



Installation Instructions for DK, KDB, KD, HKD, KDC, KW, HKW, KWC, CKD, CHKD Circuit Breakers and Molded Case Switches



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.

CUTLER-HAMMER IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

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.

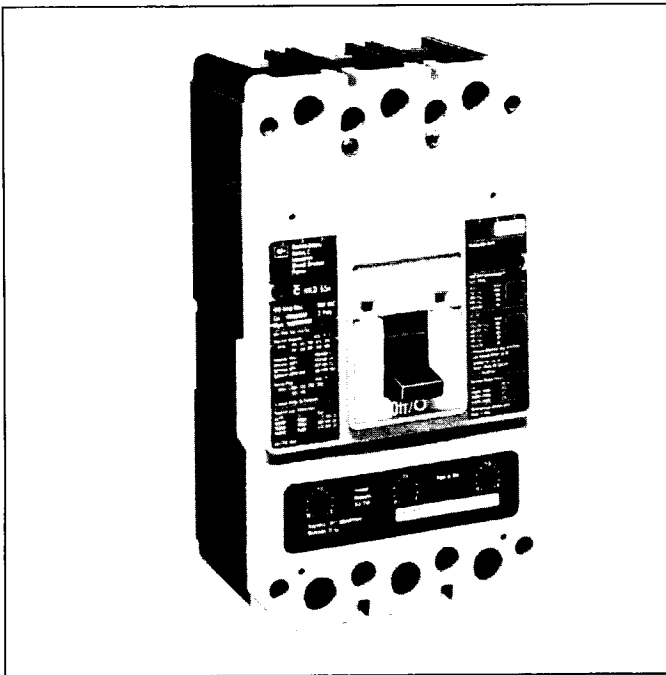


Figure 1-1 K-Frame Model D Series C Circuit Breaker Frame with KT Trip Unit Installed

The recommendations and information contained herein are based on Cutler-Hammer 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 Cutler-Hammer for further information or instructions.

1. INTRODUCTION

General Information

The K-frame Series C circuit breaker (Figure 1-1) types KD, HKD, and KDC are 600 Vac maximum rated devices with interchangeable thermal-magnetic or electronic (Seltronic) trip units rated 400A maximum continuous current. Circuit breaker types KW, HKW, and KWC are 660 Vac maximum rated devices using interchangeable adjustable thermal/adjustable magnetic or electronic trip units rated up to 400A continuous current. The type KDB noninterchangeable trip circuit breaker is rated 600 Vac maximum with a maximum continuous current rating of 400A. The type DK 240 Vac maximum circuit breaker is also a noninterchangeable trip device with trip unit ratings from 250A to 400A. Refer to Table 4-1 on page 8 for all available trip unit ratings. Model D circuit breakers are listed in accordance with Underwriters Laboratories, Inc. Standard UL489 and satisfy the (P1) requirements of the International Electrotechnical Commission Recommendations No. IEC 157-1. Model W circuit breakers satisfy the requirements of IEC C947-2. Molded case switches are listed in accordance with UL1087. For more information, see Frame Book 29-103.

100 Percent Rated K-Frame Circuit Breakers

CKD and CHKD circuit breakers are suitable for continuous operation at 100 percent of the frame rating if used with an 90°C insulated wire and AL9OCU terminals in an enclosure which measures at least 24" high x 15" wide x 6" deep. Ventilation is not required in an enclosure having these minimum dimensions. CKD and CHKD 100 percent rated circuit breakers use electronic trip units only.

This instruction leaflet (IL) gives procedures for installation and field testing of K-frame Series C circuit breakers. Instructions are also provided for replacement of existing Cutler-Hammer circuit breaker types DA, LB, LBB, HLB, JA, KA, and HKA. For this publication, the term circuit breaker shall also include the molded case switch.

