Instruction Booklet **IB 52-01-TE**

Effective October 2010
Supersedes November 2008

Instructions for the Eaton Type CM52 Network Protectors 800 to 4500 Amperes

Read and understand these instructions before attempting any assembly, operation, or maintenance of the Network Protector.

See important disclaimer of warranties and limitation of liability on page ii

See important safety information on page iii and iv.

Powering Business Worldwide

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SAFETY PAGE

Keep this instruction book available to those responsible for the installation, maintenance, and operation of the network protector.

The installation, operation and maintenance of a network protector presents numerous potential unsafe conditions, including, but not limited to, the following:

- Improper operation
- Lethal voltages
- Moving machinery
- Heavy components

Specialized procedures and instructions are required and must be adhered to when working on such apparatus. Failure to follow instructions could result in severe personal injury, death and/or property damage.

Additionally, personnel when installing, operating, and/or maintaining such equipment must use all applicable safety procedures such as OSHA requirements, regional and local safety requirements, safe working practices, and good judgment.

Safety, as defined in this instruction book, involves two conditions:

1. Personal injury or death
2. Product of property damage (includes damage to protector, other property, and reduced protector life).

Safety notations are intended to alert personnel of possible personal injury, death or property damage. They have been inserted in the instructional text prior to the step in which the condition is cited.

The safety notations are headed by one of three hazard intensity levels which are defined as follows:

1. **DANGER** — Immediate hazard, which will result in severe personal injury, death or property damage.

2. **WARNING** — Hazardous or unsafe practice, which could result in severe personal injury, death, or property damage.

3. **CAUTION** — Hazardous or unsafe practice, which could result in minor personal injury or property damage.

Some major safety concerns involving the network protectors are listed on the next page.

Refer to appropriate areas of the instruction book for further instructions.

1. CM52 Network protectors are designed to operate within the current and voltage limitations given on their nameplates. **DO NOT** applies these units to systems with currents and/or voltages exceeding these limits. See Tables 1 and 2.

2. To perform work on this type of equipment requires personnel with training and experience in high voltage circuits. Only qualified* electrical workers familiar with the construction and operation of such equipment and hazards involved, should be permitted to work on Type CM52 Network Protectors.

3. There are several interlocks on the protectors. They are for personnel and/or equipment protection. **UNDER NO CIRCUMSTANCES SHOULD THEY BE MADE INOPERATIVE. TO DO SO COULD CAUSE BODILY INJURY AND/OR PROPERTY DAMAGE.**

4. Draw out protector's removable element before making any adjustments or doing maintenance of any nature.

5. **NEVER** energize the protector without the arc chutes and barriers in place.

6. **ALWAYS** be sure the protector hardware is in place and bolted tightly before placing protector into its housing operation.

7. Network Protectors are used where a large amount of power is distributed to high load density areas. As a result, any short circuit at any point in the system involves very high fault currents; thus, extreme care should be exercised when installing or working on an energized protector.

8. Extensive use has been made of barriers and interlocks in the CM52 Network Protectors to provide greater safety to maintenance personnel. Keep barriers in place and immediately replace any that have been broken. Because barriers and interlocks are provided, insulated tools and gloves are not required to remove the drawout from the enclosure. However, the use of insulated tools and safety gloves must be utilized when removing fuses or at the initial installation of the protector on the system.

9. Before performing maintenance or removing a protector from service, **ALWAYS** de-energize the protector.

10. All Safety Codes, Safety Standards and/or Regulations as they may be applied to this equipment must be adhered to.

*Quality Persons and defined in the National Electrical Code.

CAUTION

The network protectors described in this book were designed and tested to operate within their nameplate ratings. Operation outside of these ratings may cause the equipment to fail, resulting in bodily injury and property damage.

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Table 1- CM52 Ratings Table – Ratings tested at 600V

Continuous Current Rating (Amps)	Breaker Element Width	CM52 Interrupting Rating (kA)	CM52 Close and Latch Rating (kA)	IEEE/ANSI Interrupting Rating (kA)	IEEE/ANSI Close and Latch Rating (kA)
800	17”	42	35	30	25
1200	17”	42	35	30	25
1600/1875	17”	42	35	30	25
2000	17”	42	35	35	35
2250	22”	65	45	60	40
2500/2825	22”	65	45	60	40
3000	22”	65	45	60	40
3500	35”	85	65	60	40
4500	35”	85	65	60	40

Table 2 - Weights of Draw out Units

Amperage Rating	CM52 Breaker Element Weight (lbs)	Comparable Breaker Weight (lbs)
800-2000A	170	400
2250-3000A	185	550-650
3500-4500A	350	700-1300

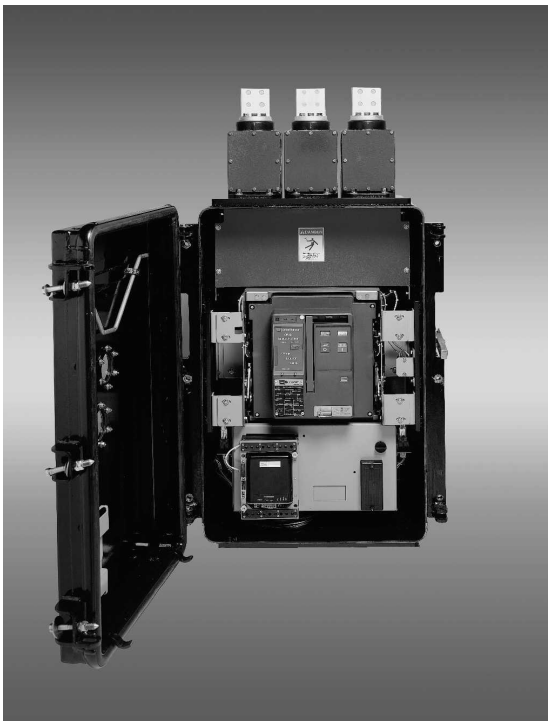

Fig. 1 *CM52 800A - 2000A Network Protector*

Fig. 1A *3500A - 4500A Network Protector*

(NOTE: 2250A – 3000A Not Shown)

INTRODUCTION

PURPOSE

This instruction book is expressly intended to describe the installation, operation and maintenance of the Type CM52 network protectors. Should any item not be sufficiently covered by these instructions and additional information is required, contact your local Cutler-Hammer office.

Information regarding operation, maintenance, and testing of network relays is contained in Instruction Book 35-581B.

For application information, consult your nearest Cutler-Hammer sales office, or see appropriate ANSI standards.

CAUTION

IT IS NOT SAFE TO OPERATE THE CM52 NETWORK PROTECTORS UNLESS THEY ARE INSTALLED IN A SUITABLE METAL ENCLOSURE OF ADEQUATE STRENGTH TO WITHSTAND THE EFFECTS OF HIGH CURRENT SHORT CIRCUIT FORCES; OR BODILY INJURY AND/OR PROPERTY DAMAGE COULD RESULT.

The need to provide electrical power at the utilization voltage – without increasing equipment size – has resulted in a shift from 125/216 – volt to 277/480 – volt systems. With this trend toward the higher voltage, a change in operation and maintenance procedures is required, because of the difference in arcing characteristics at 480-volts as compared to those 125/216 volts. For example, while an arc in a 216-volt system is normally self-extinguishing, an arc in a 480-volt system will usually burn until an extinguishing device interrupts it or until it totally consumes the arcing material.

Cutler-Hammer CM52 Network Protectors are designed to assure service continuity in 125/216 and 277/480 volt Y connected secondary network systems. These systems, in either distributed grid or spot network form, are commonly used in such areas of high load density as metropolitan and suburban business districts.

When a fault on a primary system (cable or network transformer) occurs, the CM52 Network Protectors will open to isolate the fault from the network system. Loss of the feeder will not result in service outage to any load on the secondary network. The other primary feeders will carry the load until the faulted feeder can be brought back to service.

CM52 Network Protectors consist basically of an air circuit breaker, a breaker operation mechanism, network relays and control equipment. Units are available in both weatherproof and submersible enclosure, for either separate or transformer throat mounting.

CM52 Network Protectors have a drawout design with positive safety interlocks that provide protection for personnel against contact with energized components while disconnecting the unit for test or maintenance. All the main current carrying and mechanical operating components are located behind a "dead-front" cover that prevents tools or hands from being inserted into an energized protector. The draw out unit is operated by a hand-cranked levering system, which cannot be engaged unless the circuit breaker is open; and it cannot be disengaged unless the draw out unit is either fully disconnected or fully connected.

Modular construction facilitates field maintenance and/or replacement of parts of the draw out unit.

A spring close operating mechanism in the network protectors prevents partial closures. The CM52 spring-close mechanism will not permit a closing motion of the contacts to start until the closing springs are fully charged.

Externally mounted, silver-sand fuses are provided to interrupt fault current by disconnecting the protector from the network bus in case the network protector would fail to trip. As an additional option internal copper link, or lead-alloy fuses can be fitted into a CM52 enclosure .
A low-energy, direct-trip actuator provides a mechanical force to trip the circuit breaker.

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SECTION I - RECEIVING, HANDLING, AND STORING

1.1 RECEIVING

Each unit shipped comprises a housing containing a draw out unit which may have externally mounted fuse housing, which are equipped with Type NPL fuses, and are supplied with spade terminals or threaded studs.

The type MPC series solid-state network protector relay is supplied with the CM52 network protector mounted on the relay panel. For use of the MPC series relay, please refer to relay I.B.

When receiving new network protectors, make a general inspection looking particularly for damage, which may have occurred in handling and shipping. If any damage is apparent, file a claim within 24 hours. If the unit is to be placed in storage for more than a few weeks it should be inspected and tested thoroughly and any deficiencies reported.

1.2 HANDLING

1.2.1 Lifting of Breaker

To facilitate lifting, two lifting brackets are supplied and mounted inside the door of each enclosure. These brackets can only be attached once the breaker has been completely withdrawn on its extension rails.

1.2.2 Lifting the Enclosure

A SPREADER MUST BE USED TO ENSURE THAT NO DAMAGE OCCURS. (see figure 2A)

Two lifting holes, 1-3/8 inch diameter, are located near the top at each side of the enclosure. Spreaders must be used on chains or slings to prevent damage to the fuse housings.
For shipping, network protectors are mounted on wooden skids designed for use with forklift trucks. Insert fork at the rear of unit and tilt unit slightly toward truck before lifting.

1.3 STORING

Submersible units may be stored as received with door tightly closed and with the shipping cover over the throat opening.

NOTE: Units should be transported and stored in upright position only.

