

Installation Instructions for Cutler-Hammer K- Frame Series C Motor Circuit Protector Type HMCP (With Electro- Mechanical Trip Device)



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 MIS-APPLICATION 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 Series C Type HMCP Motor Circuit Protector

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 Cutler-Hammer K-Frame Series C instantaneous (magnetic) only motor circuit protector (MCP) (Fig.1 -1) has a rating of 400A for application with NEMA motor starter size 5 and the lower horsepower range of size 6. The MCP is available as Type HMCP in 3-pole frames only. The MCP is designed to comply with the applicable requirements of Underwriter's Laboratories, Inc. Standard UL489 and the International Electrotechnical Commission Recommendations No. IEC 157-1.

The MCP is a UL-recognized component under File E7819. It is used primarily to provide short-circuit protection as part of a combination controller where other circuit protective functions are performed by other devices within the controller. Since the K-frame MCP is a non-sealed device, it is marked LINE and LOAD and is not suitable for reverse feed applications.

This instruction leaflet (IL) gives procedures for installation, operation, and field testing of K-frame Series C MCPs. Instructions are also provided for replacement of the existing Cutler-Hammer MCP Size 5 (400A), and LB/KA family of instantaneous (magnetic)-only circuit interrupters. For this publication, the term motor circuit protector (MCP) shall also include instantaneous (magnetic)-only circuit interrupters.

2. INSTALLATION

The installation procedure consists of inspecting the MCP and, as applicable, installing accessories, inter-phase barriers, and terminals; mounting the MCP; connecting the line and load conductors; torquing terminals; and, attaching terminal shields. The MCPs, accessories, mounting hardware, and unmounted terminals may be supplied in separate packages.

NOTICE

If MCP is replacing an existing Size 5 (400A) MCP or an LB/KA family instantaneous (magnetic) only circuit interrupter, refer to section 3 of this instruction leaflet.

Internally mounted accessories are listed for field installation under UL File E64983. Accessory installation should be done before the MCP is mounted and connected. Refer to individual accessory instruction leaflets.

To install the MCP, perform the following steps:

2-1. Make sure that the MCP is suitable for the intended installation by comparing nameplate data with existing equipment ratings and system requirements. Inspect the MCP for completeness, and check for damage before mounting.

NOTICE

Perform Steps 2-2, 2-3, and 2-4 only if installation of internal accessories is required.

2-2. Remove cover screws and cover.

2-3. Install accessories.



CAUTION

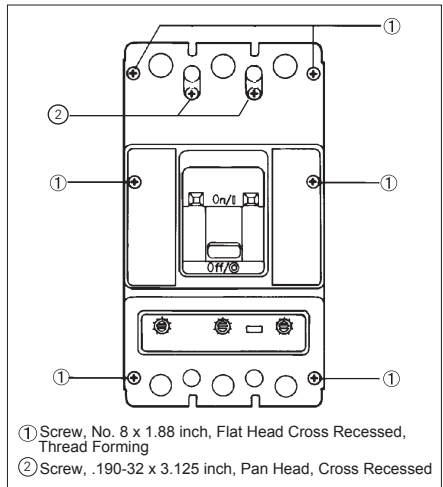
WHEN REMOVED AND REINSTALLED, THREAD-FORMING SCREWS WILL TRY TO REFORM THE THREADS IN THE BASE. CARE SHOULD BE TAKEN EVERY TIME A THREAD-FORMING SCREW IS USED TO ENSURE THE SCREW STARTS IN THE ORIGINAL THREADS. DAMAGED THREADS CAN RESULT IN IMPROPER MCP COVER RETENTION .

2-4. Install cover and secure with pan-head screws, followed by thread forming screws, as shown in Fig. 2-1. Torque the cover screws to 18-23 lb-in (2-2.6 N.m.).



