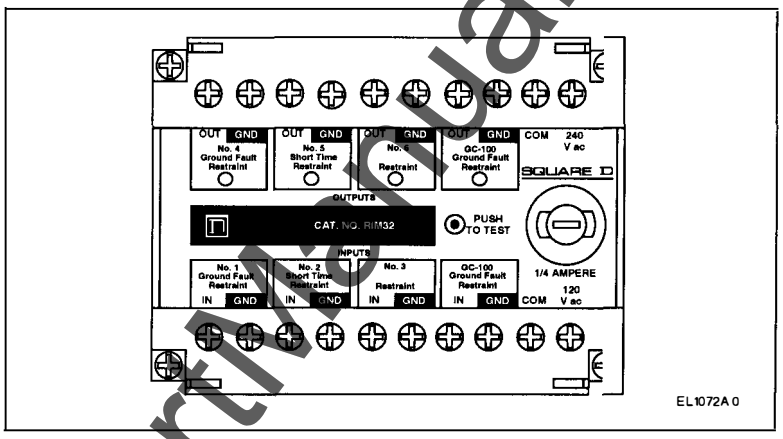


Figure 71 Restraint Interface Module

UNIVERSAL TEST SET

The universal test set is available to test all Square D circuit breakers with MICROLOGIC trip units. It has the ability to run trip unit tests automatically with prompts to the user for initial information. Test modules for each circuit breaker series are used to store data necessary for automatic tests for that type and sensor.

Testing can be done with a circuit breaker installed in the switchboard, but the zone-selective interlocking wires (restraint OUT) must be disconnected. If circuit breaker is connected to a POWERLOGIC system, the CIM3F Communications Adapter must be disconnected also. No other circuit breaker disassembly is required.

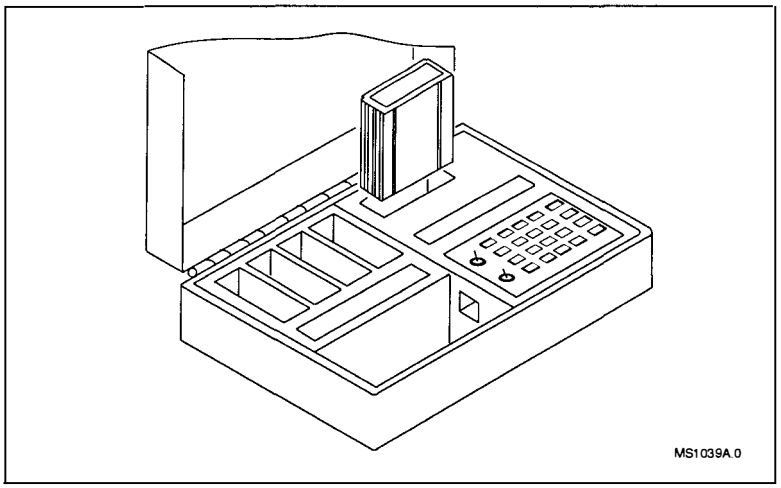


Figure 72 Universal Test Set

Section 9—Repacking Circuit Breaker

EQUIPMENT REQUIRED

Hoist, lifting capacity 300 lbs. (136 kg)
Banding or Strapping Equipment
Lifting Adapter, supplied with circuit breaker

MATERIALS REQUIRED

Tape, masking, duct, etc.
Pallet
Padding
Large Plastic Sheet or Bag
Packing Carton, 1300 lb. (590 kg) Class 2
Bands or Straps
Original packing materials or equivalent.
(Original packing materials are available from Square D, Cat. No. SERETPKG.)

REPACKING

⚠ 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.

⚠ DANGER

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE

Circuit breaker weighs over 280 lbs. (127 kg) and must be lifted using lifting adapter and hoist capable of lifting 300 lbs. (136 kg).

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

1. Disconnect all power to circuit breaker and accessories.
2. Remove circuit breaker from switchboard. Instructions for removing the circuit breakers are in Sections 3 and 4.
3. Place padding and sheet on pallet.

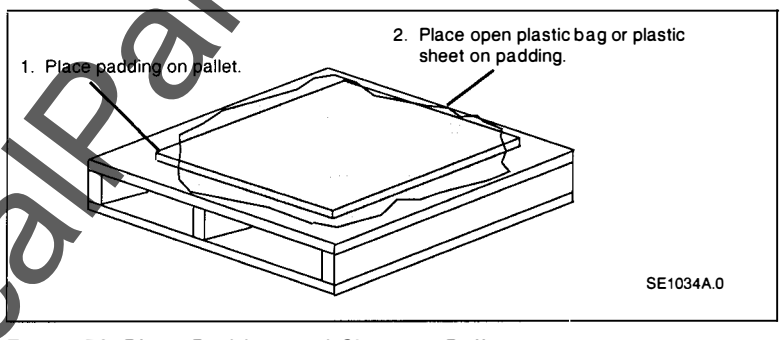


Figure 73 Place Padding and Sheet on Pallet

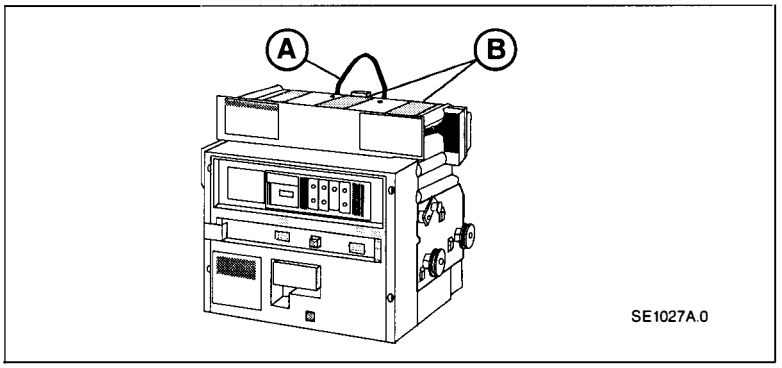


Figure 74 Lift Circuit Breaker

4. Insert hooks of lifting adapter (A) into the two holes at upper rear of circuit breaker and position adapter so hooks extend out through two holes (B) on top of circuit breaker. Connect hoist capable of lifting 300 lbs. (136 kg) or more to the lifting adapter and lift circuit breaker slowly.

5. Place circuit breaker on pallet so tangs are over wide retaining board and circuit breaker rests inside plastic bag.

6. Remove lifting adapter.

7. Secure circuit breaker to pallet.

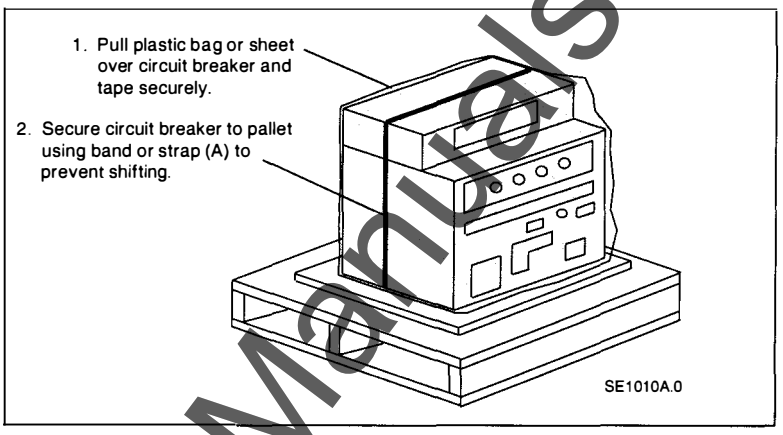


Figure 75 Secure Circuit Breaker

8. Secure unit for shipping.

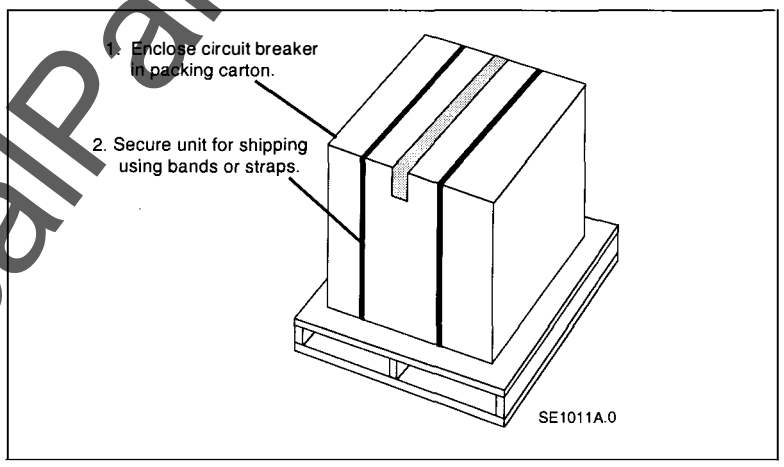


Figure 76 Secure Unit for Shipping

Section 10—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.

SEF CIRCUIT BREAKER TROUBLESHOOTING

Table 10 SEF Circuit Breaker Troubleshooting

Condition	Possible Causes	Solution
Circuit breaker will not close.	1. Closing springs are not fully charged.	1. Charge closing springs.
	2. Cell door is not closed.	2. Close cell door.
	3. Auxiliary cover is not installed properly.	3. Check auxiliary cover installation.
	4. Trip unit is not properly mounted.	4. Check trip unit mounting.
	5. Undervoltage trip is not energized.	5. Energize undervoltage trip.
	6. Shunt close fuse is open.	6. Check shunt close fuse.
	7. PUSH-TO-OPEN button is depressed.	7. Check PUSH-TO-OPEN button.
	8. Key interlock is engaged.	8. Check key interlock.
	9. Circuit breaker is already closed.	9. Check if circuit breaker is closed.
Cell door will not open.	1. Circuit breaker is closed.	1. Open circuit breaker.
	2. PUSH-TO-OPEN button is not depressed.	2. Depress PUSH-TO-OPEN button.
Auxiliary cover cannot be removed.	1. Circuit breaker is closed.	1. Open circuit breaker.

SED CIRCUIT BREAKER TROUBLESHOOTING

Table 11 SED Circuit Breaker Troubleshooting

Condition	Possible Causes	Solution
Circuit breaker will not close.	1. Closing springs are not fully charged.	1. Charge closing springs.
	2. Drawout access cover is not closed.	2. Close drawout access cover.
	3. Auxiliary cover is not installed properly.	3. Check auxiliary cover installation.
	4. Trip unit is not properly mounted.	4. Check trip unit mounting.
	5. Undervoltage trip is not energized.	5. Energize undervoltage trip.
	6. Shunt close fuse is open.	6. Check shunt close fuse.
	7. Key interlock is engaged.	7. Check key interlock.
	8. Circuit breaker is already closed.	8. Check if circuit breaker is closed.
Cell door will not open.	1. Circuit breaker is installed in cradle with drawout mechanism past DISC position.	1. Check circuit breaker position in cradle. Drawout mechanism must be in DISC position.
Drawout mechanism will not operate.	1. Circuit breaker is closed.	1. Open circuit breaker.
Drawout access cover will not operate.	1. Circuit breaker is closed.	1. Open circuit breaker.
Drawout access cover will not close.	1. Circuit breaker is between CONN and TEST positions.	1. Check circuit breaker position. Circuit breaker must be either fully connected or withdrawn at least to the TEST position.
	2. Access cover is locked open by the drawout mechanism lockout.	2. Check position of drawout mechanism lockout.
Drawout access cover cannot be padlocked open.	1. Circuit breaker is in the DISC position.	1. Check circuit breaker position.
Circuit breaker cannot be pushed into carriage.	1. Drawout assembly is not completely in DISC position.	1. Check circuit breaker position.
	2. Padlock installed in padlock hasp.	2. Remove padlock from padlock hasp.
Auxiliary cover cannot be removed.	1. Circuit breaker is closed.	1. Open circuit breaker.
	2. Drawout assembly is not completely in DISC position.	2. Place drawout assembly completely in DISC position.

BEFORE WORKING ON CIRCUIT BREAKER

1. Disconnect all power to circuit breaker and accessories.

2. Open the circuit breaker by pushing the PUSH-TO-OPEN button (A).

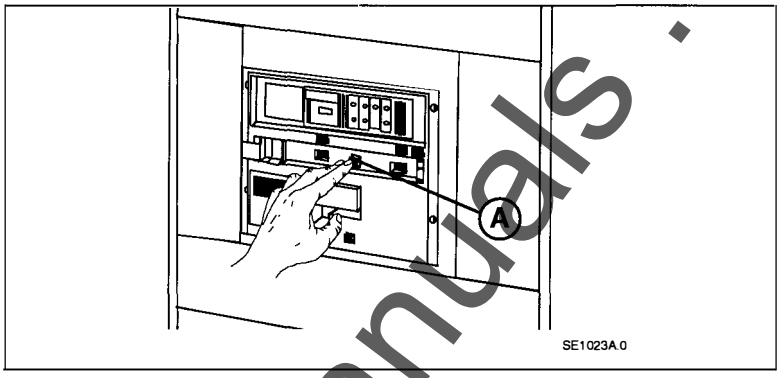


Figure 77 Open Circuit Breaker

3. SED circuit breaker only: Place SED circuit breaker in DISC position before doing any work on circuit breaker:

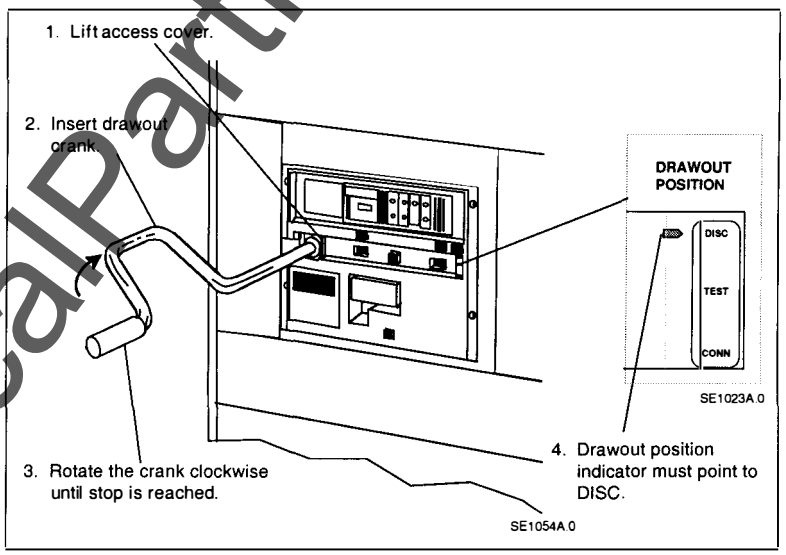
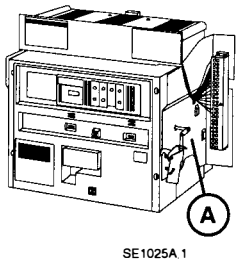


Figure 78 Place in DISC Position

- Lift drawout access cover and remove crank. Allow drawout access cover to close.