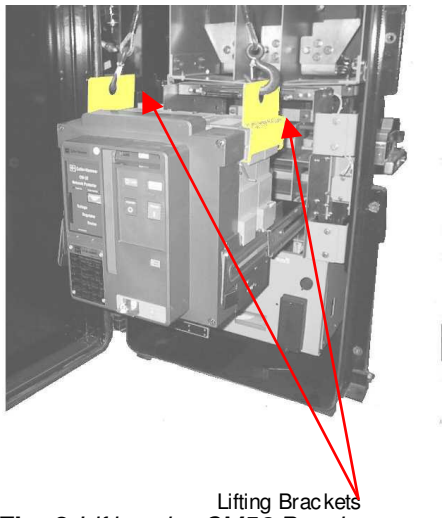


Fig. 2 *Lifting the CM52 Breaker*

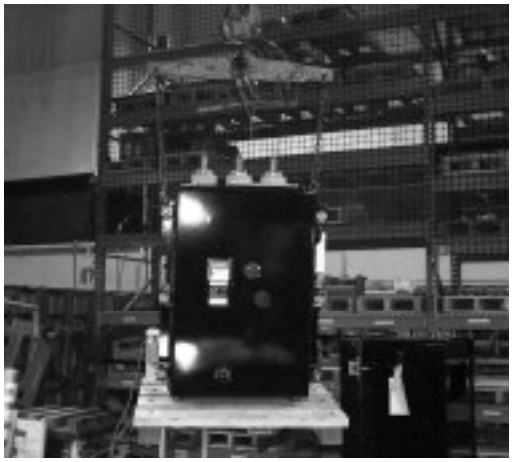


Fig. 2A *Lifting the CM52 enclosure*

SECTION II - GENERAL DESCRIPTION

2.0 GENERAL

Type CM52 network protector is a special air circuit breaker equipped with a relay that operates in response to voltage across the protector or current through the protector. This relay causes the protector to close or to open as required by the conditions between the network and the feeder transformers. Control power is taken directly from the system and therefore no separate power source is required.

CM52 units are available as standard, for 216Y/125 volts, 480Y/277 volts at 60 Hertz, with other voltages as well as 50 Hertz units available upon request.

CAUTION

Type CM52 Network Protectors are protective devices. As such, they are maximum current rated devices. Therefore, they should not under any circumstances be applied outside of their ratings , which could cause the equipment to fail, resulting in severe personal injury, death, or property damage.

Fig. 3 *NPL Fuse Housing (external fuses)*

The standard submersible enclosure is equipped with type NPL fuses in externally mounted fuse housing located on top of the network body. The CM52 is also available with internal fuses.

The normal power flow is in at the throat from the transformer, down to the transformer side disconnect device on the levering-out unit, up through the unit to the network side disconnect device, out the top of the enclosure into the fuse housings, through the fuse to the supplied mounting terminal.

Fig. 3A *(Internal fuses)*

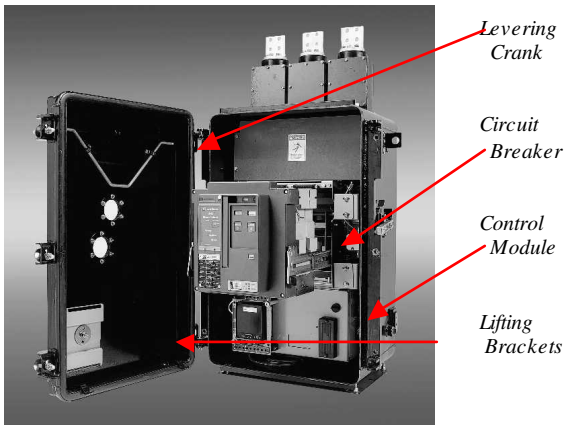


Fig. 4 *CM52 w/Breaker Element withdrawn On rails*

Opening the Enclosure

The CM52 enclosure incorporates a hinge design, which is separate from the door bolt hardware.

CAUTION - make sure that each bolt has been fully extended before attempting to swing the door open. Having completed that, the door can be swung into its full position.

NOTE: With the door closed and the door hardware lagged down, the hinge and door lifting attachments can be switched for opposite door opening, without breaking the door seal. The outside operating handle and associated switch, mounted inside the enclosure, can be switched to the opposite side once the door has been opened.

2.1 CM52 NETWORK PROTECTORS

The complete network unit consists of the air circuit breaker and its associated relaying equipment consisting of four major elements.

2.1.1 Cassette Frame

The supporting structure of the breaker and relay module is mounted directly in the enclosure.

2.1.2 Circuit Breaker

Each contains arc chutes, contact system, current transformers, primary and secondary disconnect

2.1.2.1 Arc chutes

Arc Chutes are designed and constructed to entrap the splitter plates.

A single captive hold-down screw is located in the rear of each arc chute to facilitate its removal.

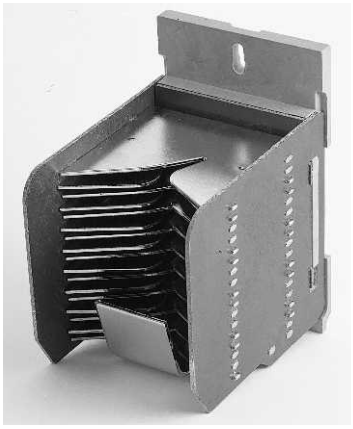


Fig. 5 *Arc Chute*

2.1.2.2 Current Transformers

Current transformers located on the rear of the circuit breaker and are molded frame construction with exposed fast-on terminals.

2.1.2.3 Operating Mechanism

The operating mechanism , located on the front of the circuit breaker, consists of an independent spring-closing mechanism; spring charging motor, and trip device.

2.1.2.4 Control Module

The control module consists of switches; relays, transformer and secondary disconnect points. It is electrically connected to the operating mechanism by plugs and sockets.

Relay Module Layout

The relay module of the CM52 has a swing open front panel that permits the replacement of the CPT, PT's (480V) and all of the relay module control wiring. The hinged front panel has the mounting of the MPC series relay and the Test switch.

Once the front panel has been swung open, the Auxiliary Switch and Secondary Connection Block is mounted in the lower center portion of the relay module, see figure 6. This device is a DIN rail mounted terminal block. All of the factory wiring has been made on the rear ports of

the block , while all customer connections can be made on the front portion of the blocks. There is a wire designation strip that identifies the wire number to its port. This terminal block only requires that the wire be stripped approximately ¼", inserted into the wire clamp area and the top recessed screw tightened to ensure a secure joint.

Fig. 6 *Relay Module Panel Opened*

NOTE: All of the secondary contact wiring has been factory made from the breaker secondary disconnecting to the DIN rail terminal block. Two 1.00" NPT half-pipe couplings are welded to the enclosure body, one on each side, adjacent to the relay module area. There is a large opening on the left and right hand side sheets of the relay module to facilitate wire routings from the pipe plug to the secondary terminal block.

SECTION III – OPERATION

PROCEDURE TO REMOVE THE DRAWOUT UNIT FROM HOUSING

When the enclosure is not attached to a transformer, the enclosure must be supported in a way that will prevent tipping forward when the door is open and the draw out unit is on the extension rails.

3.1.1 To Open Door

Loosening all the bolts, starting with the bolts on the hinged side, opens the quick opening enclosure. The bolts are loosened until the bolts are completely disengaged from the housing support.

3.1.2 Levering Circuit Breaker

The circuit breaker is now ready to be levered. With the circuit breaker OPEN, the levering device access door can be raised. The levering device is hand operated under a standard 3/8" square drive speed wrench, which is provided. As long as the access door is raised, the circuit breaker is held trip free. Begin by rotating the levering-in screw to the full counterclockwise (DISCONNECT) position.

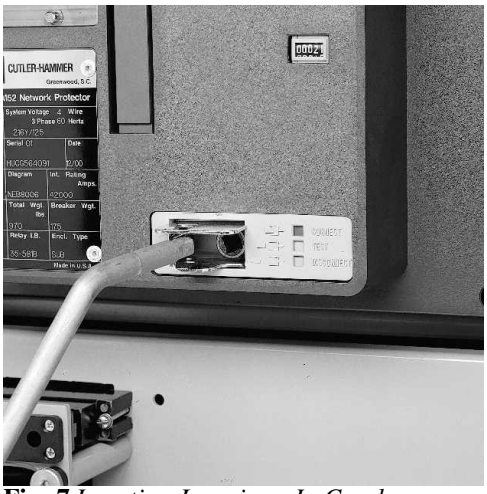


Fig. 7 *Inserting Levering –In Crank*

Note: Levering-in door must be completely closed after crank removal to insure proper operation.

The position of the circuit breaker within its compartment is dictated by color-coded position indicators (Red = Connect, Yellow = Test, Green = Disconnect). To remove the circuit breaker from its compartment, follow the procedure just described using a counterclockwise motion.

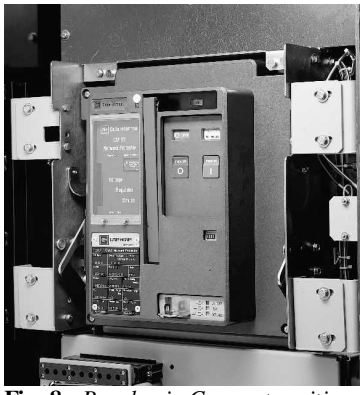


Fig. 8a *Breaker in Connect position*

Fig. 8b *Breaker in Test position*

Fig. 8c *Breaker in Disconnect Position*

NOTICE

The circuit breaker mechanism is interlocked such that charged closed springs are automatically discharged if the circuit breaker is levered into or out of the CONNECT position.

3.2 ENCLOSURE

The CM52 submersible enclosure is of welded steel construction, which has been bonderized and protected by several coats of high-grade paint, thereby minimizing corrosion in service. This enclosure incorporates several innovative features, such as:

1. Side mounted external operation handle
2. Internal window hardware
3. Housing Gasket
4. Externally mounted fuse housing or internal fuse design.

A door is arranged so that it may be hinged on either side while the clamping bolts are still supporting the door. The window is made of tempered glass clamped by gaskets with a cushioning action to keep the housing watertight. The operating handle is made watertight through the enclosure by use of an O-ring held captive with a retaining plate.

3.2.1 Outside Operating Handle

WARNING

DO NOT MANUALLY CLOSE A PROTECTOR TO CONNECT AN ENERGIZED TRANSFORMER TO AN ENERGIZED NETWORK SYSTEM.

The operating handle has three positions: OPEN, AUTO and CLOSE as indicated on the nameplate located directly beside the handle.

The handle is held captive in the OPEN and AUTO position by means of the detent cam, but is spring returned from the CLOSE position. External padlock provisions are available in the AUTO and OPEN modes. It is recommended that the operator should not normally attempt to place the Network Protector into service by utilizing the external handle CLOSE mode. The protector should be placed in the AUTO position to permit the MPC series relay to control the breaker actions. An exception to this recommendation would be in the initial closing of a Network Protector into a known bus which lacks connected load to correctly operate the MPC series relay. For this type of operation, with the housing door of the protector securely closed, move and hold the external handle to the CLOSE position. After the protector closes move the handle to the AUTO position. Do not drop handle from the close position, this action could result in the Network Protector opening and a repeat close operation would be necessary.

Fig. 9a *Handle in "OPEN"*

Fig. 9b *Handle in "AUTO"*

Fig. 9c *Handle in "CLOSE"*

(Handle is shown with optional 90 degree handle extension.)

3.2.2. Mechanical Anti-Close Interlock (non-standard)

The Electrical Interlock has superceded this device, see Addendum pg. 19. The Mechanical Anti-Close Interlock is available on request only.

The CM52 is supplied with a mechanical anti-close interlock, which interfaces with a welded pad located on the inside edge of the enclosure door. This pad depresses an exposed rod that will hold the breaker in a mechanical trip free state. It will also prevent electrical closure of the breaker in the instance where a CM52 breaker is being connected (levered-in) to energize bus and the outside operating handle was left in the AUTO position. The Anti-Close interlock permits a close of a breaker in its connected position only if the door has been closed and the outside handle is placed either in the AUTO or CLOSE positions. It is supplied with a defeat mechanism, which permits an operator to open the enclosure door while the breaker remains closed. This entire anti-close assembly is located on the cassette and can be reversed for either left hand or right hand door hinging.