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- ① Screw, No. 8 x 1.88 inch, Flat Head Cross Recessed, Thread Forming
- ② Screw, .190-32 x 3.125 inch, Pan Head, Cross Recessed

Figure 2-1 Cover Screw Installation Positions

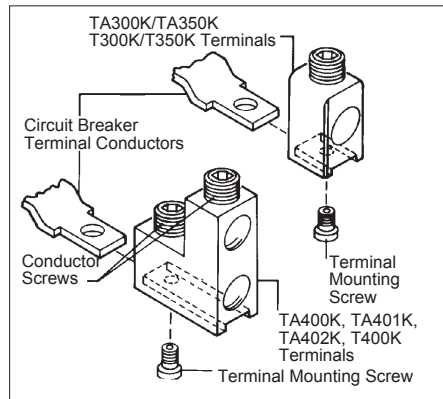


Figure 2-2 Terminal Installation

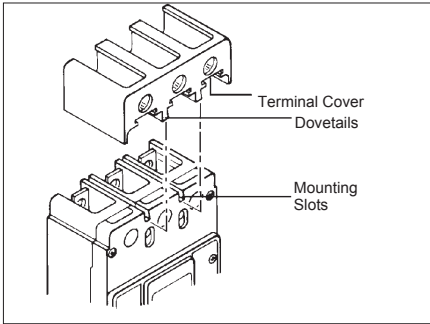


Figure 2-3 Terminal Cover Installation

2-5. If not already installed, mount terminals as shown in Fig. 2-2. Secure the terminals to the MCP using a 7/32-inch socket wrench, and torque to 6-8 lb-ft (8-11 N.m). After mounting the MCP and before installing the conductors, check, or retighten the terminal mounting screw through the terminal. Conductor securing screw must be removed for this check. If Warning Label is supplied with the terminal, place on upper portion of circuit breaker cover.

NOTICE

When using step-type terminals (Catalog No. TA401K, TA402K, TA400K or T400K), the terminal cover supplied with the terminals must be installed (Figure 2-3). Step-type terminals are standard for the K-frame MCP. Terminals are shipped separately from the MCP. Warning Label supplied with the kit must be attached to the circuit breaker front cover.

2-6. Install terminal cover. Slide dovetails on terminal cover into mounting slots in MCP. (See Fig 2-3.)

NOTICE

Depending on the equipment configuration, the MCP can be mounted using different styles of hardware. The following steps describe how to mount the MCP 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.

2-7. To mount the MCP, perform the following steps:

- a. For individual surface mounting, drill mounting panel using the drilling plan shown in Fig. 2-4. For deadfront cover applications, cut out cover to correct escutcheon dimensions. (See Fig. 2-5.)
- b. If MCP includes factory- or field-installed internal accessories, make sure accessory wiring can be reached with the MCP mounted.

NOTICE

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

- c. Position MCP on mounting surface.
- d. Install MCP mounting screws and washers. Tighten screws firmly, but do not exceed 28 pound-inches (3 N.m).

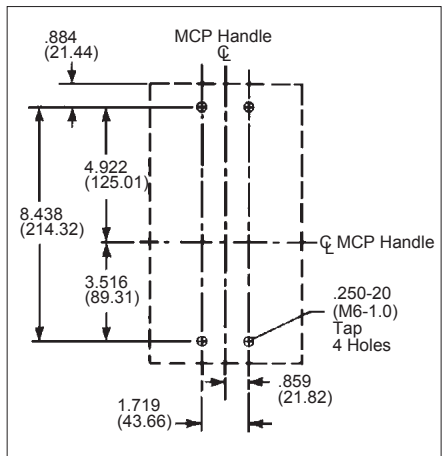


Figure 2-4 MCP Mounting Bolt Drilling Plans

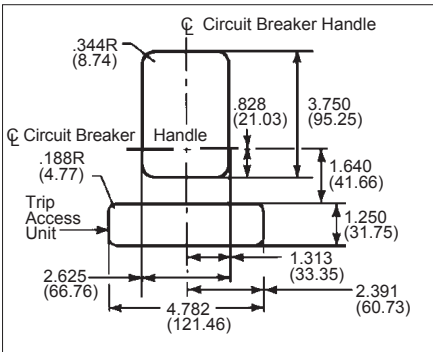


Figure 2-5 MCP Escutcheon Dimensions



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 MCP.

