

MCC
Nedco

PASA NACHAMPASSAK
Bay 288, 2880-45th Avenue SE
Calgary, AB T2B 3M1
403-214-3155
403-243-4770

BILL OF MATERIAL

Q2C Number: 25633327

Quote Number: 2

Revision Number: 0

Project Name: CSRI FARRELL CREEK AREA GAS PROCES

Project Sub-Name:

Project Location: CALGARY, AB

Quote Name:

Through Addenda Number: 0

Bid Date: 7/18/2008

Consultant / Specifier:

Contractor / Installer: NEDCO

Sales Representative: ALI MASTROUK

Terms & Conditions

The quotation and accompanying Bill of Material and Quote Addendum are to be considered as one entity. This quotation is subject to Schneider Canada's published terms and conditions.

This quotation is per our interpretation only of information available at time of quotation. It is the responsibility of the purchaser to confirm this bill of material. Changes to this bill of material could result in a price increase. Unless noted otherwise, lamicoïd nameplates, fuses, entry plates, co-ordination study and pre-service testing are not included in this quotation.

All equipment to be finished standard ASA gray.

Payment Terms: STANDARD

Billing Type(s):

Currency: CANADIAN DOLLARS

Quote Markings

001-00

1

Designation: MCC-100A
Model 6 LVMCC

Q2C Number: 25633327

Quote Number: 2

Revision Number: 0

Project Name: CSRI FARRELL CREEK AREA GAS PROCES

Quote Name:

Model 6 MCC - Industrial Package

System Voltage: 480V 3PH 3W 60Hz
 Max Available Fault Current (RMS) - 42kA

Control Power - 120Vac

General Purpose Type 1 Enclosure

Class 1 Type B Wiring

20" Deep Construction

1/4" x 1" Horizontal Ground Bus, Copper

42kA Bus Withstand Rating

600A Tin Plated Copper Horizontal Bus

Tin Plated Copper Vertical Ground Bus

White Interior

Standard Exterior Paint ANSI 49

Equipment Mounting Height 72"

Manual Vertical Bus Shutters

Fishtape Barrier

Unit Nameplate Engraved with Gray Surface/

White Letters

Rodent Barriers

Assembled To Order (ATO)

1 - Section(s) with 600A Tin Plated Copper
Vertical Bus1 - Section(s) with 300A Tin Plated Copper
Vertical Bus

DIMENSIONS AND WEIGHT

Dimensions: 40.00"W X 20"D X 94.5"H

Approximate Weight: 1500.00 lbs / 680.40 kgs

INCOMING

Incoming Connection: Cable

MAIN

65kA Interrupting Rating

Main Breaker Top Entry 250A

65kA Interrupting Rating

FULL VOLTAGE NON-REVERSING STARTERS

1 - 10 HP NEMA Size 1 FVNR Compac Six Inch
Starter w/Circuit Breaker1 - 3 HP NEMA Size 1 FVNR Compac Six Inch
Starter w/Circuit Breaker

COMMON FULL VOLTAGE NON-REVERSING FEATURES

Motor Circuit Protector

Control Power Transformer 100VA

Motor Logic Overload

Motor On Pilot Light Red

2 NO & 2 NC Auxiliary Electrical Interlocks

Additional Wired Terminal Points

22mm XB5 Pilot Devices

Motor OFF Pilot Light Green

Overload Alarm Pilot Light (Amber)

FEEDERS

4 - 65kA Interrupting Rating
Compac 6 Circuit Breaker Branch Feeder
15A1 - 65kA Interrupting Rating
Compac 6 Circuit Breaker Branch Feeder
200A

Q2C Number: 25833327	Quote Number: 2	Revision Number: 0
Project Name: CSRI FARRELL CREEK AREA GAS PROCES		Quote Name:

- 1 - 65kA Interrupting Rating
Compac 6 Circuit Breaker Branch Feeder
60A
- 2 - 65kA Interrupting Rating
Compac 6 Circuit Breaker Branch Feeder
30A

COMMON FEEDER FEATURES

65kA Interrupting Rating

MISCELLANEOUS DEVICES

- 1 - 36" Prepared Space
1 - 30" Prepared Space

Markings:
CONTACT LONNIE HUTCHINSON 403-314-5422.
TAG: 1757-CSRI-"MCC-100A" CQ0708

Q2C Number: 25633327	Quote Number: 2	Revision Number: 0
Project Name: CSRI FARRELL CREEK AREA GAS PROCES		Quote Name:

Spare Parts

Recommended Spare Parts

Quantity	Part Number	Description
10	25413-00090	FRN-R 1 BUSSMAN FUSE
1	80420-607-01	UNIT N/P WHITE ON GRAY
1	ZB5AV3	TE P/L MDL XFMR 120:6VAC
1	ZBZ32	LEGEND PLATE HOLDER

The recommended quantities are provided for typical applications and equipment usage. Adjust quantities as required for specific circumstances. These parts may be purchased separately, and are not included in the base equipment price.



SQUARE D COMPANY
Schneider Electric

Job Name: CSRI FARRELL CREEK AREA GAS PROCES
Job Location: CALGARY, AB

Square D Quotation #: 25633327
Quotation Revision #:
Sales Contact: INSIDE
Sales Contact Location: 830

Purchaser: NEDCO, DIV OF REXEL ELECTRICAL INC.
Purchaser PO #:

Customer: NEDCO
Customer PO #:

User:
User Location:

Architect:
Cons. Engineer:

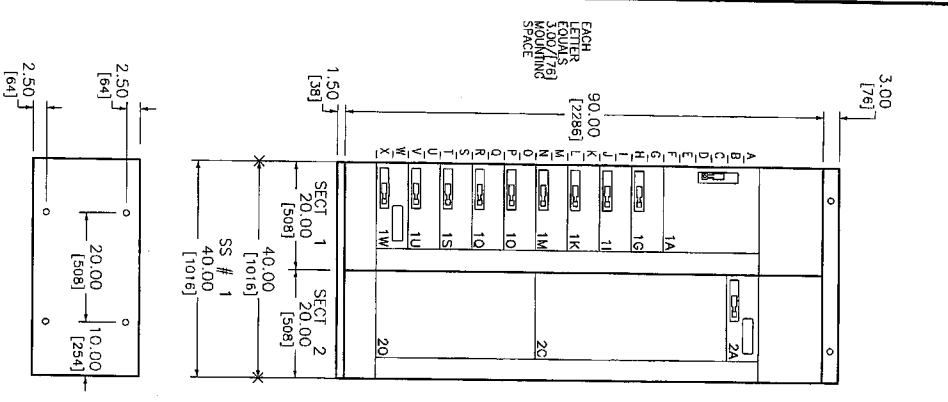
Drawing Status: RECORD

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MCC-100A	MODEL 6 MCC	ELEVATION	F25633327-001-01	1	A	
			F25633327-001-01	2	A	
		ONE LINE DIAGRAM	025633327-001-01	1	A	
			ELEMENTARY	E25633327-001-01	1	A
				E25633327-001-02	1	A
				E25633327-001-03	1	A
				E25633327-001-04	1	A
				E25633327-001-05	1	A
				E25633327-001-06	1	B
		E25633327-001-07	1	B		
		UNIT INFORMATION	I25633327-001-01	1	A	

REV	DESCRIPTION	BY	DATE
A	RELEASE TO MANUFACTURING	SL	08/13/08



ANCHOR DETAIL

GENERAL NOTES

Class 1 Type B Wiring

PRODUCT DESCRIPTION AND RATINGS

POWER SYSTEM DATA:

480V 3PH 3W 60HZ
 SHORT CIRCUIT RATING: 42KA
 POWER ENTERS: Main Breaker Top Section 1
 CONTROL POWER: 120Vac

BUS SYSTEM DATA:

MAIN HORIZONTAL BUS: 600 Amp Copper/Tin Plated / 1.5"
 BUS BRACING: 42KA
 VERTICAL BUS: 300 Amp Tin Plated Copper
 HORIZONTAL GROUND BUS: .25" X 1.0" (6.35mm X 25.4mm) Copper
 Units Securely Grounded To Structure

ENCLOSURE DATA:

ENCLOSURE TYPE: 20" DEEP Type 1
 EXTERIOR COLOR: Electrodeposition Finish ANSI 49 Medium Light Grey
 INTERIOR COLOR: Electrodeposition Finish White

STRUCTURE MODIFICATIONS:

Rodent Barriers 1,2
 Manual Bus Shutters 1,2
 Fishtape Barriers 1,2
 600A Vertical Bus 1
 Copper Vertical Ground Bus 1,2

EQUIPMENT WEIGHT:

SHIPPING SPLIT # 1: 1500.00 Lbs. (680.40 Kg.)
 TOTAL LINEUP WEIGHT (APPROX.): 1500.00 Lbs. (680.40 Kg.)

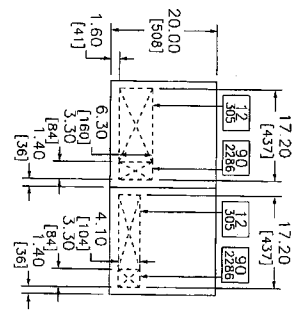
PRODUCT ACCESSORIES:

See Unit Features

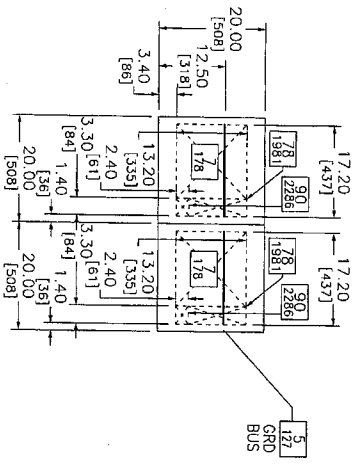
DUAL DIMENSIONS: INCHES
 MILLIMETERS

JOB NAME:	CSST FARRER GREEK AREA GAS PROCESS	EQUIPMENT DESIGNATION:	MCS-100A
JOB LOCATION:	CALGARY, AB	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	BL	DRAWING TYPE:	ELEVATION
DATE:	AUGUST 05, 2008	SCALE:	1" = 1"
DRAWING STATUS:	RECORD	DWG#	129633327-001-01
		REV	01

REV	DESCRIPTION	BY	DATE
A	RELEASE TO MANUFACTURING	SL	08/17/08



TOP VIEW



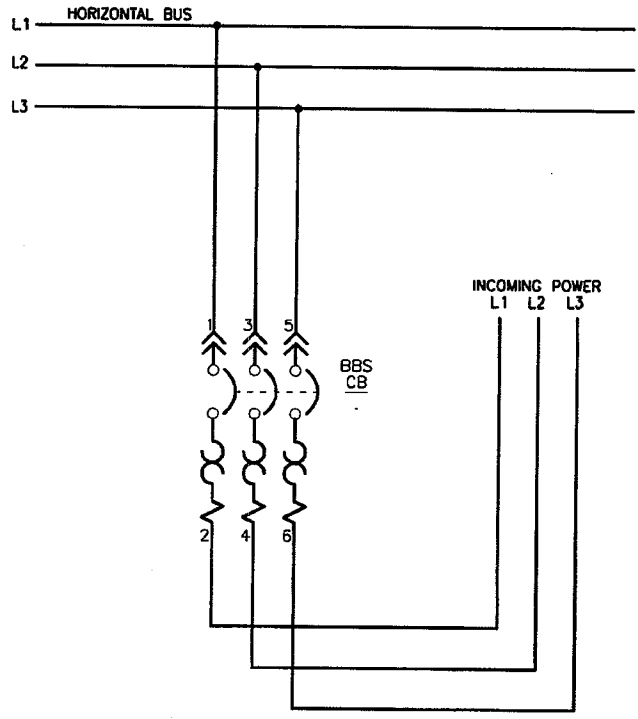
FLOOR VIEW


CROSSED AREA REPRESENTS CONDUIT ENTRY AREA. NUMBERS IN BOXES INDICATE VERTICAL CLEARANCE TO NEAREST OBSTRUCTION.

JOB NAME:	CSPF FARRER CREEK AREA GAS PROCS	EQUIPMENT DESIGNATION:	MOE-100A
JOB LOCATION:	CALOART_08	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
DRAWN BY:	BL	DRAWING TYPE:	ELEVATION
DATE:	AUGUST 08, 2008	SCALE:	1" = 1'
DRAWING STATUS:	RECORD	DATE:	PC 2
		REV:	A

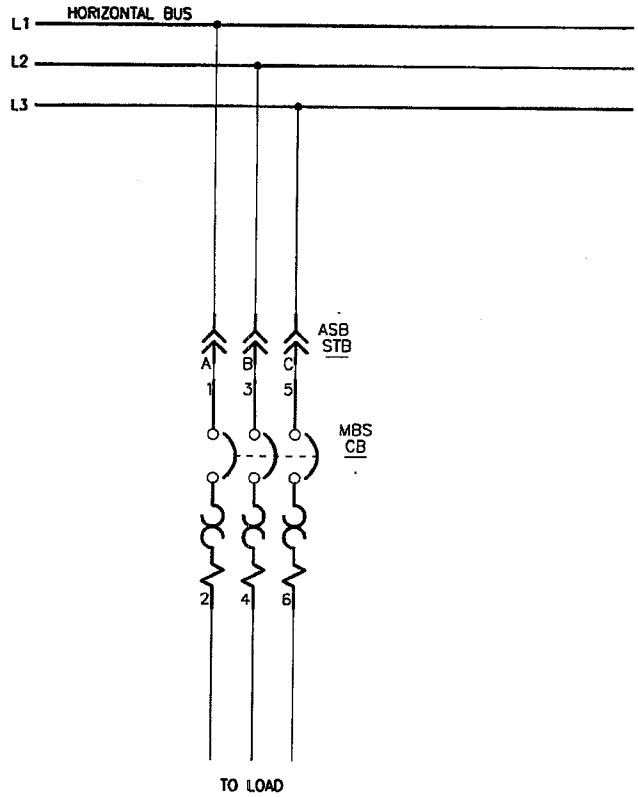
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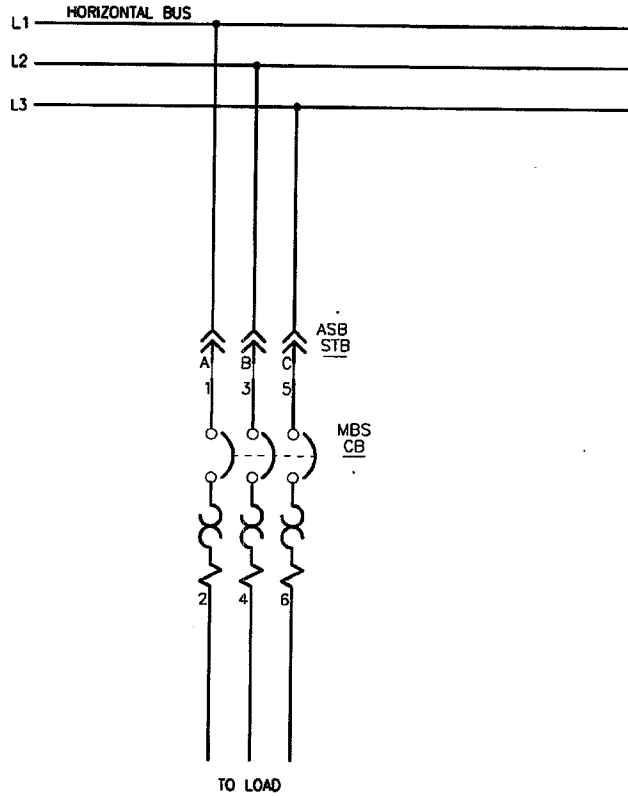
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DRAWN BY:	BL	DRAWING TYPE:	ELEMENTARY
ENGR:	BL		
DATE:	AUGUST 05, 2008		
DRAWING STATUS:	RECORD	DWG#	E25633327-001-01
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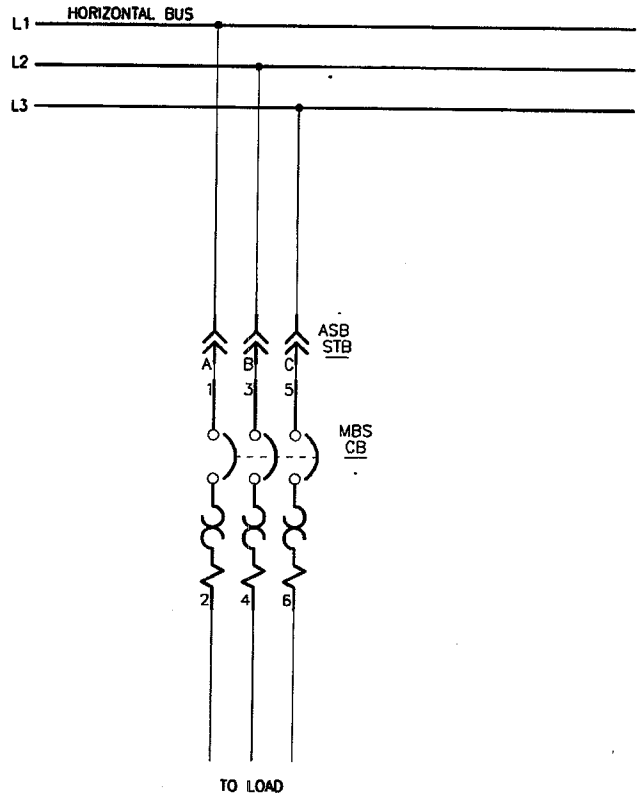
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ENGR:	BL		
DATE:	AUGUST 05, 2008		
DRAWING STATUS:	RECORD	DWG#	E25633327-001-02
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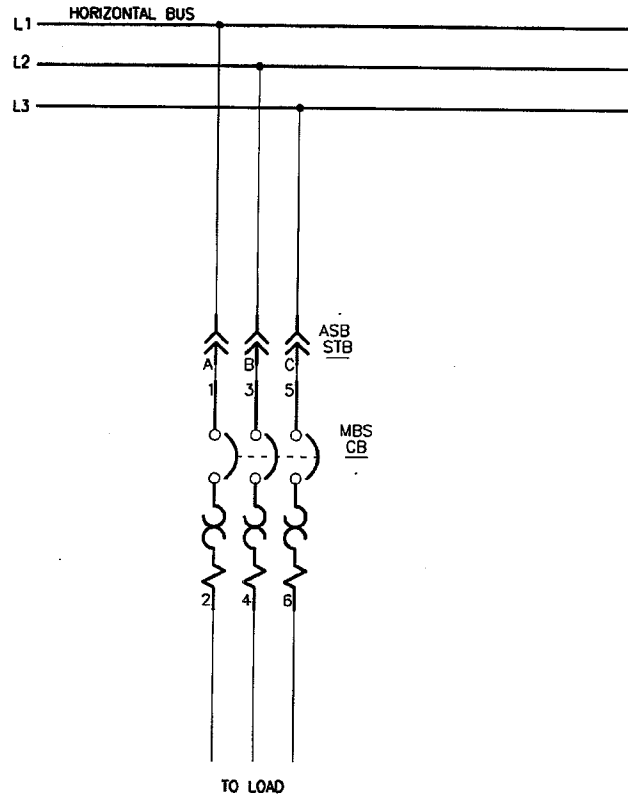
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ENGR:	BL		
DATE:	AUGUST 05, 2008		
DRAWING STATUS:	RECORD	DWG#	E25633327-001-03
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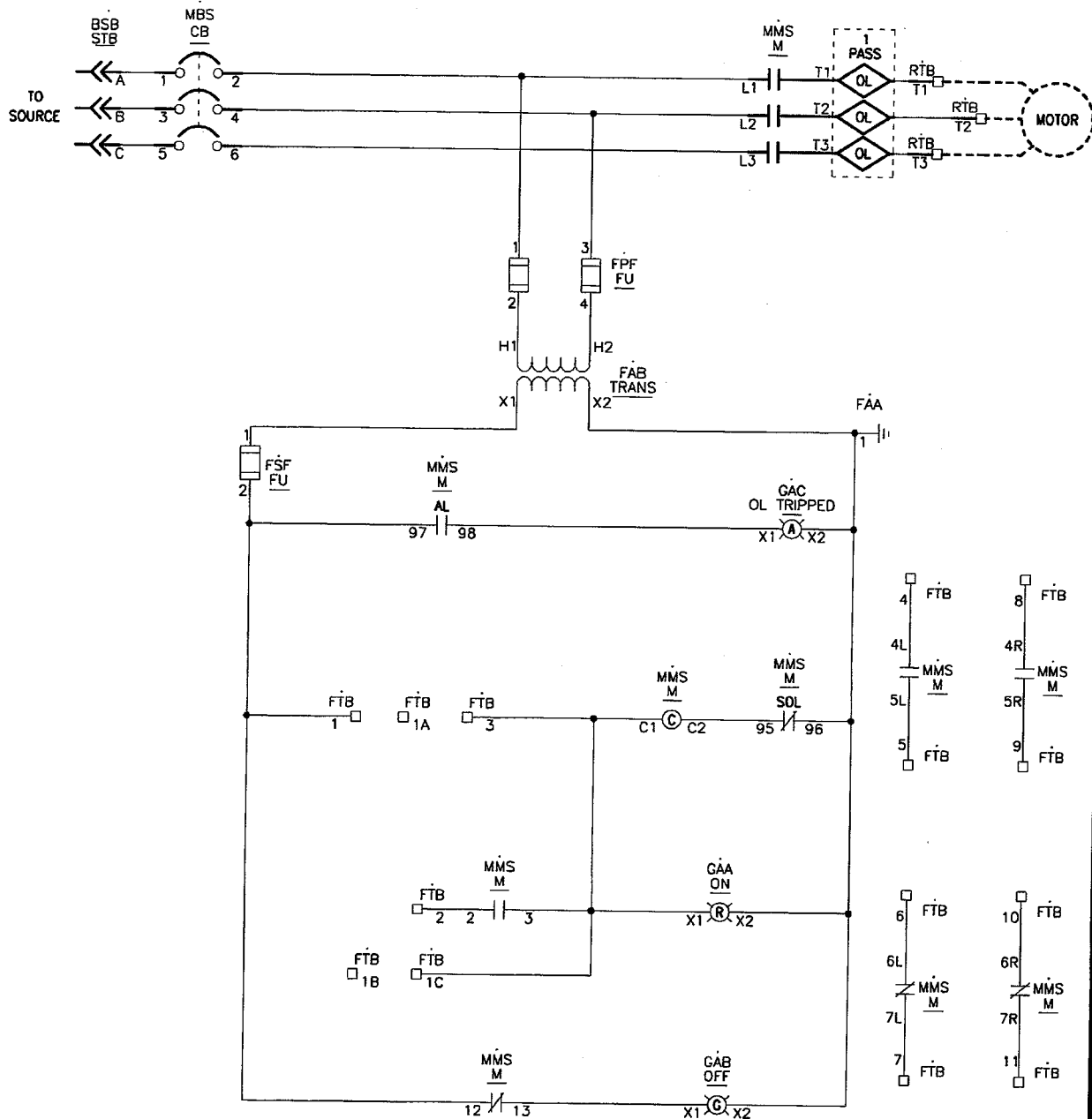
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REV	DESCRIPTION	BY	DATE				
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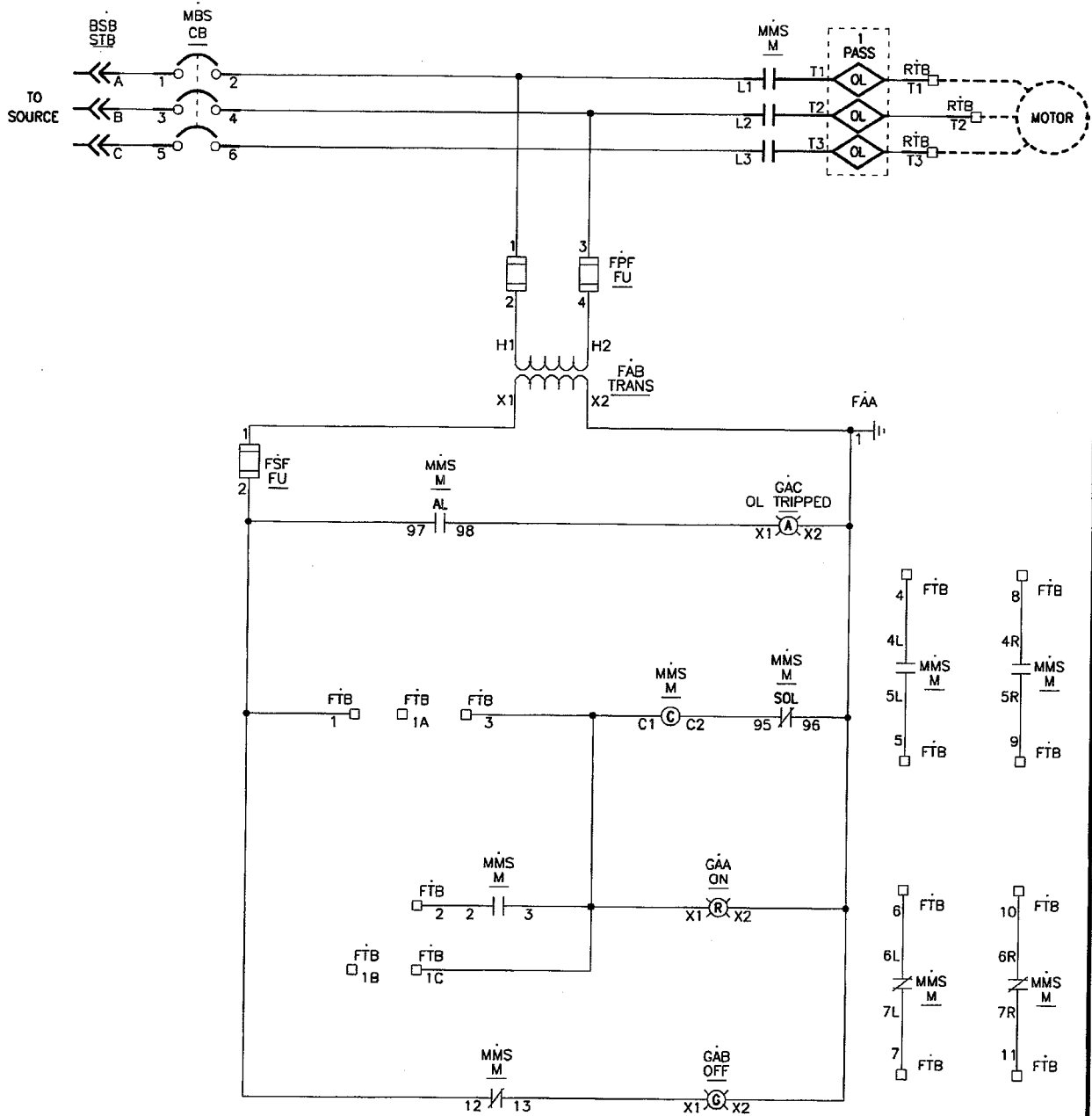
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ENGR:	BL		
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REV	DESCRIPTION	BY	DATE	B	REVISE WIRING	CN	08/21/08
A	RELEASE TO MANUFACTURING	SL	08/13/08	-	---	---	---/---/---



JOB NAME:	CSRI FARRELL CREEK AREA GAS PROCES	EQUIPMENT DESIGNATION:	MCC-100A
JOB LOCATION:	CALGARY, AB	EQUIPMENT TYPE:	MODEL 6 MOTOR CONTROL CENTER
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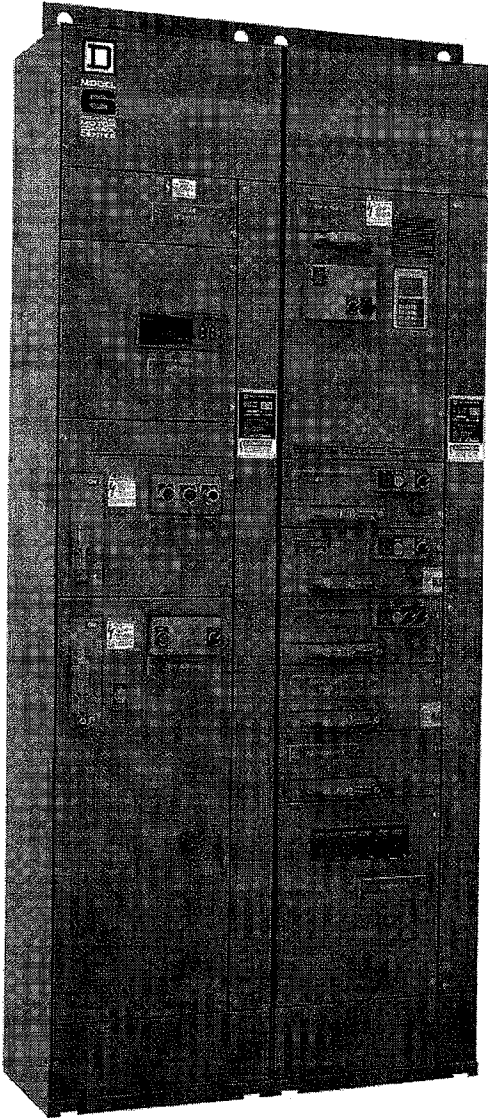
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		REV B	

Model 6 Motor Control Centers Class 8998

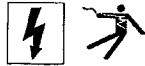
Instruction Bulletin
Retain for future use.



a brand of
Schneider
Electric

 **SQUARE D**

HAZARD CATEGORIES AND SPECIAL SYMBOLS



Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in death** or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in death** or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in minor** or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in property damage**.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

SYSTEMS INTEGRATION DISCLAIMER

Unless performed by Schneider Electric, Schneider Electric disclaims liability for any systems integration work. Schneider Electric assumes no responsibility for application software and control systems designs supplied by a third party.