3.2.3 Installing Network Protector to Network Transformer

1. Remove front fuse cover barrier cover.
2. Remove fuse links or internal fuses.
3. Remove Interphase barriers by lifting barrier up and tilting forward. The barriers will lift directly out.
4. Mount Network Protector to transformer flange using gasket provided by the transformer manufacturer and the hardware* provided with the Network Protector.

*Because of the close proximity between phases A & B, and B & C to the throat mounting holes, you may need to use the four special Allen head bolts with an Allen extender provided in the hardware bag.

***On 800A – 2000A design units only**

SECTION IV - CIRCUIT BREAKER DESCRIPTION AND OPERATION

4.1 INTRODUCTION

CM52 circuit breakers are available in both draw out and fixed mounting configurations. A majority of features are common to both configurations and will be discussed in this section.

Controls and indicators for both draw out and fixed circuit breakers are functionally grouped on the front of the circuit breaker.

4.2 BASIC CIRCUIT BREAKER ASSEMBLY

Fig. 10 *CM52 w/ Breaker withdrawn*

The CM52 circuit breakers use a rigid frame housing construction of high temperature engineered thermoset composite resins. This

construction provides high strength structural properties, excellent dielectric characteristics and resistance to arc tracking. The 3-piece construction approach provides support while isolating and insulating power conductors.

1. A 2-Piece engineered thermoset composite resin case enclosed current path and arc chambers. The chambers act to channel arc gases up and out of the circuit breaker during interruption.
2. The operating mechanism sits on the front of the case and is electrically isolated from current contact structures. An insulating dead front cover covers the completed breaker.

4.3 POLE UNIT

A current carrying pole unit is individually enclosed and rigidly supported by the case. The individual chambers provide for pole unit isolation and insulation from one another. Each pole unit has one primary contact assembly, which consists of a moving portion.

4.3.1 Primary Moving Contacts

Depending upon the frame size, each primary moving contact assembly is comprised of multiple individual copper contact fingers connected to the load conductor through flexible braided connectors. Two flexible connectors are used to connect each finger to the load conductor. The number of fingers used depends upon the circuit breaker's continuous and short-circuit current ratings.

The middle four contact fingers perform both the main and arcing contact functions of the moving contacts. A highly conductive alloy pad is part of the contact finger and functions as the moving main contact, and is called the "Heel".
A contact wear indictor is provided for each contact assembly. When making a contact wear inspection, always look straight down into the arc chamber to eliminate parallax. The contact wear indicator is a side-to-side ledge, which is a part of the arc chamber. With the contacts closed and in good condition, the ledge is covered by the back edge of the moving contacts. If the back edge of the moving contacts does not totally cover this ledge, the contacts should be replaced

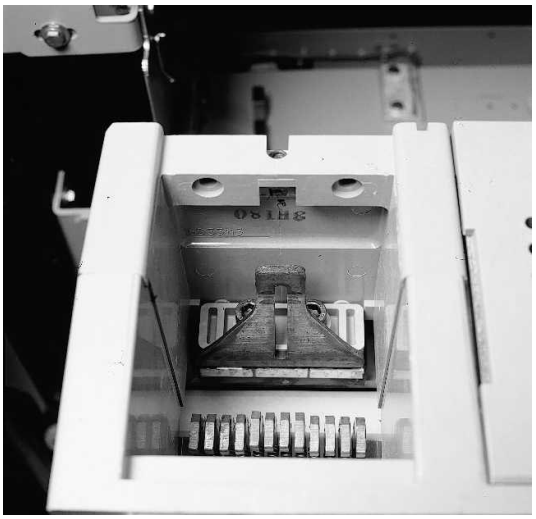


Fig.11a *Main Contacts Open*

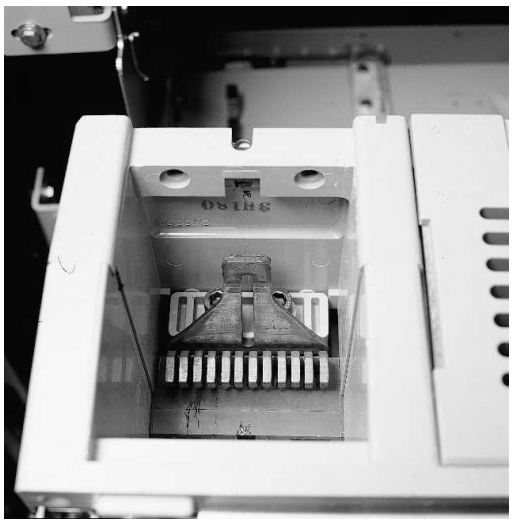


Fig. 11b *Main Contacts Closed*

4.3.2 Primary Stationary Contacts

The primary stationary contact is a combination of two items. One is a conductive pad mounted on the line conductor, which functions as the stationary main contact. The other is an arc runner, also connected to a line conductor. The integral arc runner serves a dual purpose.

- Fixed arcing contact
- Part of the Arc chute

4.4 ELECTRICAL OPERATION

For electrically operated circuit breakers, the springs are normally charged through the use of an electrical operator. The springs can, however, be charged manually.

Electrically operated circuit breakers can also be manually closed and opened through the use of the front mounted charging handle and Manual "ON" buttons and Manual "OFF" buttons.

An electrically operated circuit breaker from the factory is also equipped as standard with a spring release to close the circuit breaker electrically. A low energy, trip activator is supplied to open breaker.

4.4.1 Procedure to remove the motor

Remove the breaker front cover. Disconnect the motor wiring connectors. The motor mount main hold-down bolt is located on the front lower portion of the motor mount plate. (Refer to Figure 12). Remove the two right hand bracket self-tapping screws. Loosen, but do not remove, the two screws that hold the right support plate to the motor, the charge pawl needs to be pressed and held behind the gear during removal, slide the entire motor and motor mount plate forward, shift slightly to the left and the motor will become free and can be removed from the breaker.

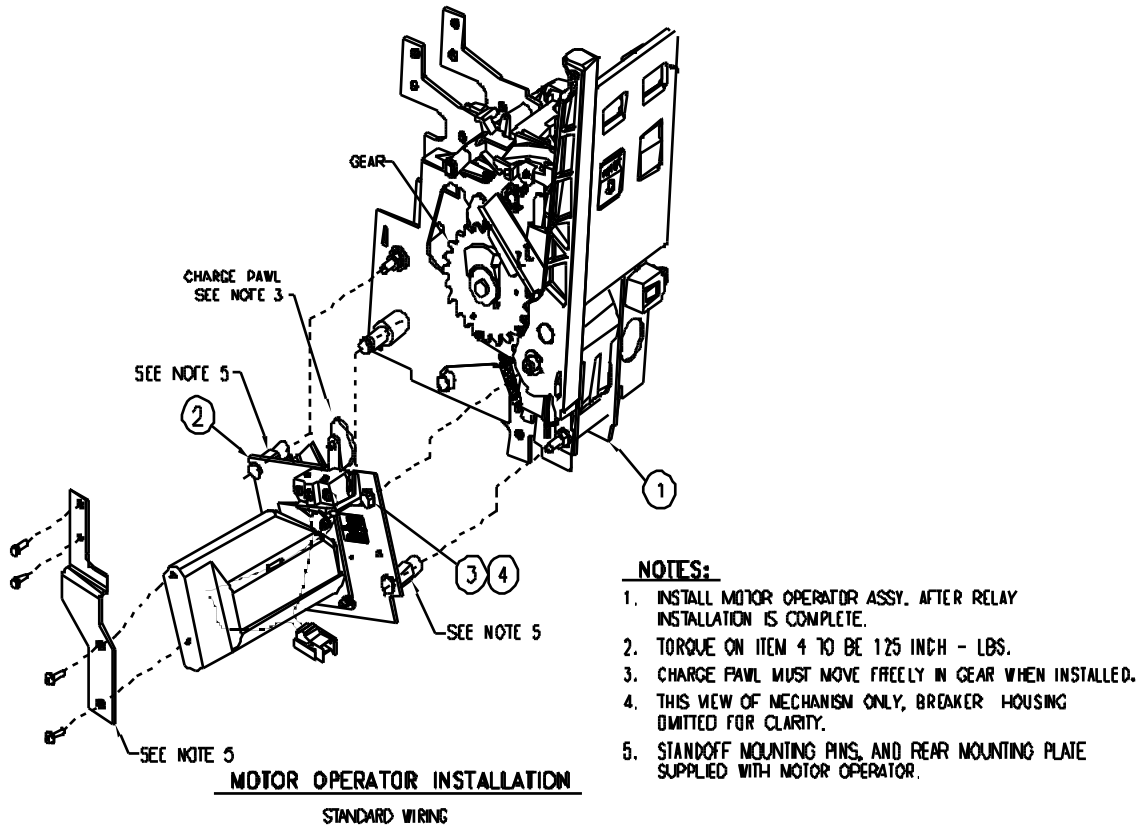


Fig. 12

4.4.2 Anti-Close Feature

The CM52 circuit breaker contains an auxiliary relay that is energized when the MPC series relay calls for a trip. This relay has a contact in series with the motor circuit, isolating the motor closing scheme.

4.4.3 Trip and Lockout

The anti-close relay also provides an automatic lockout feature when an external remote trip is applied. A remote trip can be wired from the din rail terminal block in the relay module. The wires for a remote trip and/or lockout provision are labeled on the wiring diagram provided with the unit.

4.5 ARC CHAMBERS

The CM52 circuit breaker utilizes arc chambers to insulate and isolate individual poles from one another, from the rest of the circuit breaker, and from operating personnel. Arc chambers are molded and integral parts of the circuit breaker frame. Enclosed within each arc chamber is an arc chute that mounts over each set of primary contacts.

After the main contacts part, any remaining current is driven to the arcing contacts. The main contacts separate, the moving arcing contacts discharge into the arc chute plates while the integral arc runner also helps to draw the arc into the arc chute.

4.5.1 **Arc Chute Removal**(see also 2.1.2.1)

The CM52 arc chute mounts down over the arcing contact. Alternating V-shaped arc chute plates attract the arc and interrupt it. The top arc plate, which is a part of the arc chute itself, also helps to attract the arc away from the moving arcing contact and up into the arc chute's V-shaped plates. Arc chute components are assembled in an insulating jacket that is removable from the top of the circuit breaker. Each arc chute has a baffled top cover. One single, captive 5/32" Allen head bolt holds the arc chute in place. Loosen bolt and slide top frame of the arc chute rearward. Pull the arc chute free from the breaker.

Fig. 13a *Loosen Arc Chute captive bolt*

Fig. 13b *Remove Arc Chute*

4.6 ELECTRONIC TRIPPING SYSTEM

The CM52 circuit breaker utilizes a four part tripping system.

- MPC series Relay
- Current Transformer
- Trip Actuator
- Indicating Diagnostic Module (IDM)

MPC series Relay - Refer to IB 35-581B.

Current Transformers (see also 2.1.2.2) **-** The current sensors are mounted on the lower rear set of breaker stabs and are protected by a glass polyester shield. The shield has three ports from which can be viewed the sensor ratios. Each CT

is wired to the harness through insulated fast-on terminals and the CT molded frame is keyed so it can only be positioned one way into the breaker.

Spring Release – The spring release is a standard device on the CM52 Network Protector Circuit Breaker. It remotely closes the circuit breaker when its coil is energized by voltage input. The closing spring must already be charged for the device to work.
On spring-closed breakers, the spring release is automatically energized during the spring charging cycle.

