

Instruction Bulletin

ELM150HD and ELM250JD Earth Leakage Modules For PowerPact® H- and J-Frame Circuit Breakers

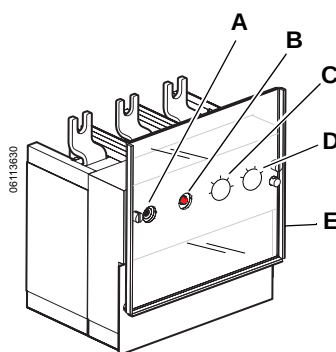
Retain for future use.

Description

The Earth Leakage Module (ELM) is a line-powered low-level ground fault sensing device. When leakage exceeds the ELM pickup setting for longer than the preset time delay, a signal is sent to the shunt trip in the companion circuit breaker, causing it to trip.

Application Guidelines

- 240 to 600 Vac maximum; 60 Hz
- 3Ø, 3-wire (no neutral sensor) or 1Ø, 2-wire
- Designed for solidly-grounded power systems only
- Neutral-grounded conductors must be grounded at service equipment.
- Do not reverse feed
- Do not high-pot circuit with ELM installed; turn circuit breaker OFF first.



(A) Earth Leakage Indicator: Pops out when the ELM sends a trip signal to the circuit breaker.

(B) Push-to-Test Button: Trips the companion circuit breaker.

(C) Pick-up Adjustment: Sets minimum earth leakage current to initiate a tripping signal to the companion circuit breaker. The settings for the ELM150HD and ELM250JD are 30 mA, 100 mA, 300 mA, 1 A, and 3 A.

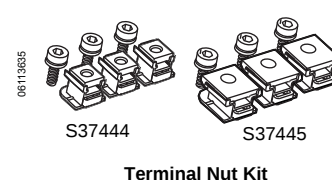
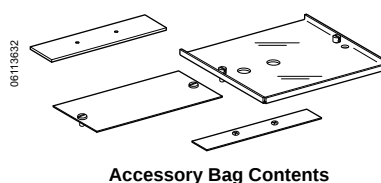
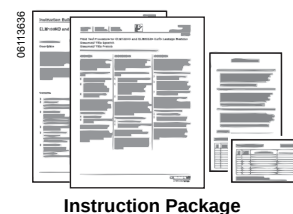
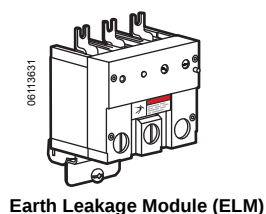
(D) Delay Band Adjustment: Sets the delay band. (The higher the band number, the longer the delay.) See trip curves, page 10 for exact time-current characteristics.

(E) Sealable Transparent Faceplate Cover: Covers faceplate area (shipped in box).

Contents

- **Earth Leakage Module (ELM)** (1)
- **Instruction Package:**
 - (1) Instruction Bulletin
 - (1) Field Test Procedure
 - (1) Test Log
 - (1) Ground Fault Test Label
- **Lug Kit (ELM150HD only):**
 - (3) 150 A Lugs
 - (3) Machine Screws (1/4-20 x 0.625 in.)
 - (3) Wire Binding Screws
- **Control Wires for Shunt Trip** (2), Orange, 18 AWG, 24 in. (Rated 600 V)
- **Accessory Bag:**
 - (1) Faceplate Cover
 - (1) Circuit Breaker Lug Access Cover
 - (2) Screws, 4-24 x .438 in.
 - (1) Spacer for Unit Mounting
- **Terminal Nut kit:**
 - (1) S37444 for ELM150HD
 - (1) S37445 for ELM250JD

Figure 1: Kit Contents



ELM Companion Circuit Breakers

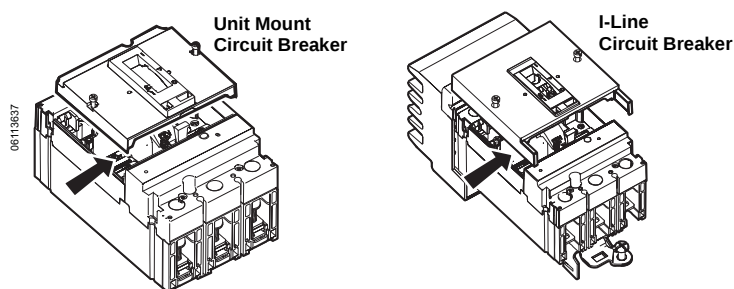
Table 1: Companion Circuit Breaker

ELM Cat. No.	Prefix	Off End Connection			Shunt Trip (48 Vdc)	
		Conn.	I-Line Example	Unit-Mount Example	Field Installed	Factory Installed
ELM150HD	HD, HG, HJ, HL	Bus Bar	HDA36xxxTBSP	HDM36xxxSP	S29392	SP suffix
ELM250JD	JD, JG, JJ, JL					

NOTE: The ELM cannot be used as an alarm-only device as the line power must be interrupted to protect the ELM power supply components. If the alarm-only function is required, consider the Square D® Vigirex® ground fault relays.