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SECTION 1—ABOUT THE MODEL 6 MCC

Motor control centers (MCCs) provide the most suitable method for grouping electrical motor control and other related devices in a compact, economical, and free-standing installation. A motor control center is made of standardized vertical sections consisting of totally enclosed, dead front, free-standing structures bolted together. These sections support and house control units, a common bus bar for distributing power to the control units, and a network of wire trough and conductor entrance areas to accommodate outgoing load and control wires.

The control units consist of components such as combination motor starters, branch feeder devices, and lighting panelboards. Each is mounted in an individual, isolated compartment having its own cover. When front-of-board unit arrangement is selected, all units are mounted on the front side of the MCC. A 15 in. (381 mm) or 20 in. (508 mm) deep section is provided for front-of-board mounting. The standard MCC width is 20 in. (508 mm) with a 4 in. (102 mm) wide vertical wireway.

An optional 25 in. (635 mm) wide section with a 9 in. (229 mm) wide wireway is also available. Larger sections are available for mounting larger equipment. When a back-to-back arrangement is selected, the units are mounted on both the front and rear of 31 in. (787 mm) or 41 in. (1041 mm) deep structures. Approximately 1 in. (25 mm) of space is between back-to-back sections. The standard height of all MCC structures is 91.5 in. (2324 mm) without the 3 in. (76.2 mm) lifting angle.

Schneider Electric Literature List

The following Schneider Electric publications may be useful in the maintenance and regular operation of your Model 6 MCC. Your Schneider Electric field sales representative can provide them upon your request. Or, you can download these documents from the Technical Library at www.us.SquareD.com.

Table 1: MCC-Related Literature

Publication No.	Title	Publication No.	Title
8998CT9701	Model 6 Catalog, Class 8998 Motor Control Centers	30072-013-24_	8536 Type S*, Series A, Form H** Starter, Size 2
80442-291-01_	Altivar® 66 Adjustable Speed Drive Controllers, NEMA Types 1 and 1A	30072-013-25_	8536 Type S*, Series A, Form H** Starter, Size 3
80442-772-01_	Altivar 66 Drive Controllers in Motor Control Centers	30072-013-26_	8536 Type S*, Series A, Form H** Starter, Size 4
80442-507-01_	Altivar 66 Drive Controller Units in Motor Control Centers	30072-013-47_	8536 Type S*, Series A, Form H** Starter, Size 5
80444-233-01_	Altivar 61/71 Adjustable Speed Drive Controllers in Motor Control Centers	30072-013-60_	8536 Type S*, Series B, Form H3* Starter, Size 6
80444-035-01_	Altivar 58 Drive Controllers in Motor Control Centers	3020IM9503	PowerLogic® Power Meter
80438-069-02_	Altistar® 48 Soft Start Units for Motor Control Centers	3020IM9806	PowerLogic Circuit Monitor Series 2000 Reference Manual
30072-013-29_	Motor Logic® Relay	63230-400-207	PowerLogic Circuit Monitor Series 3000 (CM3000) Reference Manual
30072-013-98	Motor Logic Plus Programmable Solid State Overload Relay	63230-300-213	PowerLogic Circuit Monitor Series 4000 (CM4000) Reference Manual
30072-013-99	Motor Logic Plus Solutions Software	0100PL0301	Square D Digest 173
30072-013-101	Motor Logic Plus Lug Kit	63230-500-204	Power Meter 820 Installation
30072-013-102	Motor Logic Plus Network Communication Module	63230-500-205	Power Meter 820 Reference
30072-013-52_	8536 Type S*, Series B, Form H** Starter, Size 00	63230-500-208	Power Meter 850 Installation
30072-013-22_	8536 Type S*, Series A, Form H** Starter, Size 0	63230-500-209	Power Meter 850 Reference
30072-013-23_	8536 Type S*, Series A, Form H** Starter, Size 1		

SECTION 2—SAFETY PRECAUTIONS

Carefully read and follow the safety precautions before attempting to lift, move, install, use, or maintain Model 6 MCCs and their components.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Qualified electrical personnel must perform work in accordance with all applicable national and local electrical codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Follow all safety procedures defined in NFPA-70E and OSHA 1910.331-35, as well as those established by your specific location.
- Turn off all power supplying this equipment before working on or inside equipment.
- Assume that all circuits are live until they have been completely de-energized, tested, locked out, and/or tagged out (per OSHA 1910.147). Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

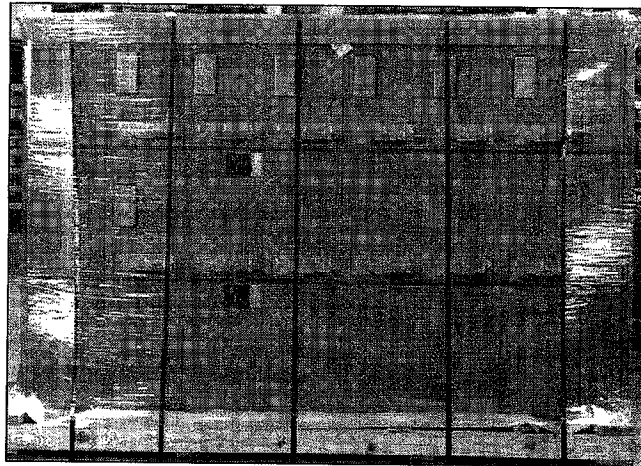
SECTION 3—RECEIVING, HANDLING, AND STORING THE MCC

MCCs are constructed in shipping blocks of up to three vertical sections. This allows for ease of handling during transportation and installation. The main horizontal bus of all shipping blocks will be spliced together at the job site with the use of captive horizontal splice bars.

Before shipment from the factory, the MCC is inspected visually, electrically, and mechanically by professional quality control analysts. Certification of quality control testing is available upon request.

After leaving Quality Control, each shipping block is carefully packaged and attached to a skid (see Figure 1).

Figure 1: Packaged Motor Control Center



Receiving the MCC

Inspect the MCC for damage as soon as it is received. Delivery of the equipment to a carrier at any of the Schneider Electric plants or other shipping point constitutes delivery to the purchaser. Title and all risk of loss or damage in transit shall pass to the purchaser at that time. Refer to the Schneider Electric Conditions of Sale for more details. All claims for loss and damage must be made by the purchaser to the carrier.

If the packaging material is removed, replace it for protection until the MCC is installed.

Handling the MCC

▲ WARNING

HAZARD OF BODILY INJURY OR EQUIPMENT DAMAGE

- Use extreme caution when moving sections. The MCC has a high center of gravity, which may cause it to tilt.
- Do not attempt to lift or attach lifting means to sections equipped with pull boxes.

Failure to follow this instruction can result in death or serious injury.

Equipment Needed

Adequate equipment, such as a fork truck, crane, or rods and pipe rollers, must be available for handling MCCs. Table 2 lists the approximate shipping weights of sections equipped with typical units.

Table 2: Approximate MCC Shipping Weights

Enclosure Type	Depth	One Section	Two Sections	Three Sections
NEMA 1, 1A, 12	15 in. (381 mm)	600 lb (272 kg)	1200 lb (544 kg)	1800 lb (816 kg)
NEMA 3R Non-Walk-In	15 in. (381 mm) (26.6 in. / 676 mm overall)	900 lb (408 kg)	1800 lb (816 kg)	2700 lb (1225 kg)
NEMA 1, 1A, 12	20 in. (508 mm)	750 lb (340 kg)	1500 lb (680 kg)	2250 lb (1021 kg)
NEMA 3R Non-Walk-In	20 in. (508 mm) (31.6 in. / 803 mm overall)	1050 lb (476 kg)	2100 lb (953 kg)	3150 lb (1429 kg)

Moving the MCC

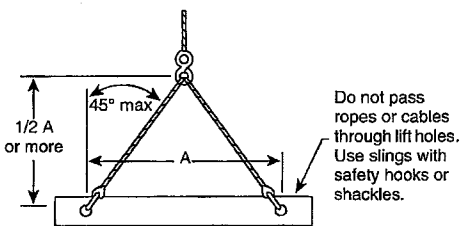
As shown in Table 2, weights vary by enclosure type and depth. To minimize the risk of injury and equipment damage while moving the MCC, follow these guidelines:

- Use caution when moving heavy equipment.
- Verify that the moving equipment is rated to handle the weight.
- Fork trucks, when available, provide a convenient method of moving MCCs (see Figure 2). When removing an MCC from a shipping pallet, carefully balance and secure it using a safety strap.

Figure 2: Moving the MCC with a Fork Truck



Figure 3: Proper Use of a Sling to Lift MCC



- Each shipping block has lifting angles for handling the MCC with overhead cranes. Take the following precautions when using a crane:
 - a. Handle MCCs in the upright position only.
 - b. Select rigging lengths to compensate for any unequal weight distribution.
 - c. Do not exceed the 45° maximum angle between the vertical and lifting cables (see Figure 3).
 - d. Use only slings with safety hooks or shackles. Do not pass ropes or cables through the holes in the lifting angle.

After the shipping section is in place, its lifting angle may be removed and discarded. To prevent the entrance of foreign materials, replace all hardware that secured the lifting angle.

NOTE: Do not attempt to lift or attach lifting means to sections equipped with pull boxes.

Storing the MCC

▲ CAUTION

EQUIPMENT DAMAGE HAZARD

Never store MCCs outdoors. Outdoor storage is inadequate, even with the protection of a tarpaulin.

Failure to follow this instruction can result in equipment damage.

If the MCC cannot be placed into service upon receipt, store it in a clean, dry, ventilated building free from temperature extremes. Acceptable storage temperatures are from 0 °C (32 °F) to 40 °C (104 °F).

If the storage area is cool and/or damp, provide enough heat to prevent condensation inside the MCC. Contact your Schneider Electric field sales representative for specific requirements.

SECTION 4—INSTALLING THE MCC

This section explains how to locate, install, and join Model 6 MCC enclosures, and how to splice power and ground bus. For information related to removing and installing existing and new units, see "Section 10—Expansion" on page 82, or the information included with the shipment of the new device.

Locating the MCC

▲ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- When moving MCC sections, follow the instructions in "Handling the MCC" on page 11. The MCC has a high center of gravity, which may cause it to tilt.

Failure to follow this instruction will result in death or serious injury.

MCCs are designed for use in non-hazardous locations. Choose a location for installation that is well ventilated and free from excess humidity, dust, and dirt. The temperature of the area should be no less than 0 °C (32 °F) and no greater than 40 °C (104 °F). Protect the enclosure from the entrance of water or any moisture.

Space Requirements

Install MCCs in an area with a minimum of 3 ft. (914 mm) of free space in front of front-of-board construction. An additional 3 ft. (914 mm) is necessary in the rear of back-to-back construction. This free space provides adequate room to remove and install units. (More space may be required for some applications; refer to applicable local and national standards.) Provide at least 0.5 in. (13 mm) of space between the back of front-of-board MCCs and a wall. For damp locations, provide at least 6 in. (152 mm).

When selecting a location for the installation of an MCC, carefully consider accessibility, overhead clearances, and future expansions. Considering these factors will eliminate many difficulties during this and future MCC installations.

Aligning the MCC

MCCs are assembled in the factory on a smooth, level surface to ensure proper alignment of all sections. A similar smooth, level surface should be provided for installation. An uneven foundation may cause misalignment of shipping blocks, units, and doors. The surface under an MCC must be of a non-combustible material, unless bottom plates are installed in each vertical section.

Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections

Before positioning the MCC sections (see Figure 4 on page 15), check for damaged bus bars and insulators. If the bus is bent or insulators are broken, do not install the MCC. Report any damage to the carrier.

- NOTES:**
- A joining hardware kit is bagged and tied to the right front corner channel of each shipping split. Captive splice bars are pre-assembled on the horizontal bus on the left side of each shipping split.
 - For gasket installation instructions, see "Splice Gaskets for NEMA 1 Gasketed and NEMA 12 Enclosures" on page 22 before joining sections.

Positioning the MCC

To mount and splice a new MCC section to an existing Model 6 section, or to join factory shipping splits, follow these steps:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the upper and lower horizontal wire trough covers in all sections, providing access to each section's front splicing bolts (see Figure 4b).

Figure 4: Motor Control Center Views

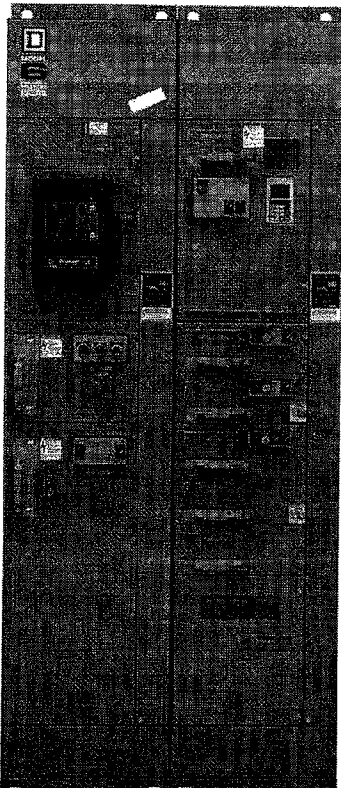


Figure 4a: All Covers in Place

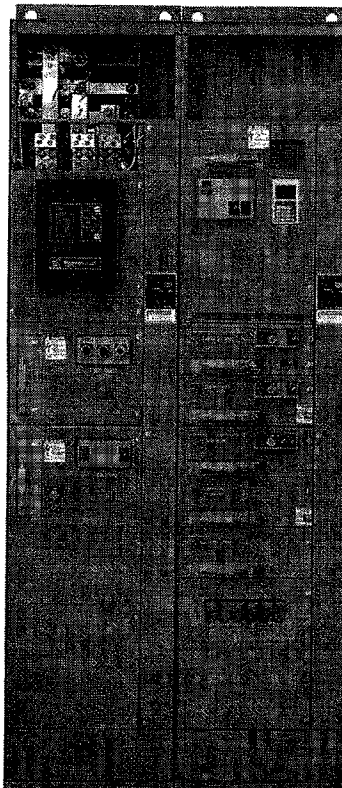


Figure 4b: Upper Horizontal Wire Trough Covers Removed

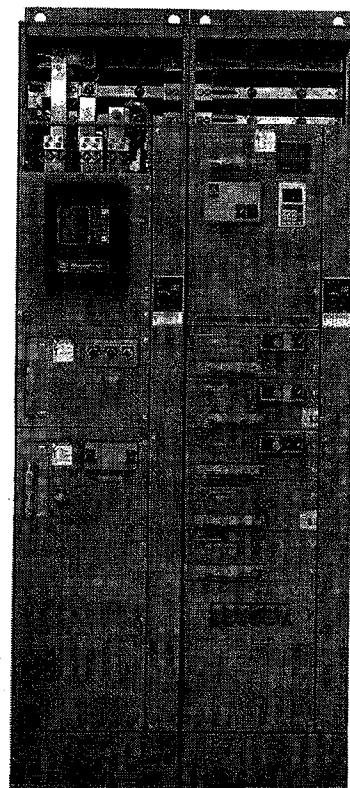
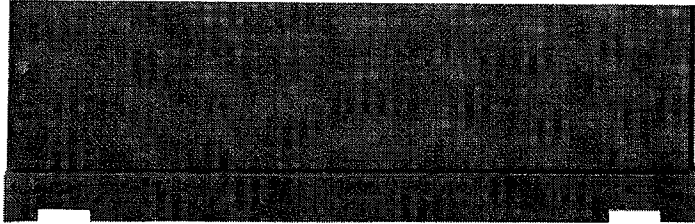


Figure 4c: Two-piece Bus Barriers Removed (splice connection made)

3. To gain access to each section's rear splicing bolts, slide the panels of the two-piece bus barriers (see Figure 4b) in the sections adjacent to a splice connection (the left and right sections).
4. Make provisions for fastening the structure(s) to the floor. See pages 16, 19, and 20 for fastener locations.
5. Supporting the MCC by its base channels and/or lifting angles, lift it into place. The front edges of the base channels must be aligned to form a continuous front.
6. Using the notches in the base channels, gradually move the sections into alignment with a crowbar (see Figure 5).

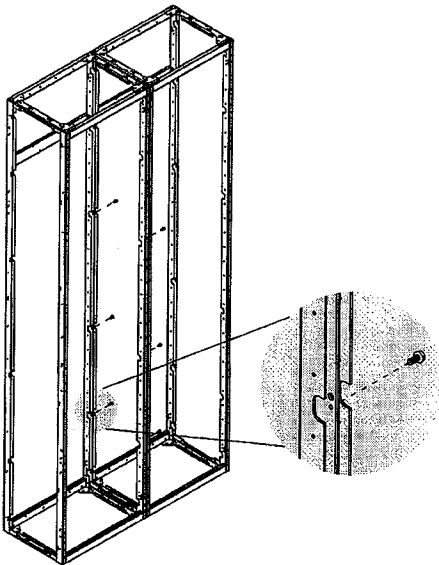
NOTE: Use caution when moving MCC sections, as they are top heavy. See "Handling the MCC" on page 11 before moving the MCC.

Figure 5: Base Channel Notches



Joining Corner Channels

Figure 6: Bolting Sections Together



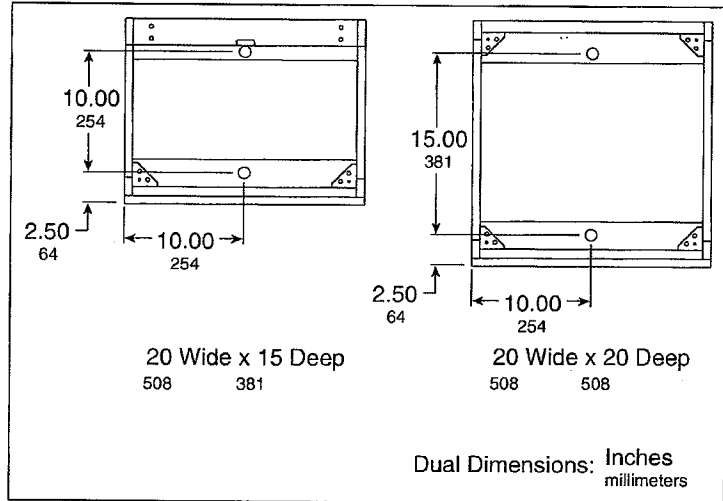
1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Open the wire trough door on the left section. Remove the section joining hardware kit that is bagged and tied to the right front corner channel.
3. Locate the six rectangular notches on the inside surface of the corner channels (see Figure 6).
4. Using six of the 3/4 in. x 1/4-20 hex head thread-forming screws supplied in the hardware kit, join the front vertical corner channels. To do so, insert the screws through the clearance holes located within the rectangular notches and into the mating thread-forming hole. Insert the screws from either the left or right, depending on ease of access to the holes according to equipment configuration; either side will join properly.
5. Repeat Steps 3 and 4 for connecting rear corner channels.

Securing Structures to the Floor

Fasten each section to the floor (see Figure 7) using 3/4 in. or 1/2 in. grade 5 or higher bolts and flat washers (furnished by the installer). 0.88 in. (22 mm) diameter base channel mounting holes provide clearance for bolt expansion anchors for 1/2 in. bolts.

NOTE: Although sections are free-standing, floor fastening prevents movement, thereby preventing conduit connection damage.

Figure 7: Standard Base Channel Mounting



Seismic Certification of Model 6 Motor Control Centers

Model 6 Motor Control Centers that are seismically certified have been qualified to the site-specific seismic requirements of the listed model building codes and/or standards. Optional construction features may be required, depending on the location of the installation and the particular code and/or standard of interest. Seismic certificates of compliance and equipment labels are provided with all seismically certified MCCs. To maintain the validity of this certification, the installation instructions provided in this section must be followed.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, Model 6 Motor Control Centers are considered nonstructural building components. Equipment capacity was determined from tri-axial seismic shake table test results as defined in the International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

Unless otherwise indicated, an equipment importance factor of 1.5 ($I_p = 1.5$) was used, indicating that equipment functionality was verified before and after shaker table seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority.

AC156 is published by the ICC ES and has been recognized by the Building Seismic Safety Council (BSSC) as an appropriate methodology in the 2003 National Earthquake Hazard Reduction Program (NEHRP) commentary. The National Institute of Building Sciences established the BSSC in 1979 to develop and promote regulatory provisions for earthquake risk mitigation at the national level.

Incoming and outgoing cable and conduit must also be considered as related but independent systems. They must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, bottom entry and/or exit of cable and conduit is preferred.

If the spectral acceleration value (S_g as defined by the International Building Code or NFPA 5000) is in excess of 2.67g (such as the New Madrid seismic area), then the equipment must also be braced at the top using a lateral restraint system. A lateral restraint system is also required in situations where horizontal motion at the top of the MCC is not be desirable (such as applications where top entry and/or exit of conduit are used). This system must be capable of transferring the loads created to the load-bearing path of the building structural system.

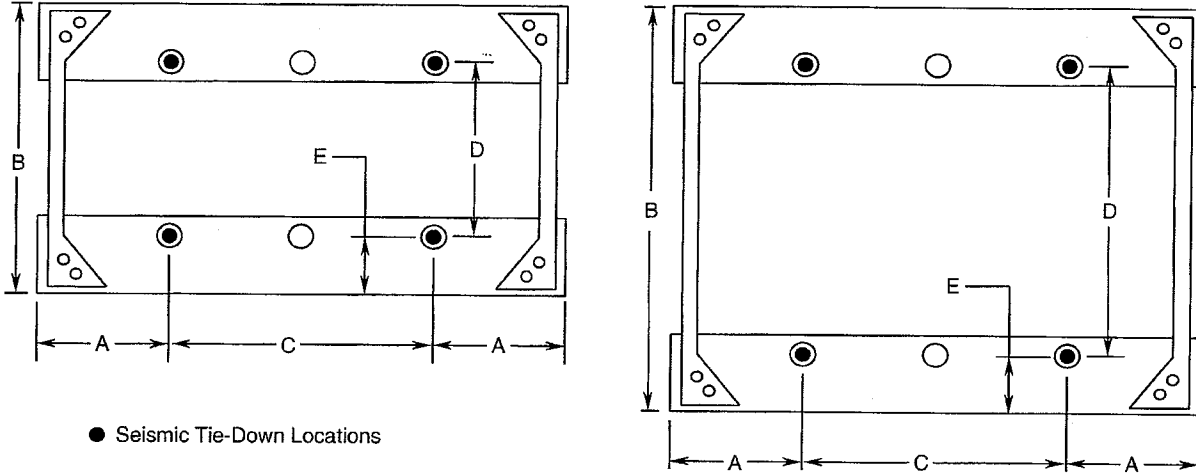
Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event, the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system.

The structural civil engineer or design engineer of record is responsible for detailing the equipment connection and anchorage requirements (including the lateral restraint system if appropriate) for the given installation. The installer and manufacturers of the anchorage and lateral restraint system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of these systems.

Securing Structures to Floor—Seismic Hazard¹
Designated Locations

Each section must be anchored per detail supplied by engineer of record to the load-bearing path of the building structural system. For floor mounting locations see Figure 8 (NEMA 1, 1A, and 12 enclosures) or Figure 9 on page 20 (NEMA 3R enclosures). Use 0.50 in. or 0.75 in. grade 5 or higher bolts (furnished by others) and Belleville washers (furnished by Schneider Electric). Torque bolts to the value specified by the manufacturer of the anchor.