INTERNALLY-MOUNTED ACCESSORIES

⚠ DANGER



HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

When connecting control power wiring to a circuit breaker which is not mounted in a switchboard, connect a temporary ground wire to circuit breaker side plate (A).

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

Internally-mounted accessories are located behind the circuit breaker auxiliary cover.

To gain access to internally-mounted accessories remove the auxiliary cover.

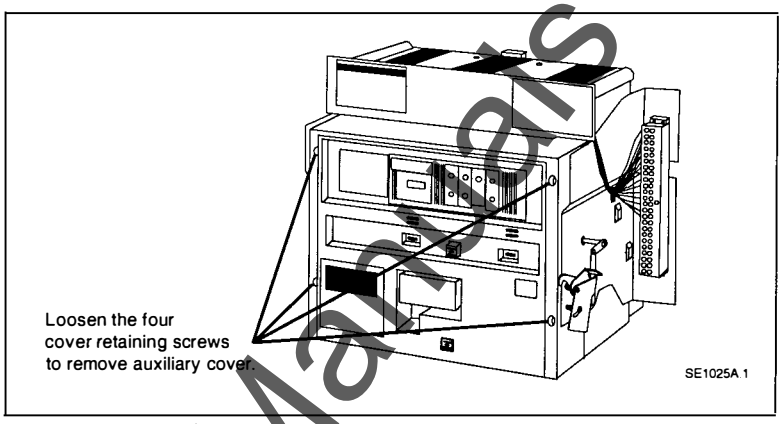


Figure 79 Remove Auxiliary Cover

NOTE: An interlock prevents removal of the auxiliary cover when circuit breaker is closed or when drawout mechanism is in any position other than DISC.

Customer wiring to internal electrical accessories is connected to the terminal connectors either on the SEF circuit breaker or in the switchboard cell for SED circuit breakers. Refer to Section 3—SEF Circuit Breaker for information regarding control wiring for the SEF circuit breaker and Section 4—SED Circuit Breaker for information regarding control wiring for the SED circuit breaker.

Table 12 lists the minimum size control power transformer necessary for operation. Wiring diagrams can be found in Appendix B.

Table 12 Control Power Transformer Requirements

Configuration	Minimum Size
Circuit breakers with ground-fault option but without accessories	150 VA
Circuit breakers with accessories, with or without ground-fault option	500 VA
Two or three circuit breaker throwover systems	1000 VA

Replace auxiliary cover (circuit breaker must be open).

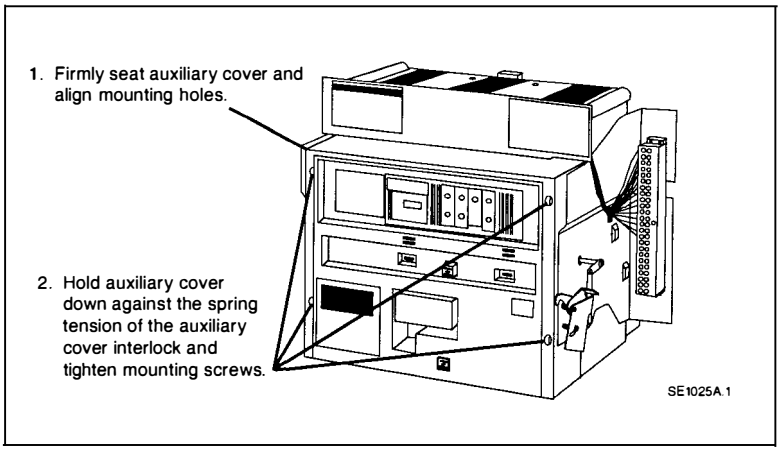


Figure 80 Replace Auxiliary Cover

Note: if auxiliary cover is not properly installed, the circuit breaker may not close or will not indicate OPEN condition.

INTERLOCKS

The SE circuit breaker includes safety interlocks to prevent unsafe or incorrect operation. Interlocks are provided to minimize the possibility of contact with energized parts or exposure to hazardous conditions. Some interlocks can be bypassed for the convenience of qualified maintenance personnel.

Interlocks which are noted as being optional are available as accessories. For more information on those interlocks, refer to Section 8—Accessories.

Auxiliary Cover Interlock

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- Bypassing interlocks can result in exposure to energized parts and/or exhaust gas resulting from circuit breaker interruption. Do not bypass interlocks on an energized system.
- Turn off all power supplying this equipment before bypassing any interlock.

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

The auxiliary cover interlock

- prevents circuit breaker from being closed when auxiliary cover is removed

  and

- prevents removal of the auxiliary cover when the circuit breaker is closed.

Bypassing Auxiliary Cover Interlock

1. Turn off all power to system.
2. To close circuit breaker with auxiliary cover removed, depress interlock arm while closing circuit breaker.

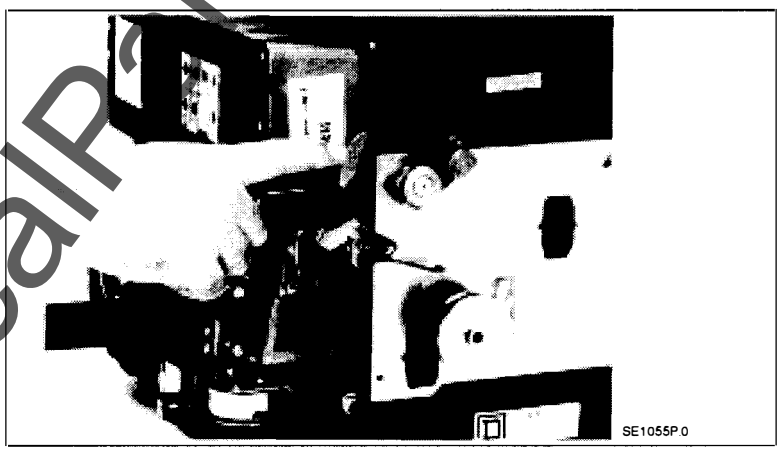


Figure 81 Auxiliary Cover Interlock

Key Interlock (Optional)

The key interlock

- coordinates circuit breaker operation with other keyed devices,

  or

- ensures circuit breaker is OFF when maintaining downstream equipment.

NOTE: PUSH-TO-OPEN button must be depressed before the interlock bolt can be extended.

Cell Door Interlock (SEF Circuit Breaker Only)

The cell door interlock

- prevents cell door from being opened when circuit breaker is closed and
- prevents circuit breaker from being closed when cell door is open.

The cell door interlock minimizes the possibility of contact with energized parts or exposure to exhaust gases from interruption.

The cell door interlock is located on the side of the circuit breaker (A) and can be bypassed for the convenience of qualified personnel. If circuit breaker cell has arc barriers in place, the interlock can be disabled. (See Section 3 for a description of arc barriers.)

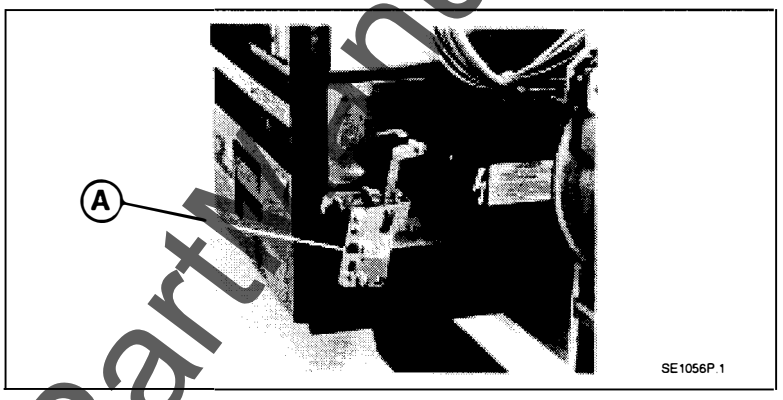


Figure 82 Cell Door Interlock

Bypassing Cell Door Interlock

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- Turn off all power supplying this equipment before bypassing interlock.
- Before energizing system close door and secure it using all previously removed screws.

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

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

The interlock lever must remain depressed the entire time the door is open.

Failure to follow these instructions can result equipment damage.

When circuit breaker is closed, the door can be opened by

- removing screws securing the door,

or

- inserting a screwdriver into the slot in the front of the door and applying an upward force with screwdriver to release the cell door latch.

When the door is open, the circuit breaker can be closed by bypassing the interlock.

Depress the interlock lever while closing the circuit breaker to defeat the interlock.

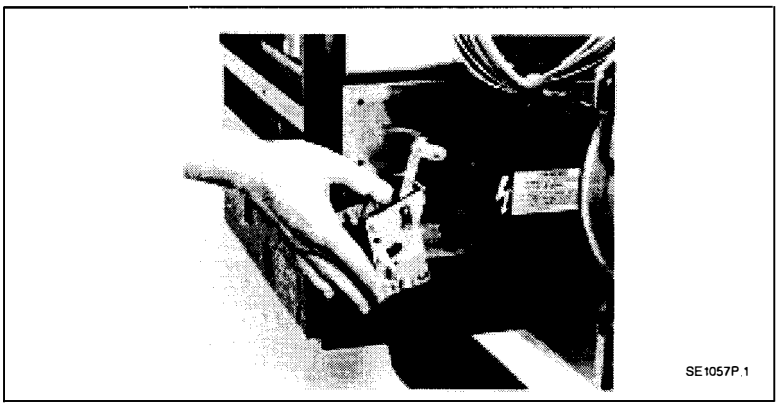


Figure 83 Bypassing the Cell Door Interlock

Disabling Cell Door Interlock

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

Do not disable cell door interlock on SEF circuit breakers unless circuit breaker cell has arc barriers in place. (See Section 3 for description of arc barriers.)

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

To disable the cell door interlock:

1. Remove interlock restraint bracket.

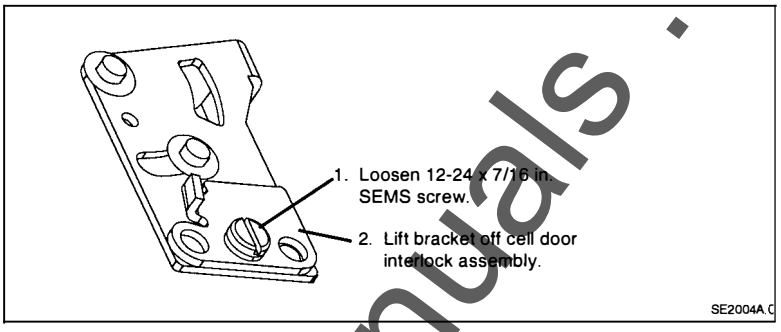


Figure 84 Remove Interlock Restraint Bracket

2. Push interlock lever in.

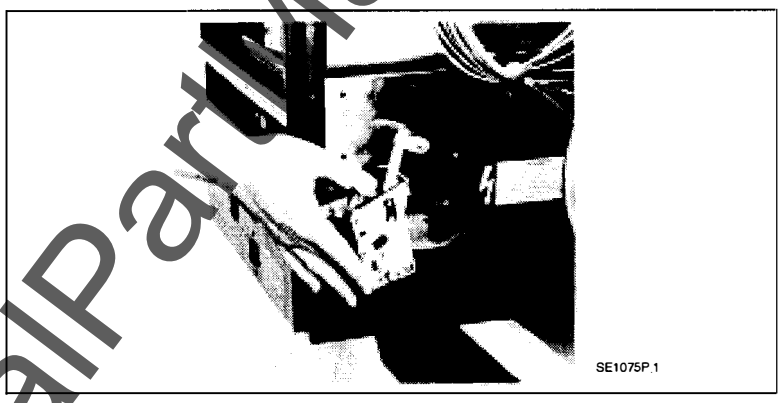


Figure 85 Push in Interlock Lever

3. While maintaining force to hold interlock lever in, install interlock restraint bracket.

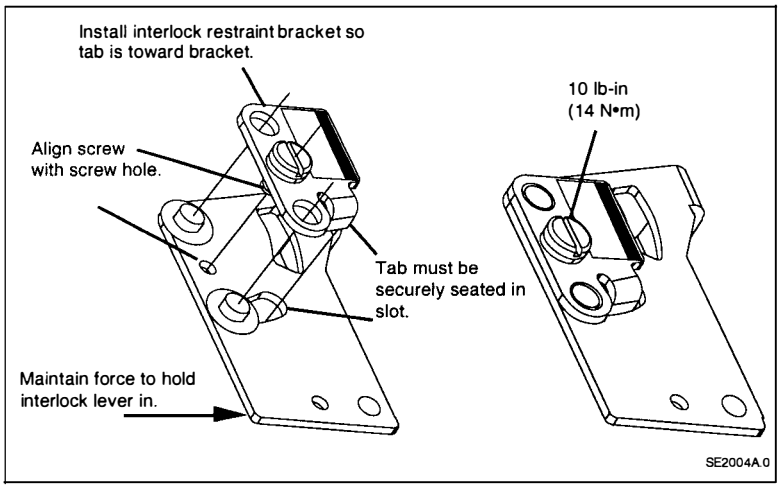


Figure 86 Install Interlock Restraint Bracket

Push-to-open Padlock Attachment (SEF Circuit Breaker Only) (Optional)

The push-to-open padlock attachment prevents closing of the circuit breaker. This is accomplished by using the padlock attachment to depress the PUSH-TO-OPEN button thus maintaining the circuit breaker in the open position.

Drawout Access Cover Interlock (SED Circuit Breaker Only)

The drawout access cover interlock

- prevents closing of circuit breaker while drawout access cover is open and
- prevents opening of drawout access cover while circuit breaker is closed.

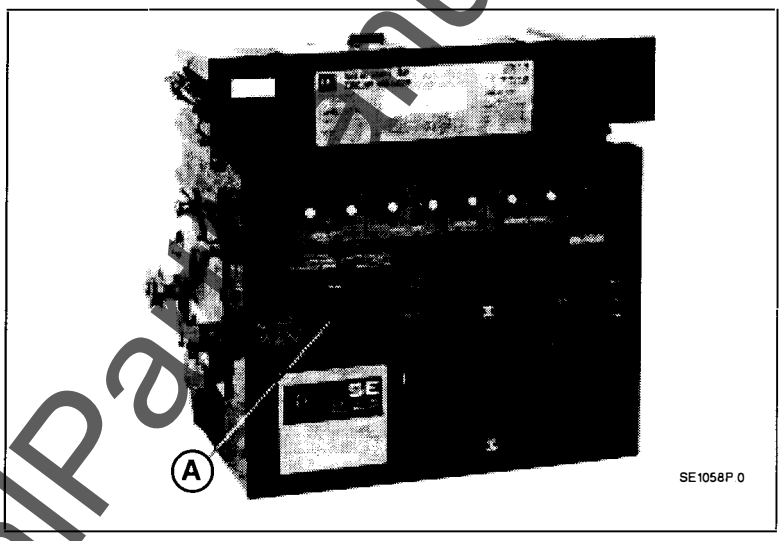


Figure 87 Drawout Access Cover

The drawout access cover is held open if circuit breaker drawout mechanism is between the CONN and TEST positions.

