

# Installation Instructions for EHD, EDB, EDS, ED, EDH, EDC, FDB, FD, HFD, FDC, HFDDC Circuit Breakers and Molded Case Switches



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# Instruction Leaflet IL 29C102I

Effective December 2013

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## ⚠ WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH, SEVERE PERSONAL INJURY 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.

EATON IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

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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 judgment, 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. Introduction



Figure 1. Model D Series C Circuit Breaker and Molded Case Switches

The F-Frame Series C circuit breakers (Fig. 1) are rated from 15A to 225A (150A for 1 pole versions) continuous current and are available as thermal-magnetic circuit breakers and molded case switches. (Molded case switches are available rated at 100A, 150A, and 225A.) Circuit breakers are listed in accordance with Underwriters Laboratories, Inc. Standard UL489, and satisfy the (P1) requirements of the International Electrotechnical Commission Recommendation No. IEC 157-1. Molded case switches are listed in accordance with UL489. For this publication, the term circuit breaker also includes molded case switches and F-Frame is used to cover all of the circuit breakers and molded case switches associated with this leaflet.

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## 2. 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 F-Frame circuit breakers are factory sealed. UL489 requires that internal accessories be installed at the factory. Where local codes and standards permit and UL listing is not required, 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 installation by comparing nameplate data with system requirements. Inspect the circuit breaker for completeness and check for damage before mounting.

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## ⚠ WARNING

BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THERE IS NO VOLTAGE PRESENT WHERE WORK IS TO BE PERFORMED. THE VOLTAGES IN ENERGIZED EQUIPMENT CAN CAUSE INJURY OR DEATH.

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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 terminations instructions.

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). For panelboard mounting, only load end support mounting holes are required. For deadfront cover applications make sure panel cover is cut out to correct escutcheon dimensions (Fig.3).

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## ⚠ CAUTION

DO NOT EXCEED CONNECTOR/BUS CAPACITY IN EATON POWER LINE 3A AND 4 PANELS. USE CONNECTOR KIT KPRL3AFD3 (3-POLE) AND KPRL3AFD2 (2-POLE) IN PANEL TYPE PRL3A AND KPRL4FD (3-POLE) AND KPRL4FD2 (2-POLE) IN PANEL PRL4.

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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)

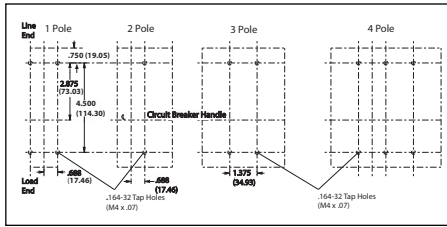


Figure 2. Circuit Breaker Mounting Bolt Drilling Plans

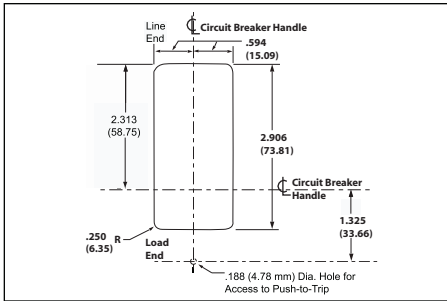


Figure 3. Circuit Breaker Escutcheon Dimensions

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 cable is connected to terminals.

**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 NOISANCE 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. If required, install an interphase barrier 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 1, 2, and 3 and on the circuit breaker nameplate.

**Note:** See Section 5 for additional details for HFDDC.

Table 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	25-95	Cu/Al	120 (13.6)
3TA225FDM ①	Aluminum	5mm Socket Hex	#4-4/0	25-95	Cu/Al	120 (13.6)
3TA225FDK ②	Aluminum	5/16 Socket Hex	#6-300	16-150	Cu/Al	275 (31)
3TA100FD ①	Aluminum	Slotted	#14-1/0	2.5-5.0	Cu/Al	See Table 2
3TA50FB ①	Aluminum	Slotted	#14-#4	2.5-16	Cu/Al	See Table 2
3T100FB ①	Steel	Slotted	#14-1/0	2.5-50	Cu/Al	See Table 2
3T150FB ①	Stainless Steel	Slotted	#4-4/0	25-95	Cu Only	See Table 2
3TA150F3 K	Aluminum	5/32 Socket Hex	#14-2	2.5-25	Cu/Al	70 (7.9)
3TA150F6 K	Aluminum	3/32 Socket Hex	#14-6	2.5-10	Cu/Al	25 (2.8)