Figure 8: NEMA 1, 1A, and 12 Seismic Tie-Down Locations



Dimension Tables
Section Dimensions A-B & D-E

Letter	Dim
A	5
B	15
D	9.98
E	2.5

Section Width	C-Dimension
20	10
25	15
30	20
35	25

Dimension Tables
Section Dimensions A-B & D-E

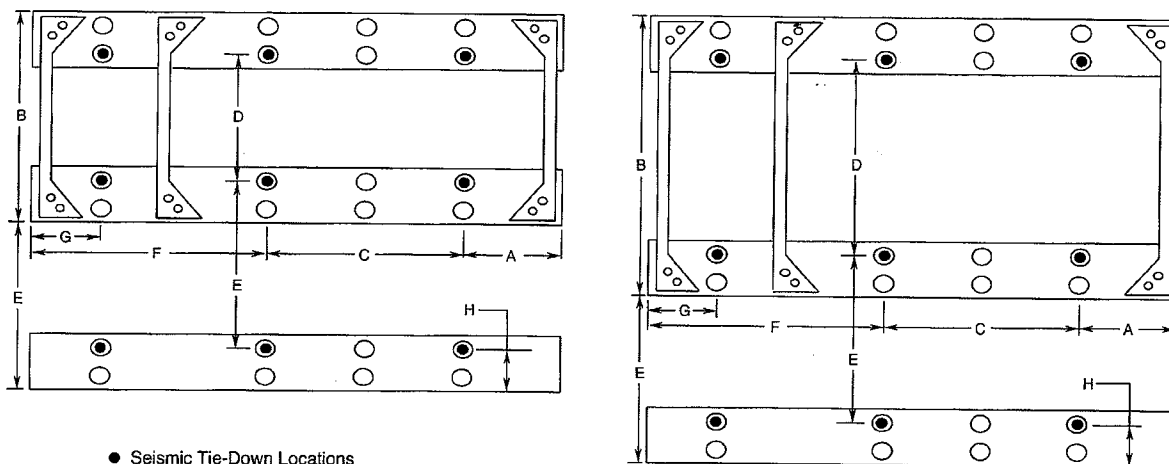
Letter	Dim
A	5
B	20
D	14.98
E	2.5

Section Width	C-Dimension
20	10
25	15
30	20
35	25

NOTE: The dimensions shown are tie-down locations within individual MCC sections. Refer to factory supplied drawings to determine appropriate anchor locations for the equipment pad.

¹ Seismic hazard for site specific locations as defined by the current edition of the International Building Code or NFPA 5000 or relevant local building code or consulting engineer of record.

Figure 9: NEMA 3R Seismic Tie-Down Locations



● Seismic Tie-Down Locations

Dimension Tables

Section Dimensions A-B & D-H

Letter	Dim
A	5
B	15
D	9.98
E	11.6
F	12.5
G	5
H	3.6

Section Width	C-Dimension
20	10
25	15
30	20
35	25

Dimension Tables

Section Dimensions A-B & D-H

Letter	Dim
A	5
B	20
D	14.98
E	11.6
F	12.5
G	5
H	3.6

Section Width	C-Dimension
20	10
25	15
30	20
35	25

NOTE: The dimensions shown are tie-down locations within individual MCC sections. Refer to factory supplied drawings to determine appropriate anchor locations for the equipment pad.

Securing Structures to Wall—Seismic Hazard¹
Designated Locations

When specified or required for the application (all seismic hazard areas with S_s in excess of 2.67g), each section must be laterally braced at the top (bracing supplied by others) and connected to the load-bearing path of the building system per detail supplied by engineer of record. Refer to the current International Building Code or NFPA 5000 for location specific values of S_s .

¹ Seismic hazard for site specific locations as defined by the current edition of the International Building Code or NFPA 5000 or relevant local building code or consulting engineer of record.

⚠ DANGER

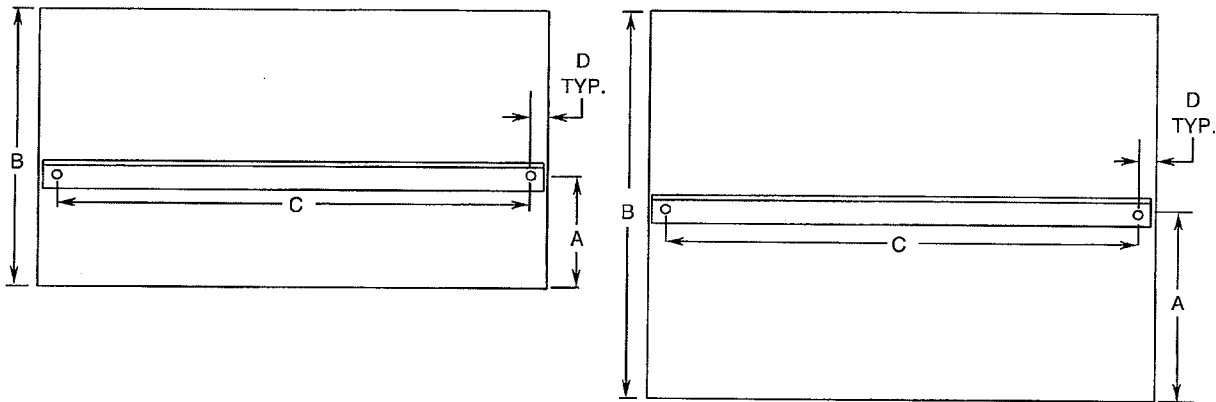
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off power supplying equipment before installing lateral bracing.
- Bolts must not penetrate top plate by more than 0.50 in.

Failure to follow this instruction will result in death or serious injury.

Remove the lifting angle and fasten each section to the lateral restraint system using the same attachment points used to secure the lifting angle. Re-use bolts [3/8 (.375 in.) by 7/8 (.875 in.) long #16 thread] and lock washer (.094 in. thick) supplied with the lifting angle or hardware supplied by others as appropriate. Pay particular attention to the limitation on the depth the bolt can penetrate below the surface of the top plate. The bolts must not penetrate the top plate of the enclosure by more than 0.50 in.

Figure 10: Attachment Locations for Top Lateral Bracing



Dimension Tables
Section Dimensions A, B, & D

Letter	Dim
A	5.25
B	15
D	0.8

Section Width	C-Dimension
20	18.4
25	23.4
30	28.4
35	33.4

Dimension Tables
Section Dimensions A, B, & D

Letter	Dim
A	10.25
B	20
D	0.8

Section Width	C-Dimension
20	18.4
25	23.4
30	28.4
35	33.4

NOTE: The dimensions shown are for locating top lateral bracing locations within individual MCC sections. Refer to factory supplied drawings to determine appropriate anchor locations for the top lateral brace support system.

**Splice Gaskets for NEMA 1 Gasketed and
NEMA 12 Enclosures**

⚠ DANGER

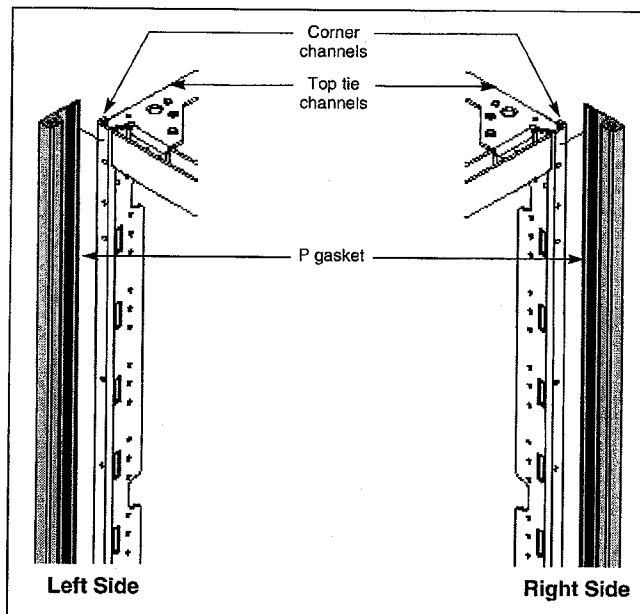
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying the equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- When moving MCC sections, follow the instructions in "Handling the MCC" on page 11. The MCC has a high center of gravity, which may cause it to tilt.

Failure to follow this instruction will result in death or serious injury.

When splicing to an existing MCC, refer to Figure 11. If P gasket is not installed, follow the instructions in "Splicing With No P Gasketing" on page 23. If P gasket is installed, follow the instructions in "Splicing With P Gasketing" on page 23.

Figure 11: P Gasketing



Splicing With No P Gasketing

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. If splicing to an existing MCC, remove the end plate and any gasketing from the existing MCC.
3. Remove the white paper backing from the new gaskets to expose the adhesive. This adhesive temporarily holds the gaskets in place while the sections are being positioned.
4. Apply P gaskets to the outside of the front and rear vertical corner channels (see Figure 11 on page 22). The gaskets should not extend above the top of the corner channels.
5. Apply flat gaskets to the outside of the top and bottom tie channels. The gaskets should not extend above the top of the tie channels.
6. Applying thumb pressure, firmly press the gaskets in place from top to bottom. Verify that the gaskets are flat along the entire length.
7. Join sections together following the appropriate steps in "Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections" on page 15.

NOTE: When new sections will be added to left side of existing line-up, follow Steps 1, 2, and 7 only.

Splicing With P Gasketing

Determine the location of the existing P gasket before splicing. If the P gasket is on the left (see Figure 11 on page 22), follow the instructions "Splice to Existing Left". If the P gasket is on the right (see Figure 11 on page 22), follow the instructions "Splice to Existing Right".

Splice to Existing Left

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the end plate and all flat gaskets from the existing MCC. Leave the P gasket on the existing front corner channel in place.
3. Remove the factory installed flat gasket from the front corner channel of the new vertical section.
4. Join sections together following the appropriate steps in "Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections" on page 15.

Splice to Existing Right

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the end plate and all flat gaskets from the existing MCC. The P gasket on the existing front corner channel should be left in place.
3. Remove the white paper backing from the new gaskets to expose the adhesive. This adhesive temporarily holds the gasket in place while the sections are being positioned.
4. Apply a P gasket to the outside of the rear vertical corner channel (see Figure 11 on page 22). The gasket should not extend above the top of the corner channel. Retain the extra P gasket for future use.
5. Apply flat gaskets to the outside of the top and bottom tie channels. The gaskets should not extend above the top of the tie channels.
6. Applying thumb pressure, firmly press the gasket in place from top to bottom. Ensure that the gasket is flat along the entire length.
7. Join sections together following the appropriate steps in "Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections" on page 15.

Joining New Style NEMA 3R Enclosures to Old Style NEMA 3R Enclosures

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

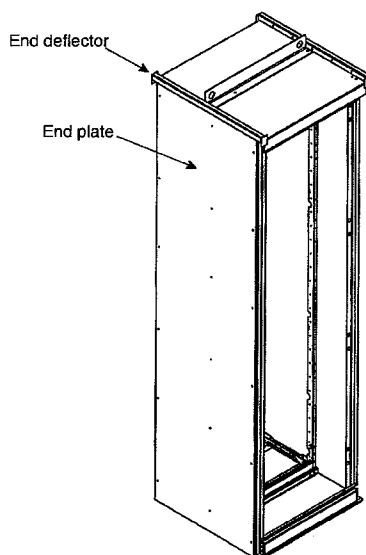
This section provides instructions for joining new style NEMA 3R enclosures manufactured after February 1998 to old style NEMA 3R enclosures manufactured before February 1998 (the new MCC enclosure is three inches shorter than the existing MCC). Instructions for joining to the left or right of an existing MCC enclosure (as viewed from the front) are provided in this bulletin.

For all MCCs in NEMA 3R enclosures, the parts required for joining the enclosures are included in a kit. This kit is shipped with the MCC order and contains all the parts necessary to join the enclosures.

NOTE: All NEMA 3R sections manufactured after February 1998 measure approximately 93 in. from the bottom of the section to the top of the deflector.

Joining to the Left Side of an Existing NEMA 3R
MCC Enclosure.

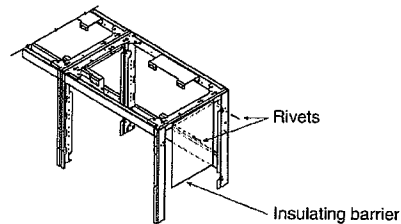
Figure 12: Removing the End Deflector



1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the end deflector (see Figure 12) from the leftmost section of the existing MCC and the end deflector, if supplied, from the rightmost section of the MCC being added. Discard both end deflectors. Retain the hardware for installation of new parts.
3. Remove the back plate from the leftmost section of the existing MCC and also from the rightmost section of the MCC being added. Retain the back plates and mounting hardware for re-installation.
4. Remove the end plate (see Figure 12) from the leftmost section of the existing MCC and the end plate, if supplied, from the rightmost section of the MCC being added. Discard both end plates. Retain the hardware for installation of new parts.
5. Remove the insulating barrier (see Figure 13 on page 25) from the leftmost section of the existing MCC by punching out the rivets that are holding the barrier in place. Repeat this procedure for the barrier, if supplied, in the rightmost section of the MCC being added. Discard both barriers.

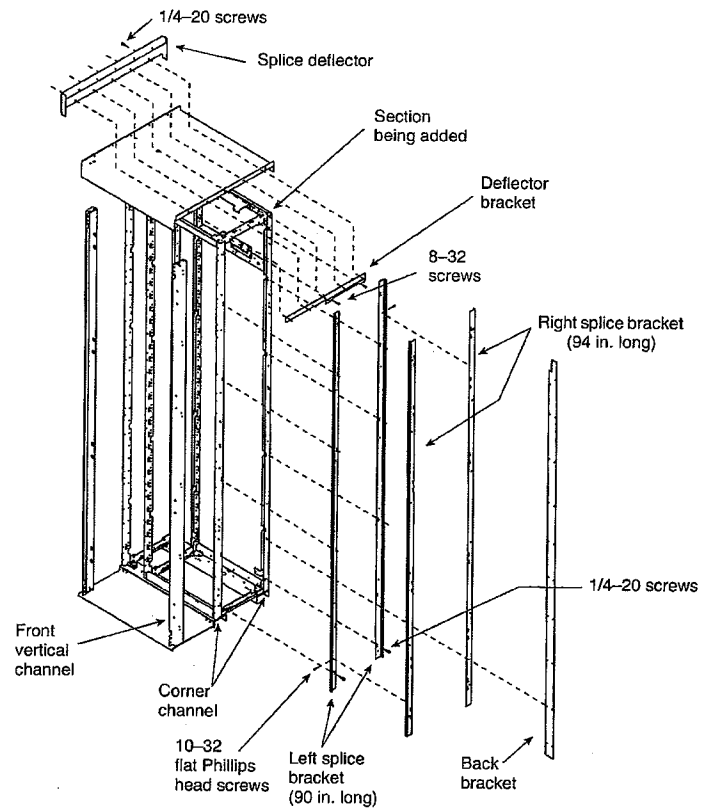
NOTE: Ensure that rivet parts do not fall into the MCC.

Figure 13: Removing the Insulating Barrier



6. Install the deflector bracket (see Figure 14) on the rightmost section of the MCC being added using two 8-32 Phillips head screws included in the kit. The same holes from which the rivets were removed will be used to mount the deflector bracket. Ensure that the top holes of the bracket align with the holes in the top plate of the enclosure.

Figure 14: Installing the Deflector Bracket

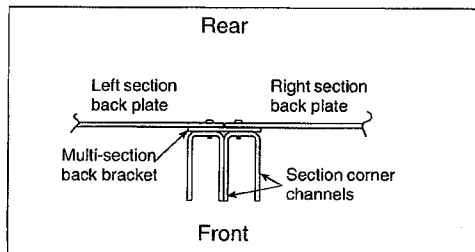


7. Attach a left splice bracket (see Figure 14), 90 inches long, to the front corner channel of the rightmost section of the MCC being added using six 1/4-20 screws contained in the kit. Ensure that the short flange is flush with the front of the corner channel and that the holes in the bracket line up with the holes in the corner channel.

8. Install a left splice bracket (see Figure 14 on page 25), 90 inches long, to the rear corner channel of the rightmost section of the MCC being added using six 1/4–20 screws contained in the kit. Ensure that the short flange is flush with the back of the corner channel and that the holes in the bracket line up with the holes in the corner channel.
9. Attach a right splice bracket (see Figure 14), 94 inches long, to the left splice bracket installed in Step 7 using six 10–32 flat Phillips head screws contained in the kit. Ensure that the short flange is behind the flange of the left splice bracket. The right splice bracket will extend below the left splice bracket by approximately one inch when properly installed.
10. Install a right splice bracket (see Figure 14), 94 inches long, to the left splice bracket installed in Step 8 using six 10–32 flat Phillips head screws contained in the kit. Ensure that the short flange is in front of the flange of the left splice bracket. The right splice bracket will extend below the left splice bracket by approximately one inch when properly installed.
11. Position the structures that are to be spliced. Check that the fronts are flush to ensure proper alignment of all components.
12. Splice sections using the instructions in the Model 5 Instruction Bulletin (8998IM9101R5/92) if joining to a Model 5 MCC, or the instructions on page 22 of this instruction bulletin if joining to a Model 6 MCC.

NOTE: When splicing the horizontal bus between the new and existing MCC sections, remove the splice bars contained in the leftmost section of the existing MCC. Discard the splice bars. Install the horizontal bus splice assembly provided in this kit using the instructions in the Model 5 or Model 6 Instruction Bulletin. Use the remaining six 1/4–20 hex head screws provided in the kit to splice the corner channels of the existing MCC to the right splice brackets installed in Steps 9 and 10.

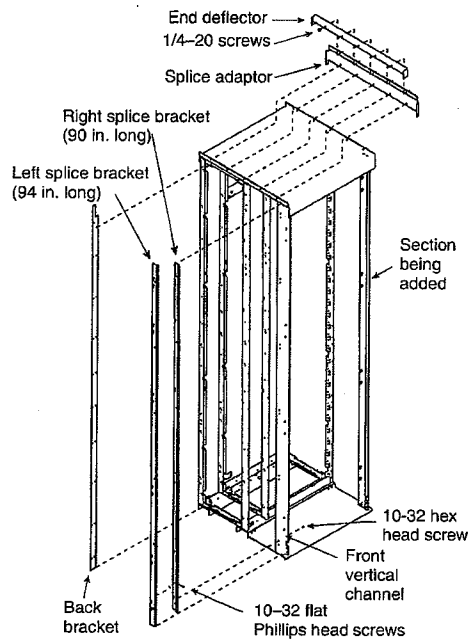
Figure 15: Re-attaching the Back Plates



13. Using the 10–32 hex head screws removed in Step 3, re-attach the back plate (see Figure 15) to the rightmost section of the new MCC. Install the back bracket (see Figure 14 on page 25) under the back plate using the left side holes of the back bracket. Ensure that the notch at the top of the back bracket is installed toward the new MCC section.
14. Using the 10–32 screws removed in Step 3, re-attach the back plate (see Figure 15) to the right section.
15. Install the splice deflector (see Figure 14 on page 25) to the rightmost section of the MCC being added. Use the five 1/4–20 screws supplied in the kit. Ensure that both top plate flanges are covered.
16. Install five of the 1/4–20 screws removed in Step 2 through the splice deflector and into the top plate of the leftmost section of the existing MCC.
17. Using the six 10–32 screws supplied in the kit, secure the right front vertical channel of the new NEMA Type 3R enclosure to the left front vertical channel of the existing NEMA Type 3R enclosure.
NOTE: Install the screws through the clearance holes in the left front vertical channel of the existing MCC into the right front vertical channel of the new MCC.
18. Before energizing the equipment, replace all covers and barriers.

Joining to the Right Side of an Existing NEMA 3R
MCC Enclosure

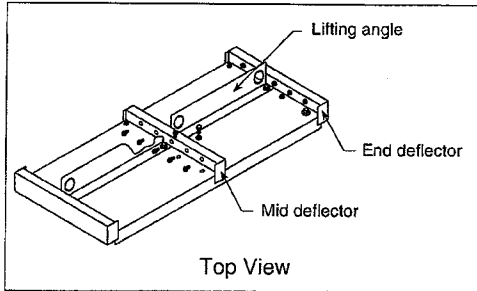
Figure 16: Installing the Splice Deflector



1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
 2. Remove the end deflector (see Figure 12 on page 24) from the rightmost section of the existing MCC and the end deflector, if supplied, from the leftmost section of the MCC being added. Retain hardware for use in Step 12. Discard both end deflectors.
 3. Remove the back plate from the rightmost section of the existing MCC and also from the leftmost section of the MCC being added. Retain the back plates and mounting hardware for re-installation.
 4. Remove the end plate (see Figure 12 on page 24) from the rightmost section of the existing MCC and the end plate, if supplied, from the leftmost section of the MCC being added. Discard both end plates.
 5. Remove the insulating barrier (see Figure 13 on page 25) from the rightmost section of the existing MCC by punching out the rivets that are holding the barrier in place. Repeat this procedure for the barrier, if provided, located in the leftmost section of the MCC being added. Discard both barriers.
- NOTE: Ensure that rivet parts do not fall into the MCC.*
6. Install the left splice bracket (see Figure 16), 94 inches long, to the right front vertical channel of the existing MCC. Use six 10-32 hex head screws provided in the kit. The long flange of the splice channel will mount to the side of the vertical channel with the short flange near the front of the vertical channel. When properly installed, the bottom of the left splice bracket will be flush with the bottom of the vertical channel.
 7. Install the right splice bracket (see Figure 16), 90 inches long, to the left splice bracket installed in Step 6 using six 10-32 flat Phillips head screws provided in the kit. Ensure that the short flange of the right splice bracket is in front of the flange of the left splice bracket. When properly installed, the left splice bracket will extend approximately one inch below the right splice bracket.
 8. Position the structures that are to be spliced together. Make sure that the fronts are flush. This ensures proper alignment of all components.
 9. Splice sections using the instructions in the Model 5 Instruction Bulletin (8998IM9101R5/92) if joining to a Model 5 MCC, or the instructions on page 22 of this instruction bulletin if joining to a Model 6 MCC. Use the 12 1/4-20 hex head screws provided in the kit to splice the corner channels of the existing MCC to the corner channels of the new MCC.
 10. Re-attach the back plate (see Figure 15 on page 26) to the leftmost section of the MCC being added by using the 10-32 hex head screws removed in Step 4. Install the back bracket (see Figure 16) under the back plate using the right side holes of the back bracket. Ensure that the notch at the top of the back bracket is installed toward the new MCC section.
 11. Using the hardware removed in Step 3, re-attach the back plate (see Figure 15 on page 26) to the rightmost section of the existing MCC.
 12. Install the splice adaptor (see Figure 16) to the leftmost section of the MCC being added by using five 1/4-20 screws provided in the kit.
 13. Next, position the end deflector, provided in the kit, over the top plate flanges of both sections (see Figure 16) and install with five 1/4-20 screws removed in Step 2.
 14. Using six 10-32 hex head screws, provided in the kit, secure the right front vertical channel of the MCC being added to the right splice bracket installed in Step 7 (see Figure 16).
 15. Before energizing the equipment, replace all covers and barriers.

Joining NEMA 3R Sections

Figure 17: Remove Mid and End Deflector Caps from the Top of the MCC



This section provides instructions for joining NEMA 3R MCC sections (manufactured after February 1998).

NOTE: All NEMA 3R sections manufactured after February 1998 are approximately 93 inches from the bottom of the section to the top of the deflector.

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the right section (see Figure 18) back plate.

NOTE: Steps 3 and 4 apply only if a new section is being added to an existing MCC line-up. If installing a new line-up, skip to Step 5.

3. Remove the end deflector cap from the right side of the existing NEMA 3R section (see Figure 17). Also, remove the mid deflector cap from the section being added to the right.
4. Remove the end closing plate from the right side of the existing section.
5. After placing the structures side-by-side, join them as described in "Joining NEMA 1/ NEMA 1 Gasketed/ NEMA 12 Sections" on page 15.
6. Re-attach the back plate (removed in Step 2) to the right section using the additional hardware supplied. Attach the right side to the multi-section bracket (see Figure 18).
7. Install the mid deflector, ensuring both top plate flanges are covered (see Figure 17).
8. Using the six 10-32 screws supplied, secure the left front vertical channel of the NEMA 3R extension to the right front vertical channel of the NEMA 3R extension (see Figure 19).
9. If the lifting angle is to be removed from the sections after installation, replace all hardware in the order shown (see Figure 20).

Figure 18: Attach the Multi-section Bracket

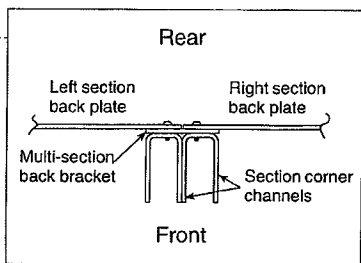


Figure 19: Secure the Vertical Channels

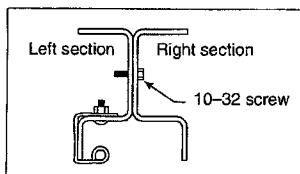
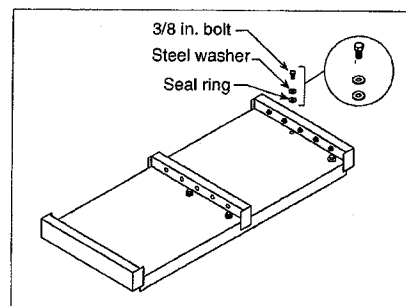


Figure 20: Replace Lifting Angle Hardware



Splicing Power Bus for NEMA 1 and NEMA 12 Enclosures

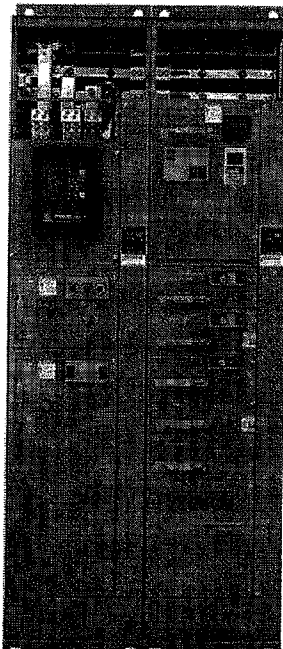
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 21: Horizontal Bus Covers and Bus Barriers Removed



Left Section Right Section

To splice the power bus, follow these steps:

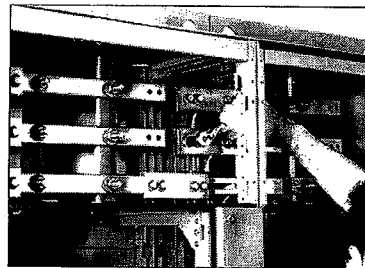
1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the horizontal bus covers and slide horizontal bus barriers from the left and right sections (see Figure 21).