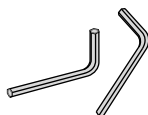
NOTE: The companion circuit breaker must have an S29392 48 Vdc **shunt trip** accessory installed. If shunt trip S29392 is not installed in the circuit breaker, install it following instructions shipped with shunt trip.

Figure 2: S29392 Shunt Trip Location



Tools Required

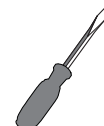
- Hex Wrenches; 5/32, 3/16, 1/4, 5/16, and 3/8 in.
- Screwdriver, Phillips #1 and #2.
- Screwdriver, Slotted, 0.1 in. (2.5 mm) and 0.25 in. (6.5 mm)



Hex Wrenches



Screwdriver, Phillips



Screwdriver, Slotted

Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

Installation

Companion Circuit Breaker Preparation (I-Line or Unit Mount)

NOTE: The companion circuit breaker must have the terminal nuts installed for bus bar connection. The terminal nuts are included with the module.

Terminal Nut Installation

If existing lugs and conductors are installed on the off-end of the circuit breaker, remove as follows:

1. If installed, remove off-end conductors (A).
2. Remove lugs, by placing slotted screwdriver in terminal slot (B) and levering lug out.

3. Insert terminal nuts by aligning curved edge (C) of terminal nut with curved edge (D) of circuit breaker lug slot and snapping into place.

4. Start terminal mounting screws (E) into terminal nuts (F), engaging only first few threads.

Figure 3: Existing Lug Removal (if installed)

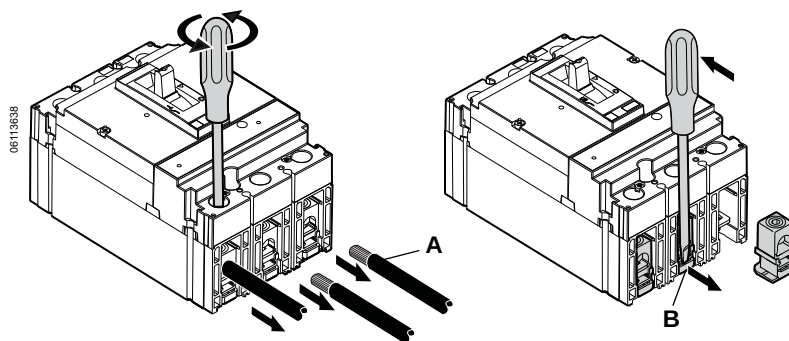


Figure 4: Terminal Nut Installation

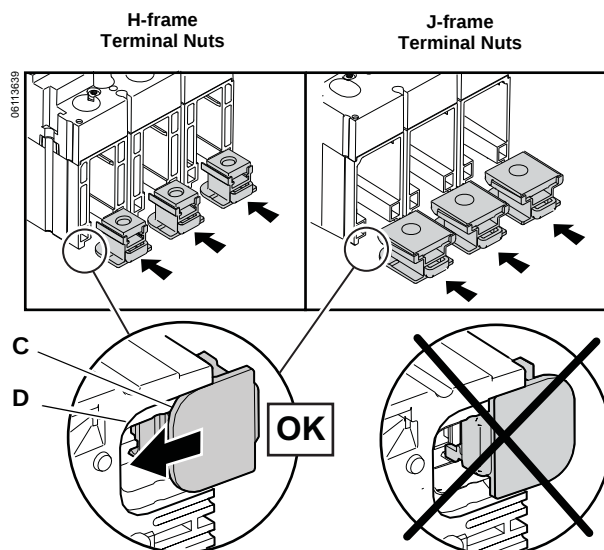
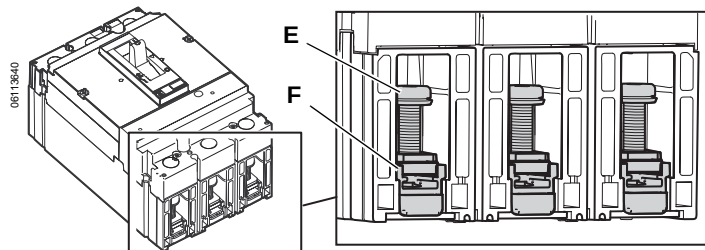