NOTICE

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

2-8. Connect line and load conductors and accessory leads.

NOTICE

When an MCP is equipped with standard terminals and a terminal cover, interphase barriers cannot be used.

2-9. If required, install interphase barriers.

2-10. If required, install terminal shield on MCP cover with mounting screws provided.

2-11. After the MCP is installed, check all mounting hardware and terminal connecting hardware for correct torque loading. Torque values for line/load terminals are given in Table 2-1 and on the MCP nameplate.

3. REPLACEMENT OF EXISTING WESTINGHOUSE MCPS SIZE 5 (400A) AND LB/KA FAMILY OF INSTANTANEOUS (MAGNETIC)-ONLY CIRCUIT INTERRUPTERS

Although the physical size of the K frame Series C MCP is the same as earlier model 400A MCPs and LB/KA family of instantaneous (magnetic)-only circuit interrupters, there are certain differences that must be considered when making replacements.

- MCP mounting details, panel cutouts, and terminal centerline locations are identical.
- Handle locations, handle throw, base mounting hardware, and terminal connection details are different. Therefore, existing handle mechanisms and externally-mounted accessories must be replaced or mounting details modified. Consult Cutler-Hammer for additional information.

Table 2-1 Terminal Types^①

Terminal Cat. No.	Terminal Material Body	Screw Head Type	AWG Wire Range	Metric Wire Range	Wire Type	Torque Value lb-in (N.m.)
Standard Terminals						
TA400K	Aluminum	Socket	3/0-250(2)	95-120(2)	Cu/Al	275(31)
Optional Terminals						
T400K	Copper	Socket	3/0-250(2)	95-120(2)	Cu Only	275(31)
Non-Standard						
TA300K	Aluminum	Socket	3-350(1)	35-185	Cu/Al	275(31)
TA350K	Aluminum	Socket	250-500(1)	120-240	Cu/Al	375(42)
TA401K	Aluminum	Socket	250(2) or	120(2) or	Cu/Al	275 & 375 (31 & 42)
			500(1)	240(1)	Cu/Al	375(42)
TA402K	Aluminum	Socket	500-750(2)	240-300	Cu/Al	550(62)
T300K	Copper	Socket	3-350(1)	35-185	Cu Only	275(31)
T350K	Copper	Socket	250-500(1)	120-240	Cu Only	375(42)

^① Terminal wire connectors are UL listed for standard wire sizes as defined in UL486A and UL486B
^② Use Cu only terminals for CSA listed applications.

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NOTICE

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

3-1. If existing MCP is equipped with a handle mechanism, remove the mechanism. Refer to Selection Data 29-120H for information on ordering new handle extensions.

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

3-3. Remove all external accessories that impede removal of the MCP.

3-4. Remove MCP from installation.

3-5. Install Series C MCP that has been prepared using Steps 2-1 through 2-5 to fit installation requirements. The following paragraph reviews changes required for mounting the K-frame MCP to existing front or rear connected bus bars.

Individually-Mounted MCPs

K-frame Series C MCPs can be used to replace individually mounted existing 400A MCPs and LB/KA family of instantaneous (magnetic)-only circuit interrupters under the following conditions:

- a. For cable-connected MCP's no special connection adaptation should be required.
- b. For front or rear connected bus bars, use existing connecting details coupled with K-Frame terminal adapters and/or keeper nuts to compensate for the change in height of the HMCP terminal conductor. Refer to Selection Data 29-120H.

4. MANUAL OPERATION AND TRIP DEVICE ADJUSTMENT**Manual Operation**

Manual operation of the MCP is controlled by the MCP handle and the PUSH-TO-TRIP button in the trip device. The MCP handle has three positions, two of which are shown on the cover with the international symbols I/O and 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 handle position: red for ON, white for tripped, and green for OFF. (See Fig. 4-1.)

MCP Reset

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

NOTICE

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

PUSH-TO-TRIP Button

The PUSH-TO-TRIP button checks the MCP tripping function and is used to periodically exercise the operating mechanism. The button is designed to be operated by a small screwdriver.

