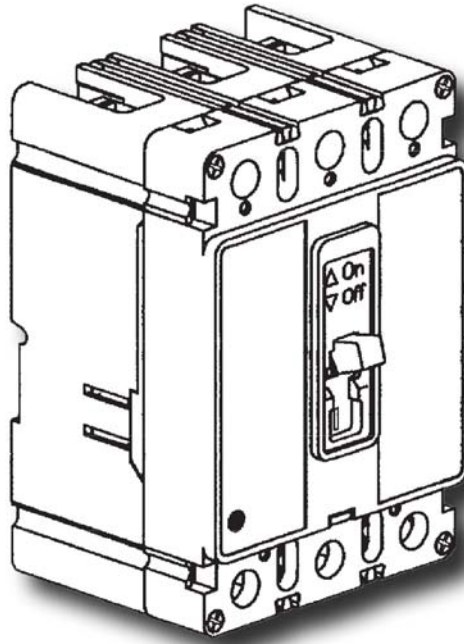


Installation Instructions for E²F, E²FM Mining Service Circuit Breakers



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Powering Business Worldwide



WARNING

DO NOT ATTEMPT TO INSTALL, ADJUST, OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. SEVERE PERSONAL INJURY, DEATH, OR SUBSTANTIAL PROPERTY DAMAGE CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING WITH THE TASK, AND ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

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The user is cautioned to observe all recommendations, warnings, and cautions relating to the safety of personnel and equipment, as well as, all general and local health and safety laws, codes, and procedures.

The recommendations and information contained herein are based on Eaton experience and judgement, but should not be considered to be all-inclusive or covering every application or circumstance which may arise. If any questions arise, contact Eaton for further information or instructions.

1.0 INTRODUCTION

General Information

E²F and E²FM mining service circuit breakers (Fig. 1-1) are available as 3-pole devices, in several ratings from 3A to 150A continuous current. The E²F and E²FM are available in both thermal-magnetic and magnetic-only versions. Mining service circuit breakers have been developed to meet the Federal Register ruling on trailing cable protection.

This instruction leaflet (IL) gives procedures for the installation and field testing of E²F and E²FM mining service circuit breakers. For this publication, mining service circuit breaker shall be abbreviated to circuit breaker.

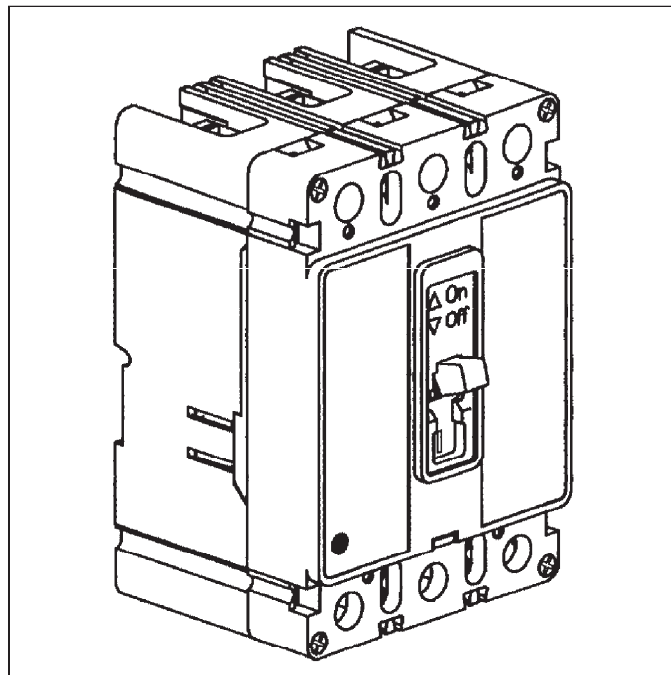


Fig. 1-1 E²F Magnetic ONLY Mining Service Circuit Breaker

2.0 INSTALLATION

The installation procedure consists of inspecting and mounting the circuit breaker, connecting and torquing the line and load terminations, and attaching terminal shields or barriers (when supplied). To install the circuit breaker, perform the following steps:

Note: The E²F and E²FM circuit breakers are factory sealed. Where local codes and standards permit, internal accessories can be field installed. Accessory installation should be done before the circuit breaker is mounted and connected.

Mounting hardware and unmounted terminations (where required) are supplied in separate packages.

- 2.1. Make sure that the circuit breaker is suitable for the intended installation by comparing nameplate data with system requirements. Inspect the circuit breaker for completeness, and check for damage before mounting.



WARNING

BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THAT THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

- 2.2. Depending on the equipment configuration, the circuit breaker can be mounted using different styles of hardware. The following steps describe how to mount the circuit breaker using standard hardware. When special hardware is needed (for example, with the electrical operator), the instruction leaflet describing the accessory also describes the special mounting arrangements.