On stored-energy breakers, the spring energy will be stored until the MPCV relay calls for a CLOSE, whereby the spring release coil will be energized permitting the closing springs to close the breaker main contacts.

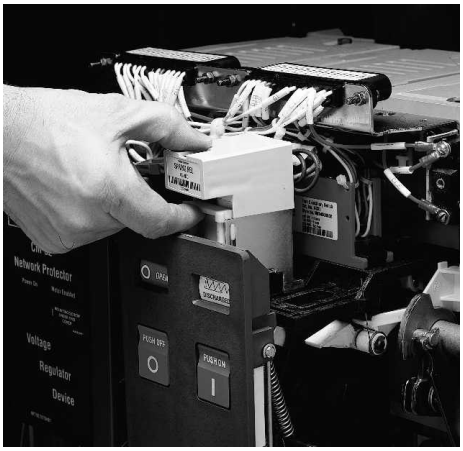


Fig.14 *Removing Spring Release*

Pulling upward on locking tap, sliding device forward and removing from the auxiliary deck can remove the spring. Each device is electrically connected through disconnect plugs.

IDM – CM52 Technical Specification
Indicating Diagnostic Module

This device located on the front of the breaker provides voltage regulation and diagnostic information.
The IDM has self-diagnostic circuitry built into the design to aid the
user in determining if a component should be replaced. The LED indicators are described below.

- **MOTOR ENABLED (Red LED)**
  Indicates the supply voltage is normal and the motor circuit is operable.
- **POWER ON (Yellow LED)**
  Indicates the presence of normal power input to the IDM.
- **MOTOR OK (Yellow LED)**
  Indicates the motor is healthy.
- **SPRING RELEASE OK (Yellow LED)**
  Indicates a healthy spring release.
- **TRIP ACTUATOR OK (Yellow LED)**
  Indicates the IDM trip portion of the circuit is healthy and is ready to implement a trip, if trip conditions should arise.

Fig.15 *Indicating Diagnostic Module (IDM)*

4.7 INTERNAL ELECTRICAL ACCESSORIES

Auxiliary Switch – An auxiliary switch is an optional device providing remote electrical indication if the circuit breaker is open or closed.

AUXILIARY SWITCH LAYOUT

Each CM52, as standard, has two Auxiliary Switch blocks. These blocks are located behind and to the left of the Spring Release device, but mounted on the accessory platform. The far left rear position of the Auxiliary Switch (position A) has breaker only contacts. As standard, the customer used Auxiliary Switch is located in the front right hand position (position D).

The Auxiliary Switch wiring colors indicate: Black=common, NO=yellow, NC=blue.
Each standard CM52 contains 3 N.O. auxiliary switches and 3 N.C. Auxiliary Switch spare for the customers use.

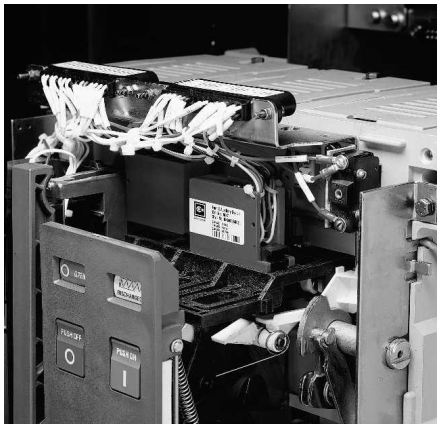


Fig.16a *Location of Auxiliary Switch "D"*

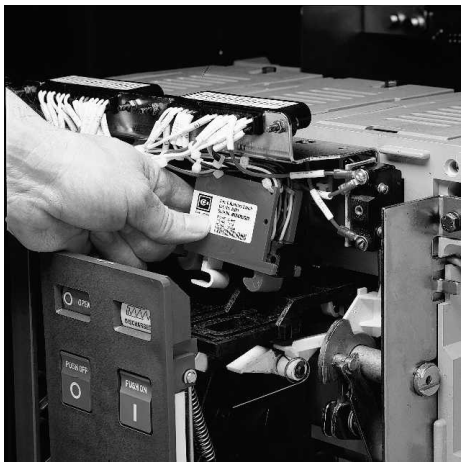


Fig. 16b *Removal of Auxiliary Switch*

Customer Secondary Wiring Terminals – Mounted, as part of the relay module is a DIN rail-mounted terminal block. One side has been factory wired from the Auxiliary Switches, the other side remains open for the customer landing area of secondary wiring.

As standard, 1.0 inch NPT pipe coupling is located on the left-hand side of the enclosure, permitting the entrance/exit of secondary wiring from the enclosure.

Electrical Testing

Three phase testing of the type CM52 can be accomplished in the following manner:

1. Vent the hinge side (if submersible)
2. Open the enclosure door after the breaker has been TRIPPED.
3. Remove the special function speed wrench from the door mount by pressing in tabs mounted to door.
4. Lift the lev-in shutter door and insert the 3/8 square end of the speed wrench into the lev-in drive socket.
5. Turn the speed wrench crank counterclockwise until the "YELLOW" indicator appears on the breaker position indicator. In this position, the main power finger clusters have been disconnected, while the secondary disconnects are still made-up. This is the "TEST" position.
6. Remove the crank and remove the test plug front cover.

WARNING

Test for zero voltage across the top 6 test switches.

7. Also remove the GPO-3 cover located above the breaker by removing the four (4) insulated machine screw.
8. Run the electrical tests per the test set instructions.

Fig. 17 *Test Plug Connector*

Fig. 18 *Test plug with connections*

CAUTION

THE NETWORK SIDE BUS WILL BE ENERGIZED.
ATTACH THE TEST KIT SUPPLY LEADS USING SUITABLE INSULATED GLOVES.

*** Alternative Test position with visible break available with extended jumpers.**

MANUAL CLOSING OF THE CM52 BREAKER

With the breaker racked out on its rails, the CM52 breaker can be manually closed (for maintenance purposes only).

WARNING
DO NOT ATTEMPT TO MANUALLY CLOSE A CM52 BREAKER ON TO AN ENERGIZED SYSTEM.

Grasp the manually charging handle and pull downward. Repeat this operation until the Spring Indicator shows that the charging springs have

been charges. Push the GREEN "ON" pushbutton. The breaker should close and the breaker semaphore should indicate, "CLOSE"

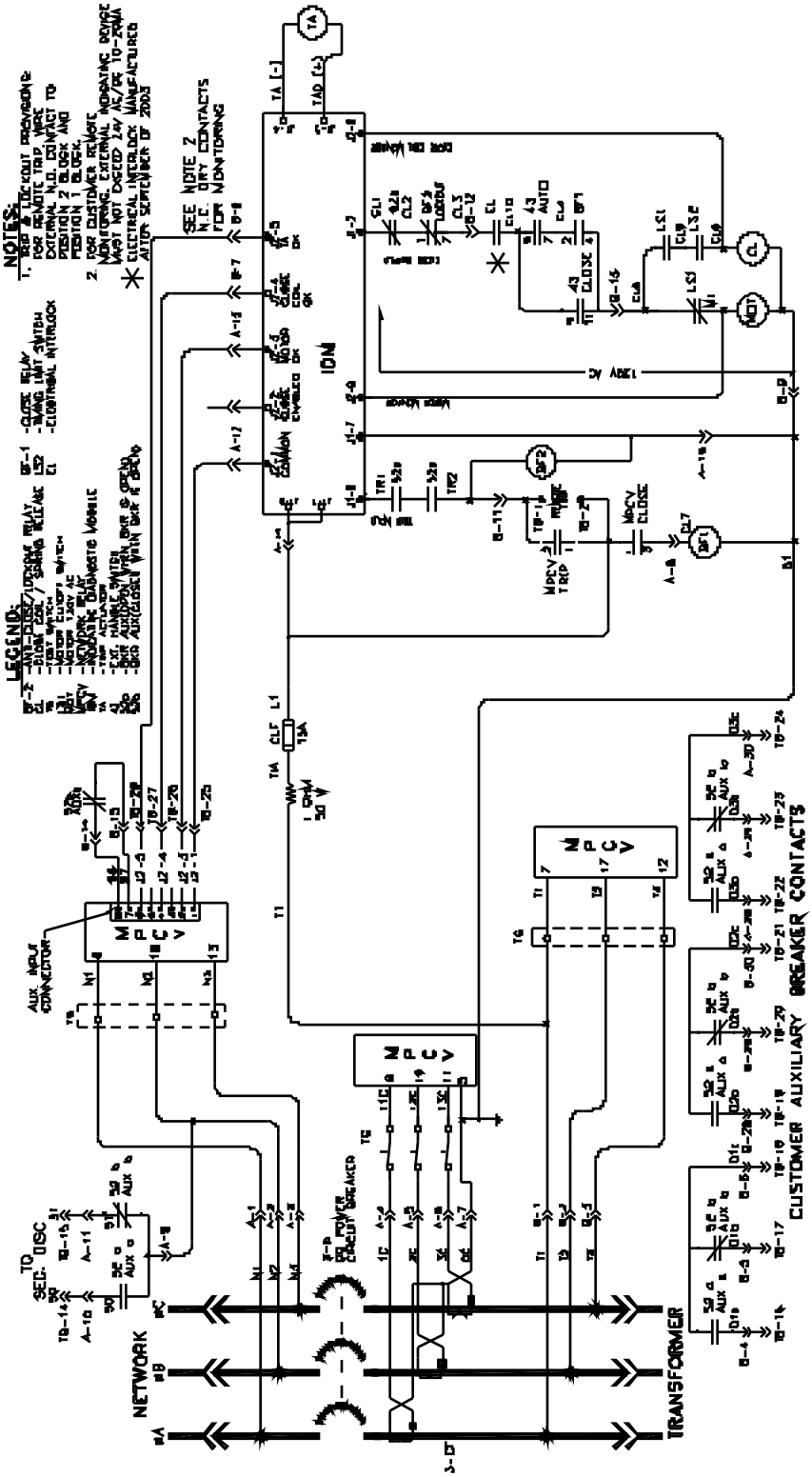
To manually open a CM52 breaker, during maintenance, push the RED "OFF" pushbutton. The breaker should open and the breaker semaphore should indicate "TRIP".