Drawout Mechanism Lockout (SED Circuit Breaker Only)

The drawout mechanism lockout prevents access to the drawout mechanism, preventing movement of circuit breaker on the drawout rails. It can be used to lock the circuit breaker in either the CONN or TEST position. It can also be used to hold the drawout access cover open, preventing closing of circuit breaker.

Drawout Carriage Padlock Hasp (SED Circuit Breaker Only)

The drawout carriage padlock hasp prevents a circuit breaker from being inserted into a drawout carriage.

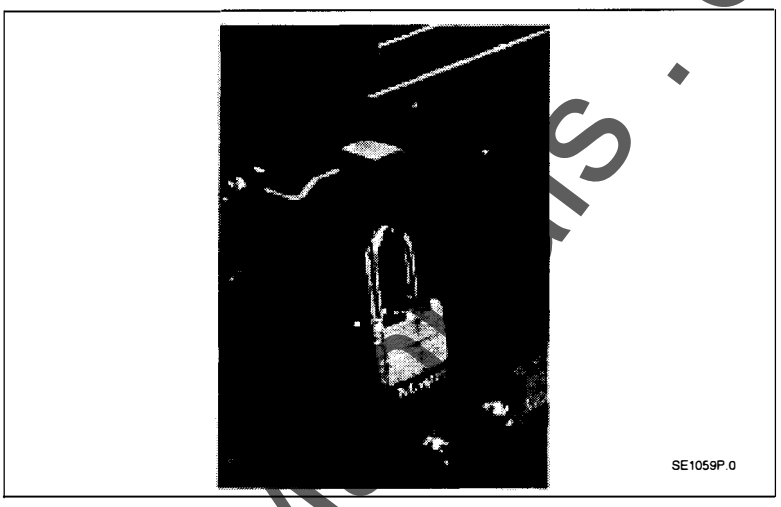


Figure 88 Drawout Carriage Padlock Hasp

A padlock installed on the padlock hasp interferes with circuit breaker movement, keeping the circuit breaker on the drawout rails.

SED 4000 A Circuit Breaker Interlock (SED Circuit Breaker Only)

The SED 4000 A circuit breaker interlock prohibits installation of the SED 4000 A fan-cooled circuit breaker into any cell other than the cell designed for it.

Appendix A—Dimensions

SED (DRAWOUT) CIRCUIT BREAKER

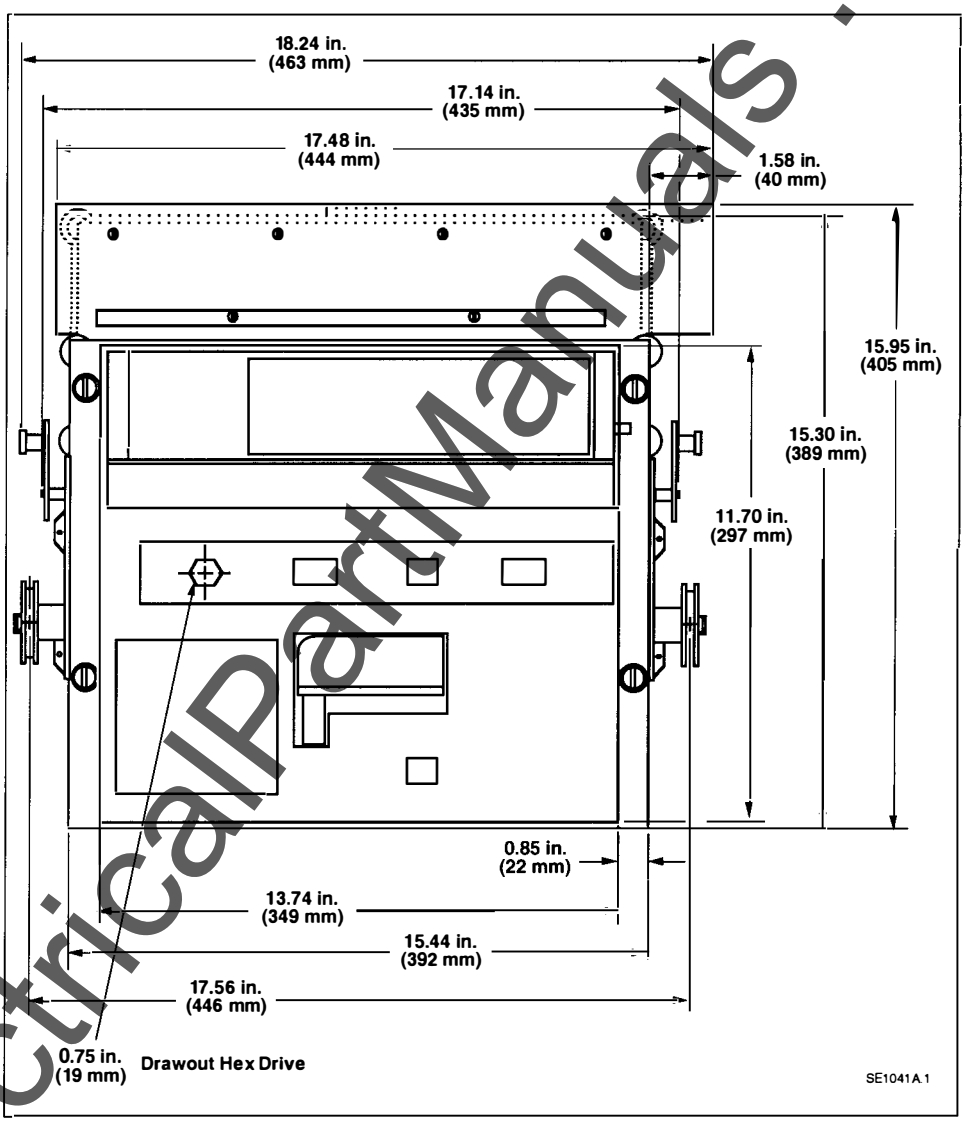


Figure 89 SED Circuit Breaker, Front View

(Continued on next page)

SED (DRAWOUT) CIRCUIT BREAKER
—Continued

Table 13
SED and SEHD Circuit Breaker Dimensions

Circuit Breaker Type	Frame Size	Dim. A
SED	400 A–1200 A	18.44 in. (468 mm)
SED SEHD	1600 A–3000 A 400 A–3000 A	18.44 in. (468 mm)
SED SEHD	4000 A	19.44 in. (479 mm)

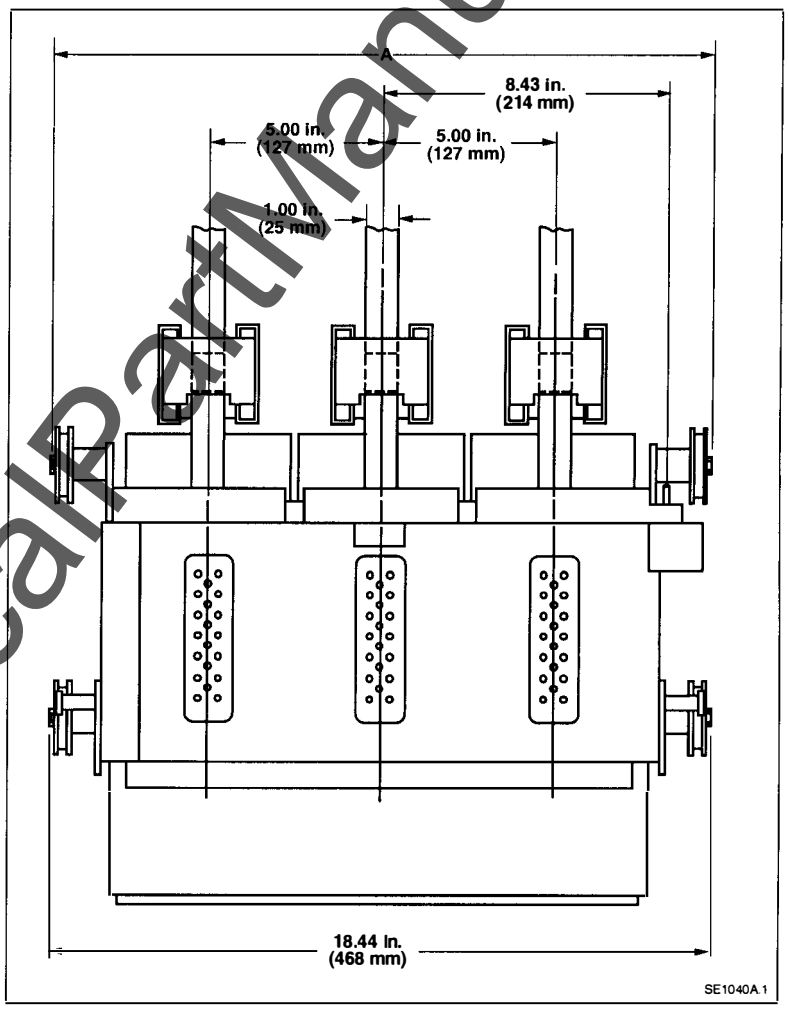


Figure 90 SED Circuit Breaker, Top View

(Continued on next page)

SED (DRAWOUT) CIRCUIT BREAKER
—Continued

Table 14 SED and SEHD Circuit Breaker Dimensions

Circuit Breaker Type	Frame Size	Dim. A	Dim. B	Dim. C	Dim. D
SED	400 A–1200 A	17.32 in. (440 mm)	12.96 in. (329 mm)	3.00 in. (76 mm)	2.75 in. (70 mm)
SED SEHD	1600 A–3000 A 400 A–3000 A	17.32 in. (440 mm)	12.96 in. (329 mm)	3.00 in. (76 mm)	4.00 in. (102 mm)
SED SEHD	4000 A	18.32 in. (465 mm)	13.96 in. (355 mm)	3.50 in. (89 mm)	4.00 in. (102 mm)

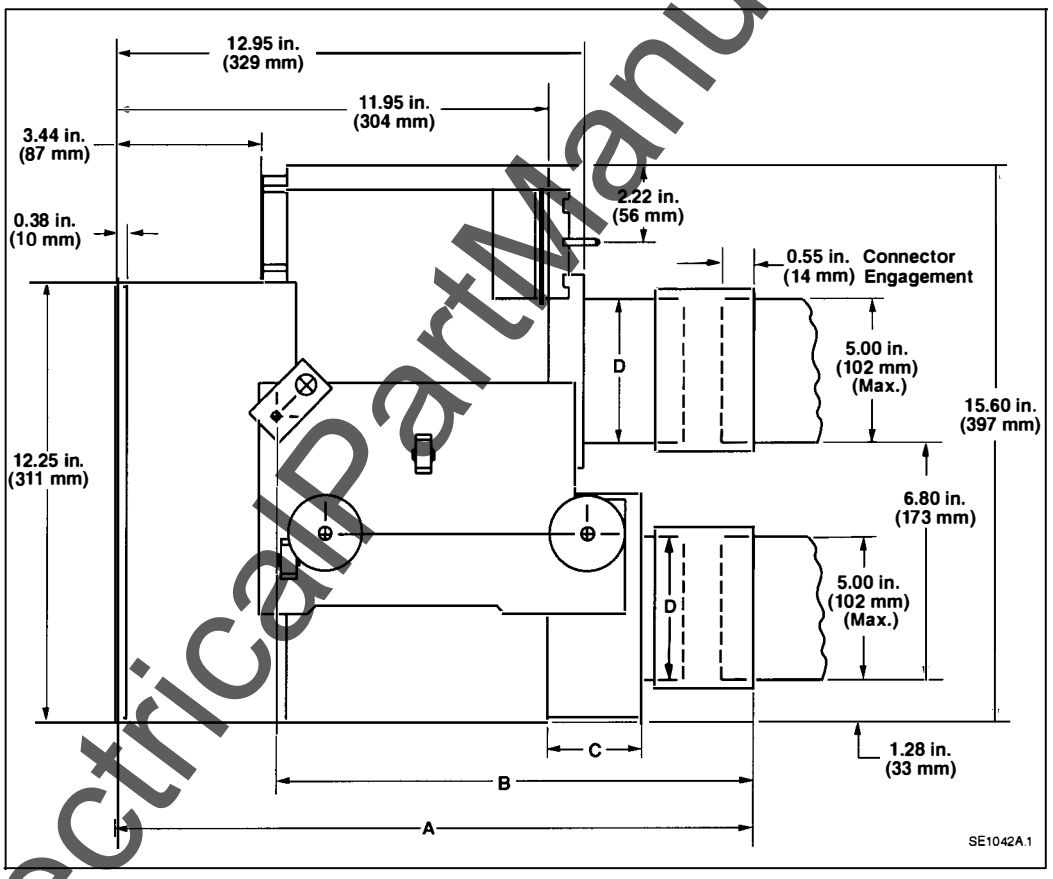


Figure 91 SED Circuit Breaker, Side View

SEF (FIXED-MOUNTED) CIRCUIT BREAKER

Type SEF with 1600–4000 A Sensors
Type SEHF with 400–4000 A Sensors

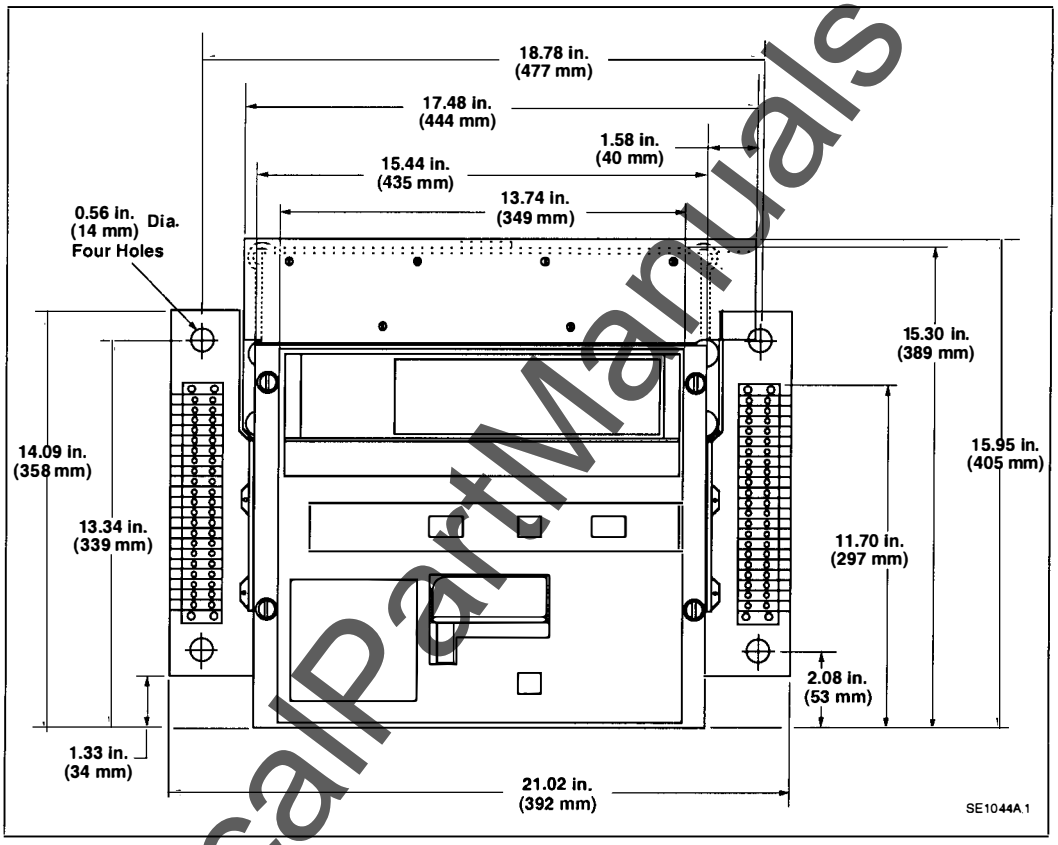


Figure 92 SEF Circuit Breaker, Front View

(Continued on next page)