Note: Before mounting the circuit breaker, check if the termination devices should be installed first. See instructions supplied with terminations.

- 2.3. To mount the circuit breaker, perform the following steps.
 - a. For individual mounting panels, make sure that mounting panel is predrilled using bolt drilling plan (Fig. 2-1). For panelboard mounting, only load end support mounting holes are required. For deadfront cover applications, make sure mounting panel cover is cut out to correct escutcheon dimensions (Fig. 2-2).
 - b. If circuit breaker includes factory installed internal accessories, make sure accessory wiring can be reached when the circuit breaker is mounted.
 - c. Position circuit breaker on mounting surface.
 - d. Install mounting screws, washers, and nuts. Tighten screws firmly, but do not exceed 28 pound-inches (3.16 N.m.).

- 2.4. If an optional terminal end cover is to be installed with the circuit breaker (usually line-end only), it must be positioned before cables are connected to terminals.

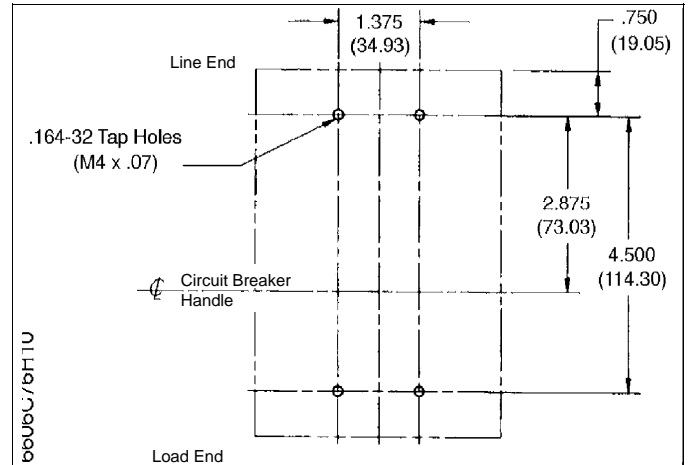


Fig. 2-1 Circuit Breaker Mounting Bolt Drilling Plan

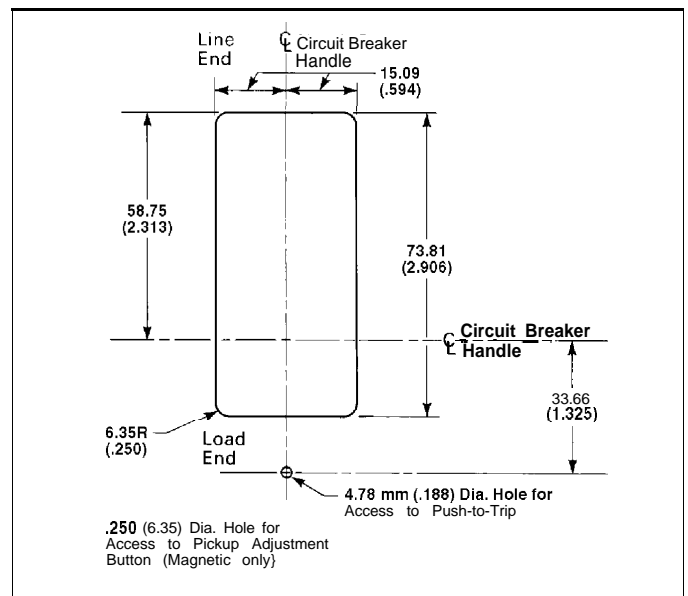


Fig. 2-2. Circuit Breaker Escutcheon Dimensions



CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY OF TERMINAL OVERHEATING. TERMINAL OVERHEATING CAN CAUSE NUISANCE TRIPPING AND DAMAGE TO THE CIRCUIT BREAKER.

- 2.5. After mounting the circuit breaker, line and load terminals and accessory leads should be connected.

(See accessory schematic diagram on side of circuit breaker.)

Note: If terminal shield or interphase barriers are to be installed on the circuit breaker, install them after the terminals are connected.

- 2.6. If required, install terminal shield on circuit breaker cover with mounting screws provided.
- 2.7. The supplied interphase barriers should be installed to the line end of the circuit breaker (E²FM1000V only) by sliding barrier into dovetail grooves between terminals.
- 2.8. After the circuit breaker is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line load terminals are given in Tables 2-1 and 2-2 and on the circuit breaker nameplate.