Note: Terminal wireconnector are UL listed for standard wire sizes as denifed in UL486A and UL486B

① Package of Three

② Individual terminal identified as TA225FD1

Table 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 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	Upper Supplied	10-32/M5	35 (4.0)
KPEKxxx	Slotted	10-32/M5	35 (4.0)

### 3. 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. 4.)

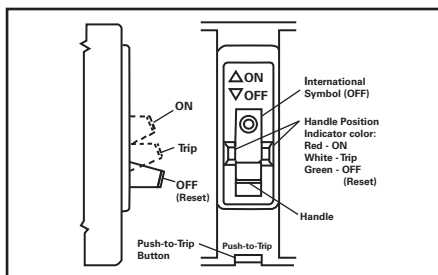


Figure 4. Circuit Breaker Manual Controls.

#### 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.

### 4. Inspection and Field Testing

Series C 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 4-1 thru 4-7.

#### **⚠ WARNING**

**BEFORE INSPECTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE THE CIRCUIT BREAKER IS SWITCHED TO THE OFF POSITION AND 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 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 NAME PLATES OR MOLDED PARTS.**

- 4-1. Remove dust, dirt, soot, grease, 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.
- 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

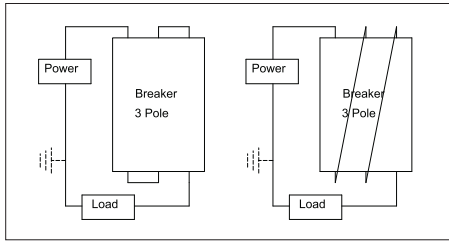
Any field testing should be done in accordance with applicable NEMA Standards.

## 5. HFDDC

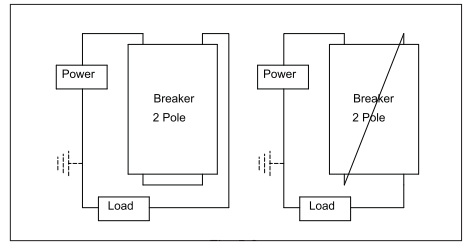
5-1. The HFDDC circuit breakers and switches are qualified for direct current voltages and interruptions with multiple poles wired in series.

5-2. See Figures 5, 6, 7, and 8 for typical wiring configurations. A 3-pole breaker may be wired as a 2-pole.

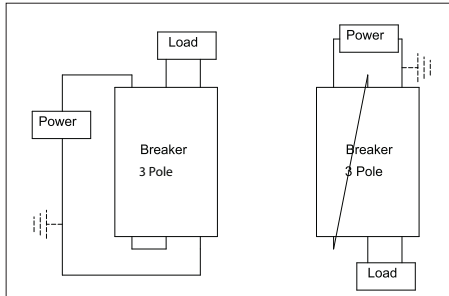
5-3. For grounded insulated load configurations, the interruption rating is based on number of poles in series that break the ungrounded leg of power supply.



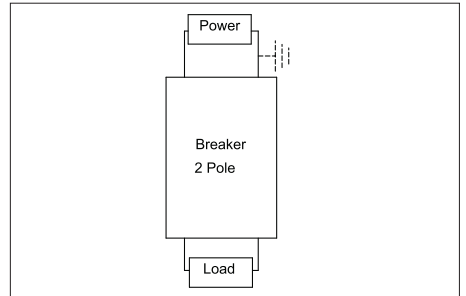
**Figure 5. Load Connected to Power Source. Grounded or Ungrounded Systems.**



**Figure 7. Load Connected to Power Source. Grounded or Ungrounded Systems.**



**Figure 6. Load Isolated from Power Source. Grounded or Ungrounded Systems. If System Voltage Exceeds 300 Vdc, then Ungrounded Systems Only.**



**Figure 8. Load Isolated from Power Source. Grounded or Ungrounded Systems. If System Voltage Exceeds 125 Vdc, then Ungrounded Systems Only.**

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HFD, FDC, HFDDC Circuit Breakers and Molded Case Switches

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