SEF (FIXED-MOUNTED) CIRCUIT BREAKER—*Continued*

Type SEF with 1600–4000 A Sensors
Type SEHF with 400–4000 A Sensors

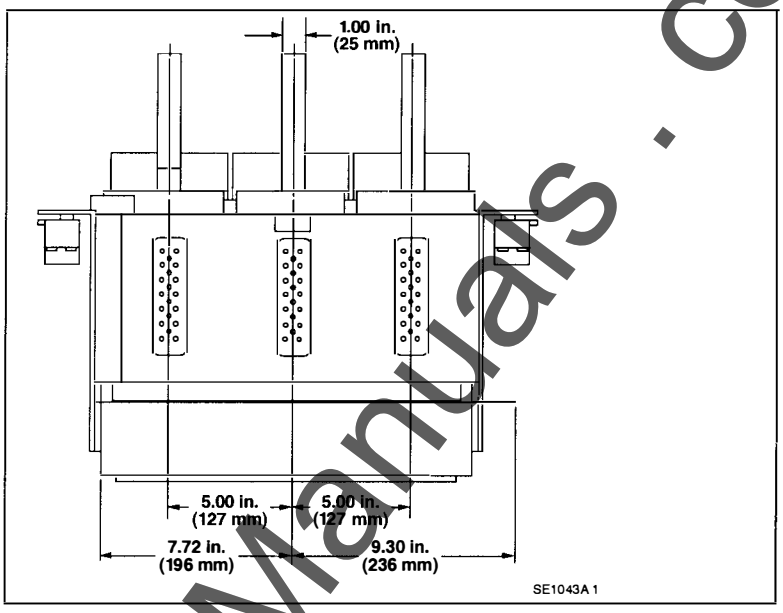


Figure 93 SEF Circuit Breaker, Top View

Table 15 SEF and SEHF Circuit Breaker Dimensions

Sensor Size	Dim. A	Dim. B	Dim. C	Dim. D	Dim. E	Dim. F	Dim. G
3000 A and below	6.10 in. (155 mm)	1.12 in. (29 mm)	1.75 in. (45 mm)	1.12 in. (29 mm)	1.75 in. (45 mm)	3.00 in. (76 mm)	4.10 in. (104 mm)
4000 A	8.10 in. (206 mm)	1.50 in. (38 mm)	2.00 in. (51 mm)	1.20 in. (31 mm)	1.60 in. (41 mm)	3.75 in. (89 mm)	5.35 in. (136 mm)