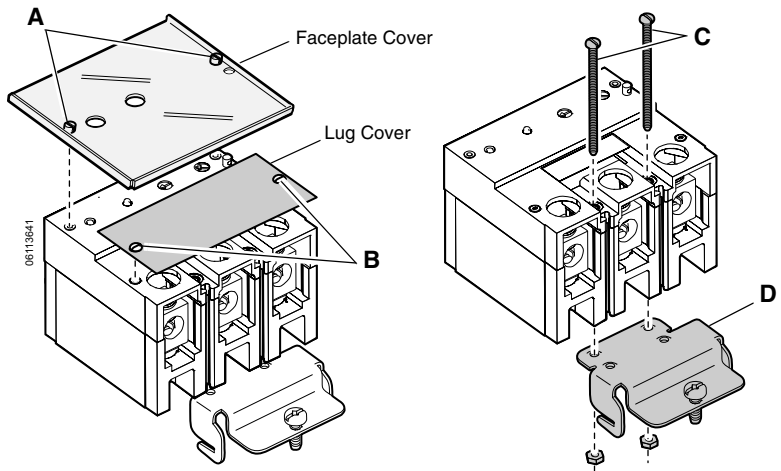
Figure 5: Terminal Mounting Screw Installation



Earth Leakage Module (ELM) Preparation

1. If previously installed, loosen captive faceplate cover screws (A). Remove and save faceplate cover.
 2. Loosen captive screws (B). Remove and save lug cover.
- NOTE:** ELM is shipped with I-Line bracket installed. The I-Line bracket must be removed for unit-mount applications.
3. For I-Line installations, skip to "I-Line ELM Installation" on page 5.
 4. For unit-mount installations, remove I-Line bracket as follows:
 - a. Remove screws (C) and retain for "Unit Mount ELM Installation", step 5 on page 5.
 - b. Remove and discard I-Line mounting bracket (D).

Figure 6: ELM Preparation



Unit Mount ELM Installation

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Install circuit breaker before installing ELM.
- Install ELM on Load side of circuit breaker.
Do not install on Line side of circuit breaker.

Failure to follow these instructions can result in equipment damage.

NOTE: For additional circuit breaker mounting information, refer to instructions shipped with circuit breaker.

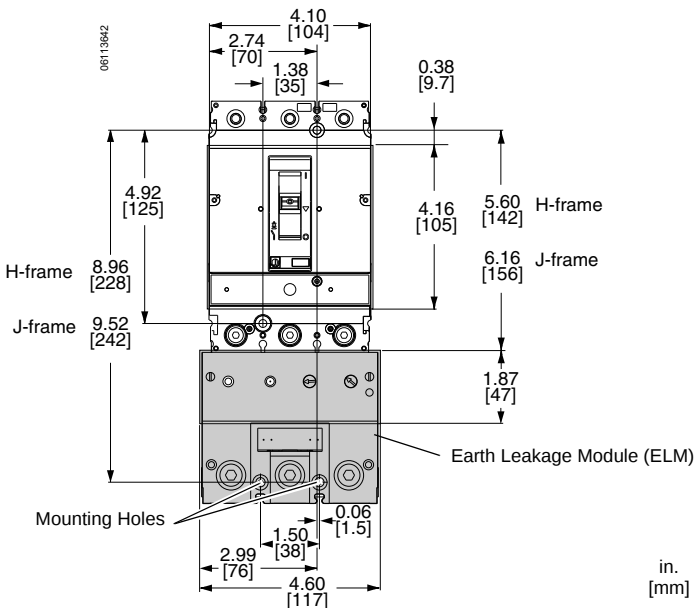
1. Install unit-mount circuit breaker in enclosure. Refer to Table 2 for minimum enclosure sizes.
2. Refer to Figure 7 and drill and tap ELM mounting holes in enclosure pan.

Table 2: Minimum Enclosure Sizes

Circuit Breaker Prefix	Rating	Minimum Enclosure Sizes (h x w x d)	
		Standard (80%) Rated	100% Rated ¹
HD, HG, HJ, HL	15–150 A	18.13 x 8.63 x 4.13 in. (461 x 219 x 105 mm)	62 x 22.5 x 14 in. (572 x 1575 x 356 mm)
JD, JG, JJ, JL	150–250 A	28.5 x 12.38 x 5.38 in. (724 x 314 x 137 mm)	62 x 22.5 x 14 in. (572 x 1575 x 356 mm)

¹ ELM250JD is not certified for use with 100% rated 250 A circuit breakers.