Trip Device Adjustment for MCPs

The magnetic element of each pole of the trip device can be adjusted by rotating the adjustment buttons (Fig. 4-2) on the front face of the trip unit with a screwdriver. The buttons have several settings, which are indicated on the nameplate with letters A through I; the ampere settings are shown on the MCP nameplate and in Table 4-1. To adjust the setting, rotate each button clockwise until arrow on button points to desired setting.

Conforming to NEC requirements, the maximum MCP trip ampere value is set by the motor FLA. Since there are various types and classes of motor designs (based on duty cycle, electrical load, and manufacturer's discretion) locked rotor currents (and therefore Inrush current magnitudes) vary. These are normally identified by NEC codes. The Listed MCP trip ampere value is considered typical but not all inclusive. This is the reason for the adjustable magnetic trip setting; that is, to compensate for different actual motor Inrush currents. That adjustments need to be made is not only normal, but sometimes

necessary, to enable the motor to start without nuisance trip ping, particularly when motor or system conditions induce higher than expected Inrush currents. These circumstances could be beyond the control of the MCP so far as its allowable trip setting is concerned and should be treated as a special case, referable to Cutler-Hammer.

5. INSPECTION AND FIELD TESTING

Series C MCPs are designed to provide years of almost maintenance-free operation. The following procedure describes how to inspect and test an MCP in service.

Inspection

MCPs in service should be inspected periodically. The

Table 4-1 MCP Trip Settings

Cam Setting	Motor Full Load Current Amperes	NEMA Starter Size	Continuous Amps	MCP Catalog Number	MCP Trip Setting
A	38.5 – 43.4	5			500
B	43.5 – 48.0	5			565
C	48.1 – 53.0	5			625
D	53.1 – 57.6	5			690
E	57.7 – 62.3	5	400	HMCP400D5	750
F	62.4 – 67.3	5			810
G	67.4 – 71.9	5			875
H	72.0 – 76.9	5			935
I	77.0 – 81.6	5			1000
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A	48.1 – 53.8	5			625
B	53.9 – 59.9	5			700
C	60.0 – 66.1	5			780
D	66.2 – 72.3	5			860
E	72.4 – 78.4	5	400	HMCP400F5	940
F	78.5 – 83.8	5			1020
G	83.9 – 89.9	5			1090
H	90.0 – 96.1	5			1170
I	96.2 – 102.0	5			1250
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A	57.7 – 64.6	5			750
B	64.7 – 71.9	5			840
C	72.0 – 79.2	5			935
D	79.3 – 86.5	5			1030
E	86.6 – 93.8	5	400	HMCP400G5	1125
F	93.9 – 101.1	5			1220
G	101.2 – 108.4	5			1315
H	108.5 – 115.3	5			1410
I	115.4 – 122.4	5			1500
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A	67.4 – 75.3	5			875
B	75.4 – 83.8	5			980
C	83.9 – 92.3	5			1090
D	92.4 – 100.7	5			1200
E	100.8 – 109.2	5	400	HMCP400J5	1310
F	109.3 – 117.6	5			1420
G	117.7 – 126.1	5			1530
H	126.2 – 134.6	5			1640
I	134.7 – 142.8	5			1750
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A	77.0 – 86.5	5			1000
B	86.6 – 96.1	5			1125
C	96.2 – 105.7	5			1250
D	105.8 – 115.3	5			1375
E	115.4 – 124.9	5	400	HMCP400K5	1500
F	125.0 – 134.6	5			1625
G	134.7 – 144.2	5			1750
H	144.3 – 153.8	5			1875
I	153.9 – 163.3	5			2000