RENEWAL PARTS

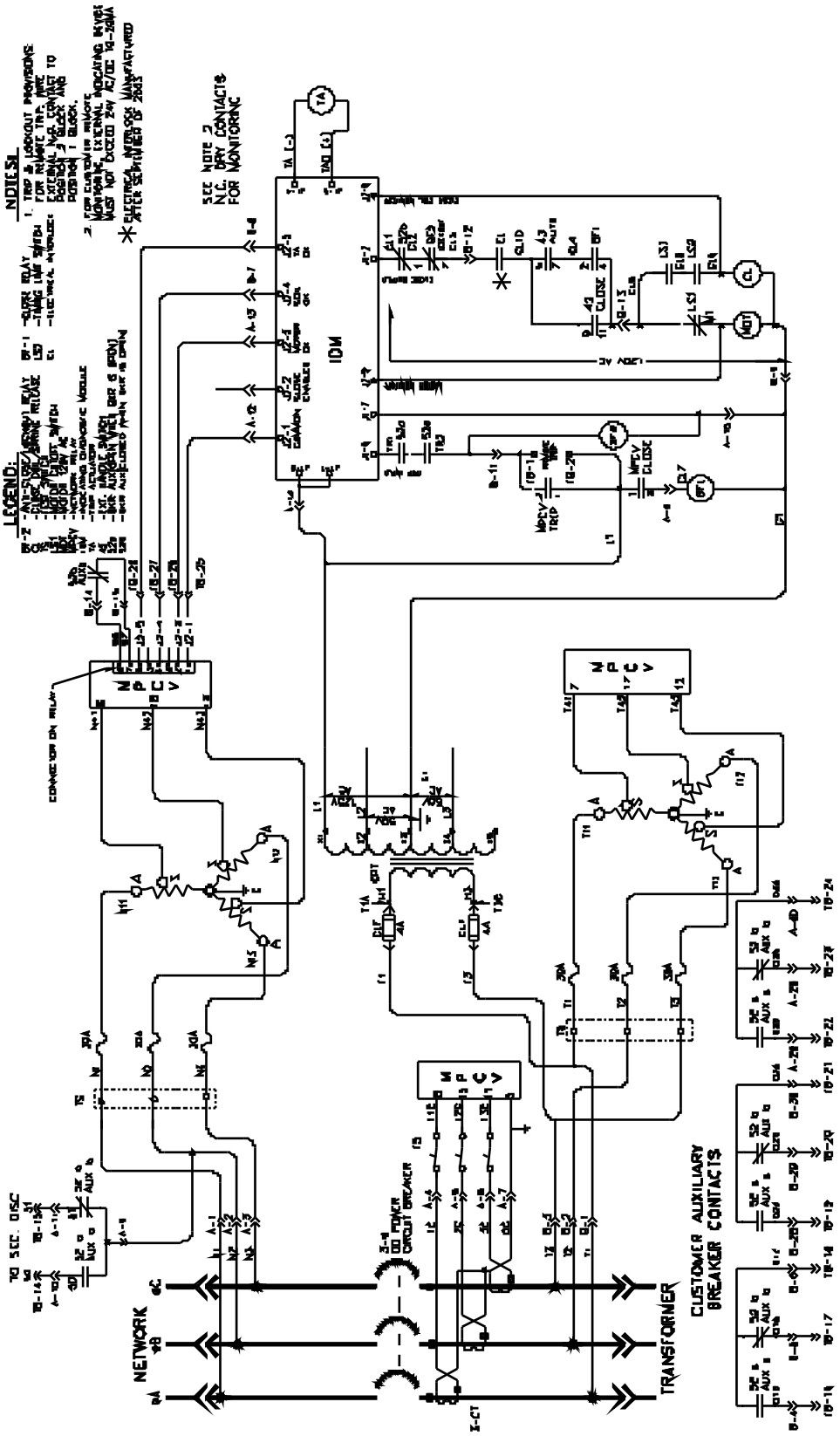
The CM52 breaker modular construction makes change out of replacement parts an easier task than on other network breakers.

The following list tabulates the renewal parts for the type CM52 breaker:

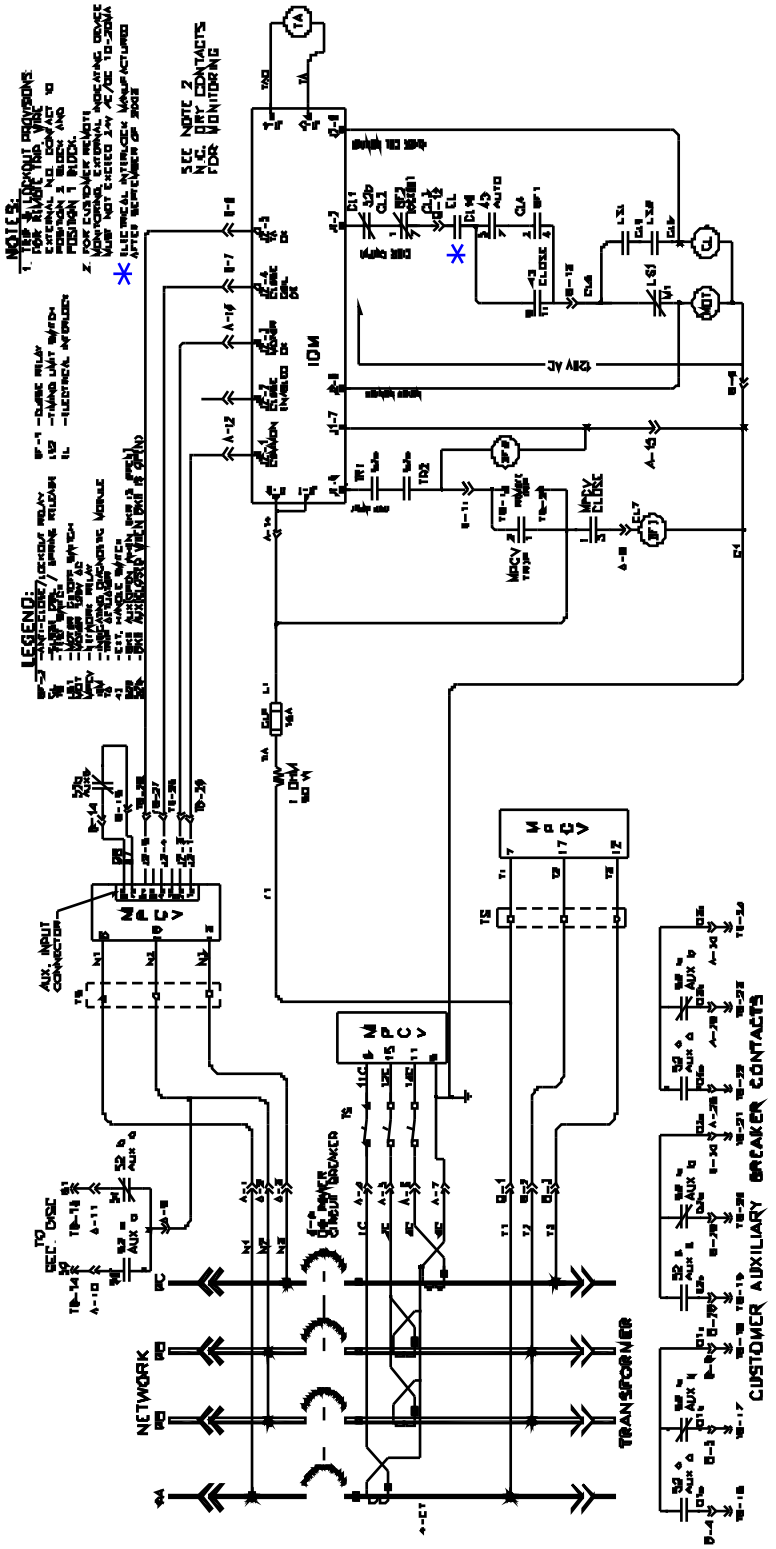
1. Motor Assembly 125 VAC
2. Indicating Diagnostic Module (IDM)
3. Spring Release 125 VAC
4. Trip actuator
5. Auxiliary Switch
    a. Position A (brkr use only) L/H rear
    b. Position D-4 form C R/H (std on all units)
6. BF1 Motor closing relay
7. BF2 Anti-close relay
8. Current Transformer
9. Control Power Transformer (480V only)
10. 480V Relay Potential Transformer (480V only)
11. 15A C.L. Fuses
12. Lifting Brackets
13. Lever-in Crank w/10mm Socket
14. Arc Chute Assembly
15. Test Switch.