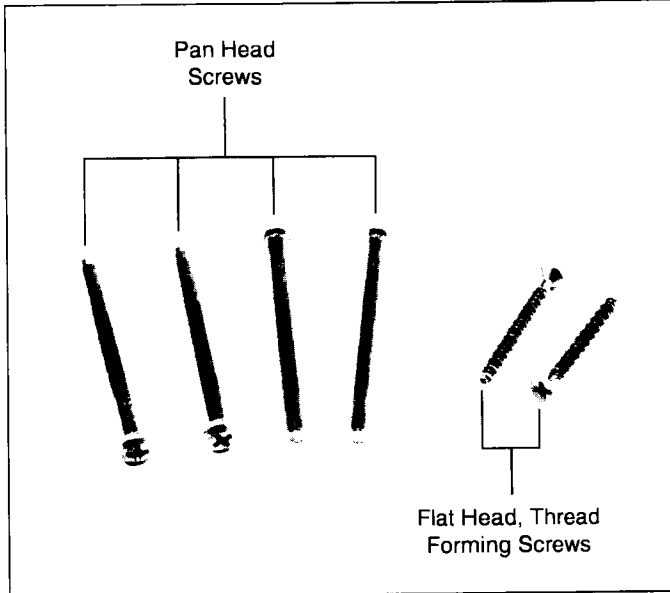


Figure 2-1 Cover Mounting Hardware

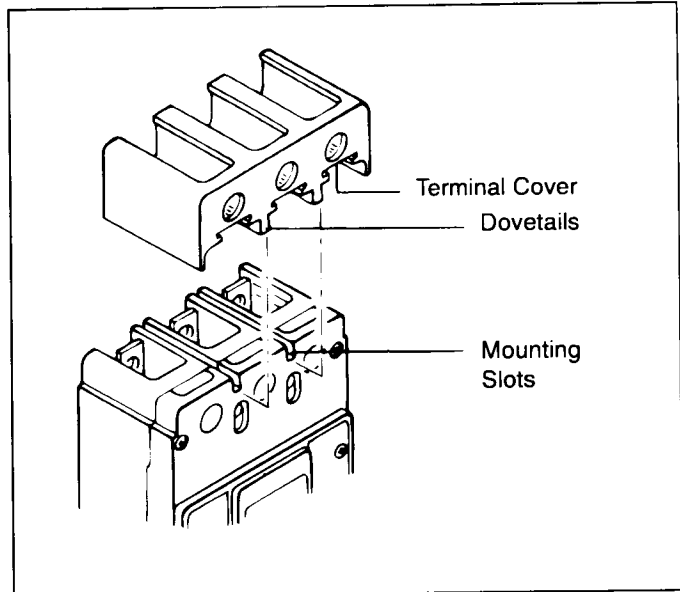


Figure 2-3 Terminal Cover Installation

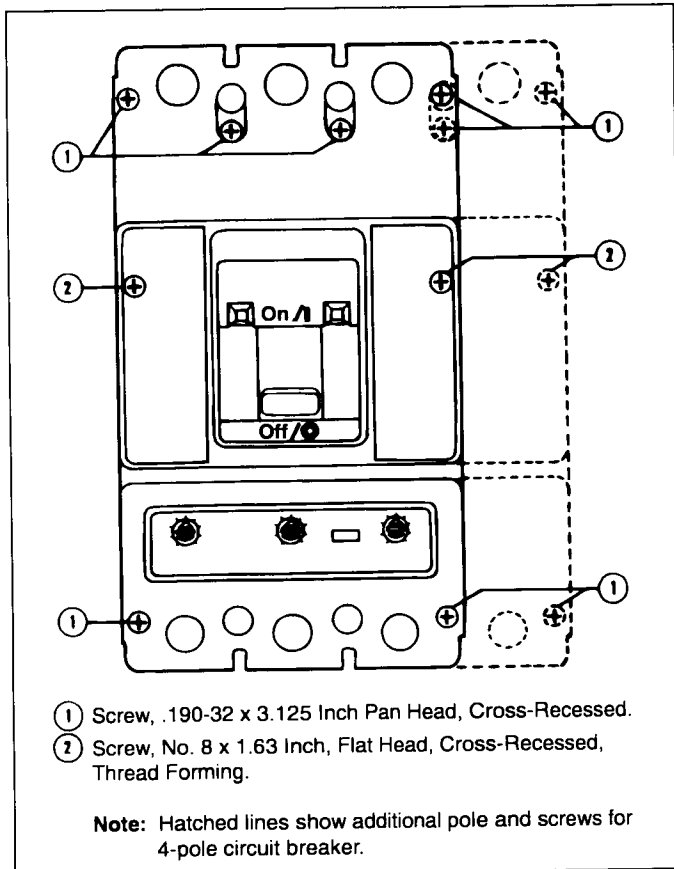


Figure 2-2 Cover Screw Installation Positions

2. INSTALLATION

The installation procedure consists of inspecting the circuit breaker and, as applicable, installing the trip unit and rating plug, accessories, interphase barriers, and terminals; mounting the circuit breaker; connecting the line and load conductors; torquing terminals; and attaching terminal shields. Circuit breaker frames, trip units, rating plugs, accessories, mounting hardware, and unmounted terminals may be supplied in separate packages. To install the circuit breaker, perform the following steps.

NOTICE

If circuit breaker is replacing a DA, JA, KA, HKA, LB, LBB, or HLB circuit breaker, refer to section 3 of this instruction leaflet.

DK and KDB circuit breakers are factory sealed for reverse feed applications under UL489. UL requires that internal accessories be installed at the factory in these types of circuit breakers.

NOTICE

If required, internal accessory installation in any type of circuit breaker should be done before the

circuit breaker is mounted and connected. Refer to individual accessory instruction leaflets.