NOTE: On the integral splice assembly, located on the left side of each phase bus, the number of bus links is one greater than the number of horizontal bus bars. This creates a sandwich splice. The rear-most splice link contains the captive nuts.

3. Remove the two left bolts. Loosen, but do not remove, the two right bolts on the splice assembly (see Figure 22).

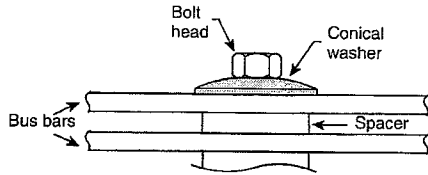
NOTE: Do not remove the two right bolts from the splice assemblies. Doing so will permit spacers to fall from the splice assembly. If this occurs, re-assemble the splice bars and spacers (if applicable) in the proper order before continuing.

Figure 22: Removing the Left Bolts and Loosening the Right Bolts on the Splice Assembly



4. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus on the left section (see Figure 24 on page 30).

Figure 23: Placing a Conical Washer Under the Bolt Head



5. Reinstall the two left bolts through the splice links and into the horizontal bus; make sure the original conical washers are reinstalled with the concave side facing the splice bus (see Figure 23 and Figure 25). Torque all bolts, on both ends, to 31–32 lb-ft (41.87–43.22 N•m).
6. Repeat Steps 2–5 for all phases and the neutral bus (if supplied).
7. Before energizing the equipment, slide horizontal bus barriers into closed position and replace all covers.

Figure 24: Aligning the Splice and Bus Holes

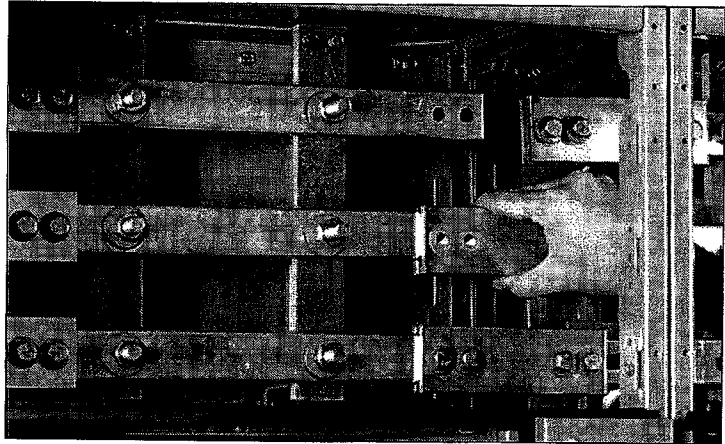
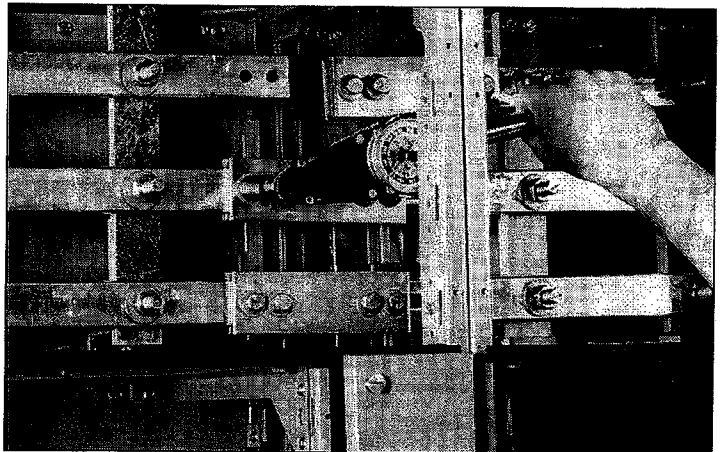


Figure 25: Torquing the Bolts



Splicing Power Bus in NEMA 3R Enclosures

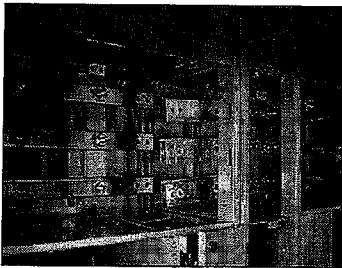
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 26: Bus Covers Removed and Horizontal Bus Barriers Open



This section describes how to splice the power bus of a NEMA 3R enclosure (manufactured after February 1998) to the power bus of another NEMA 3R section. Bus splicing material is not captive if the section is equipped with offset bus. Refer to bulletin 80453-649-01_ for instructions for splicing offset power bus in NEMA 3R enclosures.

To splice power bus, follow these steps.

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the horizontal bus covers from the left and right sections (see Figure 26). Slide horizontal bus barriers open.

NOTE: All splice connections have one more splice bar than the number of laminations of the horizontal bus. The rear-most splice bar contains captive nuts.

3. Remove the two left bolts from each splice assembly. Then loosen, but do not remove, the two right bolts of each splice assembly (see Figure 27). If the bus has optional 85,000 A bus bracing supplied (see Figure 28), also loosen the center nut of each splice assembly.

NOTE: Do not remove the two right bolts or the center bolt (if applicable) from the splice assemblies. Doing so will permit spacers to fall from the splice assembly. If this occurs, re-assemble the splice bars and spacers (if applicable) in the proper order before continuing.

4. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus in the left section (see Figure 29).

Figure 27: Loosen Bolts

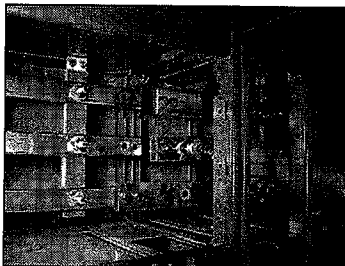


Figure 28: Optional 85,000 A Bus Bracing

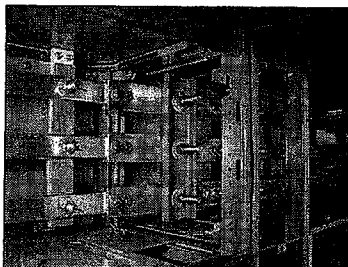


Figure 29: Slide the Splice Assembly to the Left

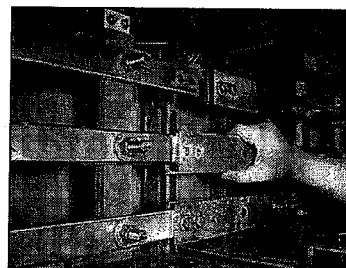
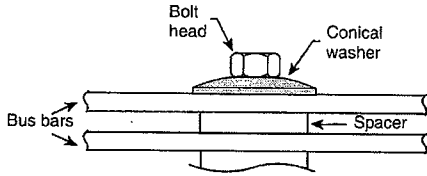
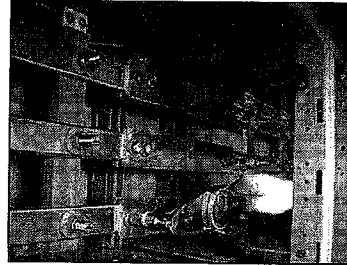


Figure 30: Place a Conical Washer Under the Bolt Head



5. Re-install the two left bolts through the splice assembly and into the horizontal bus. Make sure the original conical washers are re-installed with the concave side facing the splice bus (see Figure 30).
6. Torque the bolts to 31–32 lb-ft (41.87–43.22 N•m) (see Figure 31). If the optional 85,000 A bus bracing is supplied, torque the center nut to 70 lb-ft (94.92 N•m).

Figure 31: Torque All Bolts



7. Repeat Steps 2–6 for all phases and the neutral bus (if supplied).
8. Before energizing the equipment, replace all covers and barriers.

Ground Bus Splicing for NEMA 1, NEMA 12, and NEMA 3R

Figure 32: Ground Splice Bar as Shipped

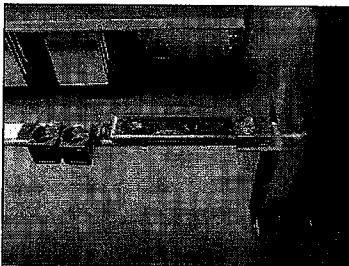


Figure 33: Ground Bar Bolt Replaced



⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

To splice the ground bus, follow these steps:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove ground bar bolts from the right and left sections (see Figure 32).
3. Slide the ground splice bar into the right section, aligning the mounting holes (see Figure 33).
4. Replace the ground bar bolts (see Figure 33) in the right and left sections. Torque both bolts to 60–75 lb-in (6.75–8.44 N•m).
5. Replace all covers and barriers and close all doors.

Power Bus Splicing of Two-Inch Bus with 100,000 Ampere Short Circuit

This section provides instructions for splicing the power bus of one NEMA 1 or NEMA 12 section with two-inch bus braced for 100,000 A to the power bus of another section of the same type. Splicing material is captive on the integral splice assembly unless the section is equipped with offset bus.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

To splice the power bus, follow these steps:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the horizontal bus covers from the left and right sections (see Figure 21 on page 29).

NOTE: The integral splice assembly, located on the left side of each phase bus, creates a sandwich splice. The rear of the splice housing contains the captive nuts.

3. Remove all four bolts from each splice assembly (see Figure 34).
4. Slide the splice assembly to the left until the two left holes are in line with the corresponding holes in the horizontal bus on the left section (see Figure 35).

Figure 34: Removing the Bolts from the Splice Assembly



Figure 35: Aligning the Splice and Bus Holes

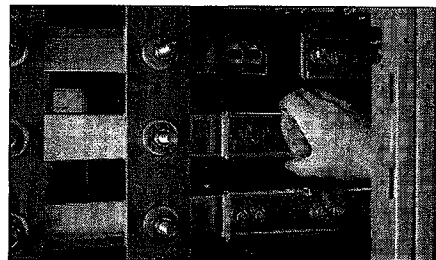
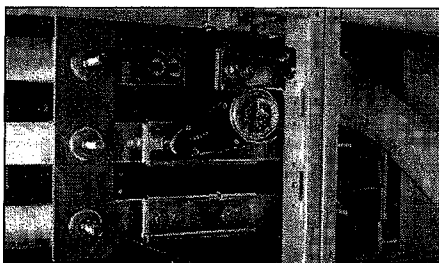


Figure 36: Torquing the Bolts



5. Reinstall all four bolts through the splice assembly and into the horizontal bus; make sure the original conical washers are reinstalled with the concave side facing the splice bus (see Figure 30 on page 32).
6. Torque all bolts, on both ends, to 31–32 lb-ft (41.87–43.22 N•m). See Figure 25.
7. Repeat Steps 2–6 for all phases and the neutral bus (if supplied).
8. Before energizing the equipment, replace all covers and barriers.

Splicing Offset Horizontal Bus (Left Side of Structure Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

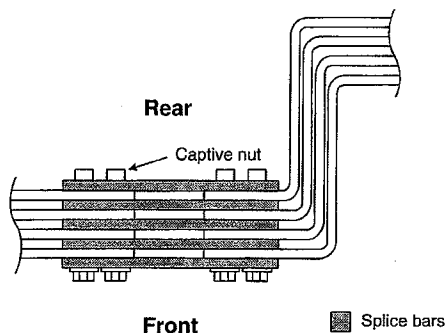
Failure to follow this instruction will result in death or serious injury.

NOTE: In all structures with an offset horizontal bus, splice bars are provided as a kit. This kit is packaged in a carton and shipped inside the structure. The kit contains all splice bars and mounting hardware necessary for horizontal bus splicing.

Use the splice kit only if splicing is to be done on the left (while facing the structure). If the splice is not on the left, remove the kit before energizing and retain it for future expansion. If a structure is to be spliced to another structure on the right, follow splicing instructions provided for that structure application.

NOTE: All splice connections have one more splice bar than the number of horizontal bus bars. The rear-most splice bar contains captive nuts.

Figure 37: Splicing Offset Horizontal Bus



To splice a horizontal bus on the left side of the structure, follow these steps:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Join sections together following the appropriate steps beginning at "Locating the MCC" on page 14 and continuing through page 28. This provides proper alignment of the horizontal bus.
3. Position the rear splice bar (bar with captive nuts; see Figure 37) against the back face of the rear horizontal bus bar.
4. Install a plain splice bar between each lamination of horizontal bus; install the last bar against the front face of the horizontal bus (see Figure 37).
5. Align the four mounting holes in the splice bus and the horizontal bus.
6. Re-install the two left bolts through the splice assembly and into the horizontal bus. Make sure the original conical washers are re-installed with the concave side facing the splice bus (see Figure 30 on page 32). Torque these bolts to 31–32 lb-ft (41.87–43.22 N•m) (see Figure 37). If the optional 85,000 A bus bracing is supplied, torque the center nut to 70 lb-ft (94.92 N•m).
7. Repeat Steps 2–6 for each of the three horizontal bus phases.
8. Before energizing the equipment, replace all covers and barriers.

Conductor Entry

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Conduit entry space is provided at the top and bottom of the MCC structure. The top plates (and closing plates in bottom, if present) are removable for convenience in wiring and cutting conduit openings). A hinged door allows access to the main lug, main circuit breaker, or main switch compartment. In some cases, the horizontal wire trough cover must be removed.

Pullboxes are available if additional wiring space is required.

Cable connection torque values are listed in Table 3 and Table 4 on page 40.

Vent Hood Installation for Motor Control Centers with 2500 A Horizontal Bus

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Do not drill or cut in the top area of the motor control center.
- Avoid contaminating the motor control center with dust or debris.
- **DO NOT** lift the cabinet by the vent hood or by attaching lifting angles to the vent hood.

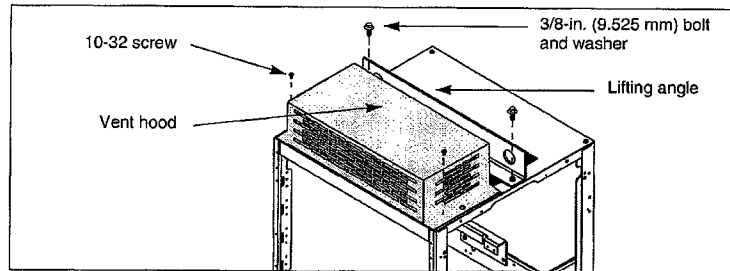
Failure to follow this instruction will result in death or serious injury.

This section contains instructions for installing a vent hood over the top plate vents on a motor control center (MCC) with 2500 A horizontal bus.

- NOTES:**
- *Do not install the vent hood until the MCC is in its final location.*
 - *Retain all hardware.*

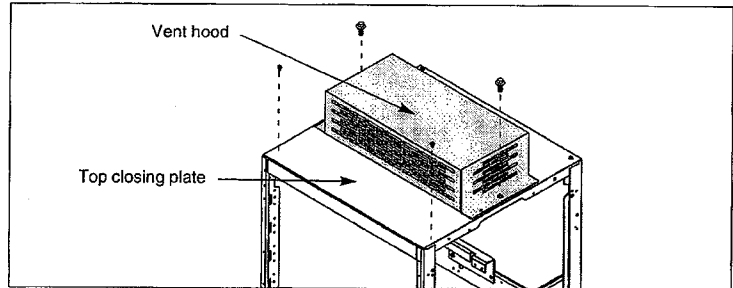
1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the 3/8-in. (9.525 mm) bolts, washers, and the lifting angle (see Figure 38).

Figure 38: Remove the Hardware



3. Remove the two 10-32 screws that secure the vent hood and closing plate to the top of the cabinet (see Figure 38).
4. Once the vent hood is removed, secure the top closing plate by reinstalling the 10-32 screws removed in Step 3 (see Figure 39).

Figure 39: Reposition and Attach the Vent Hood



5. Position the vent hood on the top of the cabinet as shown.
6. Secure the vent hood in place using the two 3/8-in. (9.525 mm) bolts and washers removed in Step 2. Torque the bolts to 28–33 lb-in (3.164–3.729 N•m).

Vented Pullbox Installation for MCCs with 2500 A Horizontal Bus

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside it.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Do not drill or cut in the top area of the motor control center.
- Avoid contaminating the motor control center with dust or debris.
- DO NOT lift the cabinet by the vent hood or by attaching lifting angles to the vent hood.

Failure to follow this instruction will result in death or serious injury.

This section contains instructions for installing a vented pullbox on a motor control center with 2500 A horizontal bus. Pullboxes are either 12 or 18 in. (304.8 or 457.2 mm) high and mount on the top of the MCC.

NOTES:

- Do not install the pullbox until the MCC is in its final location.
- Retain all hardware.

Figure 40: Remove the Hardware

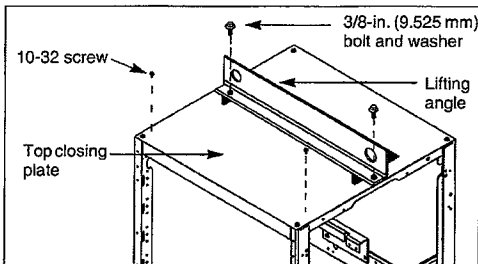
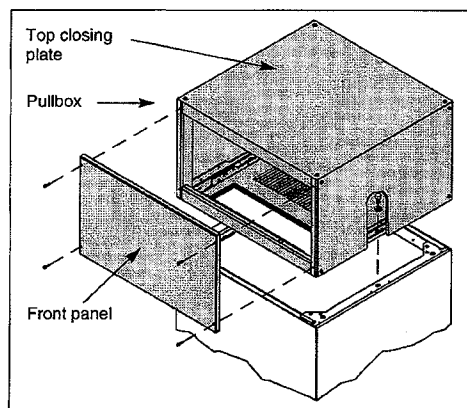


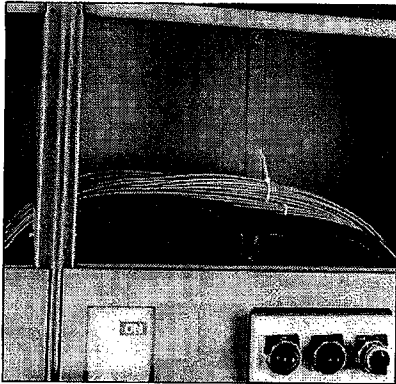
Figure 41: Install the Pullbox



1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm power is off.
2. Remove the 3/8-in. (9.525 mm) bolts, washers, and the lifting angle (see Figure 40).
3. Remove the two 10-32 screws that secure the top closing plate to the top of the cabinet (see Figure 40).
4. Remove the top closing plate from the structure.
5. Remove the front panel from the pullbox. Position the pullbox on top of the cabinet as shown in Figure 41.
6. Install the two 3/8-in. (9.525 mm) bolts and washers that were removed in Step 2. Place them through the pullbox lower side channels and into the top of the cabinet. Torque the bolts to 28–33 lb-in (3.164–3.729 N•m).
7. Re-install the pullbox front panel removed in Step 5 and the top closing plate removed in Step 4 (see Figure 41).

Load and Control Wiring

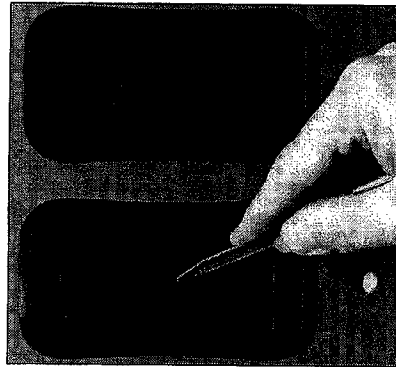
Figure 42: Wiring in the Top Horizontal Wire Trough



The top and bottom horizontal wire troughs and the vertical wire trough are convenient areas to run incoming line, load and control wires (see Figure 42). Openings between sections permit wire to pass from one section into the next for interwiring.

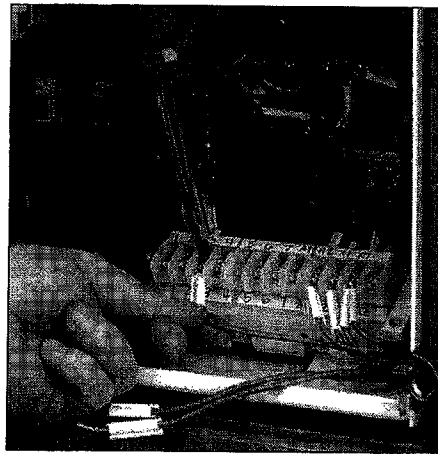
Control and power wires are routed to each unit via the vertical wire trough. When supplied, grommets wire ports must be opened to route wire to the unit. The H-shaped cut pattern is pre-scored for easy opening. Using a small knife, cut through the center tabs and complete the H-shaped slice (see Figure 43). When cutting, be sure not to damage the wires located near the grommet.

Figure 43: Vertical Wire Trough Grommet



Pull-apart control terminals (see Figure 44) are mounted on a 35 mm DIN-rail located adjacent to the wiring ports toward the front of the unit. Terminate field control wiring on the removable portion of the block.

Figure 44: Pull-apart Type Terminal Blocks



Crimp Lug Cable Assembly for Cabled Disconnect Unit Installation

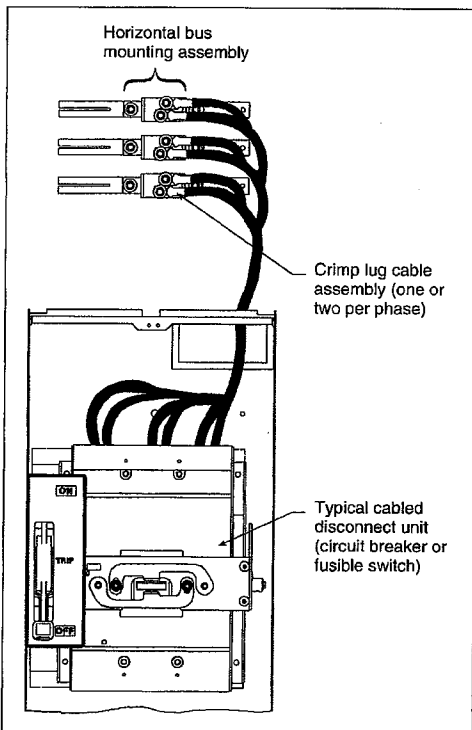
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

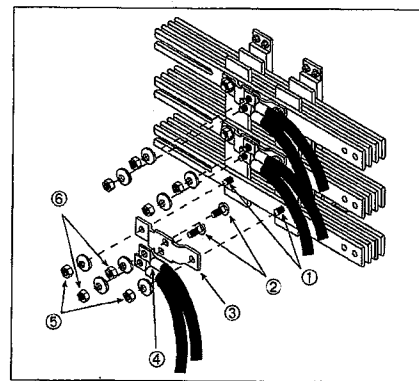
Failure to follow this instruction will result in death or serious injury.

Figure 45: Typical Cabled Disconnect Unit



1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Access the horizontal bus in the motor control center.
3. Remove the horizontal bus mounting nuts and washers (item ⑤) from the horizontal bus assembly.
4. Insert the loom bolts (item ②) through the rear of the lug pad (item ③).
5. Using the mounting nuts and washers from Step 3, attach the lug pad to the horizontal bus mounting bolts (item ①).
6. Torque the horizontal bus mounting nuts to 820–840 lb-in (93–95 N•m).
7. Route the cable to the circuit breaker or fuse disconnect unit; trim cable length as required.
8. Using the lug pad nuts and washers (item ⑥), attach the crimp lug cable assembly (item ④) to the loom bolts on the lug pad.
9. Torque the lug pad nuts to 820–840 lb-in (93–95 N•m).

Figure 46: Typical Horizontal Bus Assembly



- | | |
|---------------------------------|--|
| ① Horizontal bus mounting bolts | ④ Crimp lug cable assembly |
| ② Loom bolts | ⑤ Horizontal bus mounting nuts and washers |
| ③ Lug pad | ⑥ Lug pad nuts and washers |

Cable Connection Torque Values

The following tables provide main disconnect and branch feeder torque values, which apply to both aluminum and copper conductors.

Table 3: Connection Torque Values for Main Lug Compartments

Socket Size Across Flat	Torque
3/8 in.	375 lb-in. (42.21 N•m)
1/2 in.	600 lb-in. (67.79 N•m)

Table 4: Connection Torque Values for Main and Branch Feeders

Frame Size	Ampere Rating	Torque
H	15–30 A	50 lb-in. (5.00 N•m)
	35–150 A	120 lb-in. (14.00 N•m)
J	150–250 A	225 lb-in. (25.00 N•m)
FA	15–30 A	35 lb-in. (3.94 N•m)
	35–100 A	80 lb-in. (9.00 N•m)
FC	20–30 A	35 lb-in. (3.94 N•m)
	40–100 A	65 lb-in. (7.32 N•m)
KA	70–250 A	250 lb-in. (28.14 N•m)
KC	110–250 A	250 lb-in. (28.14 N•m)
LA/LH	125–400 A	200 lb-in. (22.51 N•m)
LC/LI/LE/LX/LXI	300–600 A	300 lb-in. (33.76 N•m)
MA/MH/ME/MX	200–400 A	300 lb-in. (33.76 N•m)
	450–1000 A	300 lb-in. (33.76 N•m)
NT	400–1200 A	600 lb-in. (67.51 N•m)
NW (top entry)	400–2500 A	600 lb-in. (67.51 N•m)
PA/PH/PE/PX	800–2000 A	300 lb-in. (33.76 N•m)

Component Instructional Information

Component manuals for devices such as adjustable frequency drive controllers, solid state reduced voltage starters, and programmable logic controllers are included with the MCC instruction information packet.

Thermal overload selection data is listed on the inside of the vertical wire trough door of each section. This information is also listed in this bulletin; see "Thermal Overload Unit Selection" beginning on page 93. Select proper thermal overloads from the applicable starter size tables.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Modifying Fuse Clip Locations

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

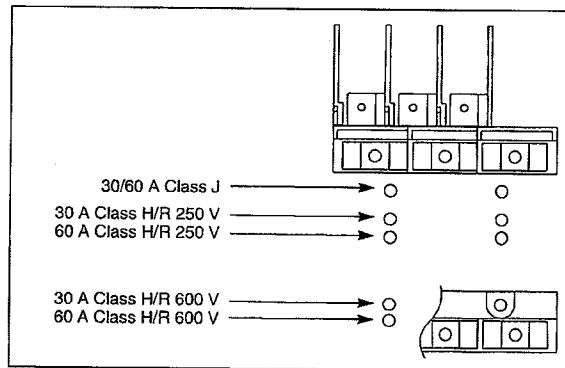
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Never operate energized switch with door open.
- Turn off switch before removing or installing fuses or making load side connections.
- Always use a properly rated voltage sensing device at all line and load fuse clips to confirm switch is off.
- Turn off all power supplying switch before doing any other work on or inside switch.
- Do not use renewable link fuses in fused switches.