Cam Setting	Motor Full Load Current Amperes	NEMA Starter Size	Continuous Amps	MCP Catalog Number	MCP Trip Setting
A	86.6 – 97.3	5			1125
B	97.4 – 108.4	5			1265
C	108.5 – 118.8	5			1410
D	118.9 – 129.9	5			1545
E	130.0 – 140.7	5	400	HMCP400L5	1690
F	140.8 – 151.5	5			1830
G	151.6 – 162.3	5			1970
H	162.4 – 173.0	5			2110
I	173.1 – 183.6	5			2250
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A	96.2 – 108.0	5			1250
B	108.1 – 119.9	5			1405
C	120.0 – 132.3	5			1560
D	132.4 – 144.2	5			1720
E	144.3 – 156.1	5	400	HMCP400M5	1875
F	156.2 – 168.0	5			2030
G	168.1 – 179.9	5			2185
H	180.0 – 192.3	5			2340
I	192.4 – 204.0	5			2500
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A	115.4 – 129.9	5			1500
B	130.0 – 144.2	5			1690
C	144.3 – 158.4	5			1875
D	158.5 – 173.0	5			2060
E	173.1 – 187.6	5	400	HMCP400N5	2250
F	187.7 – 201.9	5			2440
G	202.0 – 216.1	5			2625
H	216.2 – 230.7	5			2810
I	230.8 – 244.9	5			3000
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A	134.7 – 151.5	5			1750
B	151.6 – 168.4	5			1970
C	168.5 – 185.3	5			2190
D	185.4 – 201.9	5			2410
E	202.0 – 218.8	5	400	HMCP400R5	2625
F	218.9 – 235.7	5			2845
G	235.8 – 252.6	5			3065
H	252.7 – 269.2	5			3285
I	269.3 – 285.7	5			3500
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A	153.9 – 173.0	5			2000
B	173.1 – 192.3	5			2250
C	192.4 – 211.5	5			2500
D	211.6 – 230.7	5			2750
E	230.8 – 249.9	5	400	HMCP400X5	3000
F	250.0 – 269.2	5			3250
G	269.3 – 288.4	5			3500
H	288.5 – 307.6	5			3750
I	307.7 – 326.9	5			4000

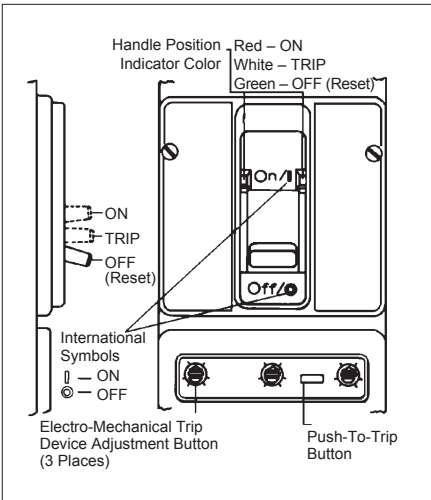


Figure 4-1 MCP Manual Controls

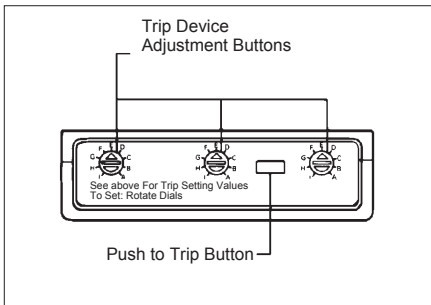


Figure 4-2 Trip Device Adjustment Buttons

inspection should include the following checks (5-1 through 5-7):

WARNING

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CAUTION

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

5-1. Remove dust, dirt, soot, grease, or moisture from the surface of the MCP using a lint-free dry cloth, brush, or vacuum cleaner. Do not blow debris into MCP. If contamination is found, look for the source and eliminate the problem.

5-2. Switch MCP 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 MCP.

5-3 With the MCP electrically isolated, switch handle to the ON position and press the PUSH-TO-TRIP button to mechanically trip the MCP. Trip, reset, and switch MCP ON several times. If mechanism does not reset each time the MCP is tripped, replace the MCP.

5-4. Check base, cover, and operating handle for cracks, chips, and discoloration. Replace MCPs if cracks or severe discolorization is found.

5-5. Check terminals and connectors for looseness and signs of overheating. Overheating shows 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 reenergizing the MCP, all terminations and cable should be refurbished to the condition when originally installed.

5-6. Check MCP mounting hardware. Tighten if necessary.

5-7. Check area where MCP 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 the applicable NEMA Standards.

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Printed in Dominican Republic
Publication 6632C92H07
April 2015