2-1. Make sure that the circuit breaker is suitable for the intended installation by comparing nameplate data with existing equipment ratings and system requirements. Inspect the circuit breaker for completeness, and check for damage before mounting. Uninstalled cover mounting hardware is supplied in a plastic bag with the circuit breaker frame. (See Figure 2-1.)

2-2. Remove installed cover screws and cover.

NOTICE

The circuit breaker handle must be in the tripped or OFF position to remove the cover. Instructions for installing the trip unit and accessories are supplied with the devices.

2-3. If not already installed, mount trip unit and accessories (if required) in circuit breaker frame. Rating plug must be installed in Seltronic trip units.

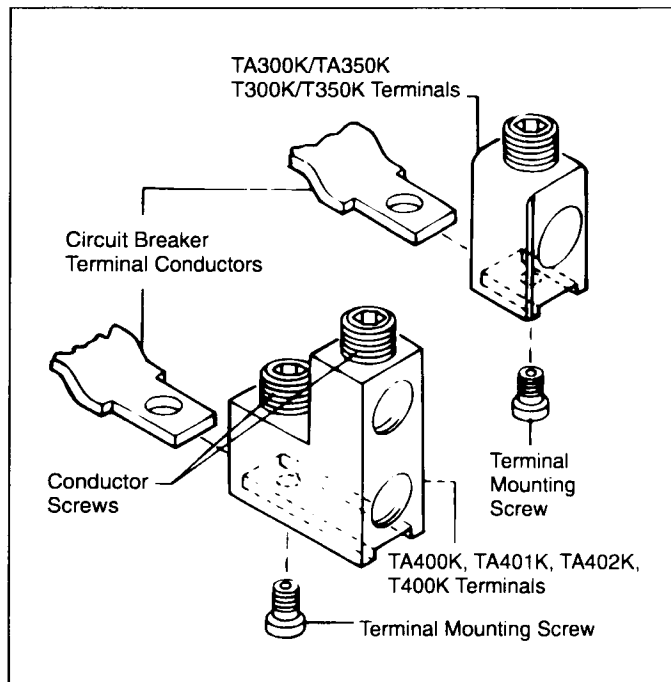


Figure 2-4 Terminal Installation



CAUTION

WHEN REMOVED AND REINSTALLED, THREAD-FORMING SCREWS WILL TRY TO REFORM THE THREADS IN THE BASE. CARE SHOULD BE TAKEN EVERY TIME A THREAD-FORMING SCREW IS USED TO ENSURE THE SCREW STARTS IN THE ORIGINAL THREADS. DAMAGED THREADS CAN RESULT IN IMPROPER CIRCUIT BREAKER COVER RETENTION.

2-4. Replace cover and install pan-head screws followed by thread-forming screws as shown in Figure 2-2.