Failure to follow this instruction will result in death or serious injury.

Install 30 and 60 A fuse bases for the proper fuse size and class and maximum voltage in Size 1 and 2 starter units. The base pan of the disconnect switch has five sets of mounting holes for this purpose. The lower fuse base is installed in the proper mounting holes at the factory (see Figure 47). Additional clips and bases may be required if changing fuse class.

Turn off all power supplying this equipment and follow lockout/tagout procedures before working on or inside equipment. Always use a properly rated voltage sensing device to confirm the power is off.

Figure 47: Size 1 and 2 Fuse Clip Locations



NOTE: For Form II Class C fuse spacing, contact your Schneider Canada representative.

SECTION 5—OPERATION

Included in this section are the pre-operation checklist and energizing procedures. For information regarding solid state overload relay operation, see Section 7—Motor Logic® Solid State Overload Relay on page 57. For Compac™ 6 operating instructions, see “Compac™ 6 Units” on page 86. For Mag-Gard® or Powerpact® Motor Circuit Protector operating instructions and selection information, see “Mag-Gard Magnetic Trip Adjustment” on page 61.

Pre-operation Checklist

To ensure proper operation of the MCC, check the items listed below before energizing the MCC:

- Complete the maintenance procedures beginning on page 44 and continuing up to “Insulation Test” on page 53. This initial maintenance is necessary to detect any shipping damage or loose connections. Do not energize the MCC until initial maintenance is complete.

NOTE: The following maintenance procedures are not necessary before energizing the MCC for the first time: Control Unit Removal, Stab Assemblies, Starter Contacts and Barriers/Insulators.

- Perform an insulation test on the MCC (see “Insulation Test” on page 53).
- If the MCC is equipped with ground fault protection, properly adjust and test the ground fault protective device before energizing.
- Remove all blocks or other temporary holding means from the electrical devices.
- Remove any secondary shunt bars from the current transformers. Do not operate a current transformer with its secondary open-circuited.
- Manually exercise all switches, circuit breakers, and other operating mechanisms to ensure that they are properly aligned and operate freely.
- Electrically exercise all electrically-operated switches, circuit breakers and other mechanisms (but not under load) to ensure that the devices operate properly. An auxiliary source of control power may be required.
- Verify proper interval and contact operation of the timers.
- Verify that proper overload units are installed by checking the overload selection tables against motor full load current. Motor Logic and IEC overload relays (if supplied) do not require thermal units, but are set at the lowest setting at the factory.
- Verify that all load and remote control connections have been made and that they agree with the wiring diagrams provided.
- Verify that all ground connections are made properly.
- Install the covers and close the doors; ensure that all are properly tightened.

Figure 48: Pre-operation Check



Energizing the MCC

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Review the "Pre-operation Checklist" on page 42, ensuring that all items check out.

Failure to follow this instruction will result in death or serious injury.

To energize the MCC:

1. Review the "Pre-operation Checklist" on page 42 before energizing.
2. Turn off all downstream loads, including distribution equipment and other devices that are remote from the MCC.
3. Verify that all barriers, doors, and covers are closed before energizing the equipment.
4. Energize the equipment in sequence, starting with the main devices, the feeder devices next, and then the motor starter devices.
5. With all barriers in place and all unit doors closed and latched, turn on the devices with a firm, positive motion.
6. After all disconnect devices are closed, loads such as lighting circuits, starters, contactors, heaters, and motors may be energized.

SECTION 6—MAINTAINING THE MCC

Examining the Enclosure

Before energizing any new MCC equipment, perform the maintenance described in this section. Perform regular maintenance at least annually, or more frequently if indicated by service conditions and your established maintenance policy. Also perform maintenance following any service interruption, electrical fault, or unusual occurrence.

Examine the interior and exterior of the MCC for moisture, oil, or other foreign material. Eliminate all foreign material and clean the MCC.

Clean the interior and exterior of the MCC with a vacuum cleaner. **Do not use compressed air; it will redistribute contaminants to other surfaces.** Check the enclosure for damage that might reduce electrical clearances.

Examine the finish of the enclosure. Touch up the paint if necessary. Replace any badly corroded or damaged enclosure parts.

Maintaining Bus Bars and Incoming Line Compartments

Perform maintenance of bus and incoming line lug connections at least annually, or more frequently if indicated by service conditions and your established maintenance policy. Follow the steps below at the time of installation to locate and tighten any connections that may have loosened during shipment and handling:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm power is off.
2. Remove the top and bottom horizontal wire trough covers in each section.
3. Expose the bus and bus connections by removing the two-piece bus barrier in each section.
4. Examine all bus bars and connectors. Replace any parts that are badly discolored, corroded, or pitted. Also replace parts subjected to excessive temperatures.
5. Verify that all bolts at the bus connection points indicated by a hexagon in Figure 49 are in place and properly tightened. Although one specific type of compartment or bus is shown in Figure 49, perform this maintenance on all bolted connections. See Table 5 for torque values.

▲ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

▲ CAUTION

HAZARD OF EQUIPMENT DAMAGE

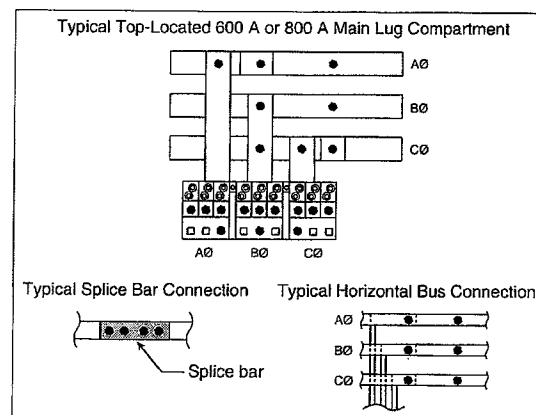
- Never brush or use sandpaper on the bus; doing so will remove plating and cause oxidation. Use a cleaning fluid approved for such use. Do not use cleaning fluid on insulators.
- Do not attempt to clean bus bars or connectors that are damaged in any way. Replace them with new parts.

Failure to follow this instruction can result in equipment damage.

Table 5: Bus Connection Torque Values

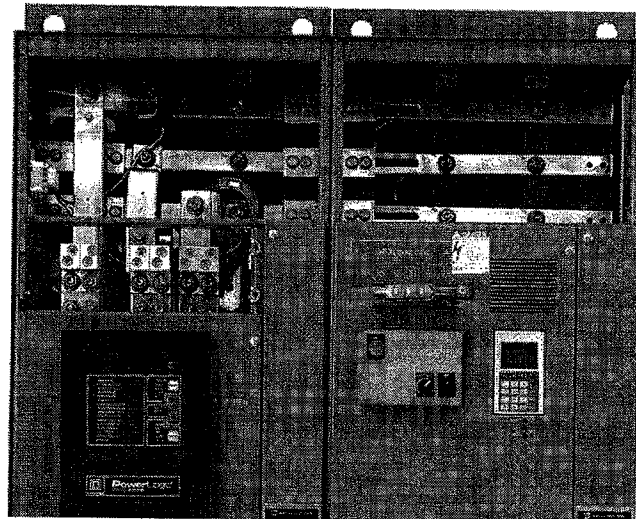
Bolted Connection Location	Torque Range
Horizontal bus (all locations)	68–70 lb-ft (92.29–94.54 N•m)
Splice bars – 0.375 in. diameter bolts	31–32 lb-ft (41.64–43.33 N•m)
Horizontal ground bus (all locations)	5–6 lb-ft (6.75–8.44 N•m)

Figure 49: Typical Bus Connection Points



6. Verify that all main lug, circuit breaker, or fusible switch set screws holding incoming conductors in main lugs (see Figure 50) are in place and properly tightened. Use a torque wrench and a 3/8 in. allen bit to torque the lug set screws to the appropriate value (see "Cable Connection Torque Values" beginning on page 40).

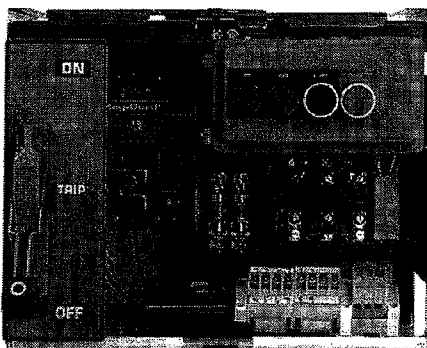
Figure 50: Top-located Main Lug Compartment



7. Inspect all insulators, braces, and barriers; replace any that show signs of arcing damage, tracking, excessive heat, or cracking.

Maintaining the Control Unit

Figure 51: Control Unit



⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Perform maintenance on control units at least annually, or more frequently if indicated by service conditions and your established maintenance policy. During installation, locate and tighten any connections that have become loose during shipment and handling, using the following procedures. If the control unit (see Figure 51) is being removed from the MCC for maintenance, start with "Removing the Control Unit" beginning on page 46. If maintenance is performed with the control unit installed, start with "Circuit Breaker or Disconnect Switch" on page 51.

Removing the Control Unit

Figure 52: Operating Mechanism in the Off Position

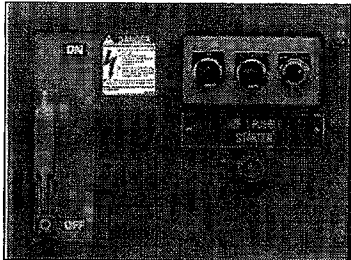


Figure 53: Loosening Captive Quarter-Turn Fasteners

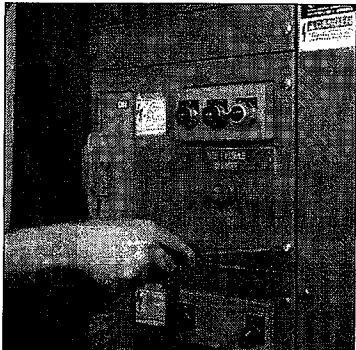


Figure 54: Releasing the Lock-in Device (when supplied)



⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Do not attempt to remove the unit from the structure with the disconnect in the *on* position.
- The control unit is interlocked with the MCC structure to prevent the unit from being withdrawn while the disconnect is in the *on* position. Do not attempt to override the mechanism-to-structure interlock.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury

The Model 6 MCC is designed for convenient and quick control unit removal and replacement. Follow these steps to remove control units:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Move the operating mechanism to the *off* position (see Figure 52).
3. Loosen the captive quarter-turn fasteners (see Figure 53) on the door and open it. Use a properly rated voltmeter to check for live circuits. De-energize any voltage sources.
4. Release the lock-in device located at the bottom front of the unit (when supplied) by turning the screw on the front of the device until the locking pawl is parallel to the bottom of the unit (see Figure 54).
5. Disconnect the power wiring from the starter terminals or, if provided, the power terminal blocks. Tag the terminations for re-installation (see Figure 55).

Remove the top portion of the pull-apart control terminal blocks to which field wiring is connected.

Figure 55: Disconnected Terminal Blocks

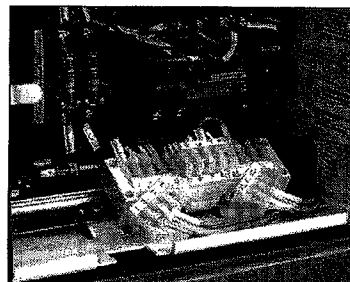
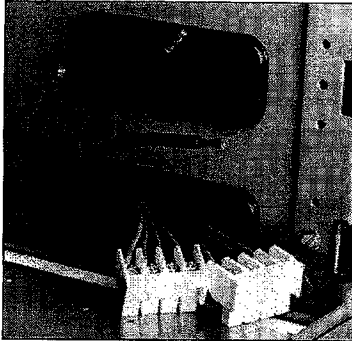


Figure 56: Power Leads and Top of Terminal Blocks Fed through Wiring Port



6. Push the power leads and the top portion of the control pull-apart terminal blocks through the wiring port and into the vertical wire trough (see Figure 56).
7. Pull forward on the twin handle cam mechanism located at the top front of the unit to rack the unit partially out of the structure (see Figure 57). This action disconnects the power stabs from the vertical bus. Continue pulling forward until the handles are fully extended.

Figure 57: Pulling the Twin Handle Cam Mechanism Forward

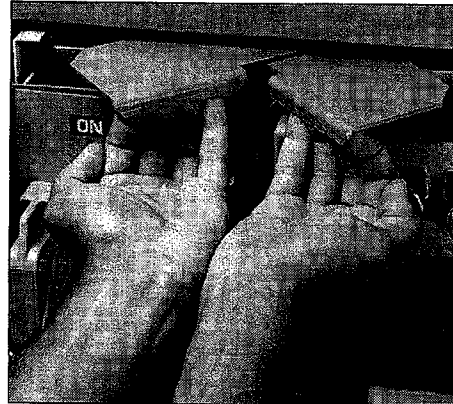
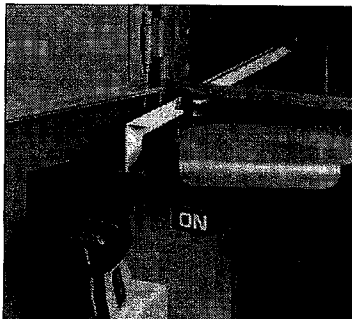


Figure 58: Operating the Mechanism-to-Structure Interlock



8. The operating mechanism-to-structure interlock prevents the control unit from being withdrawn or inserted with the handle in the *on* position (see Figure 58).
9. If the withdrawn unit is left in the structure, use appropriate lock-out procedures to avoid re-loading by non-authorized personnel (see Figure 59).

Figure 59: Locked Out Device

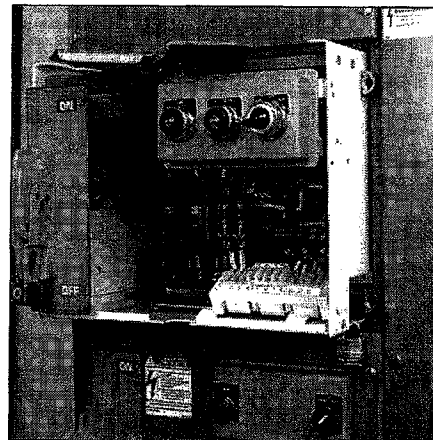
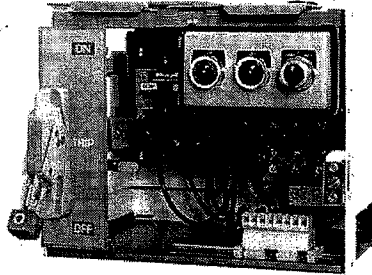
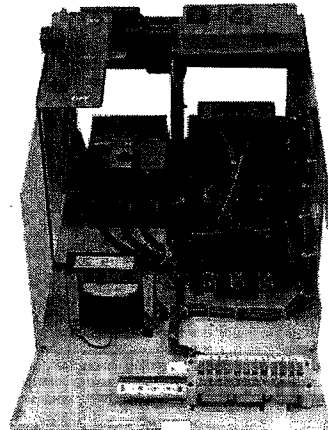


Figure 60: Control Unit Removed



10. Remove the control unit from the structure for servicing (see Figure 60). In units with a full bottom plate, additional accessibility to the components and wiring can be achieved by folding the bottom plate down. To do so, lean the unit on its back, remove the two front screws, and fold the bottom plate down (see Figure 61).

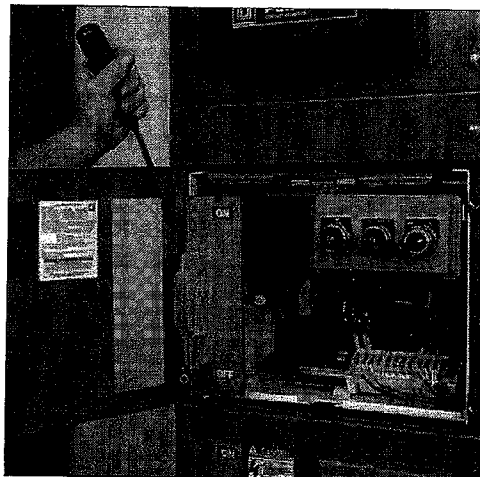
Figure 61: Control Unit Bottom Plate Folded Down



11. If necessary, the door can be taken off its hinges without removing the unit. To do so, drive the hinge pins out of the hinge collars, using a small flat-bladed screwdriver or small punch (see Figure 62). Remove the bottom hinge pin first.

As an alternative to removing the hinge pins, the hinge mounting screws can be removed from the structure through the access holes provided.

Figure 62: Driving Out Hinge Pin



12. When reinstalling a hinge pin, make certain that the hooked end is fully engaged into the hinge collar.

Removing the Compac™ 6 Control Unit

The following information is specific to Compac 6, six-inch units. For more information regarding Compac 6, six-inch units, refer to “Compac™ 6 Units” beginning on page 86, or the information included with the shipment of the new device.

▲ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside it.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm power is off.
2. Move the operating mechanism to the OFF position (see Figure 63).

Figure 63: Operator Handle in the Off Position

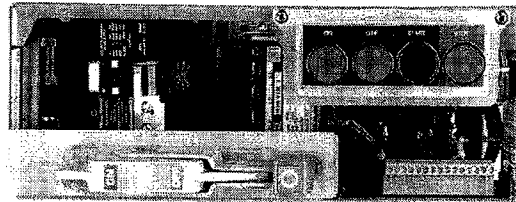
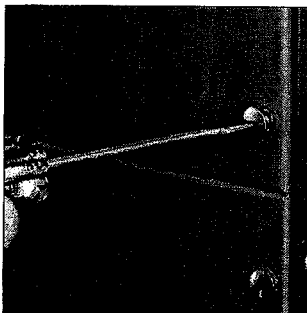


Figure 64: Loosening Captive Quarter-turn Fasteners



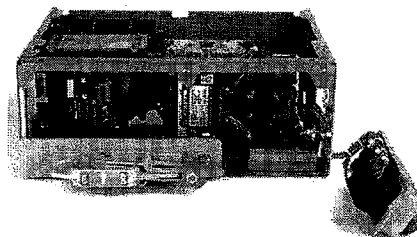
3. Loosen the captive quarter-turn fasteners (see Figure 64) on the door and open it. Check for live circuits using a properly rated voltage sensing device. De-energize any voltage sources.

NOTE: Removal of the control station plate may be necessary to perform Steps 4 and 5. To remove the control station plate, follow these steps:

- a. Loosen the captive mounting screws holding the plate to the front of the unit.
- b. Remove the plate from the unit (see Figure 65).
- c. Re-attach the plate after disconnecting the load wires and control terminal block.

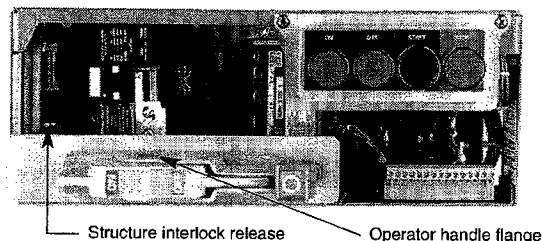
NOTE: Do not disconnect the wires to the control station plate.

Figure 65: Control Station Plate Removed



4. Disconnect the power wiring from the starter terminals. Tag the terminations for re-installation.
5. Remove the top portion of the pull-apart control terminal block to which field wiring is connected.
6. Push the power leads and the top portion of the control pull-apart terminal blocks through the wiring port and into the vertical wire trough.
7. Grasp the operating handle flange and press down on the structure interlock release (see Figure 66).

Figure 66: Operator Handle and Interlock Release



8. Firmly pull the unit forward to disengage the power stabs from the vertical bus. The unit should now slide freely from the MCC structure.
9. The operating mechanism-to-structure interlock prevents the control unit from being inserted or withdrawn with the handle in the ON position.
10. If the withdrawn unit is left in the structure, use appropriate lock-out/tag-out procedures to avoid re-loading by non-authorized personnel.
11. Remove the control unit from the structure and place it on a flat surface for servicing.

NOTE: Partial disassembly of the unit may be necessary to gain access to various electrical connections for servicing.

Tests and Maintenance Performed with the Control Unit Removed

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not remove the protective lubricant from the stabs. If additional lubricant is required, order Schneider Electric electrical joint compound #PJC-7201.

Failure to follow this instruction can result in equipment damage.

Once the control unit is removed, perform the following tests and maintenance:

Stab Assemblies—Inspect the stab assemblies (see Figure 67) for signs of arcing or overheating. **Replace the disconnect assembly (FA/KA type circuit breakers) or the jaw connector assembly (H- or J-frame circuit breakers) immediately if overheating has occurred.** For replacement disconnect assemblies, see "Section 13—Circuit Breaker and Fusible Switch Replacement" beginning on page 100.

NOTE: If the stab assembly is badly pitted, the vertical bus may also need to be replaced.

Figure 67: Stab Assembly

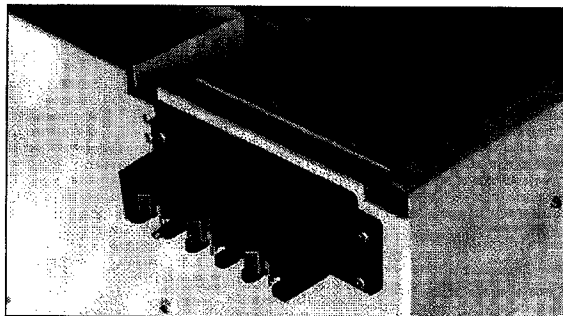
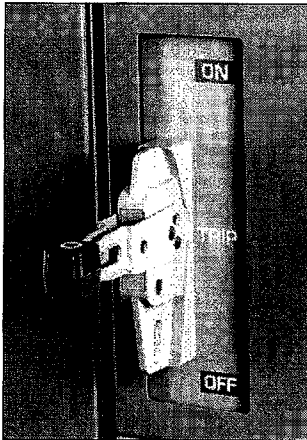


Figure 68: Operator Mechanism in the Tripped Position



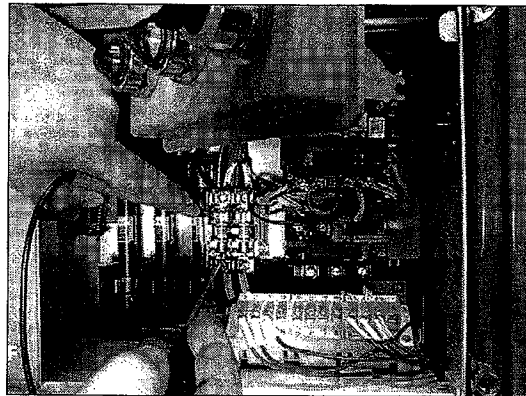
Circuit Breaker or Disconnect Switch—Verify proper operation of the circuit breaker or disconnect switch. Inspect switch blades; if evidence of arcing or excessive heat is present, replace the switch assembly. Exercise the push-to-trip feature on the circuit breakers.

Operator Mechanism—Verify proper operation of the operator mechanism (see Figure 68). Test for proper *on*, *trip*, *off*, and *reset* positions (FA/KA type circuit breakers) or *on*, *trip*, and *off* positions (H- or J-frame circuit breakers). Verify proper door interlock operation.

NOTE: Fusible switch operator mechanisms do not have "trip" or "reset" positions.

Fuses—Inspect all fuses and fuse clips (see Figure 69). Replace any parts showing signs of overheating or arcing.

Figure 69: Inspecting Fuses



Starter Contacts—Check the starter contacts (see Figure 70). Replace any that are badly worn or pitted. (See the contactor instruction bulletin included with the original shipment.)

Figure 70: Starter Contacts

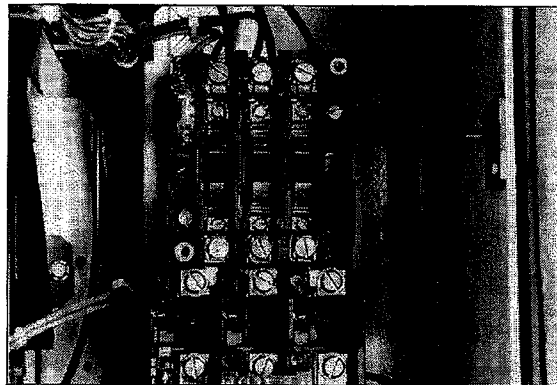
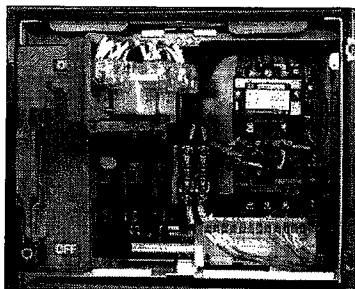


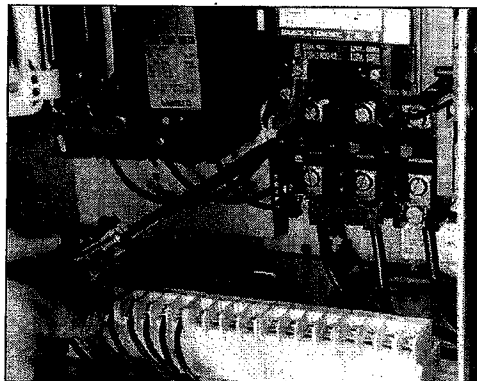
Figure 71: Control Devices



Control Devices—Check for proper operation of starters, relays, timers, and other control devices (see Figure 71).

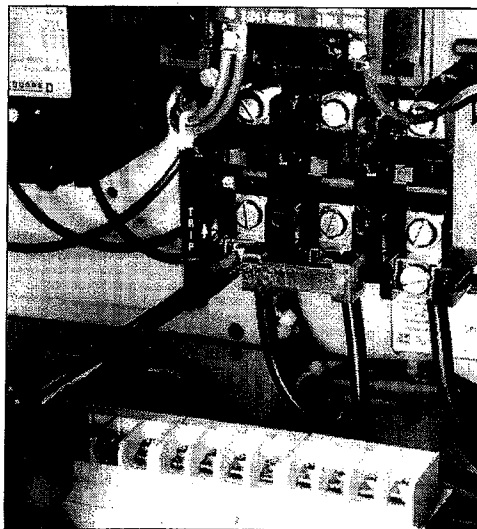
Overload Relay—Manually trip the overload relay to ensure proper operation (see Figure 72). Verify that the thermal unit is the proper size for the application. Refer to the thermal unit selection tables on the inside of the vertical wire trough doors.