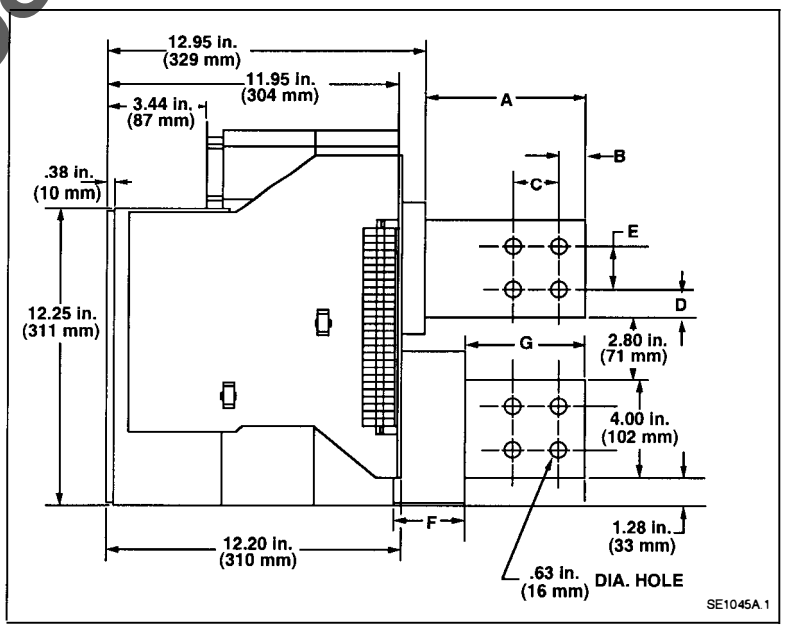


Figure 94 SEF Circuit Breaker, Side View

SEF (FIXED-MOUNTED) CIRCUIT BREAKER

Type SEF with 400–1200 A Sensors

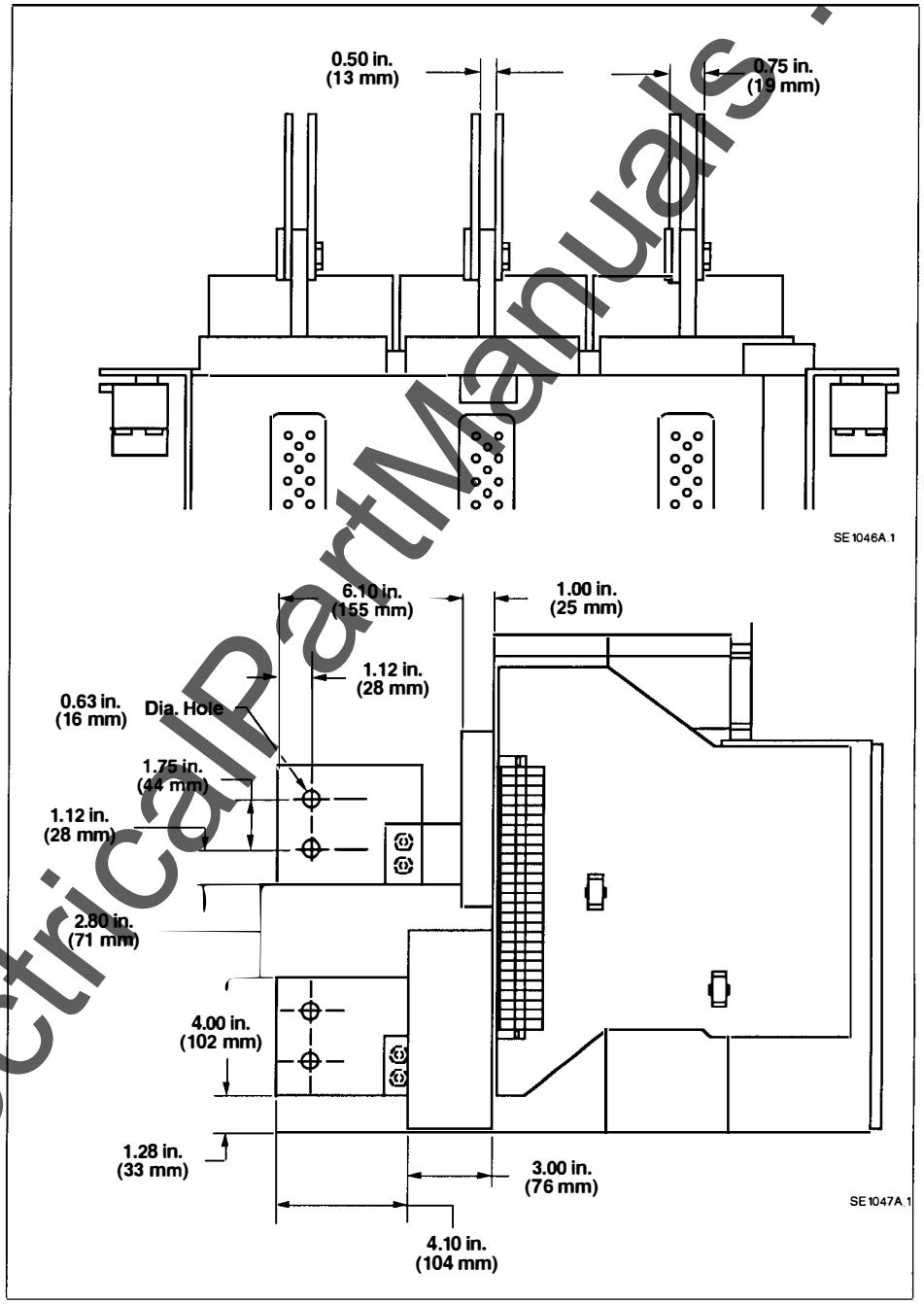


Figure 95 SEF Circuit Breaker

NEUTRAL CURRENT TRANSFORMER

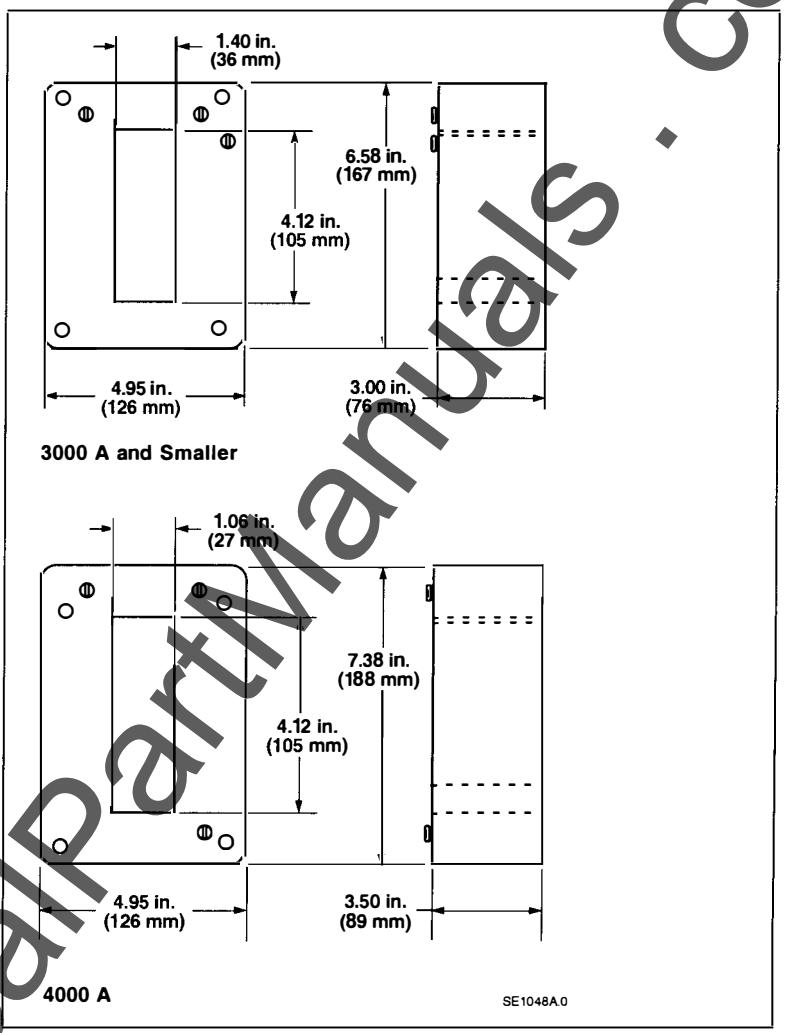


Figure 96 Neutral Current Transformer

SEFM40CK TERMINAL CONNECTOR KIT

For Use with Type SEF Circuit Breakers with 4000 A Sensors

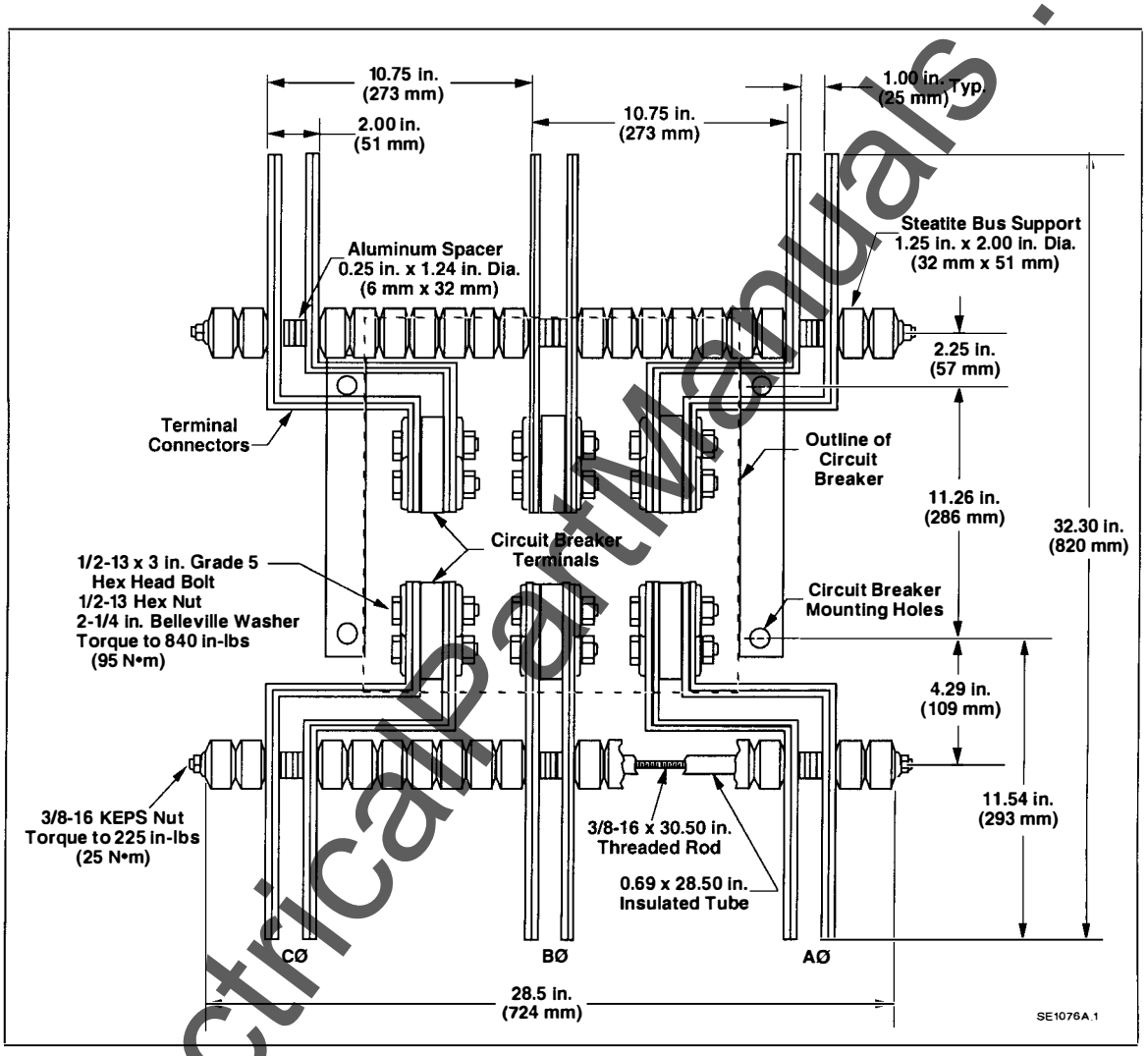


Figure 97 SEFM40CK Terminal Connector Kit

SEF (FIXED-MOUNTED) CIRCUIT BREAKER WITH SEFM40CK TERMINAL CONNECTOR KIT

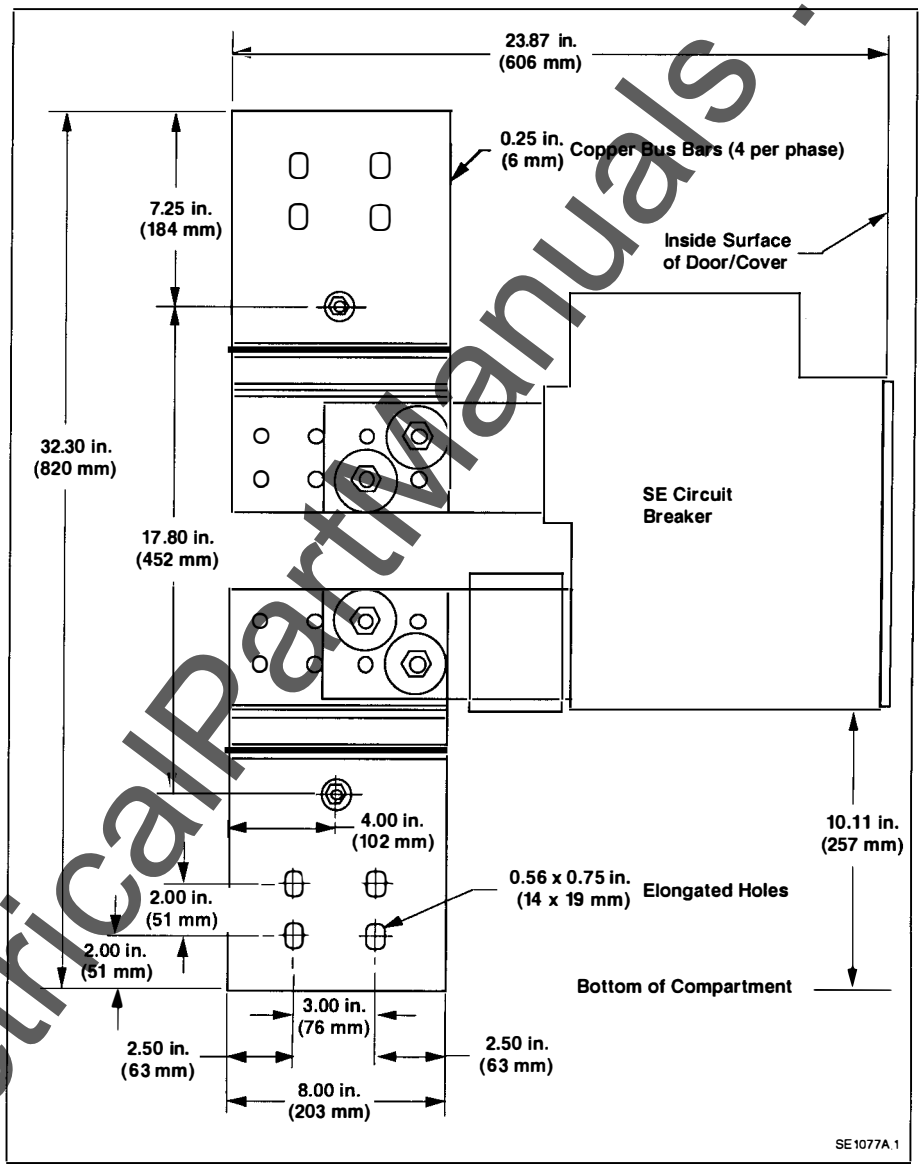


Figure 98 SEF Circuit Breaker With SEFM40CK Terminal Connector Kit

Appendix B—Wiring Diagrams

TERMINAL CONNECTOR FOR SE CIRCUIT BREAKER

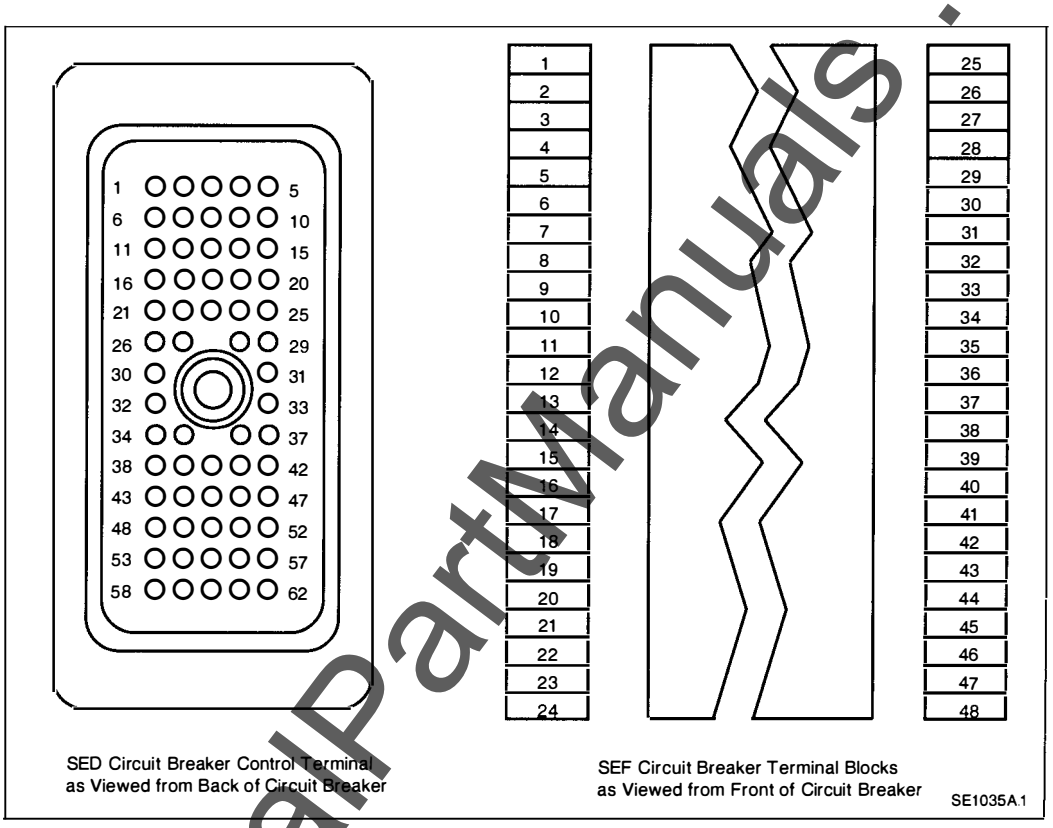


Figure 99 Terminal Connectors

Table 16 Terminal Connection

Terminal No.	Connection	Terminal No.	Connection
1, 2	Alarm Switch 1	29, 30	Auxiliary Switch 3
3, 4	Alarm Switch 2	31, 32	Auxiliary Switch 4
5, 6	Undervoltage Trip	33, 34	Auxiliary Switch 5
7, 8	Shunt Close	35, 36	Auxiliary Switch 6
9, 10	Shunt Trip	37, 38	Auxiliary Switch 7
11, 12	Spring Charging Motor	39, 40	Auxiliary Switch 8
13, 14	Ground-fault Test	41	CIM3F - Red
15	Reserved	42	CIM3F - Black
16, 17	Ground-fault Sensing	43	CIM3F - Blue
18, 19	Ground-fault Sensing	44	CIM3F - Orange
20, 21	Ground-fault Zone Interlock	45, 46	Fan Cooling
22	Equipment Ground (Common)		(SED 4000 A only)
23, 24	Short-time Zone Interlock	47, 48	Spring Charged Contact*
25, 26	Auxiliary Switch 1	49, 50	Jumpered Internally in
27, 28	Auxiliary Switch 2		Control Plug

* Circuit breakers with spring charging motors only.

AC AUXILIARY SWITCHES

Switch Ratings:
(0.04 ampere minimum)
10 A 120 Vac 50/60 Hz
1/4 HP 120 Vac 50/60 Hz

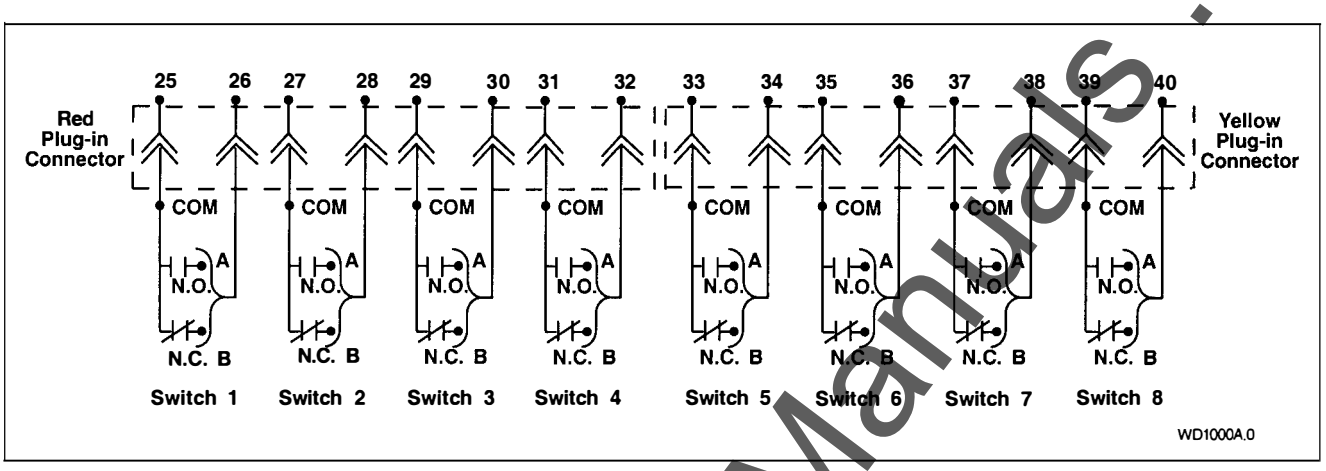


Figure 100 AC Auxiliary Switches as Viewed from Front of Circuit Breaker

Table 17 AC Auxiliary Switch Configuration

Accessory	Switch 1		Switch 2		Switch 3		Switch 4		Switch 5		Switch 6		Switch 7		Switch 8	
Suffix	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
A4	X		X			X		X								
B4	X		X			X		X								
C4	X		X			X		X								
A8	X		X		X		X			X		X		X		X
B8	X		X		X		X			X		X		X		X
C8	X		X		X		X			X		X		X		X

Wiring notes:

1. Connect yellow leads to common terminal.
2. Switch type A is OPEN when circuit breaker is open (wire normally-open contact using blue leads).
3. Switch type B is CLOSED when circuit breaker is open (wire normally-closed contact using blue leads).
4. Due to the limited number of available control terminals, switches can be wired as either A or B.

AC/DC AUXILIARY SWITCHES

Switch Ratings:
(1 ampere minimum)
10 A 120 Vac 50/60 Hz
10 A 125 Vdc
1/4 HP 120 Vac 50/60 Hz
1/4 HP 125 Vdc

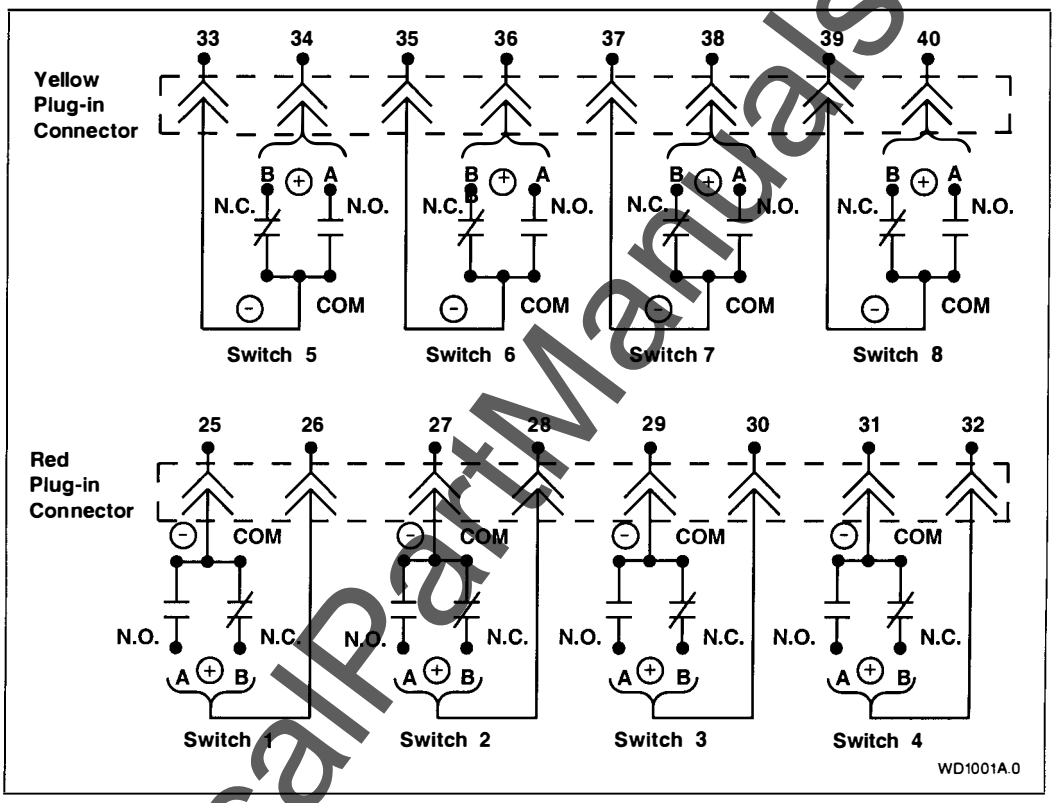


Figure 101 AC/DC Auxiliary Switches

Table 18 AC/DC Auxiliary Switch Configuration

Accessory	Switch 1		Switch 2		Switch 3		Switch 4		Switch 5		Switch 6		Switch 7		Switch 8	
Suffix	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
D4	X		X			X		X								
E4	X		X			X		X								
F4	X		X			X		X								
D8	X		X		X		X			X		X		X		X
E8	X		X		X		X			X		X		X		X
F8	X		X		X		X			X		X		X		X