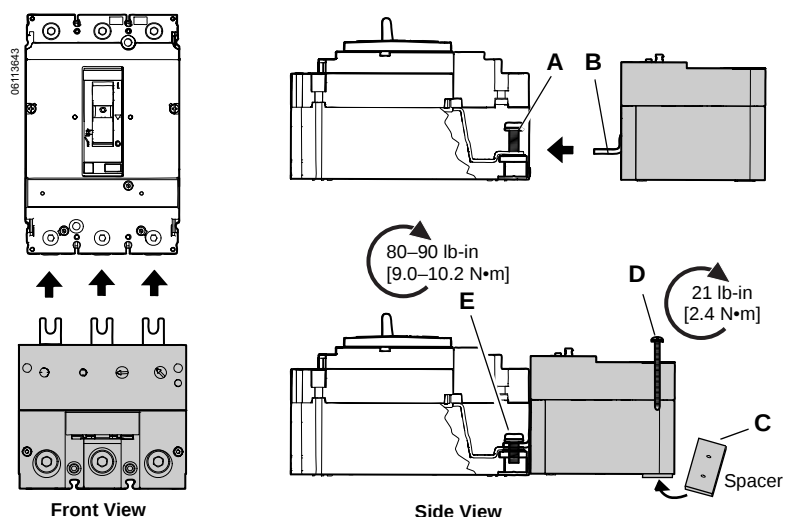
Figure 7: ELM Mounting



NOTE: Circuit breaker terminal screws (A) should have only a few threads engaged before installing ELM.

3. Align ELM tangs (B) with circuit breaker terminal screws and slide ELM against circuit breaker.
4. Place spacer (C, provided) between ELM and mounting pan.
5. Install mounting screws (D), which were removed in step 4-a on Page 4, through ELM and spacer into mounting pan holes. Tighten screws.
6. Tighten circuit breaker terminal screws (E).

Figure 8: ELM Installation (Unit Mount Circuit Breaker)



I-Line ELM Installation

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Install circuit breaker before installing ELM.

Failure to follow these instructions can result in equipment damage.

NOTE: Spacers and mounting screws packed with ELM are not used in I-Line installations.

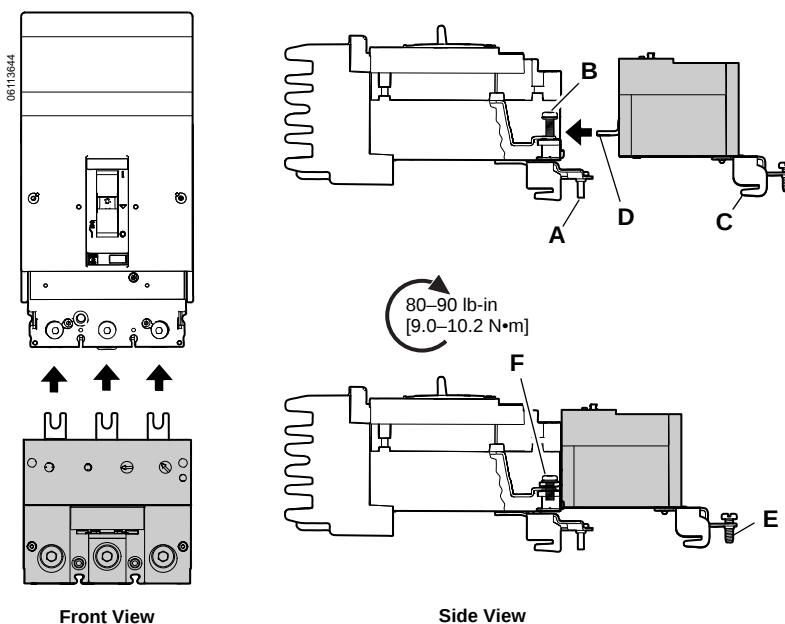
1. Install line end of circuit breaker in I-Line panel per circuit breaker instructions.

NOTE: I-Line circuit breaker bracket screw (A) must be tightened before ELM is installed.

NOTE: Circuit breaker terminal screws (B) should have only a few threads engaged before installing ELM.

2. Align ELM I-Line mounting bracket (C) with LA I-Line slots of panelboards or switchboards.
3. Align ELM tangs (D) with circuit breaker terminal screws. Slide ELM against circuit breaker.
4. Tighten retaining screw (E).
5. Tighten circuit breaker terminal screws (F).

Figure 9: ELM Installation (I-Line Circuit Breaker)



Circuit Breaker Wiring

ELM150HD Small Lug Replacement (If Applicable)

NOTE: The ELM150HD is shipped with small lugs installed. Replace small lugs with large lugs as required per Table 3.