Figure 72: Tripping the Overload Relay



Wiring and Electrical Connections—Verify that all electrical connections are correct; tighten them if necessary (see Figure 73). Also inspect all power and control wiring, replacing any wire that has worn insulation or shows signs of overheating or cracking.

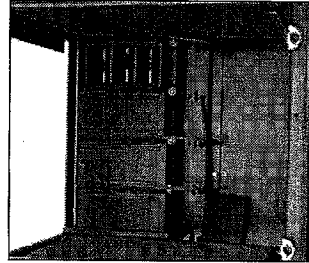
Figure 73: Tightening Electrical Connections



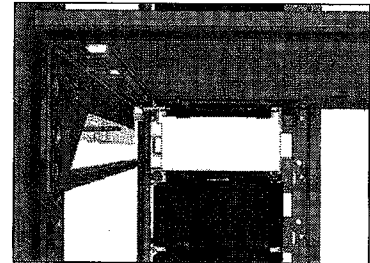
Starter Interlocks—Check the mechanical interlocks on reversing, multi-speed, or reduced voltage starters.

Barriers/Insulators—Inspect all insulators, braces, and barriers (see Figure 74); replace any that show signs of arcing damage, tracking, excessive heat, or cracking.

Figure 74: Manual and Automatic Bus Shutters



Manual Bus Shutter



Automatic Bus Shutter

Special Units—Follow the manufacturer's recommended maintenance procedures for special units (for example: drives, soft starts, and automatic transfer switches).

Reassembly

To reassemble the MCC after testing and maintenance, follow the steps below:

1. Reinstall all units by reversing Steps 1–12 in "Removing the Control Unit" beginning on page 46.
2. Replace all barriers and cover plates and close and fasten all doors.

Insulation Test

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

▲ CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Do not use a megohmmeter on:
 - adjustable speed drives
 - solid state soft starters
 - transient voltage surge suppressor (TVSS) units
 - AccuSine® active harmonic filter units
 - PowerLogic® Circuit Monitor units
 - PowerLogic Power Meter units
 - capacitor units
 - any devices not designed to withstand megohmmeter voltage.
- Disconnect all solid state devices such as TVSS's, drives, soft starts, capacitors, filters, and circuit monitors before performing megohmmeter tests on the MCC.

Failure to follow this instruction can result in equipment damage.

Before an MCC is re-energized (after installation or regular maintenance), take resistance measurements. Use an insulation tester (megohmmeter) with a potential of 500–1000 V.

Take readings between each phase and from each phase to ground, with the branch disconnects *off* and *on*. Make sure the main disconnect is *off* during all insulation tests.

Readings from a megohmmeter with all disconnects *off* will typically be 5–20 megohms. On new equipment that has been stored in a damp area, lower readings may occur during start-up. If the readings are below one megohm, a few branch units may be energized to help dry out the MCC. If additional readings are above one megohm, additional units may be energized. After the equipment has been in operation for 48 hours, readings should be in the 5–20 megohm range.

When megohmmeter readings are taken with the disconnects *on* (except for the main), disconnect all devices completing circuits between phases or between phases and neutral (*e.g.*, control transformers). Although readings may be slightly different, observe the one megohm lower limit during start-up.

Record all megohmmeter readings on the insulation resistance chart on page 92. Any sudden change in resistance values (even within the acceptable range) may indicate potential insulation failure. Early detection and replacement of faulty insulating components helps avoid equipment damage.

If megohmmeter readings are below 5 megohms (one megohm during start-up) consult your Schneider Electric field sales representative.

Re-energize the equipment in sequence, starting with the main devices, the feeder devices next, and then the motor starter devices. (See "Energizing the MCC" beginning on page 43).

Maintenance after a Fault Has Occurred

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Excessive currents occurring during a fault may result in structure, component, bus or conductor damage. This damage is caused by mechanical distortion, thermal damage, metal deposits, or smoke from fault currents. After a fault, locate and correct the cause of the fault. Inspect all equipment and make any necessary repairs or replacements before putting the equipment into service again. Make sure all replacement parts are rated properly and are suitable for the application. If in doubt, consult your Schneider Electric field sales representative.

After any fault, perform all maintenance procedures, starting on page 44 and continuing to "Insulation Test" beginning on page 53. Also perform the following procedures after a fault:

1. If the fault occurred downstream from the MCC, perform appropriate maintenance on all equipment involved.
2. Examine the enclosure. External evidence of enclosure damage usually indicates damage within. Extensive damage requires replacement of the enclosure parts and the enclosed equipment.
3. Replace any parts that are damaged or deformed. Pay particular attention to door hinges and door closing hardware. Inspect the area around any damaged units (both inside and out) for displaced parts from the damaged unit. See "Examining the Enclosure" on page 44.
4. Examine bus bars and incoming line compartments; tighten all electrical connections to their proper torques. Replace any deformed bus bars or connectors, as well as any showing signs of arcing damage. Inspect all insulators for cracks or burn marks; replace any displaying these characteristics.
5. Follow maintenance procedures for control units. Begin with "Maintaining the Control Unit" beginning on page 45, and continue to "Insulation Test" beginning on page 53. Also perform the steps listed below:
 - a. Examine the disconnect means for evidence of possible damage. Ensure that the operator mechanism properly turns the disconnect *on* and *off*. Exercise the *push-to-trip* feature on circuit breakers. Make sure that the operator mechanism properly resets the circuit breaker.
 - b. Check that the door interlock keeps the unit door from opening while the disconnect is in the *on* position.

Figure 75: Operating Door Interlock Defeat Mechanism



NOTE: If the unit door must be opened while the unit is energized, only authorized personnel may operate an interlock defeat mechanism (see Figure 75).

- c. Inspect the motor starters for damage. Replace contacts and contact springs if the contacts are welded or show heat damage. If deterioration extends beyond the contacts, replace the entire contactor or starter.
 - d. Replace the complete overload relay if the thermal units are burned out, or if any indications of arcing or burning are present on the relay.
 - e. Inspect all fuses and fuse clips. Replace all fuses in a set, even if only one or two are open-circuited.
 - f. Check all conductors and other devices within the units for signs of damage.
6. Complete an insulation test (see "Insulation Test" beginning on page 53) before placing the MCC back into service.
 7. Complete the "Pre-operation Checklist" beginning on page 42.
 8. Re-energize the equipment. See "Energizing the MCC" beginning on page 43.

SECTION 7—MOTOR LOGIC® SOLID STATE OVERLOAD RELAY

The following describes 600 V rated MCC starter units equipped with the Motor Logic solid-state overload relay (SSOLR). Read and understand the safety precautions at the beginning of this section before you install, adjust, or perform maintenance on these units. For full details about MCC installation, refer to "Section 4—Installing the MCC" on page 14.

Figure 76: Motor Logic SSOLR

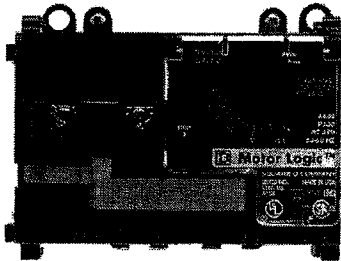


Figure 77: NEMA Rated Compac™ 6 Unit

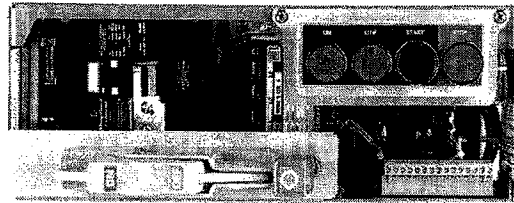
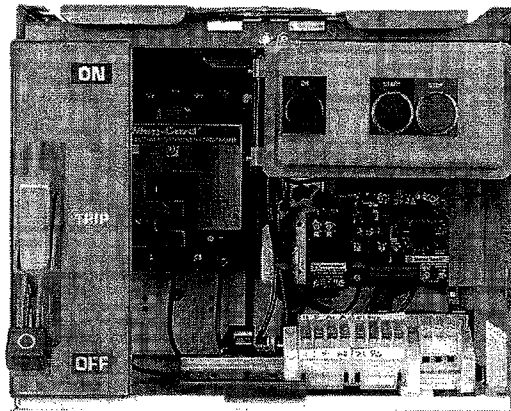


Figure 78: NEMA Rated Standard Unit



Retrofit Applications

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

- **Lug Kits:**
Use only 9999 LBO and 9999 LLO purchased after 5/1/95 for Size 0, 00B, 00C, and Size 1 units.
- **Z Element:**
Do not use the 9999Z3, 9999Z2, or 9999Z1 developed for open and general enclosed starters.

Failure to follow this instruction can result in equipment damage.

Remove the starter from the unit to replace the overload (melting alloy/bi-metallic). See "Removing the Control Unit" on page 46.

Terminal blocks (OEKTTBML) should be used for applications requiring multiple passes to achieve the proper adjustment range.

Restrain looped load cabling between the overload and the terminal block with wire ties or the equivalent when terminal kits are used.

On Size 3 and 4 starter units, the overload reset button is 1-5/8 inches further from the unit door and may require an alternative reset assembly (80420-862-51).

Retrofitting NEMA rated Compac 6, six-inch units is not recommended. The Motor Logic overload relay is available factory installed in Compac 6.

On 600 V Size 1 applications, add a third wire tie between the circuit breaker and contactor near the contactor line lugs. Refer to instruction bulletin 30072-013-29 for additional information.

NOTE: For retrofit applications, contact your Schneider Electric field sales representative for assistance. Schneider Electric assumes no responsibility for the design or implementation of retrofits unless contracted to perform them.

Use copper wire only on device power and control terminals. Conductors must be sized for 60 °C or 75 °C National Electrical Code® (NEC®) ratings.

Pressure wire terminals are suitable for wire sizes #16–12 AWG, solid or stranded. Terminal instruction labels are located adjacent to the terminal block or on the wireway door.

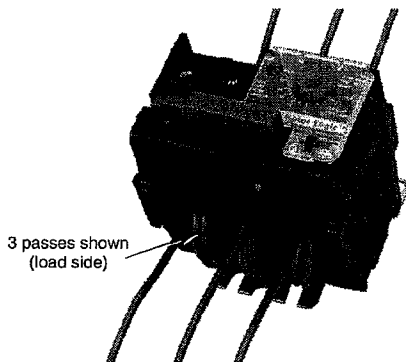
Box lugs (on interposing power terminal blocks supplied with selected units) are suitable for wire sizes #14–8 AWG, solid or stranded. Terminal instruction labels are located adjacent to the terminal block. Table 6 provides additional termination data.

Table 6: Lug Types and Wire Sizes

Class 9065 Motor Logic® Overload Relay Size ^①	Rating	Lug Type	Wire Size ^②	Torque Values ^④
00B	1.5–4.5 A	Pressure Wire ^③	14–8 AWG (2.5–6 mm ²)	25 lb-in
00C	3–9 A	Pressure Wire ^③	14–8 AWG (2.5–6 mm ²)	25 lb-in
0	6–18 A	Box Lug	14–4 AWG (2.5–16 mm ²)	50 lb-in
1	9–27 A	Box Lug	14–4 AWG (2.5–16 mm ²)	50 lb-in
3	30–90 A	Box Lug	14–1/0 AWG (2.5–50 mm ²)	100 lb-in
4	45–135 A	Box Lug	8–250 MCM (6–120 mm ²)	200 lb-in
5	90–270 A	Box Lug	250–500 MCM (120–240 mm ²)	250 lb-in
6	180–540 A	Clamp Lug	250–500 MCM (120–240 mm ²)	375 lb-in

- ① Refer to the overload relay label next to the adjustment dial.
- ② Solid or stranded copper wire, 60 or 75 °C, except 45 to 135 A overload relay, which is 75 °C wire only.
- ③ Box lug kit may be supplied, suitable for 14 to 4 AWG wire, 50 lb-in tightening torque.
- ④ Does not apply to Compact™ 6 units.

Figure 79: Looping Passes

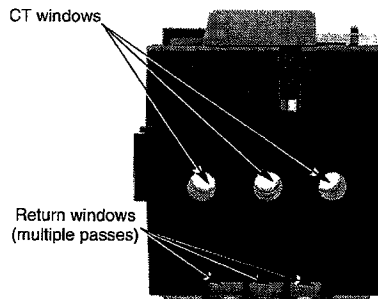


Size 00B, 00C, 0, and 1 relays have conductor (CT) windows through which the motor leads must pass before being connected to the load terminals on the contactor (T1, T2, and T3). By allowing multiple passes (turns) of the load leads through these CT windows, overload protection can be provided for motors with a full-load current lower than the specified operating range. Two passes of the load leads through each window effectively increase (by a multiple of two) the current that the overload relay senses. Three passes effectively increase the current by a multiple of three. All three conductor windows must have the same number of passes, looped in the same direction, for the overload relay to operate properly (see Figure 79).

Passes should begin from the load side of the overload through the CT window and return via the windows provided between the baseplate and overload (see Figure 80.) The final pass terminates on the load side of the contactor.

MCC units requiring multiple passes are factory supplied prelooped with #14 AWG wire and interposing terminal blocks. Refer to “Retrofit Applications” on page 58 for information concerning retrofit.

Figure 80: Motor Logic Overload (Bottom View)



Adjustment

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.


Failure to follow this instruction will result in death or serious injury.

Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.

Overload adjustment information is located on a label inside the unit door (Figure 81) of starter units equipped with the Motor Logic[®] overload relay.

Figure 81: Unit Adjustment Label

⚠ DANGER



HAZARD OF ELECTRIC SHOCK, BURN OR EXPLOSION

- Turn off power supplying equipment before working inside.
- For fusible switch starter units, power fuses must be selected in accordance with Article 430 of the NEC. Class RK5 fuses are recommended for NEMA rated applications.
- Use only Class J fuses for Compac™ 6 units.

Failure to follow these instructions will result in death, serious injury or equipment damage.

OPERATING INSTRUCTIONS:
 For continuous-rated motors with service factors of 1.0, multiply the motor full-load current (MFLC) by the number of passes through the overload relay's windows (1, 2 or 3) and set the overload relay's current adjustment dial to 90% of this value. For continuous-rated motors with service factors of 1.15 to 1.25, multiply the MFLC by the number of passes through the overload relay's windows (1, 2 or 3) and set the overload current adjustment dial to this value.

SOLID - STATE OVERLOAD RELAY

CURRENT RANGE:

SIZE 00B	1.5 - 4.5A	0.75 - 2.25A (2 PASSES)	0.5 - 1.5A (3 PASSES)
SIZE 00C	3 - 9A	1.5 - 4.5A (2 PASSES)	1 - 3A (3 PASSES)
SIZE 0	6 - 18A	3 - 9A (2 PASSES)	2 - 6A (3 PASSES)
SIZE 1	9 - 27A	4.5 - 13.5A (2 PASSES)	3 - 9A (3 PASSES)
SIZE 2	15 - 45A	MULTIPLE PASSES NOT AVAILABLE	
SIZE 3	30 - 90A	MULTIPLE PASSES NOT AVAILABLE	
SIZE 4	45 - 135A	MULTIPLE PASSES NOT AVAILABLE	

* Passes refer to multiple looping through overload windows.
 Trip current rating is 1.25 times the overload relay's current adjustment dial setting. Instructions above assume the motor is applied at its rated ambient temperature. For other conditions, consult the motor manufacturers for current capacity. NOTE: For part winding and multi-speed applications, use the MFLC of each motor winding as a basis for overload adjustment. Trip and alarm contact ratings: NEMA A600 and NEMA P300.

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SECTION 8—MAG-GARD® AND POWERPACT® MOTOR CIRCUIT PROTECTOR SETTINGS

Adjusting Mag-Gard or PowerPact Magnetic Trip Setting

The National Electrical Code® (NEC®) and Canadian Electrical Code (CEC) require that magnetic starters, used in combination with adjustable magnetic trip-only circuit breakers, have an overload relay in each conductor. Mag-Gard or PowerPact Motor Circuit Protectors are the standard motor circuit protectors used in Model 6 MCCs.

The adjustable magnetic trip setting is factory-set at Lo for Mag-Gard Motor Circuit Protectors. For PowerPact Motor Circuit Protectors, the Full Load Amp Setting (FLA) is factory set to the lowest position and the Instantaneous Trip Setting (Im) is factory set to the Auto 1 position. These settings may have to be adjusted for proper motor start-up. For both Mag-Gard and PowerPact Motor Circuit Protectors, refer to the magnetic trip setpoint limits outlined in the applicable national standards. For PowerPact Motor Circuit Protectors, refer also to the *PowerPact Motor Circuit Protector Settings* instruction bulletin (48940-260-01) shipped with the equipment.

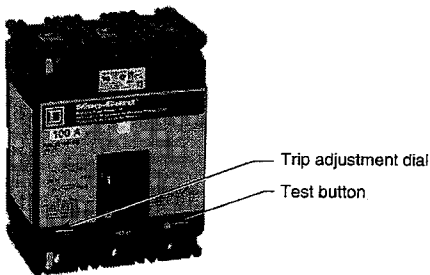
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 82: Mag-Gard Magnetic Trip Adjustment



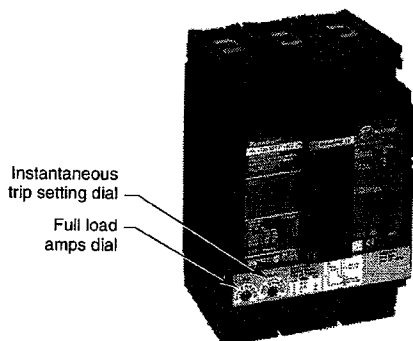
To access the Mag-Gard trip adjustment dial:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Place the unit handle in the "Off" position and open the door.
3. While pushing the door interlock lever forward, trip the circuit breaker by pressing the yellow test button (see Figure 82). The disconnect handle will automatically move up, allowing access to the adjustment dial.

After obtaining the motor full load current from the motor nameplate, select an adjustable trip setpoint to test start the motor. Further adjustments may be required because of motor load characteristics. Refer to applicable national standards for permissible setpoints.

After adjusting the trip setting, reset the circuit breaker by moving the disconnect handle to the "On" position and then to the "Off" position.

Figure 83: PowerPact® Magnetic Trip Adjustment



To access the PowerPact Full Load Amps (FLA) and Instantaneous Trip setting (Im) dials:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Place the unit handle in the "Off" position and open the door.
3. To set the FLA and Im dials, refer to the PowerPact Motor Circuit Protector Settings instruction bulletin (48940-260-01) shipped with the equipment.

- NOTES:**
- Select replacement Mag-Gard® or PowerPact Motor Circuit Protectors for MCCs using the voltage and current ratings listed in the Model 6 MCC Catalog (8998CT9701) in addition to the Mag-Gard or PowerPact selection tables in the Square D Digest.
 - These circuit breakers are suitable for motors with locked-rotor indicating code letters based on applicable national codes and standards. For other motors, consult your local Schneider Electric field sales representative.

SECTION 9—iMCC

iMCC OVERVIEW

This section includes instructions for the Model 6 iMCC, formerly known as the Model 6 OMNI Center.

The Model 6 iMCC is an MCC that provides a means of data acquisition and control. It consists of a wide range of intelligent components that may be part of a network.

Four distinct iMCC wiring categories are available:

iMCC Flex

Uses Seriplex® control bus only

iMCC Basic

- Programmable Logic Control (PLC) only
- PLC with data acquisition

iMCC with Data Acquisition

- Standalone option
- Uses Motor Logic Plus™ solid state overloads, drives, soft starts, and PowerLogic® components

iMCC Enhanced

- Uses Motor Logic Plus solid state overloads with Momentum® base or Motor Logic Plus displays
- An iMCC Enhanced MCC features one of three network options:
 - Modbus Plus™
 - Profibus
 - DeviceNet™

NETWORKS/COMMUNICATIONS OVERVIEW

iMCCs contain Schneider Electric devices with communication ports. Each device has a unique internal register map (see "iMCC-Related Literature List" below for the individual device instruction bulletins). These devices may be linked together to a single point.

iMCC-RELATED LITERATURE LIST

The following Schneider Electric publications may be useful in the setup, maintenance, and regular operation of your Model 6 iMCC. These documents are provided on the CD-ROM included with shipment. Upon request, your Schneider Electric field sales representative can provide them to you in print. Or, you can download these documents from the Technical Library at www.us.SquareD.com.

Table 7: iMCC-Related Literature

Publication No. ¹	Title	Publication Type
80438-069-01_	Altistart®46 Soft Start Units in MCCs	Instruction Bulletin
80442-291-01_	Altivar® 66 Adjustable Speed Drive Controllers in Motor Control Centers (NEMA 1 and 1A)	Instruction Bulletin
80442-507-01_	Altivar 66 Drive Controller Units in Motor Control Centers (Size 5–7)	Instruction Bulletin
80442-772-01_	Altivar 66 NEMA Type 12 Enclosures	Instruction Bulletin
80444-035-01_	Altivar 58 Adjustable Speed Drive	Instruction Bulletin
80444-233-01_	Altivar 61/71 Adjustable Speed Drive Controllers in Motor Control Centers	Instruction Bulletin
atv71_Parameters_EN	Altivar 71 Communication Parameters	User Manual
atv71_Modbus_Jbus_EN	Altivar 71 Modbus/Uni-Telway Card	User Manual
80459-641-01_	Model 6 Motor Control Centers	Instruction Bulletin

¹ Represents the current revision level of the document, and may vary from the document number shipped with your equipment.

Table 7: iMCC-Related Literature (continued)

Publication No. ¹	Title	Publication Type
8998CT9701	Model 6 Motor Control Centers	Catalog
30298-035-01_	Seriplex® Design, Installation, and Troubleshooting Manual	Instruction Bulletin
8330CT9601R4/99	Seriplex Control Bus Version 2	Catalog
Seriplex Toolbox	www.squared.com/us/internet/software.nsf	Software
840USE10000 VER.6	Modicon® TSX Quantum Automation Series	User Manual
840USE11300 VER.3.0	Modicon XMIT Function Block	User Manual
840USE11600 VER.1.0	Quantum NOE 771 X0 Ethernet Modules User Guide	User Manual
870USE00200 VER.2	TSX Momentum I/O Base User Guide	User Manual
870USE10100 VER.3	Modicon TSX Momentum M1 Processor Adapter and Option Adapter User Manual	User Manual
870USE11400	Ethernet Communications Adapter, V2	User Manual
890USE10000 VER.3	Modicon Modbus Plus™ Network Planning/Installation Guide	User Manual
890USE10300 REV.1.0	Modicon Modbus Plus Network BM85 Bridge Multiplexer User's Guide	User Manual
Modicon TSX Quantum Automation Series	www.modicon.com/specguide98/	Specifier's Guide
PI-MBUS-300 REV.J	Modicon – Modbus® Protocol Reference Guide	User Manual
30072-013-98_	Motor Logic Plus™ Programmable Solid-State Overload Relay	Instruction Bulletin
30072-013-99_	Solutions Software for Motor Logic Plus SSOL, Version 1.2	Instruction Bulletin
30072-013-101_	Motor Logic Plus Lug-Lug Kit	Instruction Bulletin
30072-013-102_	Motor Logic Plus Network Communication Module	Instruction Bulletin
30072-450-61	Altistart® 48 Y-Range Soft Start Controllers	Installation Guide
VD0C32S301_	Altistart 46 Soft Start Controller User's Manual	Instruction Bulletin
VD0C32S303	Altistart 46 Communication Option	Instruction Bulletin
VVDED397044US R12/00	Altivar® 58 Modbus Plus Communication Option VW3A58302U	Instruction Bulletin
VVDED397047US R7/00	Altivar 58 Drive Controllers Keypad Display VW3A58101	Instruction Bulletin
VVDED397048US R6/00	Altivar 58 Adjustable Speed Drive Controllers Installation Guide, Type H Controllers	Instruction Bulletin
VVDED397054US	Altivar 58 Modbus/JBUS/Uni-Telway® User's Guide	Instruction Bulletin
3000DB0001	PowerLogic® System Architecture and Application Guide	Data Bulletin
3020IB9818R11/99	PowerLogic Ethernet Communication Module, Models ECM-2000 and ECM-RM	Instruction Bulletin
3020IM9503R6/98	PowerLogic Power Meter	Instruction Bulletin
63230-400-204/_	PowerLogic Circuit Monitor Series 3000	Instruction Bulletin
3050IM9601R2/99	PowerLogic Ethernet Gateway	Instruction Bulletin
3080HO9601R10/98	System Manager™ Software SMS-3000	Handout
3080IB9803	PL, PowerLogic System Manager 3000	Instruction Bulletin
3080IM9603R8/97	Ethernet Driver for System Manager	Instruction Bulletin
63230-300-209	PowerLogic Circuit Monitor Series 4000	Instruction Bulletin
63230-500-204	Power Meter 820 Installation	Instruction Bulletin
63230-500-205	Power Meter 820 Reference	Instruction Bulletin
63230-500-208	Power Meter 850 Installation	Instruction Bulletin
63230-500-209	Power Meter 850 Reference	Instruction Bulletin

¹ Represents the current revision level of the document, and may vary from the document number shipped with your equipment.

CONNECTING THE iMCC CABLING SYSTEM

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not use excessive force when making iMCC cabling connections. Connections are keyed to ensure that pins are properly aligned.

Failure to follow this instruction can result in equipment damage.

Units within iMCCs are connected at the factory, using a UL 498 Listed 600 V cabling system. The cabling system is constructed of molded PVC material using the following five 22 AWG conductors:

4-Wire RS-485:

- Green/Blue—Rd+
- White—Rd-
- Red—Td+
- Black—Td-
- Shield—Bare

Network Cabling

Factory supplied network cabling is installed in accordance with UL 845 procedures and practices, and routed in the bottom horizontal wireway.

Each iMCC is equipped with a dedicated communication cable area within each vertical wireway. Route the communication cable so that it is separate from all other cabling, such as control, power, and network cables. Verify that network cabling is separated from power conductors either by a barrier or a minimum space of 0.25 in. (6 mm).

In order to make direct connections to Class 2 or Class CM systems, install Class 2 or Class CM wiring so that it is separated from power conductors either by a barrier or a minimum space of 0.25 in. (6 mm). Route power conductors in the top horizontal wireway for maximum separation.

External network cabling must comply with Class 2 or Class CM practices under the provisions of NEC® Articles 725 and 800.

Cables Between Shipping Splits

Connect the trunk line cables between shipping splits by aligning the keyways and plugging the male end of the trunk cable to the female end of the next trunk cable. Screw the coupling ring until it is hand-tight. Repeat this process until all shipping splits are connected.