2-5. If not already installed, mount terminals as shown in Figure 2-4. Secure the terminals to the circuit breaker using a 7/32-inch socket wrench, and torque to 6-8 lb-ft (8-11 N.m). After mounting the circuit breaker and before installation of the conductors, the terminal mounting screw can be checked or retightened through the terminal when the conductor screw is removed. If Warning label is supplied with terminal, place on upper portion of circuit breaker cover.



WARNING

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CAUSE DEATH OR SEVERE PERSONAL INJURY. BEFORE MOUNTING THE CIRCUIT BREAKER IN AN ELECTRICAL SYSTEM, MAKE SURE 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.

NOTICE

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.

2-6. To mount the circuit breaker, perform the following steps:

- a. For individual surface mounting, drill mounting panel using the drilling plan shown in Figure 2-5. For panel-board mounting, only load end support mounting

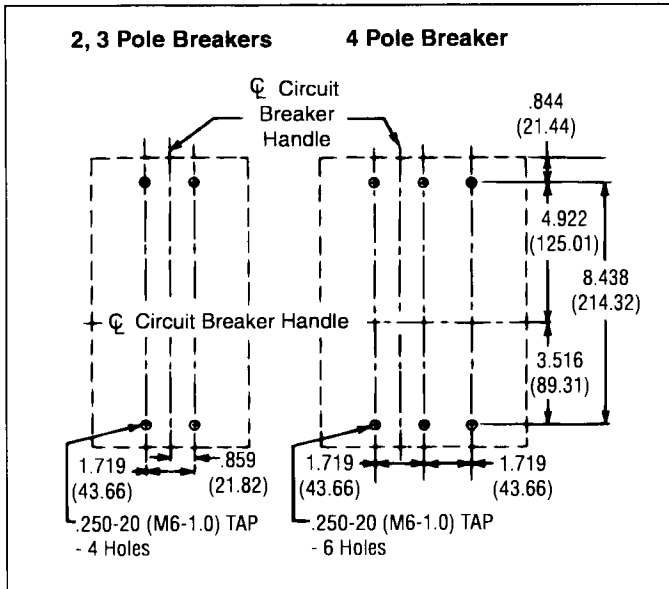


Figure 2-5 Circuit Breaker Mounting Bolt Drilling Plans

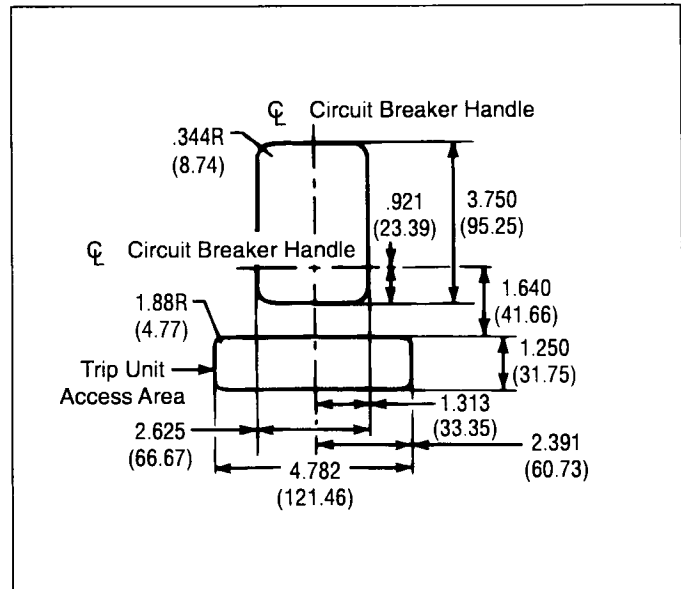


Figure 2-6 Circuit Breaker Escutcheon Dimensions for 3- and 4-Pole Circuit Breakers

holes are required. For deadfront cover applications, cut out cover to correct escutcheon dimensions, see Figure 2-6.

- b. If circuit breaker includes factory or field installed internal accessories, make sure accessory wiring can be reached when the circuit breaker is mounted.
- c. Position circuit breaker on mounting surface.

NOTICE

Labels with accessory connection schematic diagrams are provided on the side of the circuit breaker. A note should be made of the diagrams if the labels cannot be seen when the circuit breaker is mounted.