1. Remove the wire binding screws (A) using a slotted screwdriver.
2. Use a 5/32 in. hex wrench to remove the existing lug mounting screws (B). Discard screws and lugs.
3. Refer to Figure 11. Use a 1/4 in. hex wrench to remove the wire binding screws (C) from the large lugs (D).
4. Insert the large lugs, with the anti-rotation groove (E) toward the ELM.

NOTE: The new 4/0 lugs must be secured with the provided 1/4-20 pan head slotted mounting screws (F). Do not use the internal hex screws from the old 1/0 lugs to mount the new lugs.

5. Secure the large lugs with the pan-head lug mounting screws (F) provided in the parts kit. Torque to 50 lb-in. (5.6 N•m).
6. Partially install the previously removed wire binding screws (G) in the large lugs.

Figure 10: Small Lug Removal (ELM150HD - If Applicable)

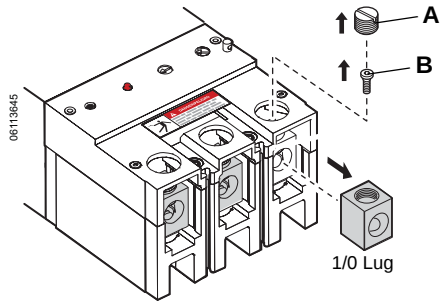
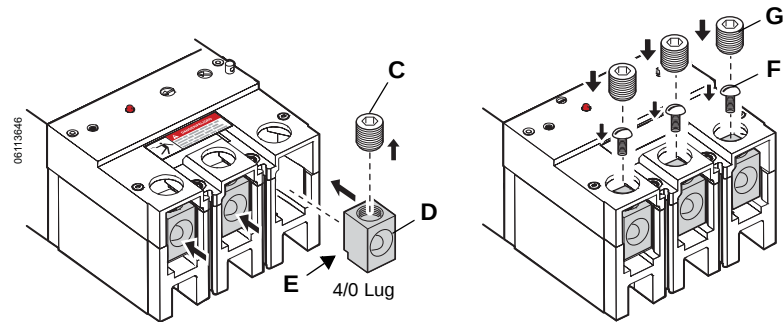


Figure 11: Large Lug Installation



Load Conductor Installation

Insert conductors into ELM lugs and tighten lug wire binding screws. See Table 3 for load conductor specifications.

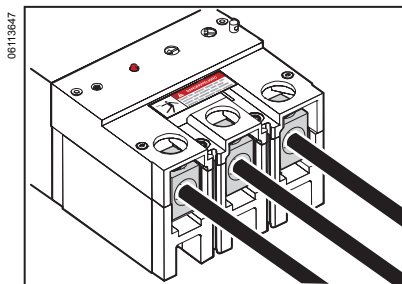


Table 3: Load Conductor Specifications

Earth Leakage Module		Wire Size	Wire Type	Wire Binding Screw Torque
ELM150HD	Small Lug	14–1/0 AWG (2.5–50 mm ²)	Cu	80 lb-in (9 N•m)
		12–1/0 AWG (2.5–50 mm ²)	Al (stranded)	80 lb-in (9 N•m)
		12–10 AWG (2.5–6 mm ²)	Al (solid)	40 lb-in (4.5 N•m)
	Large Lug	1–4/0 AWG (50–120 mm ²)	Cu/Al	150 lb-in (17 N•m)
ELM250JD		4 AWG–350 kcmil (25–185 mm ²)	Cu/Al	250 lb-in (25.8 N•m)

Control Wiring Installation

CAUTION

HAZARD OF EQUIPMENT DAMAGE

- When installing control wires, be sure wire strands do not contact adjacent terminals.
- Accessory cover must be secured with all screws tightened to stated torque. Do not over-torque screws. Do not use power equipment to torque screws.

Failure to follow these instructions can result in equipment damage.

NOTE: Control wire must have insulation rating equal to or greater than the line voltage in the panel being monitored. Use orange wires provided (Rated 600 V) for shunt trip connections.

Shunt Trip Connections

NOTE: A shunt trip must be installed in the circuit breaker and connected to the ELM. The ELM cannot be used as an alarm-only device as the line power must be interrupted to protect the ELM power supply components. If the alarm-only function is required, consider the Square D® Vigirex® ground fault relays.

1. Loosen circuit breaker accessory cover screws (A) and remove accessory cover.
2. Install orange shunt trip control wires (B, provided) to shunt trip (C).

NOTE: Be careful not to pinch wires when installing covers. If necessary, remove wire cutout from unit-mount accessory cover (D).

3. Route wiring as shown.
4. Replace accessory cover and replace all accessory cover screws. Torque accessory cover screws to 9 lb-in (1 N·m). Do not exceed torque specification.