Wiring notes:

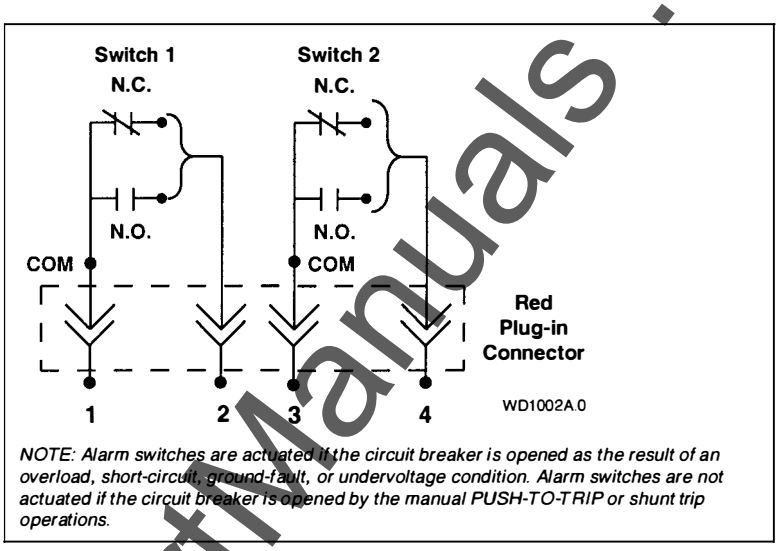
1. Connect yellow leads to common terminal.
2. Switch type A is OPEN when circuit breaker is open (wire normally-open contact using blue leads).
3. Switch type B is CLOSED when circuit breaker is open (wire normally-closed contact using blue leads).
4. Due to the limited number of available control terminals, switches can be wired as either A or B.

ALARM SWITCHES

Switch Ratings:
(0.04 ampere minimum)
10 A 120/240 Vac 50/60 Hz
1/4 HP 120 Vac 50/60 Hz

Table 19 Alarm Switch Configurations

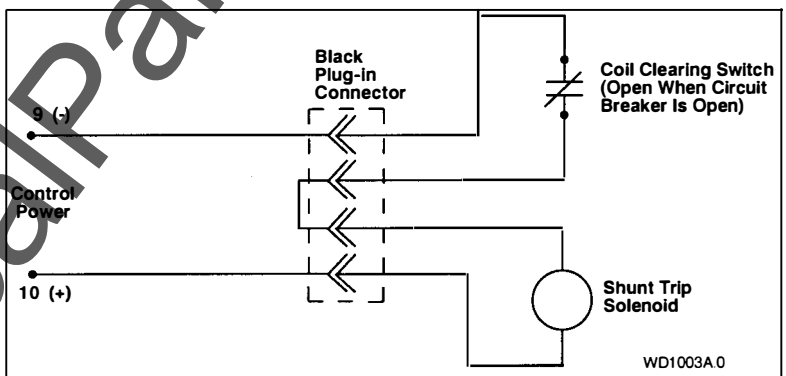
Accessory Suffix	Switch 1 N.O.	Switch 1 N.C.	Switch 2 N.O.	Switch 2 N.C.
B4, E4, B8, E8	X		X	
A4, D4, A8, D8		X	X	
C4, F4, C8, F8		X		X



NOTE: Alarm switches are actuated if the circuit breaker is opened as the result of an overload, short-circuit, ground-fault, or undervoltage condition. Alarm switches are not actuated if the circuit breaker is opened by the manual PUSH-TO-TRIP or shunt trip operations.

Figure 102 Alarm Switches as Viewed from Front of Circuit Breaker

SHUNT TRIP



The minimum size control power transformer to be supplied is as follows:

1. Circuit breakers without accessories, with ground-fault option = 150 VA
2. Circuit breakers with accessories, with or without ground-fault option = 500 VA
3. Two or three circuit breaker throwover systems = 1000 VA

Figure 103 Shunt Trip Wiring Diagram

Table 20 Shunt Trip Information

Catalog Number Suffix	Series 2 Catalog Number Suffix	Accessory Kit Number	Rating Voltage	Rating Amperage
T1, S1, ES1	S1	S3ST120AC2	120 Vac	10 A
T2, S2, ES2, ES5, ET5	T1	S3ST024DC2	24 Vdc	12 A
T3, S3, ES3, ES6, ET6	T2	S3ST048DC2	48 Vdc	24 A
T4, S4, ES4, ES7, ET7	T4	S3ST125DC2	125 Vdc	10 A

*Suffix numbers T1 through T4 are UVR/shunt trip combination Series 3 and newer.

UNDERVOLTAGE TRIP

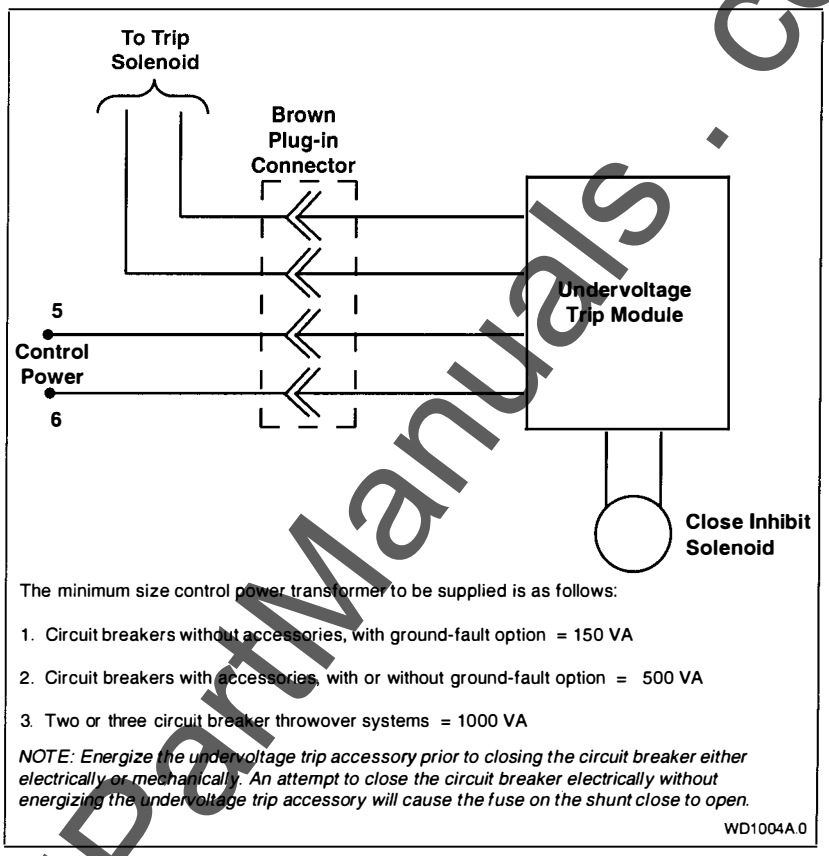
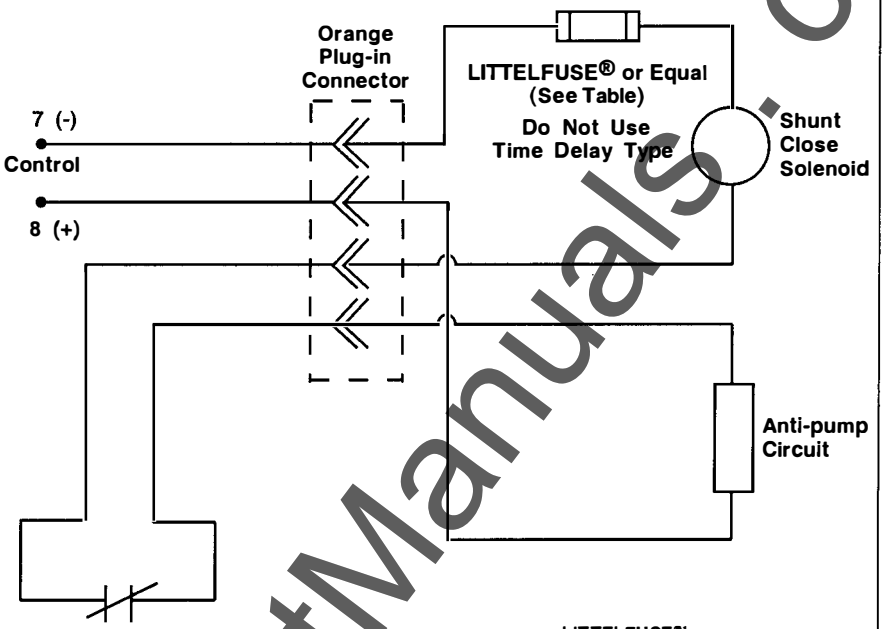


Figure 104 Undervoltage Trip Wiring Diagram

Table 21 Undervoltage Trip Information

Catalog Number Suffix	Accessory Kit Number	Rating Voltage	Rating Amperage
V1, T1–T4, ET1–ET7	SEUVR120AC2	120 Vac	100 mA

SHUNT CLOSE



Contact is closed when closing springs are charged and circuit breaker is open, ready to be closed. Interlock is located inside pressure case and is not accessible.

Shunt Close Catalog No.	LITTELFUSE®[1] 8AG Type Catalog No.	Ampere Rating
S3SC120AC2	361005	5
S3SC024DC2	361005	5
S3SC048DC2	362010	10
S3SC125DC2	361005	5

The minimum size control power transformer to be supplied is as follows:

1. Circuit breakers without accessories, with ground-fault option = 150 VA
2. Circuit breakers with accessories, with or without ground-fault option = 500 VA
3. Two or three circuit breaker throwover systems = 1000 VA

NOTE: Energize the undervoltage trip accessory, if installed, prior to closing the circuit breaker either electrically or mechanically. An attempt to close the circuit breaker electrically without energizing the undervoltage trip accessory will cause the fuse on the shunt close to open.

WD1005A.0

Figure 105 Shunt Close Wiring Diagram

Table 22 Shunt Close Information

Catalog Number Suffix	Catalog Number Suffix - Series 2	Accessory Kit Number	Rating Voltage	Rating Amperage
ES1, EV1, ES5, ES6, ES7, ET5, ET6, ET7	C1	S3SC120AC2	120 Vac	10 A
ES2	D1	S3SC024DC2	24 Vdc	12 A
ES3	D2	S3SC048DC2	48 Vdc	24 A
ES4	D4	S3SC125DC2	125 Vdc	10 A

[1] LITTELFUSE is a registered trademark of Littelfuse Inc.

SPRING CHARGING MOTOR

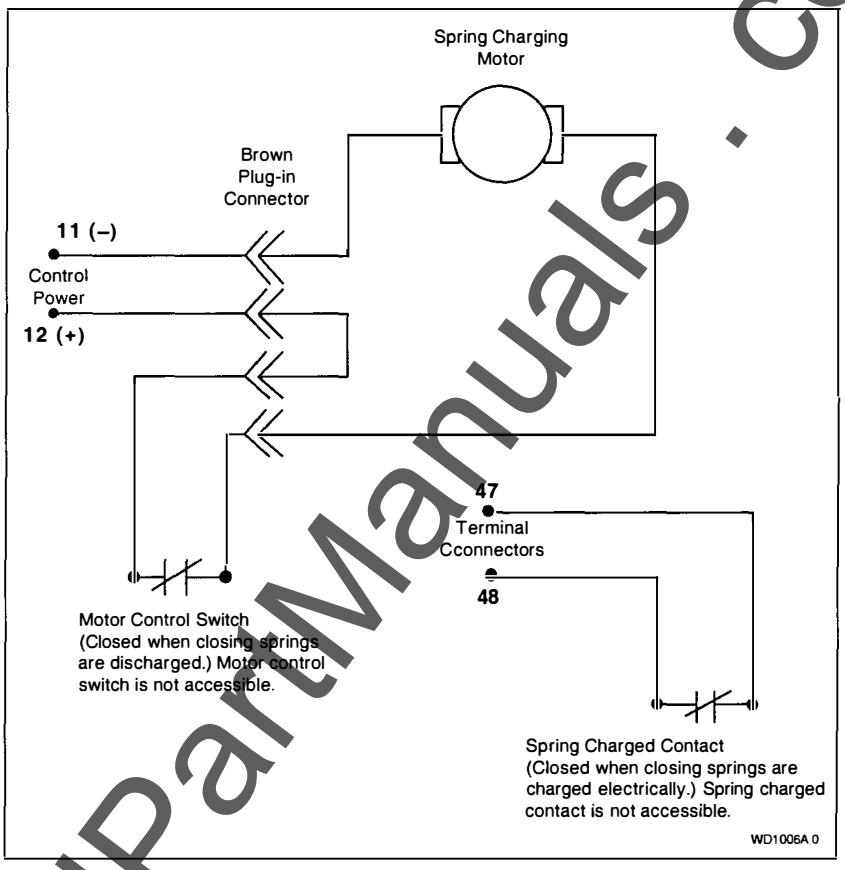


Figure 106 Spring Charging Motor Wiring Diagram

Table 23 Spring Charging Motor Information

Catalog No. Suffix	Accessory Kit Number	Rating	
		Voltage	Amperage
ES1, EV1, ET1	S3MOT120AC2	120 Vac	1.00 A
ES2	S3MOT024DC2	24 Vdc	2.75 A
ES3	S3MOT048DC2	48 Vdc	2.75 A
ES4	S3MOT125DC2	125 Vdc	2.75 A