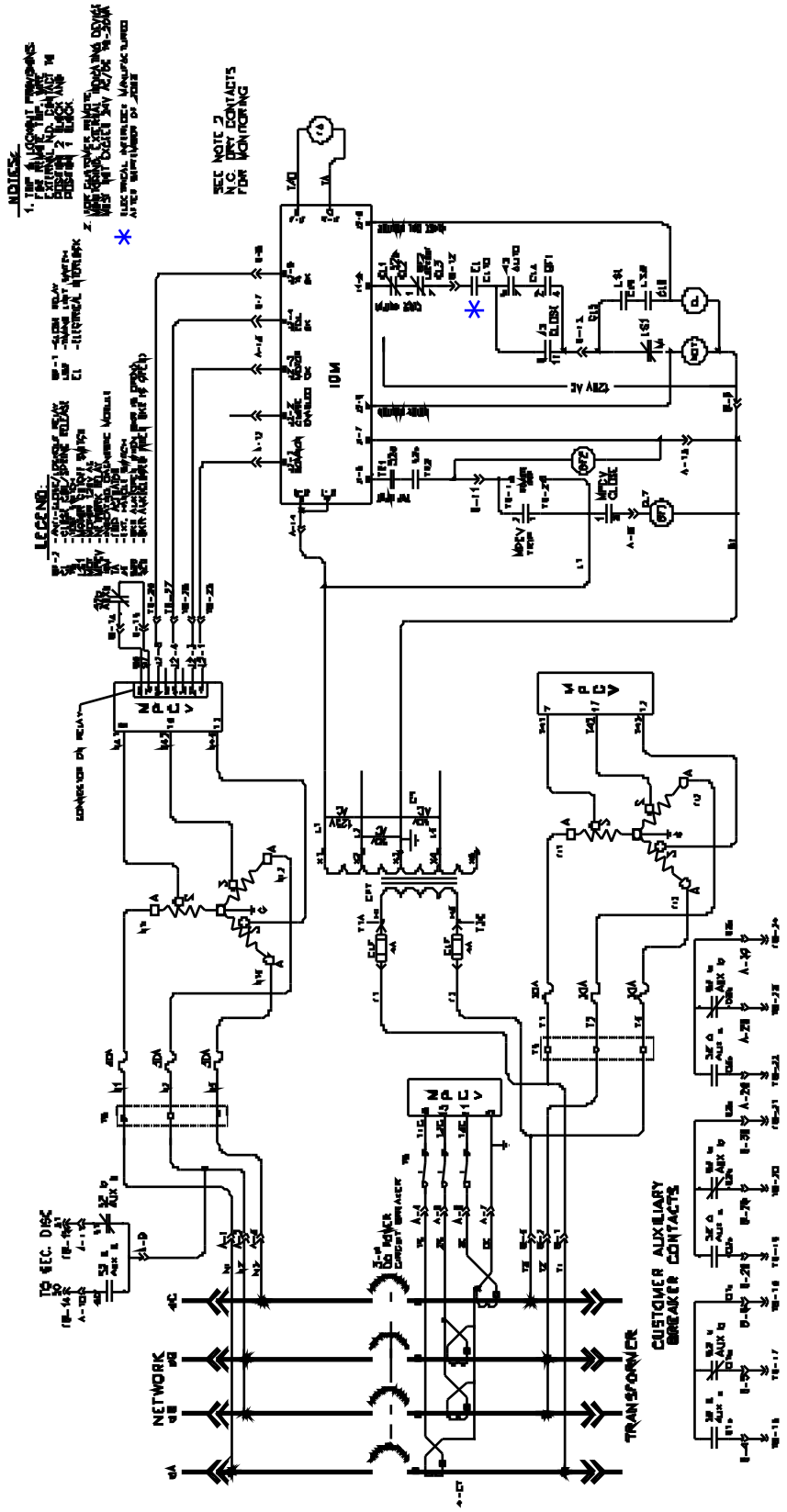
800A – 2000A 216Y/125 SCHEMATIC



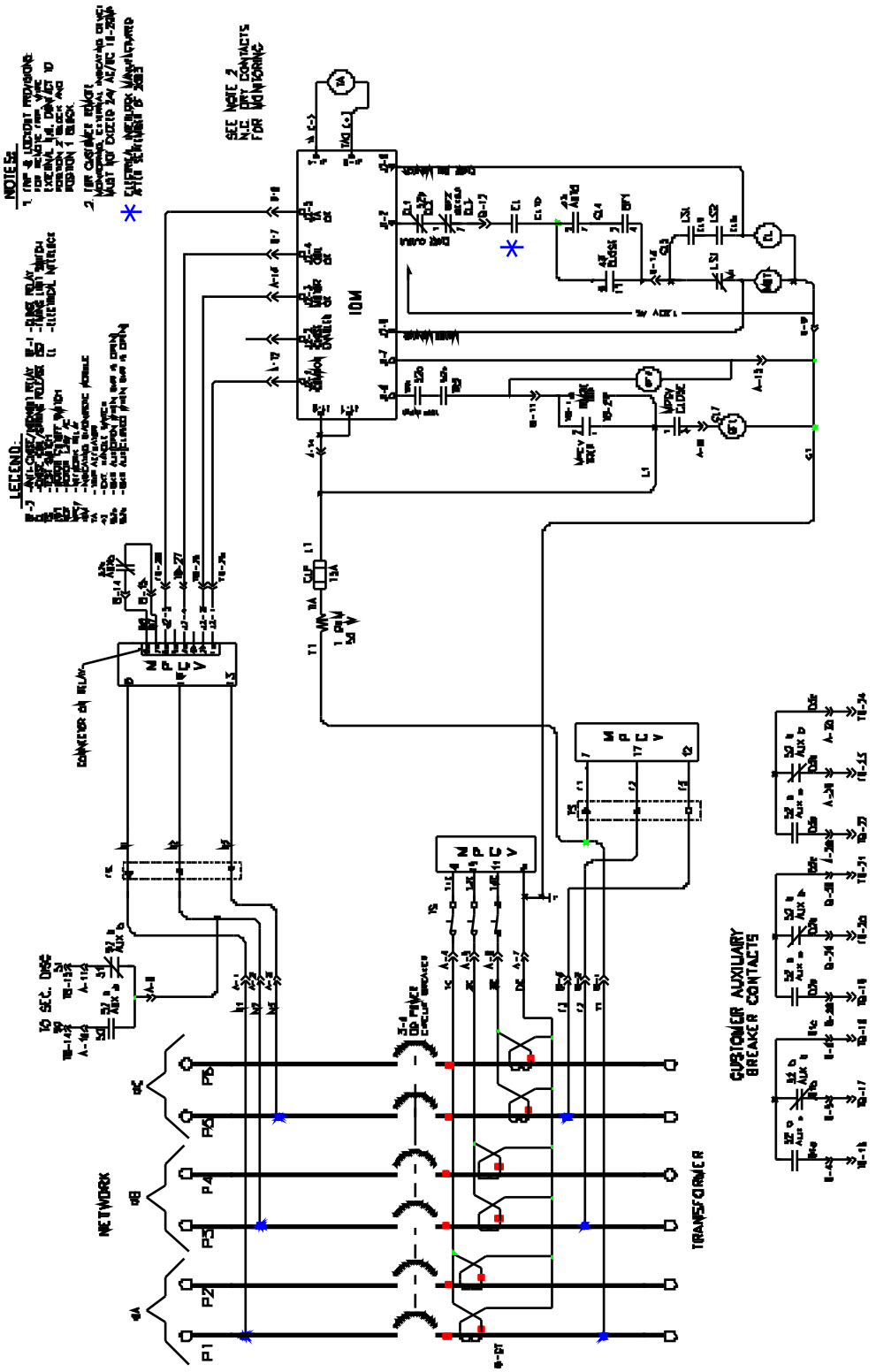
800A - 2000A 480/277 SCHEMATIC



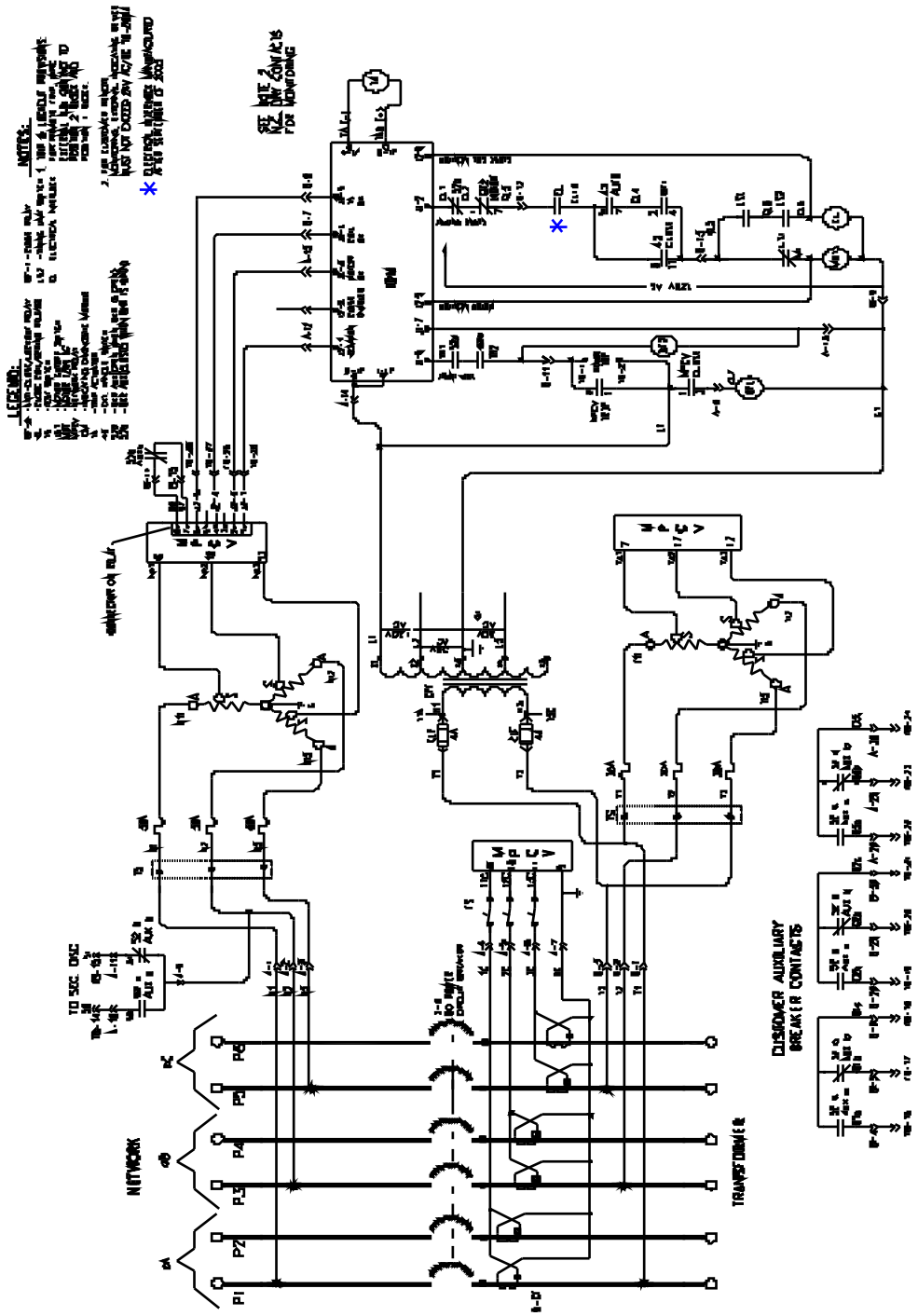
2250A – 3000A 216Y/125 SCHEMATIC



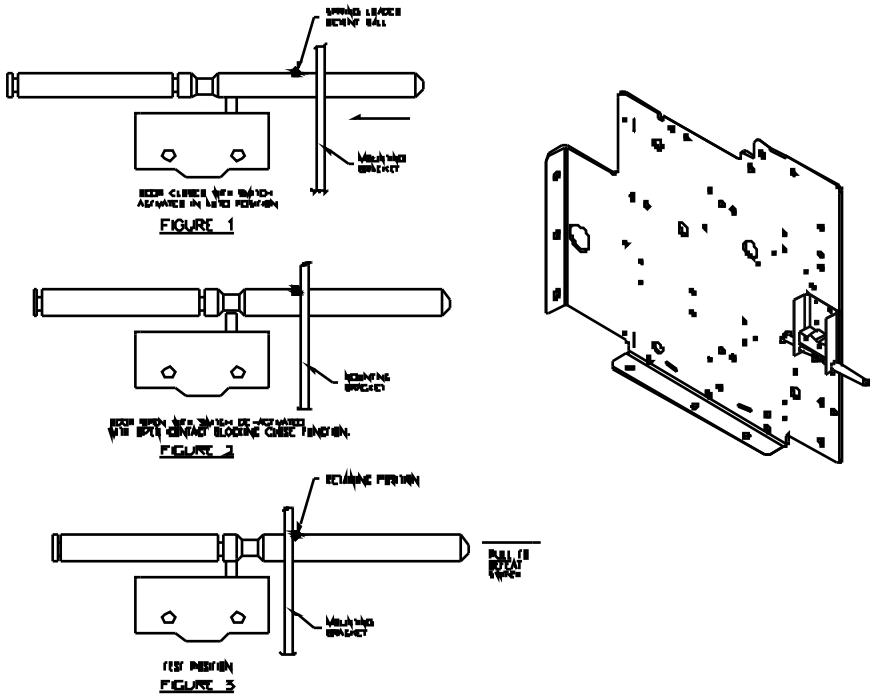
2250A – 3000A 480Y/277 SCHEMATIC



3500A – 4500A 216Y/125 SCHEMATIC



3500A – 4500A 480Y/277 SCHEMATIC



Addendum to IB-52-01-TE

Electrical Safety Interlock

The CM52 Network Protector is supplied with as standard, an electrical interlock assembly mounted on the cassette side sheet on the same side as the electrical handle switch. The purpose of the interlock is to prohibit the close function of the Network Protector if the door of the Network Protector is opened and the external operating handle is left in the AUTO position. When the door of the Network Protector is closed (Fig. 1), the shaft moves and depresses a contact on a micro switch. The micro switch normal open contact, now closed, is inserted electrically in series with the motor closing circuit; allowing normal operation under the control of the Network Protector MPC series relay.

However, when the door of the protector is opened regardless of the position of the external handle position, the shaft is spring biased and thereby positions itself to clear the micro-switch pushbutton providing a N.O. contact in the close circuit (Fig. 2), this would prevent an automatic closure by the MPC series relay.

When testing the type CM52 Network Protector either disconnected fully or in the test position, this interlock will need to be defeated in order to complete the close circuit (Fig. 3). A spring loaded detent ball is provided in the design to hold the switch in the closed position to allow testing. Pull the shaft toward you until the spring ball is in front of the mounting bracket, in this position the CM52 unit can be tested. Due to the detent design, the Interlock will reset itself if the tester forgets and leaves the shaft in the test position once the door is closed.