NOTE: To confirm proper accessory cover is matched to circuit breaker, check that the catalog number printed on side accessory label (A) matches catalog number printed on accessory cover (B).

Figure 12: Control Wire Installation

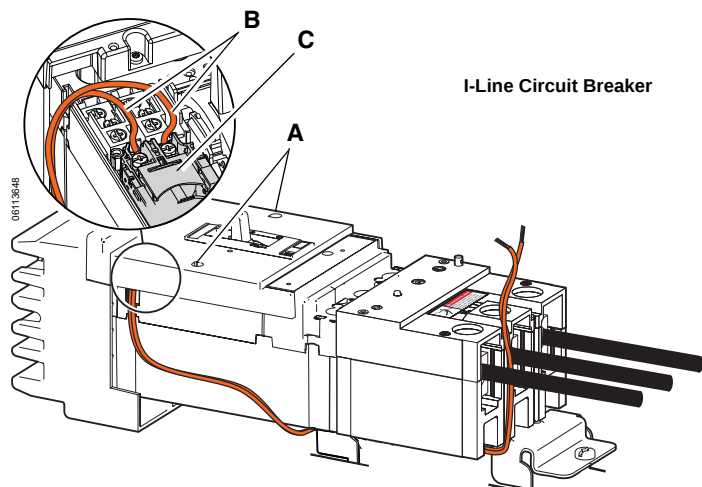


Figure 13: Control Wire Installation

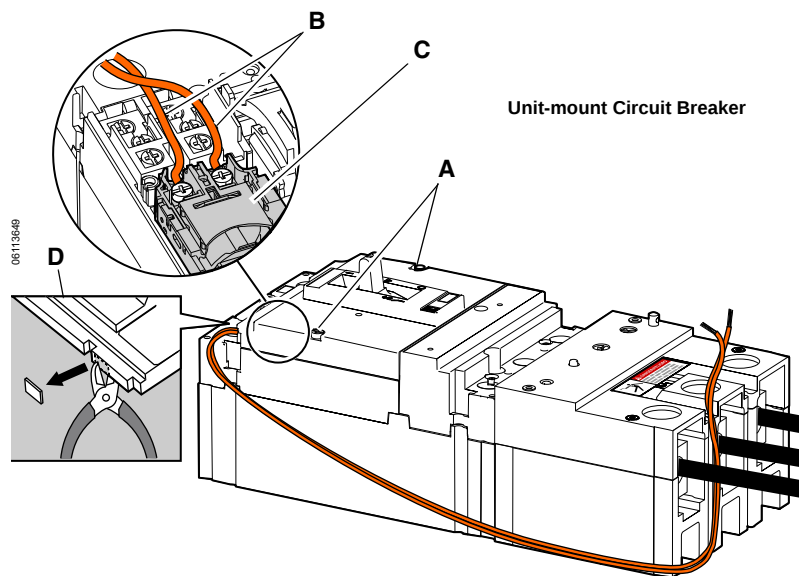
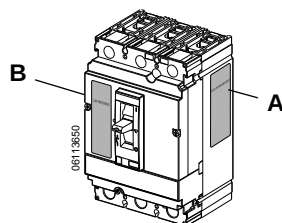


Figure 14: Accessory Cover Label

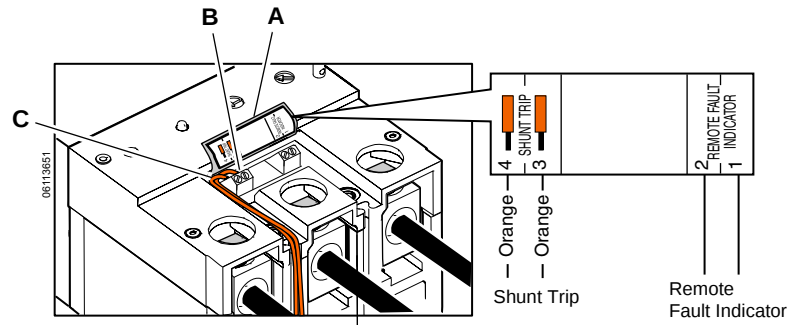


Shunt Trip Control Wiring

NOTE: Use 14–18 AWG wire and strip wire to 5/16 in. (8 mm).

1. Lift ELM warning label (A) as shown in Figure 15.
2. Loosen screws in terminals (B).
3. Install ELM control wiring (C) as shown.
4. Inspect control wire for damage before activation.
5. Using the push-to-test button, test the shunt trip and wiring before installing the remote fault indicator wiring.