Load Cables

It is recommended to route all load cables in the top horizontal wireway to keep them isolated from the communications cabling. If you route the load cables in the bottom horizontal wireway, make sure to maintain a 0.25-in. (6 mm) distance between the communications cabling and all other cabling.

MODBUS® COMMUNICATIONS NETWORK

There are three primary ways to connect the Modbus communications network: via bridges/repeaters, programmable logic controllers (PLCs), or a direct cable connection. Follow the applicable instructions below to make the cabling connections for Modbus in your Model 6 iMCC.

Bridges/Repeaters

If the PLC is not in the local area of the MCC, you will typically need to use a bridge/repeater to connect the Modbus communications network. Schneider Electric recommends installing and operating one of the bridges listed in Table 8 on the following page.

Table 8: Recommended Bridges/Repeaters

Type	Manufacturer	Bridge/Repeater No.	Reference Material
N/A	B&B Electronics	Bridge: RS-485 Repeater: 4850PDR3399	4850PDR3399 Operational Bulletin
Modbus [®] /Ethernet (TCP/IP)	Schneider Automation	Bridge: 174-CEV30010	890USE15500*
Modbus/Ethernet	Schneider Electric	Bridge: 3090-EGW-2	3050IM9601 R2/99*
Modbus/Modbus Plus™	Schneider Automation	Bridge Multiplexer: NW-BM85D-0002	890USE10300*
Momentum I/O Base Modbus	Schneider Automation	Bridge: 170ADM54080	870USE00200 VER.2'
PowerLogic [®] RS-232/RS-485	Schneider Electric	Converter: 3090-MCI-101	MCI-101

* See "iMCC-Related Literature List" on page 63.

Follow the general steps below to connect the Modbus network to a bridge/repeater. Consult the reference manual for your particular bridge/repeater for specific installation and configuration instructions:

1. Provide control power to the bridge device, if not provided by the MCC.
2. Connect the incoming communications cable to the customer side of the bridge/repeater.
3. Read and understand the instructions contained in the reference material for your device. Follow the installation and configuration instructions contained in that material to complete the setup of the bridge/repeater.

Grounding

If a Programmable Logic Controller (PLC) and/or repeater is provided with your iMCC, grounding is done at the factory. If not, the MCC network is supplied ungrounded and you will need to ground it at only one point, either a personal computer (PC), PLC, or repeater.

For typical grounding requirements, refer to Modicon[®] —Modbus Protocol Reference Guide, document number PI-MBUS-300 (see "iMCC-Related Literature List" on page 63).

Terminating Resistors

In order for the Modbus communications network to operate properly, terminating resistors are required on each end of the network. See "iMCC Cabling Replacement Parts" on page 79 for a list of available terminating resistors. If your iMCC is shipped with a bridge, repeater, and/or PLC, external terminal blocks (MCT485) are included with shipment.

Programmable Logic Controllers (PLCs)

In order to connect the Modbus[®] network to a PLC, an RS-232/RS-485 converter is usually required (see Table 8 on page 66). Connectivity varies depending on the type of PLC used.

Direct Cable Connection

Follow the steps below to connect a cable directly to the Modbus network via the MCC custom cable.

1. Determine which end (male or female) of the MCC cabling you will attach to your cable.

NOTE: The female field attachable is Schneider Electric—Seneca part # 5000129-91, and the male field attachable is Schneider Electric—Seneca part # 5000129-93.

OPERATION

This section contains pre-operation checklists, energizing procedures, and remote and local programming procedures for Motor Logic Plus™ solid state overloads, PowerLogic® Power Meter, PowerLogic Circuit Monitor, Altivar® drives, and Altistart® soft starts.

For COMPACT™ 6 operating instructions, see "Compact™ 6 Units" on page 86. For Mag-Gard® or Powerpact® Motor Circuit Protector operating instructions and selection information, see "Mag-Gard Magnetic Trip Adjustment" on page 61.

Pre-operation Checklists

To verify that the iMCC is operating properly, complete both of the following checklists before energizing the equipment:

MCC Structure

- Complete the maintenance procedures beginning on page 44 and continuing up to "Insulation Test" on page 53. This initial maintenance is necessary to detect any shipping damage or loose connections. Do not energize the MCC until initial maintenance is complete.
NOTE: The following maintenance procedures are not necessary before energizing the MCC for the first time: Control Unit Removal, Stab Assemblies, Starter Contacts and Barriers/Insulators.
- Perform an insulation test on the MCC (see "Insulation Test" on page 53).
- If the MCC is equipped with ground fault protection, properly adjust and test the ground fault protective device before energizing.
- Remove all blocks or other temporary holding means from the electrical devices.
- Remove any secondary shunt bars from the current transformers. Do not operate a current transformer with its secondary shunt bars open-circuited.
- Manually exercise all switches, circuit breakers, and other operating mechanisms to ensure that they are properly aligned and operate freely.
- Electrically exercise all electrically-operated switches, circuit breakers, and other mechanisms (but not under load) to ensure that the devices operate properly. This may require an auxiliary source of control power.
- Verify proper interval and contact operation of the timers.
- Set the Motor Logic Plus™ overcurrent setting to the maximum service factor amperage of the motor to ensure that the proper overload protection is provided. The Motor Logic Plus overcurrent threshold is set at the lowest setting at the factory. Verify that all other settings are optimized for the application.
- Verify that all load and remote control connections have been made and that they agree with the wiring diagrams provided.
- Verify that all ground connections are made properly.
- Install the covers and close the doors; verify that they are all properly tightened.

iMCC Communications

⚠ CAUTION
HAZARD OF EQUIPMENT DAMAGE
Do not use excessive force when making cabling connections. Connections are keyed to ensure that pins are properly aligned.
Failure to follow this instruction can result in equipment damage.

Before energizing the equipment, check the items below to verify that the iMCC Modbus® networking and cabling are set up and connected properly:

Cabling Connections

- Verify that the network length without a repeater is less than 1500 feet (457 m). Note that each vertical section counts as 50 feet (15 m). Refer to the Modbus Protocol Reference Guide, document #PI-MBUS-300, REV.J, for details (see “iMCC-Related Literature List” on page 63).
- Make sure that the Modbus network has no more than 32 nodes.
- Verify that the MCC cables are connected between shipping splits. See “Cables Between Shipping Splits” on page 65 for instructions.
- Verify that each device tap cable is properly connected to the main trunk line.
- Verify that all network connections are secure.
- Verify that the Modbus network is grounded at only one point.
- Verify that terminating resistors are installed on each end of the network.

Communications Setup

- Use the following table to make sure that all devices are configured for the correct communications parameters:

Table 9: Modbus® Communications Protocol

Protocol	Modbus RTU RS-485, 4-wire
Transmission speed	19,200 baud
Data bits	8
Start bits	1
Stop bits	1
Parity	Even

- Verify that all devices have been assigned correct addresses (typically from 1–32; see “Device Addressing” on page 76 for specific addressing parameters).

PC/PLC Connections

- Refer to Table 9 above to verify that the proper communications protocol is being used.
- Test the RS-232 communications port of the master device (either a PC or PLC).

Energizing the MCC

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.
- Review the "Pre-operation Checklists" beginning on page 68, and verify that all items check out.

Failure to follow this instruction will result in death or serious injury.

To energize the MCC:

1. Review the "Pre-operation Checklists" on page 68 before energizing.
2. Turn off all downstream loads, including distribution equipment and other devices that are remote from the MCC.
3. Verify that all barriers, doors, and covers are closed before energizing the equipment.
4. Energize the equipment in sequence, starting with the main devices, the feeder devices next, and then the motor starter devices.
5. With all barriers in place and all unit doors closed and latched, turn on the devices with a firm, positive motion.
6. After all disconnect devices are closed, you may energize loads such as lighting circuits, starters, contactors, heaters, and motors.

Motor Logic Plus™ Solid State Overload Relay (SSOLR)

The Motor Logic Plus Solid State Overload Relay (SSOLR) is used with the following starters:

- Full Voltage Non-Reversing (FVNR)
- Full Voltage Reversing (FVR)
- Reduced Voltage Auto Transformer (RVAT)
- Part winding
- Two speed
- Wye-delta open transition and wye-delta closed transition

Refer to Schneider Electric bulletins # 30072-013-98A and # 30072-013-102C (see "iMCC-Related Literature List" on page 63) for more information about the Motor Logic Plus SSOLR.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all power supplying this equipment before working on or inside the Motor Control Center.
- Use a properly rated voltage sensing device to confirm that all power is off. Control units must be de-energized before performing maintenance on the MCC.
- The unit disconnect switch must be locked in the "off" position before working on equipment.

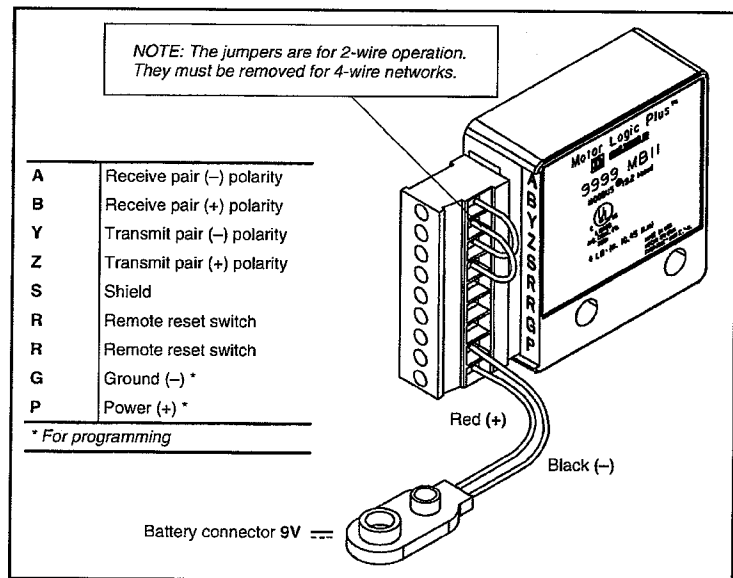
Failure to follow this instruction will result in death or serious injury.

Local Programming

Local programming can be used for setpoint programming and error readout purposes. Verify that the display is unlocked (the default setting), and disconnect all power before performing the steps below to accomplish local programming:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Connect a 9 V supply to the "P" and "G" terminals using the supplied connector, part # 80445-519-50 (see Figure 85).

Figure 85: Motor Logic Plus™ Communication Module Terminals



3. Turn the "Mode Select" switch to the parameter you are programming. Refer to bulletin # 30072-013-98_ (see "iMCC-Related Literature List" on page 63) for a list of parameters.
4. Press and hold the "Reset/Program" button.

NOTE: The display will not illuminate for local programming if the "Mode Select" switch is in the "Run" position.

5. Turn the "Display/Program" dial to the desired setting as shown on the LED display.
6. Release the "Reset/Program" button.
7. Turn the "Mode Select" switch back to the "Run" position.
8. Disconnect the 9 V supply and its connector.

Error messages are displayed on the 3-digit LED display when harmful conditions are detected. Table 10 contains a list of the error message codes and their definitions.

Table 10: Local Error Display

Displayed Message	Meaning
oc	Tripped on over current
SP	Tripped on single phasing
ub	Tripped on voltage or current unbalance
uC	Tripped on under current
cF	Tripped on contactor failure
GrF	Tripped on ground fault
HI	Tripped on high voltage
Lo	Tripped on low voltage
rP	Incoming phases have been reversed
oFF	A stop command was issued from a remote source

Remote Programming

Remote programming can be used for setpoint programming and data acquisition purposes. Follow the steps below to remotely configure the Motor Logic Plus overload:

1. Stop the overload by sending code "02H" to the command register (C6H).
2. If network programming has not been enabled, send code "05H" to the command register.
3. Program the appropriate parameter. See Table 11 on page 73 for a register map with a list of parameters. For more detailed information, refer to bulletin # 30072-013-102_. See Table 13 and Table 14 to determine the location and addressing of parameters within the Motor Logic Plus register map.
4. Restart the overload by using code "01H."

Table 11: Motor Logic Plus™ Address Descriptions

Operation	Address		Code	Description	Notes	
	RAM	Relative*				
Read only (all registers are 16-bit words)	A0	1A0	VOLTAV	Average voltage L-L	V-	
	A2	1A1	IAVE	Raw average current	A (x100, x10, x1), multiplied by scale factor	
	A4	1A2	VUB	Voltage unbalance	0-100%	
	A6	1A3	IUB	Current unbalance	0-100%	
	A8	1A4	PFANGLE	Power factor angle	Degrees	
	AA	1A5	CAPTY	Thermal capacity remaining	0-100%	
	AC	1A6	GFC	Ground fault current	A (x100, x10, x1), multiplied by scale factor	
	AE	1A7	ERCODE/TRIPRN	Real time error (RTE) & trip indicator (TI)	8-bit nibble-coded RTE; 8-bit coded TI	
	B0	1A8	FH	Fault history	Fault order: 4th, 3rd, 2nd, Last	
	B2	1A9	PID	Manufacture year/model & scale	8-bit year; 8-bit ID & scale	
	B4	1AA	VA-C	Line voltage A-C	V-	
	B6	1AB	VB-C	Line voltage B-C	V-	
	B8	1AC	VA-B	Line voltage A-B	V-	
	BA	1AD	IC	Raw current phase C	A (x100, x10, x1), multiplied by scale factor	
	BC	1AE	IB	Raw current phase B	A (x100, x10, x1), multiplied by scale factor	
	BE	1AF	IA	Raw current phase A	A (x100, x10, x1), multiplied by scale factor	
	C0	1B0	RD1	Remaining restart delay RD1		
	C2	1B1	RD2	Remaining restart delay RD2		
	C4	1B2	RD3	Remaining restart delay RD3		
	C6	1B3	COMLINE	Command line code (address C6H)	see Table 12 (write only)	
	C8	1B4	Scale	PowerLogic® scale parameter (read only)	0, 1, 2; 16-bit signed word (2's complement, read only)	
	CA	1B5	LV	Low voltage threshold	170 V~ to HV (600 V~ model; 450 V~ to HV)	
	CC	1B6	HV	High voltage threshold	LV to 528 V~ (600 V~ model; LV to 660 V~)	
	Read only (all registers are 16-bit words)	CE	1B7	VUB	Voltage unbalance threshold	2-15%, or 999 (off)
		D0	1B8	MULT	Effective turns ratio	Determined by model
		D2	1B9	OC	Overcurrent threshold	Current range of SSOLR
		D4	1BA	UC	Undercurrent threshold	0.5 x OC Min. to OC Max., Off
		D6	1BB	CUB	Current unbalance threshold	2-25%, or 999 (off)
D8		1BC	TC	Overcurrent trip class	5, J5, 10, J10, 15, J15, 20, J20, 30, J30 (J = Jam protection is enabled)	
DA		1BD	RD1	Rapid cycle timer	2-500 s	
DC		1BE	RD2	Restart delay RD2	2-500 min.	
DE		1BF	RD3	Restart delay RD3	2-500 min.	
E0		1C0	#RU	Restarts after UC	0, 1, 2, 3, 4, A	
E2		1C1	#RF	Number of restarts	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA (0 = manual, A = continuous, oc = automatic restart after RD2 expires)	
E4		1C2	UCTD	Undercurrent trip delay	2-60 s	
E6	1C3	GF	Ground fault threshold	0.15 x OC Min. to 0.2 x OC Max., Off		
E8	1C4	ADDR	RS-485 slave address	01-99		

* Required for PowerLogic software.

Table 12: Command Line Codes

Code	Command	Code	Command	Code	Command	Code	Command
01H	Start/reset	03H	Display lock	05H	Network program enable	07H	Network watchdog enable *
02H	Stop	04H	Display unlock	06H	Network program disable	08H	Network watchdog disable *

* The network watchdog feature disables the Motor Logic Plus SSOLR when the device does not receive a valid communication within a 10 s period.

Table 13: Read-Only Registers

RAM Address	Relative Address*	Code	Description	Notes																											
A0	1A0	VOLTAV	Average voltage L-L	Volts																											
A2	1A1	IAVE	Raw average current	A (x100, x10, x1), multiplied by scale factor																											
A4	1A2	VUB**	Voltage unbalance	0–100%																											
A6	1A3	IUB**	Current unbalance	0–100%																											
A8	1A4	PFANGLE**	Power factor angle	Degrees																											
AA	1A5	CAPTY**	Thermal capacity remaining	0–100%																											
AC	1A6	GFC**	Ground fault current	A (x100, x10, x1), multiplied by scale factor																											
AE	1A7	ERCODE/TRIPRN	Bit-real time errors & trip indicator	<table border="1"> <thead> <tr> <th>Bit #</th> <th>TRIPRN</th> <th>ERCODE</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Fault lockout</td> <td>Low voltage</td> </tr> <tr> <td>1</td> <td>Remote stop</td> <td>High voltage</td> </tr> <tr> <td>2</td> <td>Contactors failure</td> <td>Unbalance voltage</td> </tr> <tr> <td>3</td> <td>Under current</td> <td>Under current</td> </tr> <tr> <td>4</td> <td>Over current</td> <td>Phase reversal</td> </tr> <tr> <td>5</td> <td>Ground fault</td> <td>Unbalance current</td> </tr> <tr> <td>6</td> <td>Current unbalance</td> <td>Single phase voltage > 25%</td> </tr> <tr> <td>7</td> <td>Current single phase > 50% unbalance</td> <td>Single phase current > 50%</td> </tr> </tbody> </table>	Bit #	TRIPRN	ERCODE	0	Fault lockout	Low voltage	1	Remote stop	High voltage	2	Contactors failure	Unbalance voltage	3	Under current	Under current	4	Over current	Phase reversal	5	Ground fault	Unbalance current	6	Current unbalance	Single phase voltage > 25%	7	Current single phase > 50% unbalance	Single phase current > 50%
				Bit #	TRIPRN	ERCODE																									
				0	Fault lockout	Low voltage																									
				1	Remote stop	High voltage																									
				2	Contactors failure	Unbalance voltage																									
				3	Under current	Under current																									
				4	Over current	Phase reversal																									
				5	Ground fault	Unbalance current																									
6	Current unbalance	Single phase voltage > 25%																													
7	Current single phase > 50% unbalance	Single phase current > 50%																													
B0	1A8	FH**	NIBBLE_CODED -4 fault history	<p>The four-fault history is based on the following scheme: <u>16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1</u>, where bits 1–4 = Last fault, bits 5–8 = 2nd last fault, bits 9–12 = 3rd last fault, & bits 13–16 = 4th last fault. These four bits indicate a hex value that corresponds to the following faults:</p> <table border="1"> <tbody> <tr> <td>01</td> <td>High voltage</td> </tr> <tr> <td>02</td> <td>Low voltage</td> </tr> <tr> <td>03</td> <td>N/A</td> </tr> <tr> <td>04</td> <td>Contactors failure</td> </tr> <tr> <td>05</td> <td>Phase reversal</td> </tr> <tr> <td>06</td> <td>Single phase</td> </tr> <tr> <td>07</td> <td>Ground fault</td> </tr> <tr> <td>08</td> <td>Current unbalance</td> </tr> <tr> <td>09</td> <td>Remote off command</td> </tr> <tr> <td>10</td> <td>Overcurrent</td> </tr> <tr> <td>11</td> <td>Undercurrent</td> </tr> </tbody> </table>	01	High voltage	02	Low voltage	03	N/A	04	Contactors failure	05	Phase reversal	06	Single phase	07	Ground fault	08	Current unbalance	09	Remote off command	10	Overcurrent	11	Undercurrent					
				01	High voltage																										
				02	Low voltage																										
				03	N/A																										
				04	Contactors failure																										
				05	Phase reversal																										
				06	Single phase																										
				07	Ground fault																										
				08	Current unbalance																										
				09	Remote off command																										
				10	Overcurrent																										
				11	Undercurrent																										
B2	1A9	PID**	Manufacture year, month, product type/scale	8-bit year, 4-bit month, 4-bit I/O & scale																											
B4	1AA	VA-C	Line voltage A–C	Volts																											
B6	1AB	VB-C	Line voltage B–C	Volts																											
B8	1AC	VA-B	Line voltage A–B	Volts																											
BA	1AD	IC	Raw current phase C	A (x100, x10, x1), multiplied by scale factor																											
BC	1AE	IB	Raw current phase B	A (x100, x10, x1), multiplied by scale factor																											
BE	1AF	IA	Raw current phase A	A (x100, x10, x1), multiplied by scale factor																											
C0	1B0	RD1**	Remaining restart delay RD1	Seconds																											
C2	1B1	RD2**	Remaining restart delay RD2	Seconds																											
C4	1B2	RD3**	Remaining restart delay RD3	Seconds																											

* Must be used with PowerLogic® software
** Can only be viewed via network

Table 14: Read/Write Registers

RAM Address	Relative Address	Code	Description	Range	Default	
C6	1B3	COM-LINE	Command Line ★	Reset/run/stop, display lock, network configuration enable	Motor Logic Plus™ Command Register (C6 hex)	
					01H	Start/reset
					02H	Stop
					03H	Display lock
					04H	Display unlock
					05H	Network program enable
					06H	Network program disable
C8	1B4	Scale	PowerLogic® scale parameter	0, 1, 1–2; 16-bit signed word (2s complement, read only)	Model dependent	
CA	1B5	LV	Low voltage threshold	170 V (450 V★) - HV setting	435	
CC	1B6	HV	High voltage threshold	LV setting - 528 V (660 V★)	500	
CE	1B7	VUB	Voltage unbalance threshold	2–15% or 999%	5%	
D0	1B8	MULT	CT/turns effective ratio	1 or 10–200	1	
D2	1B9	OC	Overcurrent threshold	OL current range	Min. rating	
D4	1BA	UC	Undercurrent threshold	0.5 x OC Min. to OC Max., Off	0.8 x OC Min.	
D6	1BB	CUB	Current unbalance threshold	2–25% or 999%	6%	
D8	1BC	TC	Overcurrent trip class	5, J5, 10, J10, 15, J15, 20, J20, 30, J30 (J = Jam protection is enabled)	5	5 decimal
					J5	133 decimal
					10	10 decimal
					J10	138 decimal
					15	15 decimal
					J15	143 decimal
					20	20 decimal
					J20	148 decimal
					30	30 decimal
					J30	158 decimal
DA	1BD	RD1	Rapid cycle timer	2–500 seconds	10	
DC	1BE	RD2	Restart delay all faults except undercurrent	2–500 minutes	8	
DE	1BF	RD3	Restart delay after undercurrent	2–500 minutes	20	
E0	1C0	#RU	# Restarts after undercurrent	0, 1, 2, 3, 4, A (Automatic)	RU Values	
					8.1	0–4 in decimal
					8.2	A = 255 decimal
E2	1C1	#RF	# Restarts all faults except undercurrent	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA (0 = manual, A = continuous, oc = automatic restart after RD2 expires)	RF Values	
					0	1 decimal
					1	2 decimal
					oc1	3 decimal
					2	4 decimal
					oc2	5 decimal
					3	6 decimal
					oc3	7 decimal
					4	8 decimal
					oc4	9 decimal
					A	10 decimal
ocA	11 decimal					
E4	1C2	UCTD	Undercurrent trip delay	2–60 seconds	5	
E6	1C3	GF	Ground fault current threshold	(0.4) AOL current range or Off	0.15 x Min.	
E8	1C4	ADDR	RS-485 slave address	01–99	1	

★ Can only be viewed via network

PowerLogic® Power Meter Series 600

Instructions for performing local and remote programming for the Power Meter Series 600 are contained in Schneider Electric instruction bulletin # 3020IM9503_ (see "iMCC-Related Literature List" on page 63).

PowerLogic Power Meter Series 800

Instructions for performing local and remote programming for the Power Meter Series 800 are contained in Schneider Electric instruction bulletins # 63230-500-20_ (see "iMCC-Related Literature List" on page 63).

PowerLogic Circuit Monitor

Instructions for performing local and remote programming for the Circuit Monitor 3000 or Circuit Monitor 4000 series are contained in Schneider Electric instruction bulletin # 63230-400-204 or 63230-300-209, respectively (see "iMCC-Related Literature List" on page 63).

Altivar® 58

To accomplish local setpoint programming and fault readout for the Altivar 58, refer to Schneider Electric instruction bulletin # VVDED397047US R7/00 (see "iMCC-Related Literature List" on page 63).

To perform remote setpoint programming and fault readout, refer to Schneider Electric instruction bulletin # VVDED397054US (see "iMCC-Related Literature List" on page 63).

For Altivar 58 hardware troubleshooting, refer to Schneider Electric instruction bulletin # VVDED397048US R4/99 (see "iMCC-Related Literature List" on page 63).

See Table 13 on page 74 and Table 14 on page 75 to determine the location and addressing of parameters within the Altivar 58 register map.

Altivar 61/71

To perform local setpoint programming, please refer to Schneider Electric bulletin *atv71_Programming_Manual_EN*.

To perform remote setpoint programming, please refer to Schneider Electric bulletin *atv71_Parameters_EN*.

Altistart® 48

The Altistart 48 is factory set to operate without adjustment along with many applications. The Altistart 48 is set up with the following parameters:

Protocol	Address	Speed	Format	Parity
Modbus® RTU	Customer defined	19,200 baud	8 data bits, 1 stop bit	Even

Two switches on the back of the keypad provide three levels of access to the parameters. Each can be set to avoid adjustment of the parameters, as is the case when shipped from the factory. The parameters are locked at the factory to avoid accidental modification. To adjust parameters, you must first remove the communications module from the front of the unit door, and then change the DIP switch settings.

Device Addressing

Unless your order specifies otherwise, MCC devices are assigned addresses between 2–32 at the factory. Potential addresses beyond this range are supported on a device-specific basis. In mixed mode networks with Symax and Modbus® devices, address 1 can only be assigned to a Modbus device, and address 16 is reserved.

NOTE: When using Motor Logic Plus™ Solutions software, devices may be assigned addresses 1–99.

Software

Configurable software—such as PowerLogic® System Manager Software or Motor Logic Plus Solutions—is available for communication with your intelligent Model 6 iMCC components. For setup, operating, and maintenance instructions, consult the user manual included with your software package.

**IMCC/COMMUNICATIONS
TROUBLESHOOTING**

Use the following checklist, the table on page 77, and the wiring diagram on page 78 to troubleshoot communications problems in your iMCC.

Communications Checklist

- Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
- Verify that all cabling connections are secure.
- Refer to Table 15 on page 77 and Figure 86 on page 78 to verify that the cabling is accurate.
- If there are Modbus communications faults, verify that terminating resistors have been correctly installed.
- If a specific iMCC component is not functioning properly, consult the troubleshooting section of the reference material for that component (see "iMCC-Related Literature List" on page 63).