- d. Install circuit breaker mounting screws, washers, and nuts. Tighten screws firmly, but do not exceed 28 pounds-inches (3 N.m.).



CAUTION

WHEN ALUMINUM CONDUCTORS ARE USED, THE APPLICATION OF A SUITABLE JOINT COMPOUND IS RECOMMENDED TO REDUCE THE POSSIBILITY

OF TERMINAL OVERHEATING. OVERHEATING CAN CAUSE NUISANCE TRIPPING AND DAMAGE TO THE CIRCUIT BREAKER.

NOTICE

When a dual conductor terminal (Catalog No. TA402K, TA401K, TA400K, or T400K) is installed on the circuit breaker and a single conductor is used, the conductor should be installed in the terminal opening nearest to the circuit breaker terminal mounting conductor.

2-7. Connect line and load conductors and accessory leads.

2-8. When using step-type terminals (Cat. No. TA400K, TA401K, TA402K, TA403K, and T400K) are used, terminal shields (supplied with the terminals) must be installed on the circuit breaker (Figure 2-3). Warning label supplied with the kit must be attached to the circuit breaker front cover.

2-9. If required, install terminal shield on circuit breaker cover with mounting screws provided.

2-10. After the circuit breaker is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line/load

Table 2-1 Terminal Types

Terminal Cat. No.	Terminal Material Body	Screw Head Type	AWG Wire Range	Metric Wire Range	Wire Type	Torque Value lb-in (N.m.)
TA300K	Aluminum	Socket	3-350(1)	35-185	Cu/Al	275 (31)
TA350K	Aluminum	Socket	250-500(1)	120-240	Cu/Al	375 (42)
TA400K	Aluminum	Socket	3/0-250(2)	95-120(2)	Cu/Al	275 (31)
TA401K	Aluminum	Socket	250(2) or 500(1)	120(2) or 240(1)	Cu/Al	275 & 375 (31 & 42)
TA402K	Aluminum	Socket	500-750(1)	240-300	Cu/Al	550(56)
T300K	Copper	Socket	3-350(1)	35-185	Cu Only	275 (31)
T350K	Copper	Socket	250-500(1)	120-240	Cu Only	375 (42)
T400K	Copper	Socket	3/0-250(2)	95-120(2)	Cu Only	275 (31)

terminals are given in Table 2-1 and on the circuit breaker nameplate.

3. REPLACEMENT OF EXISTING CUTLER-HAMMER CIRCUIT BREAKERS TYPES DA, JA, KA, HKA, LB, LBB, AND HLB

Although the physical size of the K-frame Series C circuit breakers is the same as the DA, JA, KA, HKA, LB, LBB, and HLB family, there are certain differences that must be considered when making replacements.

- Circuit breaker mounting details, panel cutouts, and terminal centerline locations are identical.
- Handle locations, handle throw, and terminal connection details are different. Therefore, existing handle mechanisms and externally-mounted accessories, including electrical operator, key interlocks, etc., must be replaced or mounting details modified. Consult Cutler-Hammer for additional information.



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ALWAYS FOLLOW GENERALLY ACCEPTED SAFETY PROCEDURES.

NOTICE

When replacing an existing circuit breaker of the types listed above, make sure the voltage, continuous current, and interrupting rating of the new circuit breaker is suitable.

3-1. If existing circuit breaker is equipped with a handle mechanism, remove the mechanism. Refer to Frame Book 29-103 for ordering information on new handle mechanisms.

3-2. Disconnect accessory electrical leads and main conductors.

3-3. Remove all external accessories that would impede removal of the circuit breaker.

3-4. Remove circuit breaker from installation.

3-5. Install K-Frame Series C circuit breaker that has been prepared using steps 2-1 through 2-3 to fit installation requirements given below.

Panelboard Installation

Two types of panelboard construction/circuit breaker mounting arrangements are covered in the following procedures: convertible distribution panels (CDP), where the circuit breakers are mounted in a dual horizontal arrangement; and other panelboard constructions, where the existing circuit breaker is used as a main disconnect and mounted vertically.