Figure 15: Shunt Trip Control Wiring Installation



Remote Fault Indicator Wiring

The ELM provides contacts (1a) that are normally open in the absence of an earth leakage fault.

These can light an alarm LED or be an input to an electronic monitoring system (PLC, SCADA) to show that the ELM has tripped.

NOTE: The ELM cannot be used as an alarm-only device. A shunt trip must be installed in the circuit breaker and connected to the ELM.

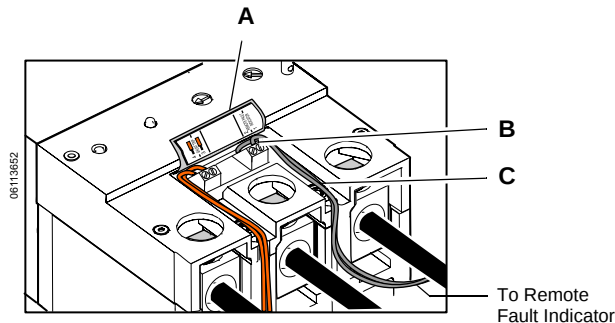
NOTE: Use 14–18 AWG wire and strip wire to 5/16 in. (8 mm). Control wires must be rated for voltage greater-than or equal-to equipment voltage.

1. Lift ELM warning label (A) as shown in Figure 16.
2. Loosen screws in terminal (B).
3. Install remote fault indicator wiring (C) as shown.
4. Inspect control wire for damage before activation.
5. Use push-to-test button to verify that the remote fault indicator is functional.

Remote Fault Indicator Characteristics:

- External “wetting voltage” of 125 Vdc, 120 Vac nominal.
- Maximum continuous current through terminals ≤ 25 mA.
- For AC voltage, the “pulse” will persist for a minimum of a half-cycle.
- DC voltage requires the monitoring system to provide means of breaking the current.
- A suitable fuse should be installed in the remote fault indicator circuit.

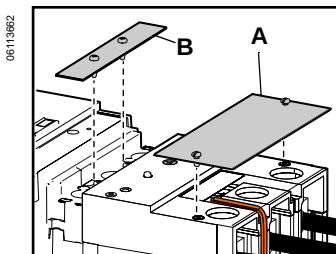
Figure 16: ELM Remote Fault Indicator Wiring



Lug Cover Installation

1. Replace ELM lug cover (A) as shown in Figure 17.
2. Install lug access cover (B).

Figure 17: ELM Lug Cover and Lug Access Cover Installation



Adjustments

Refer to the electrical diagram for your project to determine the pickup and delay settings.

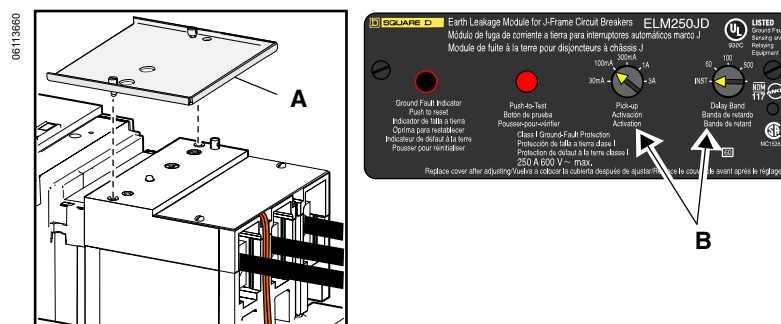
1. If installed, remove faceplate cover (A) as shown in Figure 18.
2. Set pickup and delay band adjustments (B) to desired settings.

NOTE: It is possible to set time delay at all pickup levels, including 30 mA (*Contrary to IEC practices*).

NOTE: Nuisance tripping may occur due to:

- Excessive harmonics
- Unusually high capacitive leakage to ground

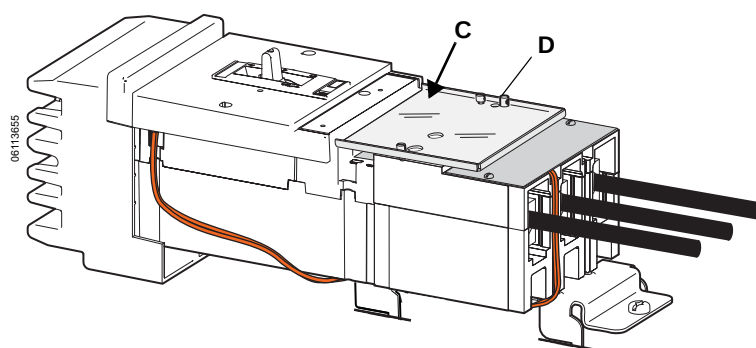
Figure 18: Pickup and Delay Adjustment



Faceplate Cover Installation

1. Orient faceplate cover so lettering at top (C) matches application (150HD or 250JD). Install cover and tighten cover screws.
2. Seal faceplate cover using wire ties or seals (D) to prevent tampering with adjustments.
3. Attach label entitled "Instructions for Ground-Fault System" to enclosure near companion circuit breaker.