Addendum II to IB-52-01-TE

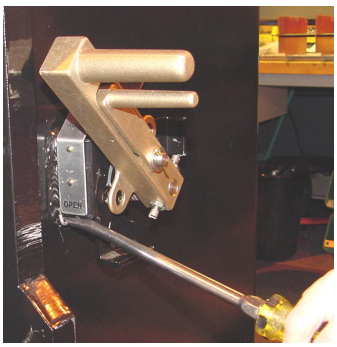
CM52 Network Protectors

Instructions for Changing Handle Position

Right to Left Side of Tank

It assumed that this conversion would be performed prior to the unit being placed into service in the field in a de-energized state. Should this change be required for a unit installed with live voltage, please take necessary precautions when working around open bus work. **Please read instructions completely before beginning handle reversal.**

1. Move the Handle to the OPEN position and withdraw and remove the breaker element to allow access to the interior of the unit.
2. Move the Handle back to the AUTO position after the breaker is removed to facilitate removal of the handle.
3. Discharge the handle return spring using a screwdriver as shown.

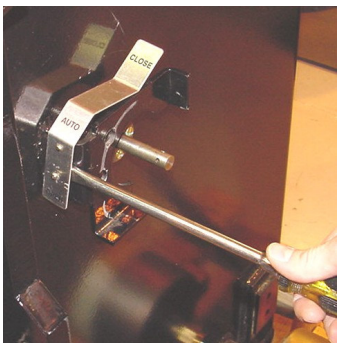


CAUTION

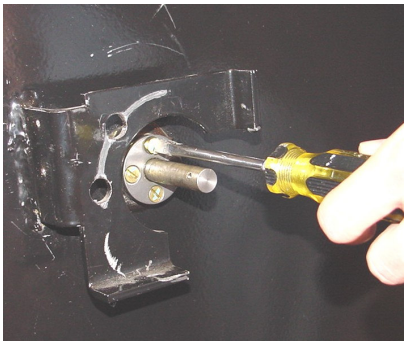
The spring is under compression and has considerable stored energy. Use caution when removing from the assembly.

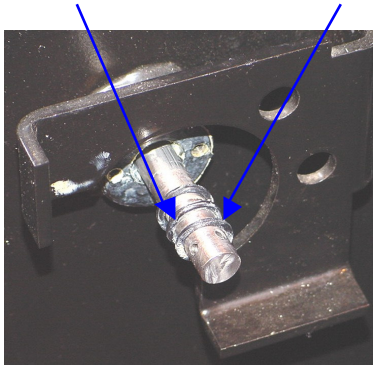
4. Apply pressure to hold the handle in place and remove both handle setscrews.

5. Remove position-indicating plate by applying pressure underneath to handle nameplate to dislodge the drive screws. New drive screws will be provided in the handle conversion kit in the hardwire bag.

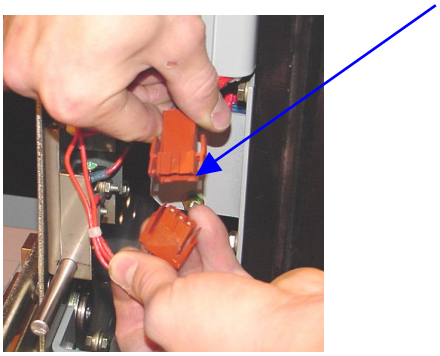


6. Remove Bearing Seal Cover and O-Ring Seal. (Note that this includes 2 Backing Rings on each side of an O-Ring with the Concave side of the backing ring toward the O-ring.)

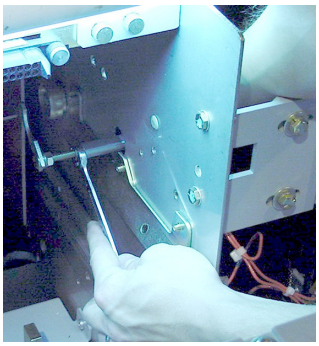




7. Unplug and Remove the blue “43” Handle Switch. Note that .25-20 Hardware is used to mount the switch. Disconnect the handle rod from the switch arm.



8. Using a 7/16” wrench, remove the handle claw.



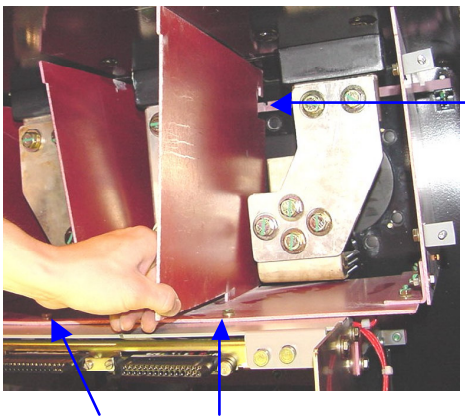
9. Remove shaft assembly from the side of the cassette

10. Remove Right Hand mounting bracket from the blue “43” switch and install the Left Hand Bracket (provided in handle conversion kit onto the existing switch).

11. Rotate the switch lever 180 degrees and rotate the handle claw as shown.

12. On the Left Hand side of the unit, remove the solid handle bearing cover and gasket and reinstall on the now open Right Hand side outlet.

13. Remove upper fuse barrier and inter-phase barriers.

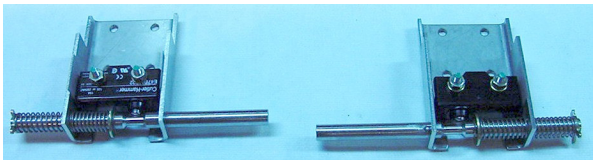


Barriers are set into a notch on the cross channel and must be lifted up to clear.

14. Remove the (2) .25-20 Barrier Hold down bolts and slide entire barrier assembly out of the unit.

15. Cut wire ties and remove the electrical interlock assembly. This will also have to be transferred to the opening side of the enclosure. Cut wire ties to red harness and route the red wire connection bundle to the left side of the cassette.

16. The existing electrical interlock assembly will have to be disassembled and re-assembled in reverse order for the Left Hand Side.



Left Hand

Right Hand

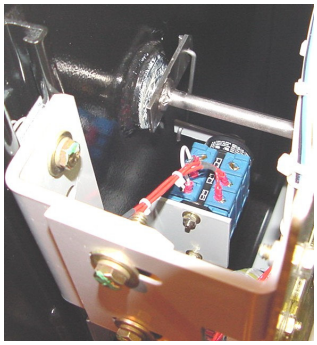
17. Remove (2) spring Nuts that hold the switch bracket in the “U” channel by Pushing down and turning to lift out of the Right Hand channel. Transfer the nuts into the Left Hand Channel.

18. Move handle shaft and put shaft through the alignment hole. Install backing rings and O-rings on shaft in the proper order. Refer to step 7.

19. Install bearing Seal Cover.

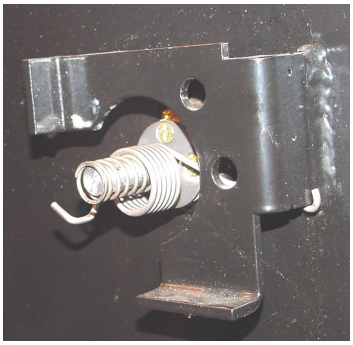
20. Mount Switch and connect linkage to handle.

21. Final switch installation should appear as shown below.



Note: Existing switch lever reversed 180 degrees for LH installation.

22. Install Left Hand handle spring provided in handle conversion kit on shaft outside of tank.



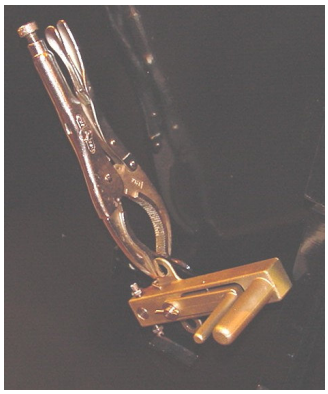
23. Hook spring on handle ear and Network Protector bracket.

24. Rotate the handle to AUTO position while applying inward pressure.

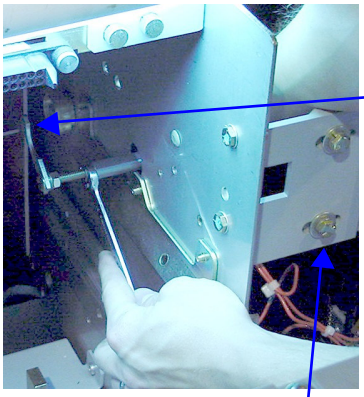
CAUTION

This step winds the spring under compression and has considerable stored energy. Use caution when installing the assembly.

25. It is recommended to use a pair of Vice Grip Pliers to hold the handle in place while installing the setscrews.



26. Loosen Front Bracket plates to set the claw position.



RH Side Shown

Front Bracket Adjustment

This claw engages the wire form that runs through the breaker element. This claw trips the breaker when the external handle is placed in the open position. The claw must be positioned correctly. Loosing the front bracket plates will allow some horizontal adjustment to clear the breaker element and set the claw properly. After setting, check clearance by slowly pushing the breaker element in position and watch engagement of the wire form. If clearance is ok, rack the breaker into the connect position. With the handle in "Auto", manually charge the breaker and close it with the push button, if the breaker trips free, then the claw must be adjusted to back off the wire form position.

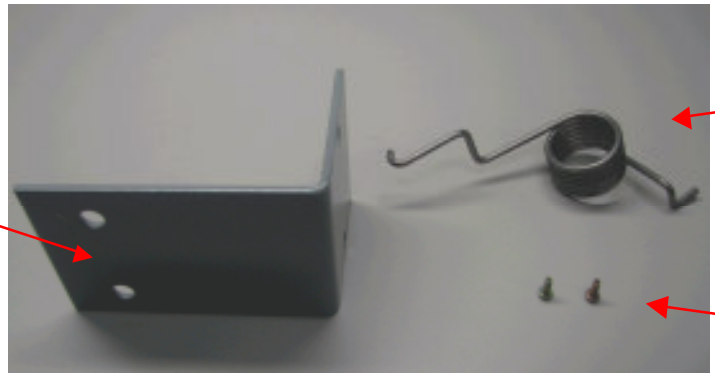
28. The next step is to convert the door hinge position. Close the door of the Network Protector and tighten down all hold down bolts, then remove the hinge pin and covert it to the right hand side. This completes the conversion of the Network Protector.

Addendum III to IB-52-01-TE

CM52 Hardware Bags

Every Eaton Corporation CM52 Network Protector is supplied with the necessary hardware to mate to its corresponding Network Transformer. Listed below are each bag, its hardware contents and picture representation.

Handle Change Bag (Used to change handle from Left to Right)



Handle Spring
NEB7024H02 (R/H)
NEB7024H01 (L/H)

Interlock Bracket
NEA7021H03 (L/H)
NEA7021H03 (R/H)

Handle Indicator Drive Pins
70012ABH1S (Qty 2)

800-2000A CM52 Hardware Bag (# 680C602G09)

Qty (12) .38 X 3.25" Bolt, **70100EG07X** (Possible CARTE XFRM Flex Conn.)