TABLE 2-1. TERMINAL TYPES

Terminal Catalog Number	Terminal Body Material	Screw Head Type	AWG Wire Range	Metric Wire Range	Wire Type	Torque Value Lb. In. (N•m)
3TA225FD ⁽¹⁾	Aluminum	3/16 Socket Hex	#4-4/0	2.5-9.5	Cu/Al	120 (13.6)
3TA225FDM ⁽¹⁾	Aluminum	5mm Socket Hex	#4-4/0	2.5-9.5	Cu/Al	120 (13.6)
3TA225FDK ⁽¹⁾⁽²⁾	Aluminum	5/16 Socket Hex	#6-300	16-150	Cu/Al	275 (31)
3TA100FD ⁽¹⁾	Aluminum	Slotted	#14-1/0	2.5-50	Cu/Al	See Table 2-2
3TA50FB ⁽¹⁾	Aluminum	Slotted	#14-#4	2.5-16	Cu/Al	See Table 2-2
3T100FB ⁽¹⁾	Steel	Slotted	#14-1/0	2.5-50	Cu/Al	See Table 2-2
3T150FB ⁽¹⁾	Stainless Steel	Slotted	#4-4/0	2.5-9.5	Cu Only	See Table 2-2

Note: Terminal wire connectors are UL listed for standard wire sizes as defined in UL 486A and UL 486B.

⁽¹⁾Package of three

⁽²⁾Individual terminal identified as TA225FD1

TABLE 2-2. TERMINAL TORQUE VALUES FOR SLOTTED HEAD

Metric Wire Range	Torque Value, N•m	AWG Wire Range	Torque Value, Lb. In.
2.5-6	3.96	#14-#10	35
10	4.52	#8	40
16-25	5.09	#6-#4	45
35-95	5.65	#3-4/0	50

TABLE 2-3. BOLTED CONNECTIONS (KEEPER NUT OR END CAP)

Termination Catalog Number	Screw Head Type	Nut Thread Size	Torque Value, Lb-In (N•m)
KPR1A /KPR1AM	User Supplied	10-32/M5	35 (4.0)
KPEKxxx	Slotted	10-32 /M5	35 (4.0)

3.0 MANUAL OPERATION

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP button. The circuit breaker handle has three indicated positions, two of which are shown on the cover with raised lettering to indicate ON and OFF. On the sliding handle barrier ON, OFF, and trip are also shown by a color coded strip for each circuit breaker handle position: red for ON, white for tripped, and green for OFF. On the sliding handle barrier, ON/OFF is also shown with the international symbols I/O (See Fig. 3-1).

Circuit Breaker Reset

After tripping, the circuit breaker is reset by moving the circuit breaker handle to the extreme OFF position.

Note: In the event of a thermal trip, the circuit breaker cannot be reset until the thermal element cools.

PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the tripping function and is used to periodically exercise the operating mechanism.

Magnetic-Only Mining Service Circuit Breaker - Adjustment of Trip Setting

The F-frame E² magnetic-only mining service circuit breaker has a trip setting adjustment mechanism that permits the circuit breaker to be fine tuned to provide more precise protection. The mechanism consists of a cam with eight positions for different trip levels. The trip levels are labeled A through H; actual trip values are shown on the circuit breaker cover nameplate and in Table 3-1. To adjust the trip level, depress and rotate adjustment button clockwise to the desired setting.



CAUTION

A ROTATION STOP PREVENTS THE ADJUSTMENT BUTTON FROM BEING ROTATED COUNTERCLOCKWISE BEYOND POSITION A. THE CIRCUIT BREAKER CAN BE DAMAGED IF THE BUTTON IS FORCED PAST POSITION A IN THE COUNTERCLOCKWISE DIRECTION.

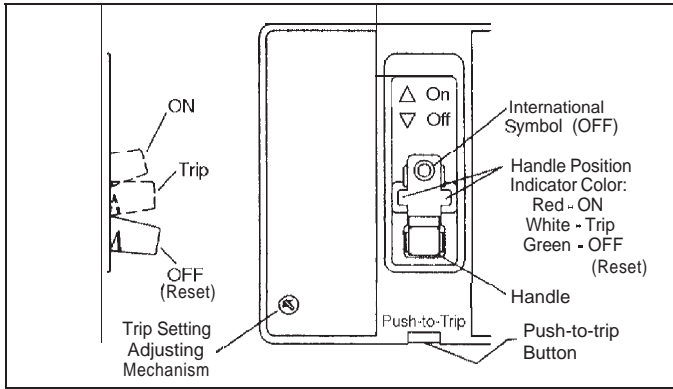


Fig. 3-1 Circuit Breaker Manual Controls

4.0 INSPECTION AND FIELD TESTING

E² molded case circuit breakers are designed to provide years of almost maintenance-free operation. The following procedure describes how to inspect and test a circuit breaker in service.