GROUND-FAULT SYSTEMS

Ground-fault Test Circuit

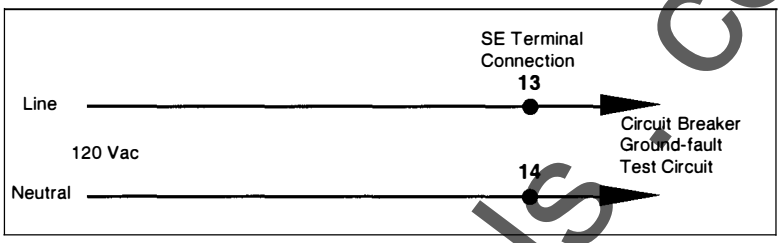
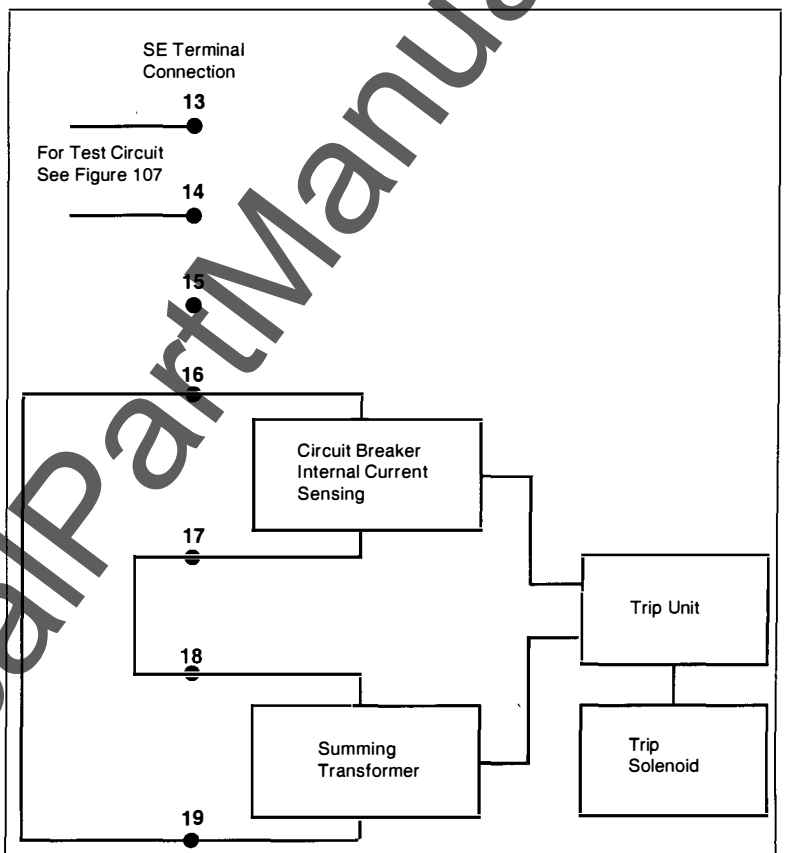


Figure 107 Ground-fault Test Circuit

3Ø3W (Three-phase, Three-wire) Residual Ground-fault Sensing System



1. SE circuit breakers furnished with the ground-fault protection for equipment feature must be wired as shown for use on three-phase, three-wire systems. SEF circuit breakers have factory-installed jumper wires on the terminal blocks. SED circuit breakers must have jumper wires installed on the switchboard carriage terminal blocks.
2. Before doing any primary injection testing, refer to Section 7—Maintenance.
3. For location of terminal connections, see Terminal Connector for SE Circuit Breaker at beginning of this appendix.

Figure 108 3Ø3W Residual Ground-fault Sensing System

3Ø4W (Three-phase, Four-wire) Residual Ground-fault Sensing System

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

Conductors attached to circuit breaker bottom terminations must have their associated neutral conductor(s) connected to end of neutral current transformer identified as **H1**.

Failure to follow these instructions can result in equipment damage.

1. Connect neutral current transformer into neutral of power system:
   - For forward fed systems, the load neutral must be connected to the "H1" end of the neutral current transformer.
   - For reverse fed systems, the supply neutral must be connected to the "H1" end of the neutral current transformer.
2. Connect neutral current transformer terminals to circuit breaker terminals:
   - If neutral current transformer is labeled Series 3, connect terminal X1 of neutral current transformer to circuit breaker terminal 16 and connect terminal X2 of neutral current transformer to circuit breaker terminal 17.
   - If neutral current transformer is not labeled Series 3, connect terminal X1 of neutral current transformer to circuit breaker terminal 17 and connect terminal X2 of neutral current transformer to circuit breaker terminal 16.

   Do not use more than 14 feet (4.27 m) of No. 14 wire for this connection.
3. Ground terminal 1 of neutral current transformer **only** if no other ground exists in control system. (Check NEC requirements and connect to equipment ground bars.)
4. SE circuit breakers furnished with the ground-fault protection for equipment feature must be wired as shown for use on three-phase, four-wire systems. SEF circuit breakers have factory-installed jumper wires on the terminal blocks. SED circuit breakers must have jumper wires installed on the switchboard carriage terminal blocks.
5. Before doing any primary injection testing, refer to Section 7—Maintenance.

(Continued on next page)

3Ø4W (Three-phase, Four-wire) Residual Ground-fault Sensing System—*Continued*

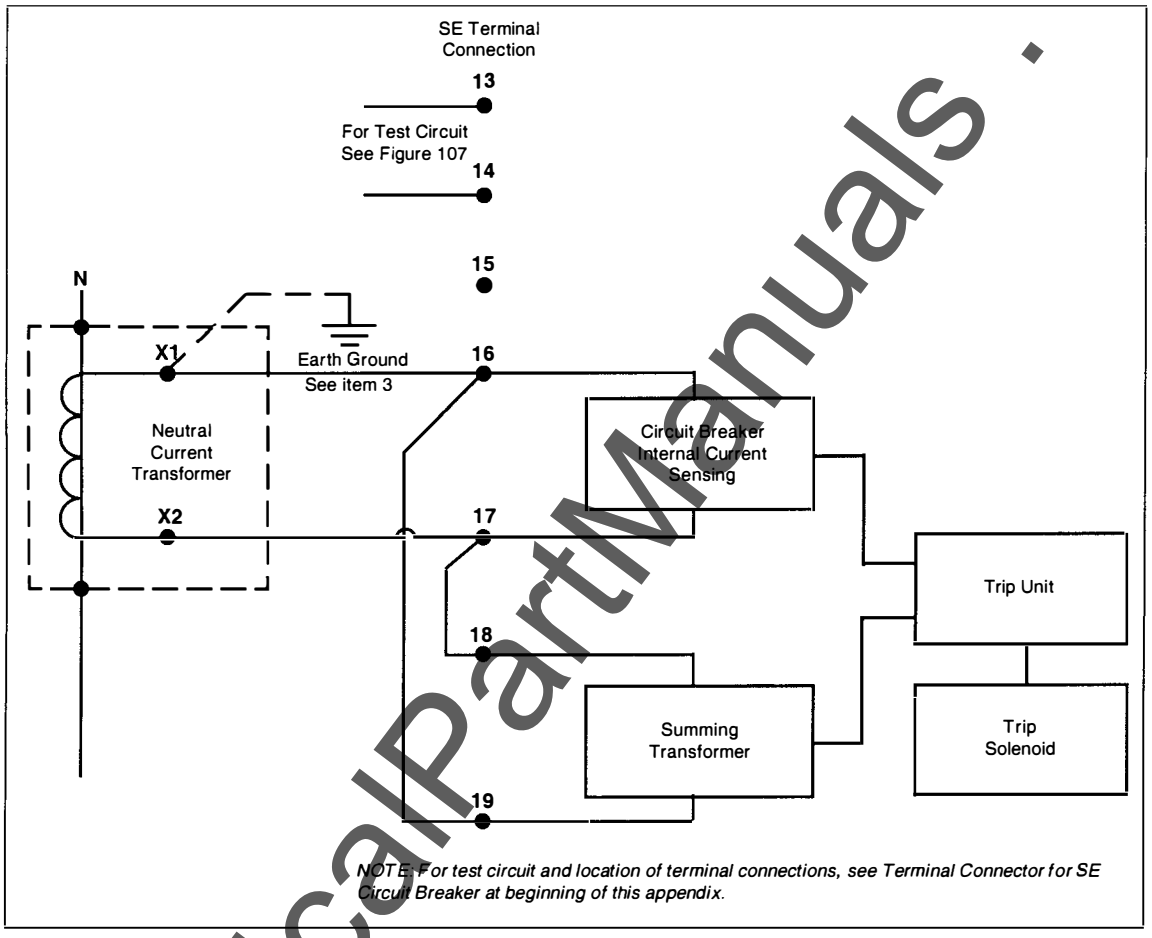


Figure 109 3Ø4W Residual Ground-fault Sensing System Wiring Diagram

Table 24 Neutral Current Transformer Connections

Neutral Current Transformer	Connections
Series 3 48162-151-52 48162-144-51 48162-142-51 48040-104-51	Connect terminal X1 of neutral current transformer to circuit breaker terminal 16. Connect terminal X2 of neutral current transformer to circuit breaker terminal 17.
48162-151-51 48162-144-50 48162-142-50 48162-104-50	Connect terminal X1 of neutral current transformer to circuit breaker terminal 17. Connect terminal X2 of neutral current transformer to circuit breaker terminal 16.

3Ø4W (Three-phase, Four-wire) Source Ground-sensing System

1. Remove jumper wires connecting terminals 16 to 19 and terminals 17 to 18 (if installed).
2. Install jumper wire (No. 18 wire or larger) between terminals 16 and 17.
3. Connect a neutral current transformer (CT) into conductor connecting power system neutral-to-ground (equipment ground conductor). Polarity of CT is not important to source ground sensing.
4. Connect terminals X1 and X2 of current transformer to circuit breaker terminals 18 and 19. DO NOT use more than 14 feet (4.27 m) of No. 14 wire for this connection.
5. Ground circuit breaker terminal 19 **only** if no other ground exists in control system. (Check NEC requirements and connect to equipment ground bars.)
6. Before doing any primary injection testing, refer to Section 7—Maintenance.

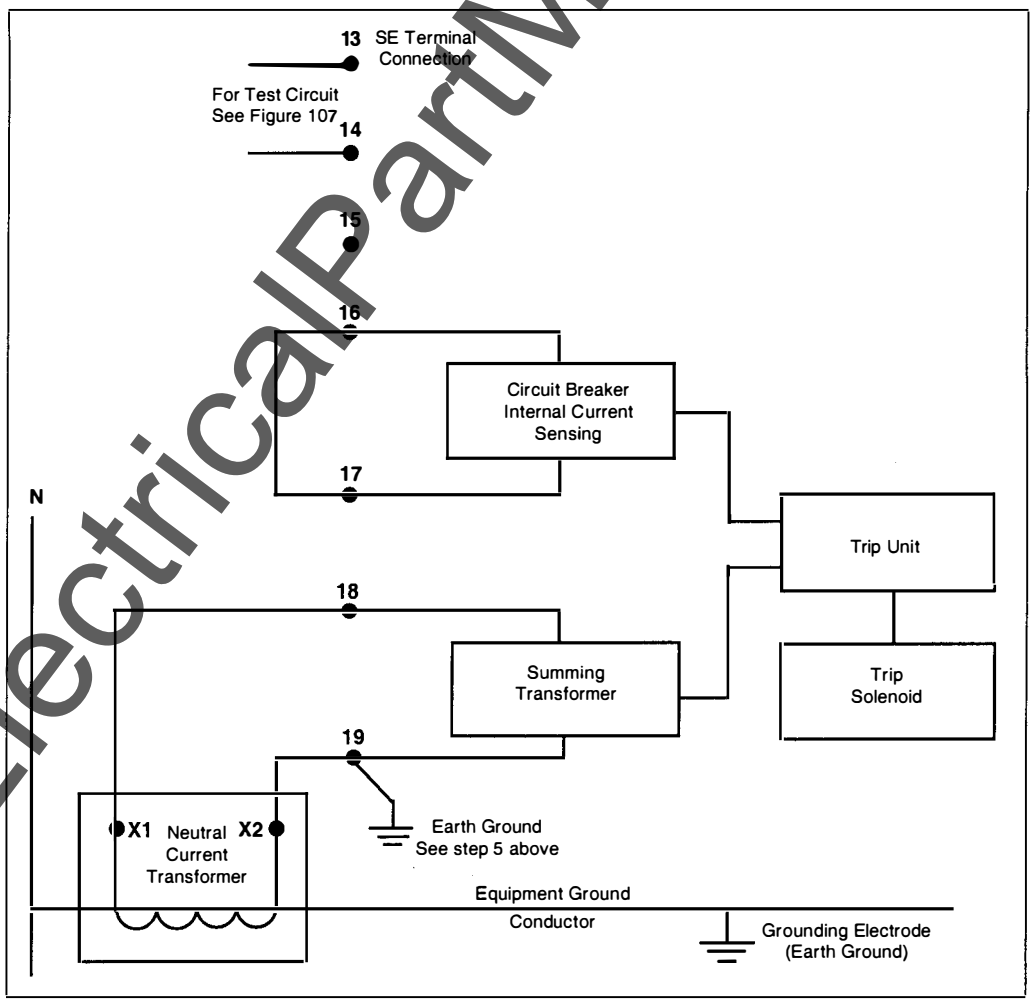


Figure 110 3Ø4W Source Ground-sensing System

ZONE-SELECTIVE INTERLOCKING

Ground-fault Zone-selective Interlocking

> **⚠ CAUTION**
>
> **HAZARD OF EQUIPMENT DAMAGE.**
>
> Do not apply more than 12 volts to terminals 20 and 21.
>
> **Failure to follow these instructions can result in trip unit damage from excessive voltage.**

Connections for ground-fault delay coordination.

- 20 Input from ground-fault restraint
- 21 Output from ground-fault restraint
- 22 Equipment ground (common)

1. Ground-fault time-delay tripping will be based on trip unit setting if circuit breaker is restrained by a self-restraint jumper wire between terminals 20 and 21. If jumper wire is removed, circuit breaker will trip approximately 0.07 seconds after ground-fault pickup point is exceeded.

2. Ground-fault time-delay tripping based on trip unit setting will also occur if circuit breaker is restrained by a restraint signal from a downstream circuit breaker. Use No. 14 or No. 16 cable, twisted in pairs, and run separately from power cables. Connect one cable from downstream circuit breaker output terminal to input terminal 20 and other cable from downstream circuit breaker equipment ground (common) to equipment ground (common) terminal 22. If cable length exceeds 1000 ft. (305 m) between circuit breakers, a restraint interface module (Cat. No. RIM32) will be required.