Qty (12) .38 X 2.00" Bolt, **70100EG07Q** (Flex connection)

Qty (12) .531 Washer, **0801975H46** (Transformer)

Qty (12) .38" Washer, **0801986H16,** (Flex Conn)

Qty (12) .50 X 1" Bolt, **70100EG0CM** (Transformer)

Qty (2) Spacer, **5765A38H01** (Kicker Bracket)

Qty (4) .531"ID washer, **08019725H24** (Kicker Bracket)

Qty (4) Allen Bolt, **70041AH0EG**, for use on bottom 4 throat holes

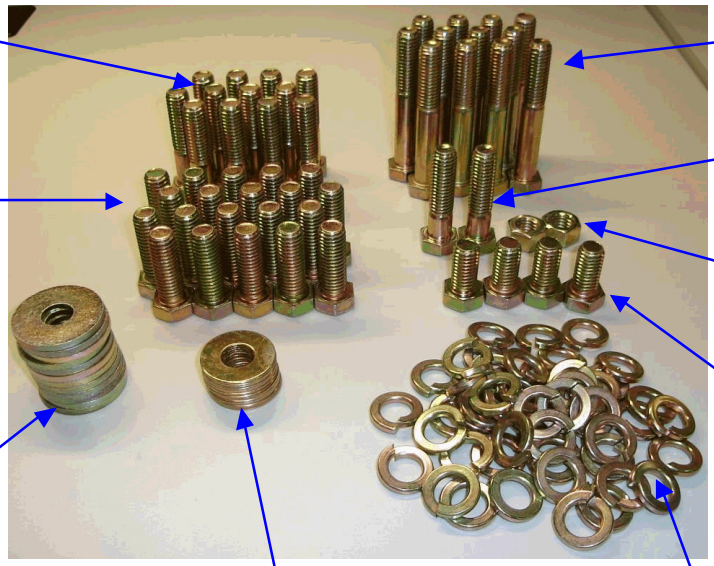
Qty (18) .50-13 Lock, **70510CV10S** (Transformer & Kicker Brackets.

Qty (2) .50 X 2" Bolt, **70100EG0CV** (Kicker Bracket)

Qty (12) .38 Star Washer, **70520AP10Q** (Flex Conn.)

Qty (2) .50-13 Nut, **70210BT61E** (Kicker Bracket)

2250-3000A CM52 Hardware Bag (# 680C602G08)



Qty (12) .50 X 2.25" Bolt, **70100EG07Q** (Flex connection)

Qty (20) .50 X 1.5:" Bolt, **70100EG0CR** (Transformer.)

Qty (12) .531 Washer, **0801975H46** (Transformer)

Qty (12) .50" Washer, **70500BD31F** (Flex Conn.)

Qty (50) .50-13 Lock, **70510CV10S** (Transformer & Kicker Brackets.)

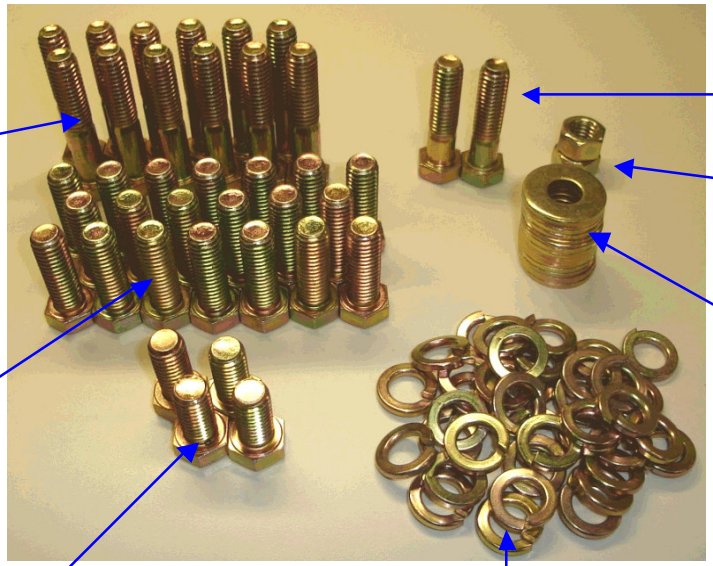
Qty (4) .50 X 1" Bolt, **70100EG0CM** (Transformer)

Qty (2) .50-13 Nut, **70210BT61E** (Kicker Bracket)

Qty (2) .50 X 2" Bolt, **70100EG0CV** (Kicker Bracket)

Qty (12) .50 X 3.25" Bolt, **70100EG07X** (Possible Carte XFMR Conn.)

3500-4500A CM52 Hardware Bag (# 078B440G12)



Qty (12) .50 X 2.5" Bolt, **70100EG0CZ**(Flex Conn.)

Qty (20) .50 X 1.5" Bolt, **70100EG0CR** (Transformer)

Qty (4) .50 X 1.25" Bolt, **70100EG0CV** (Kicker Brackets)

Qty (38) .50-13 Lock, **70510CV10S** (Transformer & Kicker Brackets.)

Qty (16) .531 Washer, 0801975H46 **(Transformer)**

Qty (2) .50-13 Nut, **70210BT61E** (Kicker Bracket)

Qty (2) .50 X 1.25" Bolt, **70100EG0CP** (Kicker Bracket)

Addendum IV to IB-52-01-TE

Maintaining the CM-52 Network Protector

1. Clean top of Network Protector to prevent contamination by dirt and debris
2. Vent the enclosure by releasing the door bolt pressure on the hinge side of the NP enclosure
3. Move the outside operating handle from AUTO to the OPEN position
4. Visually inspect for fluid leaks, blown fuses (internal), and other obvious problems.
5. Inspect the internal components for any unusual conditions or signs of overheating
6. Verify that the OPEN/CLOSE status flag on the breaker says OPEN
7. Verify that all of the IDM LEDs are illuminated.

- Yellow "Power On" LED- indicates the presence of normal power input to the IDM
- Yellow "Motor OK" LED- indicates a healthy motor and close circuit
- Red "Motor Enabled" LED- indicates that the supply voltage is at or above 73% of nominal and the motor has sufficient power to charge the breaker
- Yellow "Spring Release Coil OK" LED- indicates a healthy spring release (motor closing) coil.
- Yellow "IDM Trip Enabled" LED- indicates that the IDM trip portion of the circuit is healthy and is ready to implement a trip, if such conditions should exist.

If LEDs are illuminated, all the components listed are in working order. LED not on indicates the component or wiring to the component is damaged.

Visual Inspection

Inspect the sight glass and door gasket. Make note of the counter reading on the inspection form.

Check the bottom of the enclosure for any loose items

Complete Breaker withdrawal for maintenance inspection.

- Remove the special function wrench mounted on the inside of the door.

- Lift the levering crank access door and insert the end of the levering crank (3/8" square). As the levering crank is turned counter clockwise, the worker can observe the red window on the breaker moving from the CONNECT position toward the yellow TEST position.

- The breaker will slightly drop down as the breaker disconnects from the transformer and network side bus work.
- If the springs are charged, they will discharge when racked out.
- A full yellow position indicates that the protector is disconnected from the Network and Transformer side bus. Continue to crank until the cranks stops. The green DISCONNECT window will appear.

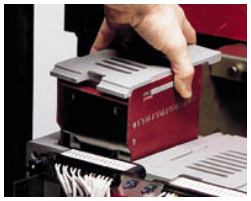
Test

Disconnected

- Lift up the handle rails on each side of the breaker and pull the breaker out until it is completely forward.
- Using the same crank, insert the 10mm socket and remove the front cover bolts. Pull slightly down on the charge handle and remove the cover.

Breaker Mechanical Inspection

- Inspect the condition of the wiring. Look for frayed or damaged wire.
- Remove the Arc Chutes. Look through the arc chutes to make sure the vents are free and clear.
- Manually charge the breaker with the charge handle.



- The Flag will indicate "Charged" after the closing spring is compressed. Push the button labeled "PUSH ON". This will close the breaker.
- Check the contact wear. A contact wear indicator is a side-by-side ledge that can be checked by looking straight down into the arc chamber. With the contacts in good condition the ledge is covered by the back edge of the moving contacts. The contacts or breaker should be replaced if the ledge is not completely covered.

NOTE: There are no adjustments needed for contact pressure, no lubrication is required. Do not wipe away or add any grease or lubricant.

- Push the button labeled "PUSH OFF". The breaker will OPEN.The main and arc contacts should only be dressed with fine scotch bright if there is black carbon residue from arcing. Do not use a file on the contacts.

  If the contacts are pitted then the contact can be tested for low resistance. The breaker will have to be closed again. The Ductor leads will have to be applied from contact cluster to contact cluster. The Ductor maximum reading should be 35 Micro Ohms or below.

Electrical Testing

- Replace the breaker cover by slightly pushing down on the charging handle and inserting the handle through the cover slot. Tighten the bolts using a cross tighten pattern.

- With the breaker in the open position, push the breaker toward the cell until it stops.

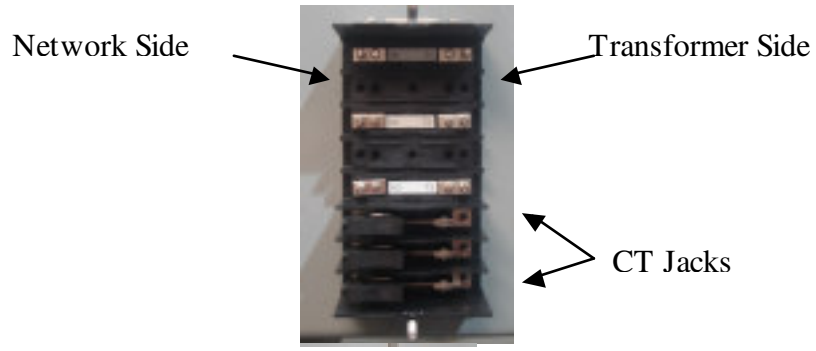
MAKE SURE THAT THE BREAKER IS PUSHED ALL THE WAY IN. A PARTIAL INSERTION WILL DAMAGE THE SHELF WHEN BEING CRANKED BACK IN.

- Crank the breaker until the yellow window is filled. This is the TEST position.

- The test set ground leads must always be connected first. Bond the latch shutter of the breaker to ground.

TEST SWITCH (PHASING BLOCK)

CAUTION Test for zero voltage on the potential studs on the test switch per below:



Using a Multi-Meter, check for voltage on the labeled N1, N2, N3, T1, T2, T3 stud positions. Verify ZERO volts present

Connect Test Kit Leads N1,N2,N3 (Black covers) and T1,T2,T3 (Blue covers) on the studs of the test block.

- Remove the dead front upper compartment cover. Connect the Power Leads (Red Covers) of the Test kit to the energized network bus. Make sure that these leads are the ones that have the in line fuse.

- Check the input sequence light on the test set before you switch the test set on, this indicates that you have the correct phasing. If the light is ON, Do Not turn the test set on. Swap the outside power phases, and re-check light. If the light is still on, check for a blown test set phase and then re-check. Place the outside handle in the AUTO position.

- Pull the Electrical Interlock forward until the spring detent ball is in front of the Interlock bracket.

- Run the standard Relay test sequence of opening and closing. (Repeat electrical OPEN and CLOSE operations a min of 20 times)

- Check closing of the breaker with the outside handle. (5 operations)

RESTORATION

1. After completion of successful tests, the NWP may be reinstalled as follows:
2. Verify External Handle in the OPEN postion.
3. Lift the lev-in drive shutter door and insert the 3/8" square end of the wrench into the lev-in drive socket
4. Turning clockwise until the "RED" indicator appears.
5. Remove crank and secure
6. Close door and tighten hinge bolts first
7. Place handle in the automatic position

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Instructions for the Eaton Type CM52 Network Protectors 800 to 4500 Amperes

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Eaton Corporation
Electrical Group
1000 Cherrington Parkway
Moon Township, PA 15108
United States
877-ETN-CARE (877-386-2273)
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