Figure 19: Faceplate Cover Installed



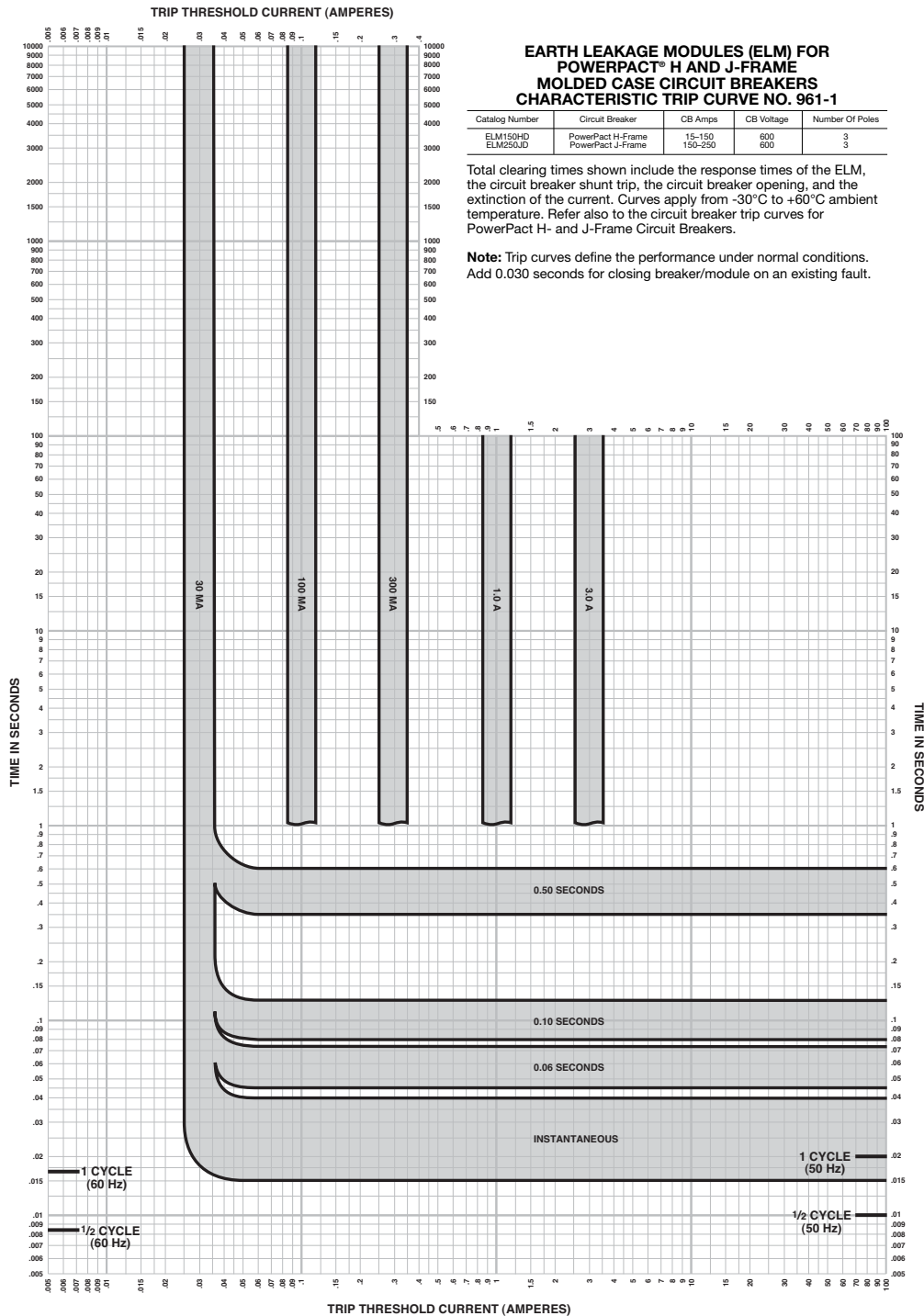
Test the Ground-fault System

Paragraph 230-95 (c) of the National Electrical Code requires ground-fault protection system to be performance tested before being placed into service.

Refer to Field Test Procedure 48041-090-XX, provided with this kit, for test information.

Trip Curves

Figure 20: ELM150HD and ELM250JD Trip Curve



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