CAUTION

TO AVOID OVERHEATING, DO NOT INSTALL K-FRAME SERIES C CIRCUIT BREAKERS WITH TRIP UNITS RATED ABOVE 225A ON EXISTING 225A JA, KA, OR HKA PANELBOARD CONNECTING STRAPS.

NOTICE

When existing CDP panelboard connecting straps are retained, a supplementary adapter and clip (Catalog No. TAD3) must be used to compensate for the change in height of the new circuit breaker terminal connections. The adapter may be used on either

side of the circuit breaker terminal mounting conductor permitting continued use of top or bottom mounted connecting straps. If Series C panelboard connecting straps that mount from the rear of the circuit breaker are used, the adapter is not required.

3-6. When required, position the TAD3 adapter under those circuit breaker terminal connectors that will be bolted to the panelboard connecting straps. Secure adapters with the spring clips supplied. Refer to instructions supplied with adapter.

3-7. Position circuit breaker in correct location on panelboard chassis.

3-8. Install socket-head bolts through circuit breaker terminal connectors and screw into panelboard connecting straps. Torque to 120 pound-inches (16.9 N.m).

3-9. Install circuit breaker mounting screws, washers, and nuts in load end of circuit breaker. Tighten screws firmly, but do not exceed 28 pound-inches (3 N.m).

3-10. After mounting the circuit breaker, refer to section 2 for instructions how to connect main conductors and accessory leads, as required.

Individually Mounted Devices

With the change in height of the circuit breaker terminal connector, K-frame Series C circuit breakers can be used to replace individually mounted existing types DA, JA, KA, HKA, LB, LBB, and HLB circuit breakers only when the following conditions are considered:

Fixed Rear Connecting Studs

New Series C fixed rear connecting studs will be required. Refer to Frame Book 29-103 for ordering information.

Plug-In Support Blocks

New male plug-in adapters will be required. Existing stationary support block receptacles can be used with new Series C male plug-in adapters. Refer to Frame Book 29-103 for ordering information.

Front or Rear Connected Bus Bars

Use existing connecting details coupled with K-Frame terminal adapter kit (Catalog No. TAD3).

4. MANUAL OPERATION, AND THERMAL-MAGNETIC TRIP UNIT ADJUSTMENT

Manual Operation

Manual operation of the circuit breaker is controlled by the circuit breaker handle and the PUSH-TO-TRIP but-

ton in the trip unit. The circuit breaker handle has three 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. (See Figure 4-1.)

Circuit Breaker Reset

After an automatic or accessory initiated trip, or a manual PUSH-TO-TRIP operation, the circuit breaker is reset by moving the circuit breaker handle to the extreme OFF position.

NOTICE

In the event of a thermal trip in a thermal magnetic type trip unit, the circuit breaker cannot be reset until the thermal element in the trip unit cools. A circuit breaker with an electronic type trip unit can be reset immediately.

No circuit breaker should be reclosed until the cause of trip is known and the situation rectified.