Inspection

Circuit breakers in service should be inspected periodically. The inspection should include the following checks.



WARNING

BEFORE INSPECTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND THAT THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. SPECIAL ATTENTION SHOULD BE PAID TO REVERSE FEED APPLICATIONS TO ENSURE NO VOLTAGE IS PRESENT. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.



CAUTION

MAKE SURE THAT CLEANING AGENTS OR SOLVENTS USED TO CLEAN THE CIRCUIT BREAKER ARE SUITABLE FOR THE JOB. SOME COMMERCIAL CLEANING AGENTS WILL DAMAGE THE NAMEPLATES OR MOLDED PARTS.

- 4.1. Remove dust, dirt, soot, grease, and/or moisture from the surface of the circuit breaker using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into circuit breaker. If contamination is found, look for the source and eliminate the problem.
- 4.2. Switch circuit breaker to ON and OFF several times to be sure that the mechanical linkages are free and do not bind. If mechanical linkages are not free, replace circuit breaker.
- 4.3. Press the PUSH-TO-TRIP button to mechanically trip the circuit breaker. Trip, reset, and switch circuit breaker ON several times. If mechanism does not reset each time the circuit breaker is tripped, replace the circuit breaker.
- 4.4. Check base cover and operating handle for cracks, chipping, and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.
- 4.5. Check terminals and connectors for looseness or signs of overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. If there is no evidence of overheating or looseness, do not disturb or tighten the connections. If there is evidence of overheating, terminations should be cleaned or replaced. Before re-energizing the circuit breaker, all terminations and cable should be refurbished to the condition when originally installed.
- 4.6. Check circuit breaker mounting hardware. Tighten, if necessary.
- 4.7. Check area where circuit breaker is installed for any safety hazards including personal safety and fire hazards. Exposure to certain types of chemicals can cause deterioration of electrical connections.

Field Testing

Any field testing should be done in accordance with NEMA Standards Publication AB2-1984.

TABLE 3-1. MCP TRIP SETTINGS

Cam Setting	Continuous Amps	MCP Catalog Number	MCP Trip Setting
A			9.0
B			12.0
C			15.0
D	3	E2F003AM	18.0
E			21.0
F			24.0
G			27.0
H			30.0
A			21.0
B			28.0
C			35.0
D	7	E2F007CM	42.0
E			49.0
F			56.0
G			63.0
H			70.0
A			45.0
B			60.0
C			75.0
D	15	E2F015EM	90.0
E			105.0
F			120.0
G			135.0
H			150.0
A			40.0
B			43.0
C			46.0
D	25	E2F025DM	49.0
E			52.0
F			55.0
G			58.0
H			60.0

TABLE 3-1. MCP TRIP SETTINGS (CONT.)

Cam Setting	Continuous Amps	MCP Catalog Number	MCP Trip Setting
A			50.0
B			60.0
C			75.0
D	30	E2F030EM	90.0
E			105.0
F			120.0
G			135.0
H			150.0
A			90.0
B			120.0
C			150.0
D	30	E2F030HM	180.0
E			210.0
F			240.0
G			270.0
H			300.0
A			66.0
B			97.0
C			112.5
D	50	E2F050YM, E2FM050YM	128.0
E			143.5
F			159.0
G			174.5
H			190.0
A			150.0
B			200.0
C			250.0
D	50	E2F050KM, E2FM050KM	300.0
E			350.0
F			400.0
G			450.0
H			500.0

TABLE 3-1. MCP TRIP SETTINGS (CONT.)

Cam Setting	Continuous Amps	MCP Catalog Number	MCP Trip Setting
A			210.0
B			280.0
C			350.0
D	70	EZF070MM,	420.0
E		EZFM070MM	490.0
F			560.0
G			630.0
H			700.0
A			150.0
B			200.0
C			250.0
D	100	E2FI OOKM,	300.0
E		E2FMI OOKM	350.0
F			420.0
G			450.0
H			500.0
A			300.0
B			400.0
C			500.0
D	100	E2FI OORM,	600.0
E		E2FMIOORM	700.0
F			800.0
G			900.0
H			1000.0
A			450.0
B			600.0
C			750.0
D	150	EZFI 50TM,	900.0
E		EZFM150TM	1050.0
F			1200.0
G			1350.0
H			1500.0

TABLE 3-1. MCP TRIP SETTINGS (CONT.)

Cam Setting	Continuous Amps	MCP Catalog Number	MCP Trip Setting
A			750.0
B			1000.0
C			1250.0
D	150	E2F-I 50UM,	1500.0
E		E2FMI 50UM	1750.0
F			2000.0
G			2250.0
H			2500.0

Effective August 2011

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