3. Output from one circuit breaker can restrain tripping of multiple circuit breakers. See Section 6, Table 8.

4. Some ZSI installations require a restraint interface module, Cat. No. RIM32. See Section 6, Table 8.

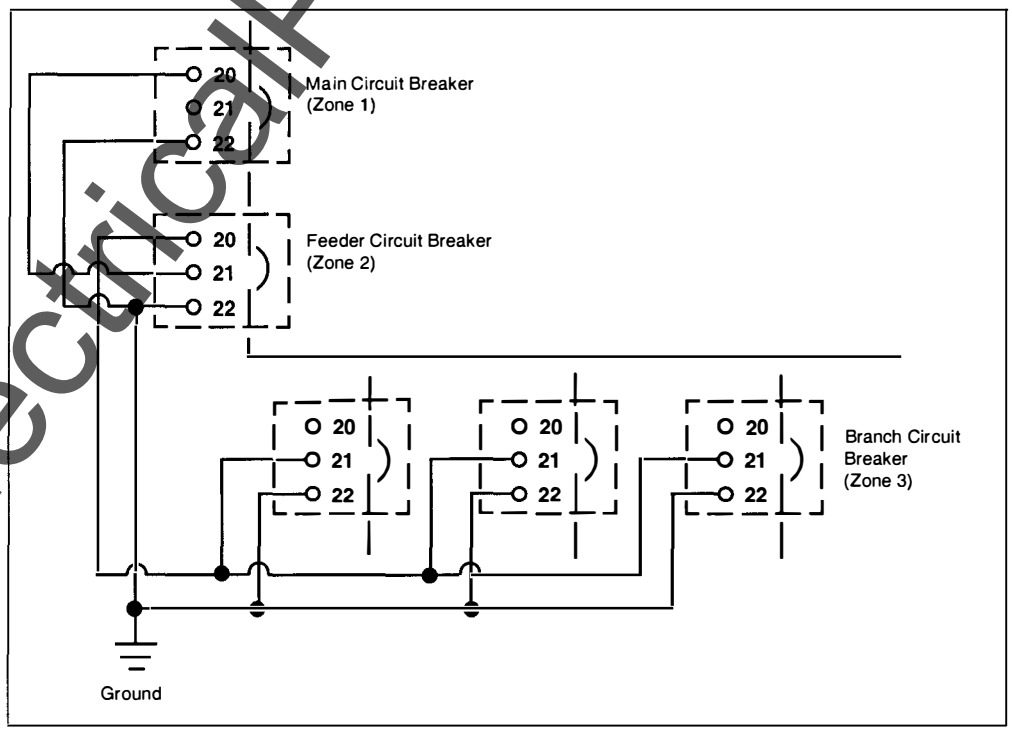


Figure 111 Typical Connections for Ground-fault Zone-selective Interlocking

Short-time Zone-selective Interlocking

> **⚠ CAUTION**
>
> **HAZARD OF EQUIPMENT DAMAGE.**
>
> Do not apply more than 12 volts to terminals 23 and 24.
>
> **Failure to follow these instructions can result in trip unit damage from excessive voltage.**

Connections for short-time delay coordination.

- 22 Equipment ground (common)
- 23 Input to short-time restraint
- 24 Output from short-time restraint

1. Short-time time-delay tripping will be based on trip unit setting if circuit breaker is restrained by a self-restraint jumper wire between terminals 23 and 24. If jumper wire is removed, circuit breaker will trip approximately 0.07 seconds after short-time pickup point is exceeded.

2. Short-time time-delay tripping based on trip unit setting will also occur if circuit breaker is restrained by a restraint signal from a downstream circuit breaker. Use No. 14 or No. 16 cable, twisted in pairs, and run separately from power cables. Connect one cable from downstream circuit breaker output terminal to input terminal 23 and other cable from downstream circuit breaker equipment ground (common) to equipment ground (common) terminal 22. If cable length exceeds 1000 ft. (305 m) between circuit breakers, a restraint interface module (Cat. No. RIM32) will be required.

3. Output from one circuit breaker can restrain tripping of multiple circuit breakers. See Section 6, Table 8.

4. Some ZSI installations require a restraint interface module, Cat. No. RIM32. See Section 6, Table 8.

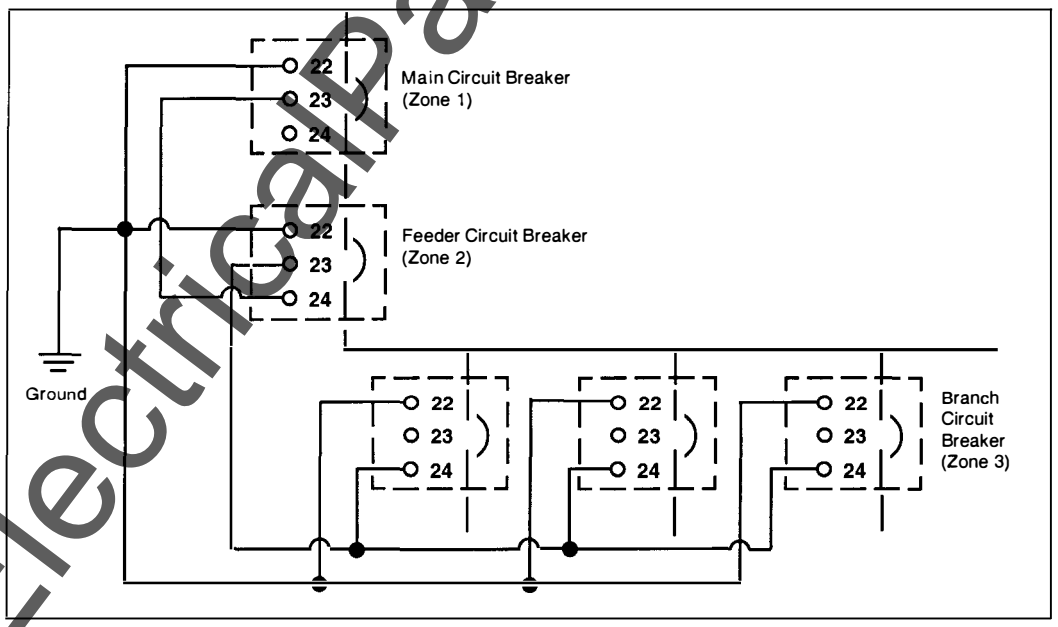


Figure 112 Typical Connections for Short-time Zone-selective Interlocking

CIM3F COMMUNICATIONS ADAPTER CONNECTIONS

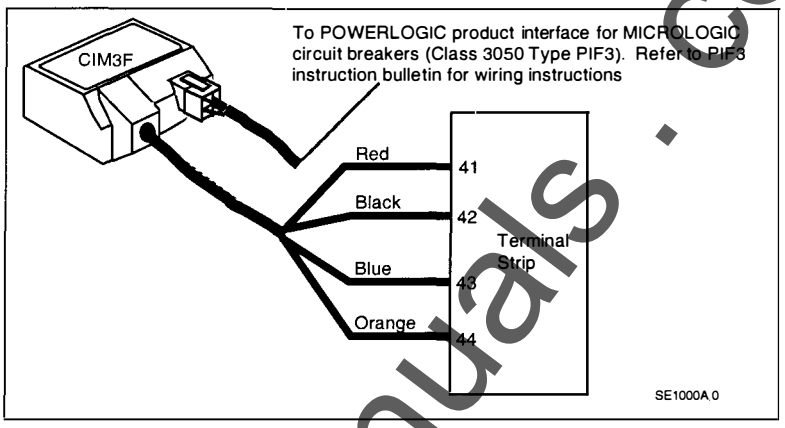


Figure 113 CIM3F Communications Adapter Connections

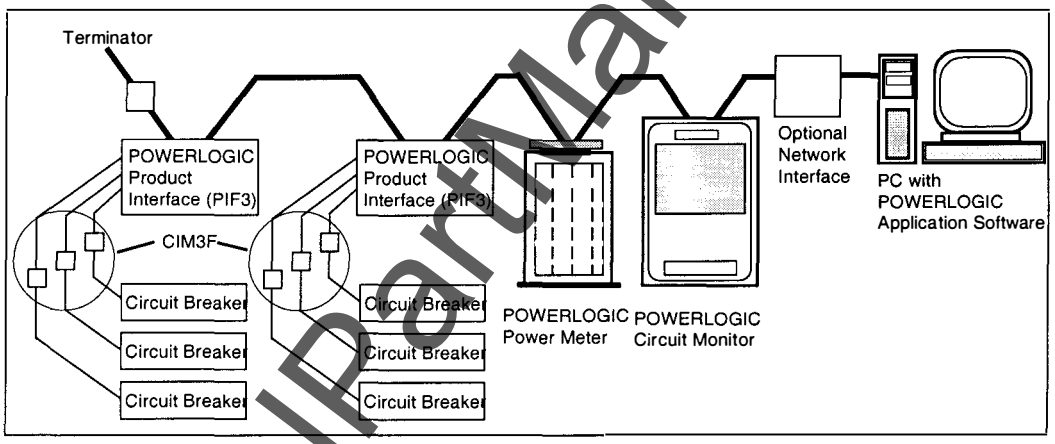


Figure 114 SE circuit breakers (CB) in a typical POWERLOGIC system.

SED4000 A CIRCUIT BREAKER COOLING FAN

1. Switch ratings: 10 ampere, 120 Vac.
2. Fan rating: 120 Vac.
3. Thermal switch contacts close when current through circuit breaker nears 4000 amperes.
4. Fan push-to-test button will operate cooling fan.
5. For location of terminal connections, see Terminal Connector for SE Circuit Breaker at beginning of this appendix.

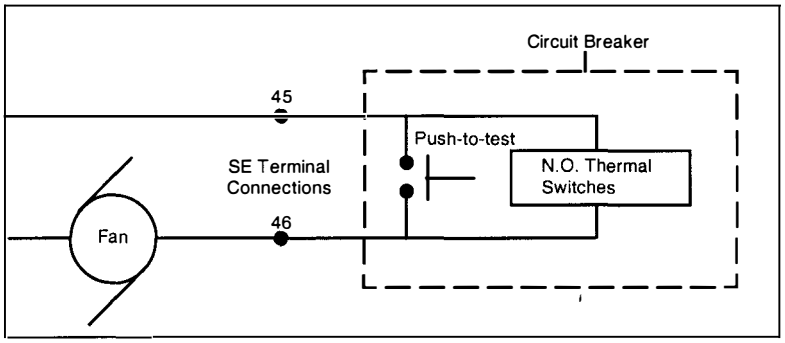


Figure 115 SED4000 A Circuit Breaker Cooling Fan Wiring Diagram

Appendix C—Catalog Numbers

Table 25 Neutral Current Transformers

Circuit Breaker Sensor Size	Neutral Current Transformer Catalog Number
400 A	SE04NCT
800–1200 A	SE12NCT
1600–3000 A	SE30NCT
4000 A	SE40NC5

Table 26 Field-replaceable Accessory Kits

Description	Rating	Catalog Number
Spring Charging Motor Replacement Kit	120 Vac	S3MOT120AC2
	24 Vdc	S3MOT024DC2
	48 Vdc	S3MOT048DC2
	125 Vdc	S3MOT125DC2
Shunt Close Replacement Kit	120 Vac	S3SC120AC2
	24 Vdc	S3SC024DC2
	48 Vdc	S3SC048DC2
	125 Vdc	S3SC125DC2
Shunt Trip Replacement Kit	120 Vac	S3ST120AC2
	24 Vdc	S3ST024DC2
	48 Vdc	S3ST048DC2
	125 Vdc	S3ST125DC2
Undervoltage Trip Replacement Kit	120 Vac	S3UVR120AC2
Auxiliary Switch Replacement Kit	4 ac/dc	S34DCB2
	4 ac/dc add on	S3DCT2
	4 ac only	S34AC2
	8 ac only	S38AC2
Alarm Switch Replacement Kit	2 ac only	S3AS2

Table 27 Field-installable Rating Plug Kits

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

Table 28 Field-installable Accessory Kits

Description	Catalog Number
Padlock Attachment	SE2PA
Close Button Cover	SE1CBC
Key Interlock Bracket	SE1K1
Drawout Crank	SEDC

Glossary of Terms and Acronyms

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

AIC = 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.

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.

close button = a button for manually closing the main contacts after the closing springs are charged.

close button cover = a cover which fits over the CLOSE button and blocks access to it. Access to the CLOSE button may be permitted through the use of a tool or rod inserted through a small hole in the front of the CLOSE button cover.

closing coil (shunt close) = a coil which closes the circuit breaker electrically using an external voltage source. It closes the circuit breaker when a specified voltage is applied across the operating coil.

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

drawout circuit breaker = an assembly of a circuit breaker and a supporting structure so constructed that the circuit breaker is supported and can be moved to either the main circuit connected or disconnected position without removing connections or mounting supports.

drawout position indicator = an indicating means which shows the position of the circuit breaker in the drawout structure.

drawout access cover = an interlocked shutter which allows or restricts access to the drawout shaft.

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.

fixed mounting = a circuit breaker so mounted that it cannot be removed without removing primary and sometimes secondary connections and/or mounting supports.

frame size = the largest ampere rating available in a group of circuit breakers of similar physical configuration.

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.

insulated case circuit breaker = a term to define UL Standard 489 Listed "hybrid" non-fused molded case circuit breakers which utilize a two-step stored energy closing mechanism, electronic trip system and drawout construction.

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

interchangeable trip unit = a trip unit which can be interchanged by a user among circuit breaker frames of the same design.

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.

latch check switch = a mechanically-operated switch which senses if the trip latch is reset.

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.

lifting adapter = a device used with a crane, chain block or an optional lifting mechanism supplied with switchgear for removing and installing a drawout circuit breaker or fuse truck.

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.

limit switch = a switch mechanically operated by a device.

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.

manual charging handle = a manually-operated handle which charges the circuit breaker closing springs.

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.

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.

open/closed indicator = an indicating means which displays the position (OPEN or CLOSED) of the main contacts.

operating mechanism = an internal mechanical system which opens and closes the circuit breaker contacts.

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 (UL only).

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

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 close (closing coil) = an accessory which closes the circuit breaker from a remote location using an external voltage source.

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

spring charging motor = a motor which electrically charges the stored energy closing spring(s).

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 = see push-to-trip button

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 = 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 release.

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.

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.

phase barrier = a barrier which provides phase-to-phase or phase-to-ground isolation.

primary disconnect contacts = an electrical plug-on connector in the main current path between the drawout component and switchboard or switchgear.

push-to-close button = a button for manually closing the main contacts after the closing springs are charged.

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

racking device shutter = see drawout shaft cover.

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.

secondary disconnect contacts = an electrical plug-on connector in the secondary (or control circuit) between the drawout component and the switchboard or switchgear.

sensor = the current sensing element within the circuit breaker which provided the sensing function for that circuit breaker.

sensor size = maximum ampere rating possible for a specific circuit breaker, based on the size of the current sensor inside the circuit breaker. Sensor size is less than or equal to frame size.

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.

INDEX

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

NOTE: 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.

Square D Company
PO Box 3069, 3700 Sixth St SW
Cedar Rapids IA 52406-3069 USA
Field Services: 1-800-634-2003