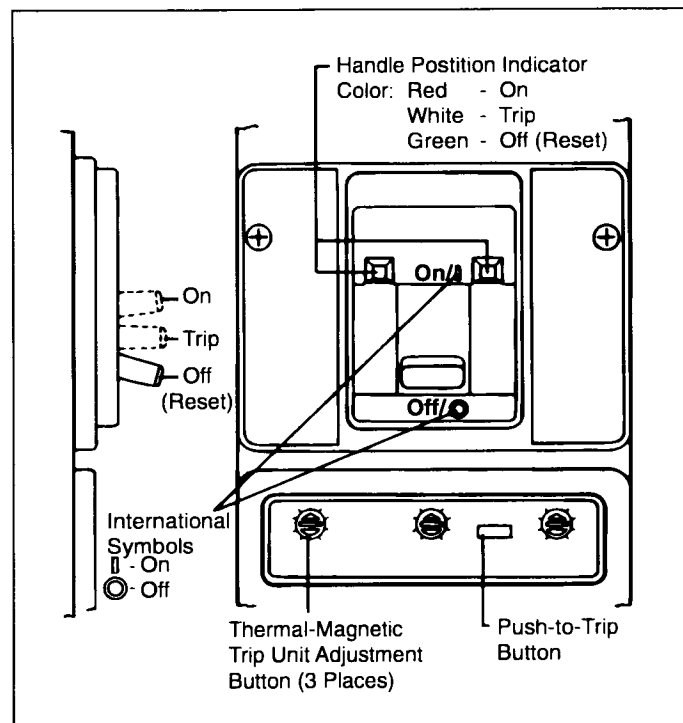


Figure 4-1 Circuit Breaker Manual Controls

PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the circuit breaker tripping function and is used to periodically exercise the operating mechanism in thermal-magnetic trip units. The button is designed to be operated by a small screwdriver. The rating plug in Seltronic trip units is the PUSH-TO-TRIP button and is operated by finger pressure. There is no PUSH-TO-TRIP button in the molded case switch.

Thermal-Magnetic Trip Unit Adjustment

The magnetic element of each pole of the trip unit can be adjusted by rotating the adjustment buttons on the front face of the trip unit with a screwdriver. The buttons have several settings as indicated on the nameplate with values in multiples of the trip unit ampere rating (I_{th}) as shown in Figure 4-2. To adjust the setting, rotate each button clockwise until arrow button points to desired setting.

Interchangeable Trip Units

For additional information on thermal-magnetic trip units, refer to I.L. 29C603, and for electronic (Seltronic) trip units, refer to I.L. 29C604. (IL supplied with trip unit.)

5. 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 and Field Testing

Circuit breakers in service should be inspected periodically. The inspection should include the following checks 5-1 through 5-8.

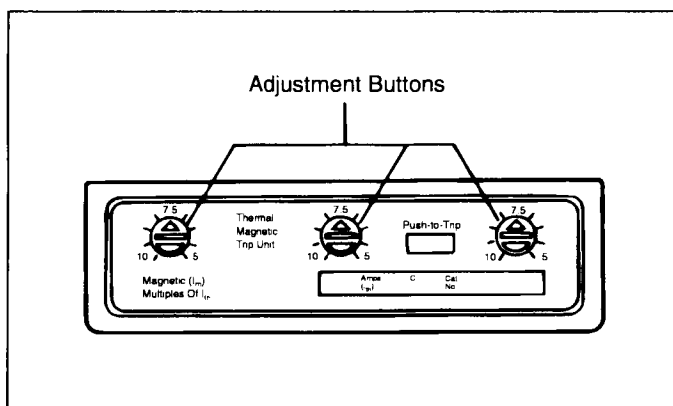


Figure 4-2 Trip Unit Magnetic Adjustment Buttons

**WARNING**

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**CAUTION**

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

5-1. 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.

5-2. 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.

NOTICE

On molded case switches, there is no PUSH-TO-TRIP feature. Omit step 5-3 when installing a molded case switch and proceed with step 5-4.

5-3. With the circuit breaker in the ON position, 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.

5-4. Check base, cover, and operating handle for cracks, chipping, and discoloration. Circuit breakers should be replaced if cracks or severe discoloration is found.

5-5. 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.

5-6. Check circuit breaker mounting hardware, and tighten if necessary.

5-7. 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.

5-8. The operation of circuit breakers with Seltronic trip units can be field tested periodically using the Seltronic test kit. (See Frame Book 29-103.)

Field Testing

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

Table 4-1 Available Trip Unit Ratings

Circuit Breaker Types	Trip Unit Types					
	Thermal-Magnetic Amperes I_{th}			Electronic (Seltronic ^①) Amperes I_{th}		
	Fixed Thermal	Adjustable Thermal ^②	Adjustable Magnetic Multiples of I_{th} ^③	Fixed Rating Plug	Adjustable Rating Plug	Adjustable Instantaneous/Short-time Multiples of I_{th} ^⑤
DK	250 300 350 400		5 to 10			
KDB, KD, HKD, KDC	100 125 150 175			200 225 250 300 350 400	200-400 250-400 315-400	2 to 8
KW, HKW, KWC ^②	200 225 250 300 350 400	160-200 200-250 250-315 313-400				

① Not available with types DK or KDB

② Not UL listed

③ For adjustable thermal trip units, the magnetic setting is a multiple of the maximum thermal setting. For Seltronic trip units, the instantaneous/short time setting is a multiple of the rating plug rating.

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