Table 15: Modbus® Device Connections

Parameter/ Device Type	Typical Bridge/Master	Momentum Master 170ADM54080	Motor Logic Plus™ SSOLR	Altivar® 58 with Modbus Card	Altivar 66 with Modbus Card	Altivar 61/71 with Modbus Card	Altistart® 46	Power Meter 600 Series	Power Meter 800 Series	Circuit Monitor
Default protocol		Modbus	JBUS	Modbus	Modbus	Modbus	Modbus	Modbus	Modbus	Modbus
Device address			Faceplate Settable (1–99)	Set by dip switch (1–31)	Set on keypad or software (1–64)	Set by dip switch (1–247)	Set by software	Set on faceplate (1–198)	Set on faceplate (1–198)	Set on faceplate (1–198)
Configuration software		Concept, Taylor, Modsoft	Solutions Software	VW3A58104	VW3A66331	VW3A8104	VW3G46105	SMS-3000	SMS-3000	SMS-3000
Communication connections		Terminal strip	Terminal strip	9-pin sub-D	15-pin sub-D	9-pin sub-D	9-pin sub-D	Terminal strip	Terminal strip	Terminal strip
2-wire: RS-485¹										
Jumpers		Required	Required	Not required	Not required	Not required	Not required	Required	Required	Required
Green/blue	D(B)+	1: RX HI	A: RD+	7: D(B)	14: D(B)	7: D(B)	7: D(B)	5: IN+	5: IN+	TX(B)+
White	D(A)-	2: RX Lo	B: RD-	3: D(A)	7: D(A)	3: D(A)	3: (D)A	4: IN-	4: IN-	TX(A)-
Bare	to ground	5: PE	S: Shld	4: 0V	15: 0V	4: 0V	4: 0V	1: Shld	1: Shld	to ground
4-wire: RS-422/485²										
Green/blue	TX(B)+	3: TX HI	A: RD+	6: RD(B)	3: RD(B)	6: RD(B)	6: RD(B)	5: IN+	5: IN+	TX(B)+
White	TX(A)-	4: TX Lo	B: RD-	2: RD(A)	8: RD(A)	2: RD(A)	2: RD(A)	4: IN-	4: IN-	TX(A)-
Red	RX(B)+	1: RX HI	Y: TD+	7: D(B)	14: D(B)	7: D(B)	7: D(B)	3: OUT+	3: OUT+	RX(B)+
Black	RX(A)-	2: RX Lo	Z: TD-	3: D(A)	7: D(A)	3: D(A)	3: D(A)	2: OUT-	2: OUT-	RX(A)-
Bare	to ground	5: PE	S: Shld	4: 0V	15: 0V	4: 0V	4: 0V	1: Shld	1: Shld	to ground

¹ Non-standard iMCC with Modbus MCC configuration

² Standard iMCC with Modbus MCC configuration

IMCC CABLING REPLACEMENT PARTS

Table 16: IMCC Standard Cabling Assemblies Parts List

Part #	Description	Use
3463512-1	Female threaded cap	Unused male taps all networks (approximately 2 per MCC)
3463512-3	Male threaded cap	Unused female taps all networks (approximately 4 per section)
5000129-75	5P MM DC male in-line plug 36 inches (stripped and tinned)	Modbus® unit taps (1 per unit)
5000129-76	5P MM DC female-to-male in-line assy 20 inches	Extension all networks
5000129-77	5P MM DC female-to-male in-line assy 24 inches	Extension all networks
5000129-78	5P MM DC female-to-male in-line assy 25 inches	Extension all networks
5000129-79	5P MM DC female-to-male in-line assy 30 inches	Extension all networks
5000129-80	5P MM DC female-to-male in-line assy 35 inches	Extension all networks
5000129-81	5P MM DC female-to-male in-line assy 25 feet	Field installation/special cables
5000129-83	5P MM DC F-F-F-F-F-F-MIL Harness assy 16 feet 2 inches (concept 2)	Main trunk cable all networks (1 per standard section)
5000129-85	5P MM DC male in-line plug 25 feet	Field installation/special cables
5000129-86	5P MM DC female plug 25 feet	Field installation/special cables
5000129-88	5P MM DC female-to-female-to-male in-line tee	Field installation/special cables
5000129-91	Female Terminator: Field attachable	Field installation/special cables
5000129-93	Male in-line plug field attachable (external thread)	Field installation/special cables
5000129-121	5P MM DC male in-line plug 200 feet	Field installation/special cables
5000129-122	5P MM DC male in-line terminator 121 ohms (white/blue pins)	Profibus, DeviceNet, Modbus Plus™, Modbus 2 wire (1 per segment)
5000129-123	5P MM DC female terminator 121 ohms (white/blue pins)	Profibus, DeviceNet, Modbus Plus, Modbus 2 wire (1 per segment)
5000129-134	5P MM DC male in-line to DB-9 Modbus Plus assy 36 inches	Modbus Plus unit taps (1 per unit)
5000129-135	5P MM DC male in-line to DB-9 assy 36 inches	Profibus unit taps (1 per unit)
5000129-136	5P MM DC male in-line to DB-9 Altivar® 58 Modbus assy 36 inches	Modbus Altivar 58 unit taps (1 per unit)
5000129-186	5P MM DC male in-line terminator 121 ohms (white/blue red/black pins)	Modbus 4 wire systems (1 per segment)
5000129-187	5P MM DC female terminator 121 ohms (white/blue red/black pins)	Modbus 4 wire systems (1 per segment)
5000129-230	5P MM DC tapping tee with shield ground wire and lug (capacitive shield break)	All networks but Seriplex® (1 per section)
5000129-231	5P MM DC tapping tee with shield ground wire (red wire broken) (black)	Seriplex (1 per power supply)
5000129-233	5P MM DC male in-line plug 36 inches (ferrules)*	DeviceNet/Seriplex unit taps (1 per unit)
5000129-295	5P MM DC female drop on female-to-male in-line assy 16 feet	Main trunk cable all networks (1 per full section unit)
80445-085-02	5P MM DC male in-line to DB-9 Modbus 4 wire assy 36 inches	Modbus 4 wire Altistar® 46 unit taps (1 per unit)

* For two Seriplex modules, cut cable 4 inches, remove jacket, shrink tube, and splice with double ferrule # AZ5DE005.

**IMCC CABLING SYSTEM
SPECIFICATIONS**

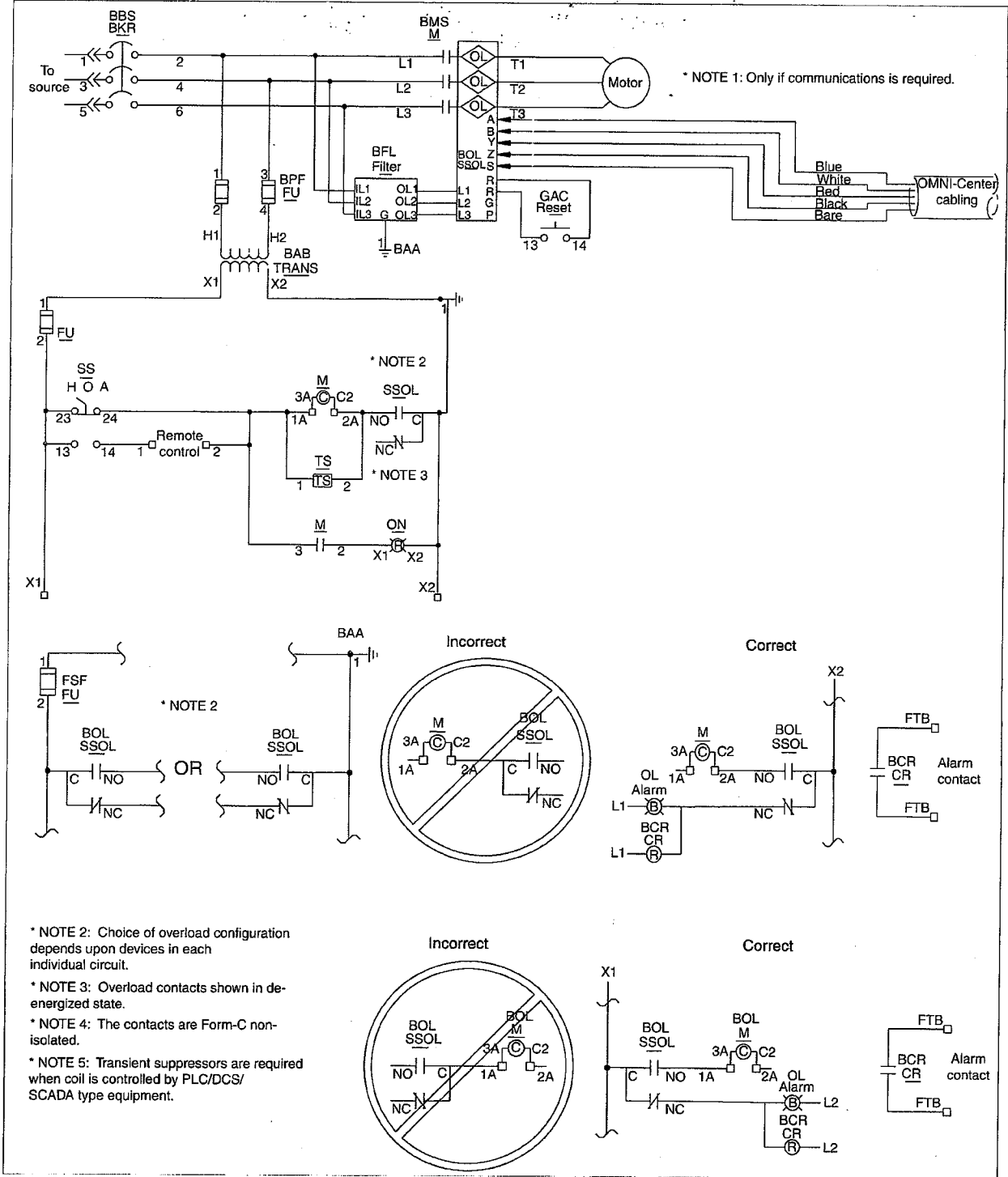
The Model 6 iMCC uses a dedicated MCC network cable assembly. This cable assembly is UL498 Listed for 3 A at 600 V. The assembly is 100% dielectrically tested at a minimum of 2000 V for 1 second. The cable carries a stand-alone 600 V AWM rating (UL style 1990). The individual conductor insulation and the cable jacket are both rated for 600 V. The following table contains a summary of the cable characteristics:

Table 17: Model 6 iMCC Cabling System Components

Parameter	Rating
Wire	Four #22 AWG (7x30 stranded) tin-plated annealed copper
Lay	4 conductors 2.5 RH lay white/red/blue/black with foam polypropylene tape 25% overlap
Conductor insulation	600 V foam high density polyethylene 27 mil minimum thickness
Jacket insulation	600 V PVC 27 mil minimum thickness
Color-code	Color-coded white/red/blue/black
Shield	100% alum/Mylar with 22 AWG drain 25% overlap
O.D.	0.31
Current rating at 60°C	3 A
Nominal inductance	120 ohms
Capacitance diagonal conductors	8 PF/ft
Capacitance conductor to all other conductors/shield	18 PF/ft
Capacitance conductor to shield	14.5 PF/ft
Diagonal conductor impedance at 1 MHz	165 ohms
Conductor DCR at 20°C	15 ohms/1000 ft
Shield DCR at 20°C	13 ohms/1000 ft
Attenuation at 1 MHz	0.148 dB/100 ft
Diagonal conductor propagation velocity	78%
Listing/Marking	UL 498, E 151405, AWM 600 V, CM, Class 2, CUL, CM 4/C 22, AWG 18 PF/ft
Flame test	FT-1

WIRING DIAGRAM

Figure 87: Typical iMCC FVNR with Modbus® Communications



SECTION 10—EXPANSION

The modular design of MCCs permits easy expansion to keep pace with an expanding electrical system. When space is available in the existing MCC, starter units can easily be added. When no more starter unit mounting space is available, vertical sections can be added to provide additional space.

Starter units may be rearranged or replaced with larger units. In most cases, a Size 2 starter unit can replace a Size 1 unit with no change in mounting space.

Ordering Information

When ordering additional MCC equipment, include the following information:

- Type of equipment being supplied
- Supply voltage, frequency, system type
- NEMA/EEMAC enclosure type
- Enclosure finish
- Control circuit voltage and frequency
- Optional control circuit components required (control transformers, push buttons, pilot lights, selector switches, etc.)
- Special features
- The factory order number of the original MCC (the number is stamped into the structure nameplate on the vertical wire trough door; the unit label inside each control unit also contains the factory order number)

When ordering new vertical sections, also provide the following information:

- Horizontal and vertical bus capacity, material, and plating
- Bus bracing (or available fault current)
- Enclosure dimensions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Modifying MCC Units

De-Energizing Equipment and Identifying Unit Type

Most MCC units are designed for easy removal from the MCC structure. Some units are not removable due primarily to the physical size of the unit.

Identify whether the unit intended for modification is a removable style or a fixed position unit. All removable units have stab connections to the vertical bus as shown on the electrical schematics and one-line diagrams provided with the MCC. Most removable units also have a twin handle cam mechanism (see Figure 57 on page 47). One notable exception is the Model 6 Compac 6-inch unit (see Figure 63 on page 49), which is removable but does not have the twin handle cam mechanism.

If the unit is removable, follow the instructions below. If the unit is a fixed position unit, follow the instructions for "Modifying Fixed Units" below.

Modifying Removable Units

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the MCC unit from the structure. See the procedure for "Maintaining the Control Unit" on page 45 of this manual.
3. Perform the required modifications. Use thread-forming screws to mount devices. Do not use bolts and nuts, as they could loosen over time and cause property damage or personal injury. The hardware must not extend beyond the back of the MCC unit saddle more than 0.25 in. or beyond the sides and bottom pan by more than 0.125 in.
4. Make sure that proper electrical spacing between uninsulated live parts of opposite polarity and an exposed or uninsulated dead metal part is maintained. Electrical spacings are defined in UL 845, table 19. Electrical spacing within a unit (251-600V) is 0.375 in. through air and 0.50 in. over surface.
5. Use a vacuum cleaner to remove all debris left in the unit as a result of the modifications. Do not use compressed air to blow out the unit, because all debris may not be fully removed.
6. Perform the recommended maintenance procedures beginning on page 45 of this manual.
7. Ensure that vertical bus closing plugs are in place (with the exception of one plug where the MCC unit will stab on the vertical bus). If other vertical bus closing plugs are not in the proper position, ensure that all power is removed from the vertical bus and reinstall the vertical bus closing plugs.
8. Use a megohmmeter to perform an insulation test as outlined on page 53.
9. Look for and clear any obstructions that would not permit proper energization of the MCC unit.
10. Reinstall the MCC unit and follow the procedures for "Energizing the MCC" on page 43 of this manual.

Modifying Fixed Units

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. If drilling holes in the back of the MCC unit saddle is required, do not drill through the back of the saddle more than 0.1875 in. Use a drill stop device for this procedure.
3. Perform the required modifications. Use thread-forming screws to mount devices. Do not use bolts and nuts, as they could loosen over time and cause property damage or personal injury. The hardware must not extend beyond the back of the MCC unit saddle more than 0.25 in. or beyond the sides and bottom pan by more than 0.125 in.
4. Make sure that proper electrical spacing between uninsulated live parts of opposite polarity and an exposed or uninsulated dead metal part is maintained. Electrical spacings are defined in UL 845, table 19. Electrical spacing within a unit (251-600V) is 0.375 in. through air and 0.50 in. over surface.
5. Use a vacuum cleaner to remove all debris left in the unit as a result of the modifications. Do not use compressed air to blow out the unit, because all debris may not be fully removed.
6. Perform the recommended maintenance procedures beginning on page 45 of this manual.
7. Use a megohmmeter to perform an insulation test as outlined on page 53.

8. Follow the procedures for “Energizing the MCC” on page 43.

Installing Additional MCC Units

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Position the midshelf (Figure 88, Item A) in the appropriate area of the structure.
3. Place the mounting foot (Item B) of the shelf into the mounting pan slots (Item C). Secure the shelf at the mounting foot end, the left side, and the right side with flat head screws (Detail A, Item D).
4. Install the hinge leaves of the door (Detail A, Item E) into the hinge slots (Item G), which are on the structure corner channel. Fasten the hinge leaves to the structure corner channel using hex head screws (Item H).
5. Install quarter-turn fastener receptacles (Detail B, Item J) into the bracket slots (Item K) and fasten with hex head screws (Item H).

Figure 88: Shelf and Door Installation

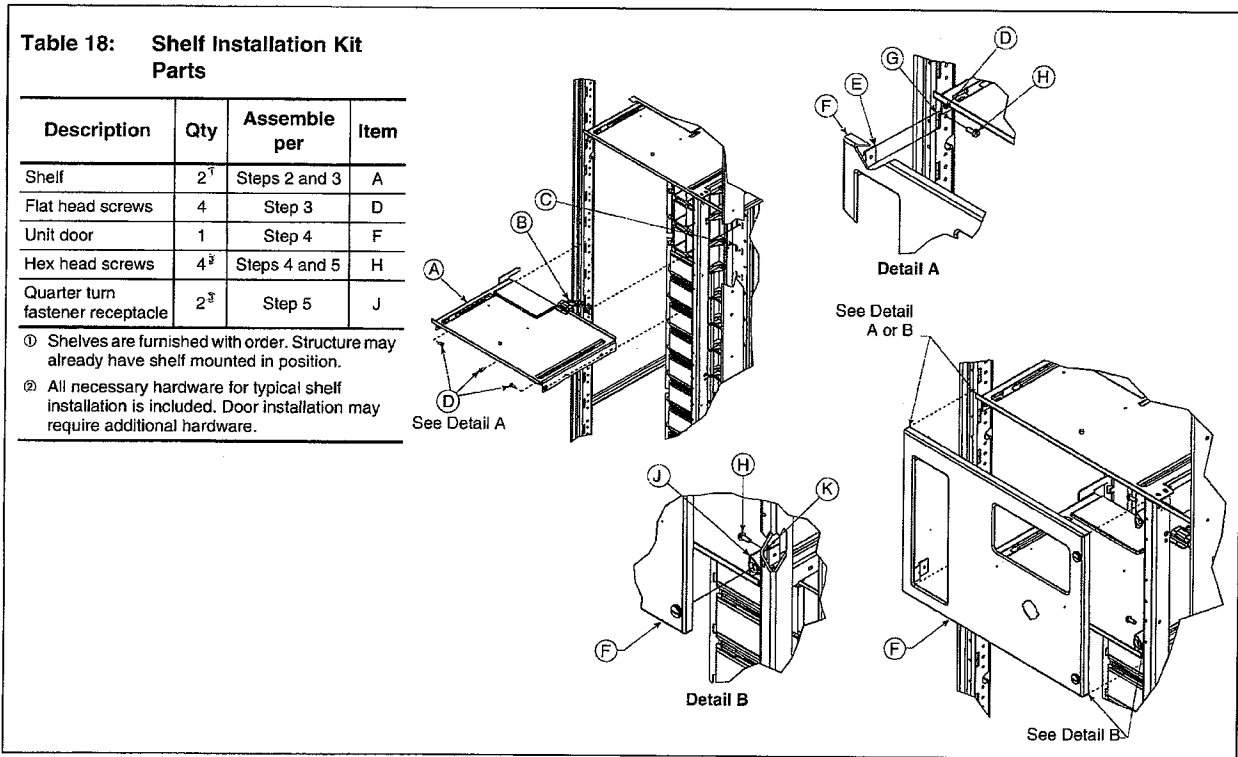
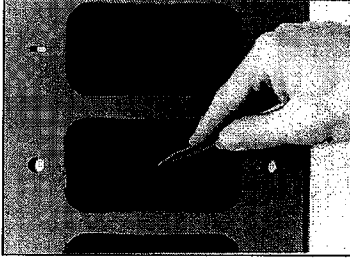


Figure 89: Cutting the Vertical Wire-Trough Grommet (when supplied)



6. If a grommated wireway barrier is supplied, locate the vertical wire trough grommet (see Figure 89) nearest the bottom of the control unit. Cut the grommet following the instructions on the grommet. See the second paragraph under "Load and Control Wiring" on page 38.
7. Remove the manual bus shutter(s) (see Figure 90) to allow insertion of the new control unit; slide out the top bus shutter.
NOTE: Do not remove the tether.

Figure 90: Removing the Manual Bus Shutter

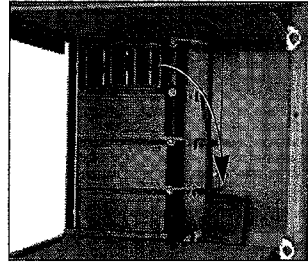
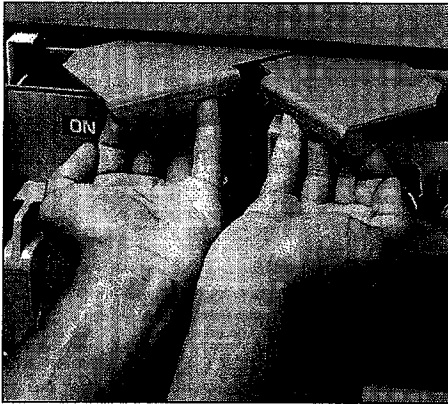


Figure 91: Pulling the Twin Handles of the Cam Mechanism Forward



8. Make certain that the twin handles of the cam mechanism unit are extended fully forward (see Figure 91). Guide the control unit onto the hanging rails and slide the unit in until the twin handles engage the cam stud located on the support shelf.
9. Press the handles inward until they are flush with the face of the MCC (see Figure 92).
NOTE: Compac™ 6 units do not have the twin handle cam mechanism.

Figure 92: Handles Flush with the Front of the MCC

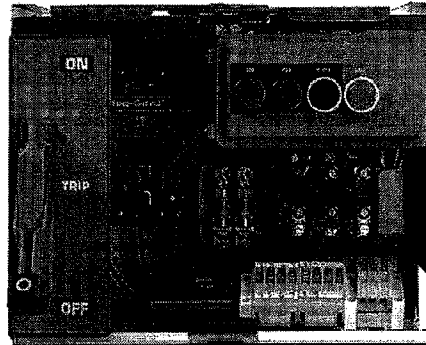
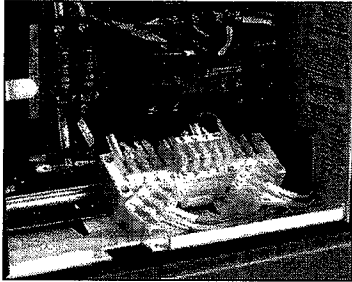


Figure 93: Tightening the Control Unit Lock-in Panel (when supplied)



10. Turn the screw on the control unit lock-in panel (when supplied) located at the bottom front of the control unit (see Figure 93), until the lock-in pawl is latched to the support shelf below the control unit.

Figure 94: Power Leads Connected to Power Terminals



11. Pull the power leads from the vertical wire trough through the grommet and into the control unit. Connect them to the power terminals in the control unit (see Figure 94).

NOTE: To provide additional working clearance, grasp the control station plate on the right side and pull gently, allowing it to hinge open (see Figure 95).

12. Pull the control leads from the vertical wire trough through the grommet and connect them to the terminals of the top (removable) portion of the control pull-apart terminal blocks (see Figure 95).

13. Close the unit door and secure the quarter-turn fasteners.

Figure 95: Connecting Control Leads to the Terminal Blocks



Compac™ 6 Units

The following describes how to add a Compac 6, six-inch unit to an MCC section. Before installing these units, read and understand the safety precautions at the beginning of this section. For full details about MCC installation, refer to "Section 4—Installing the MCC" on page 14.

Control and Load Wiring

Pull-apart control terminals (see Figure 96) are mounted on the floor of the unit adjacent to the wiring port on the right side. Terminate field control wiring on the removable portion of the block.

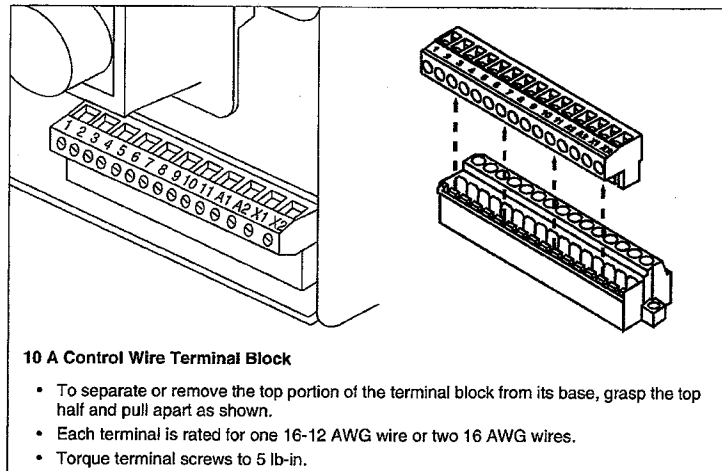
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

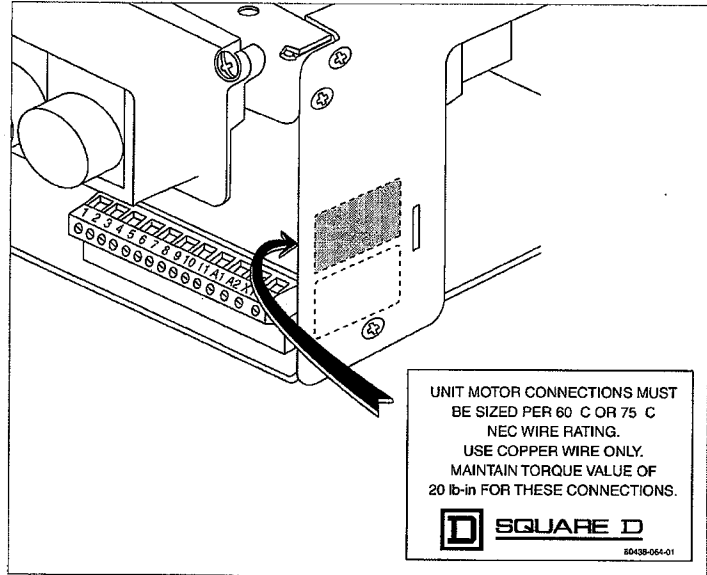
Figure 96: Pull-apart Terminals



Cable Connection Torque Values

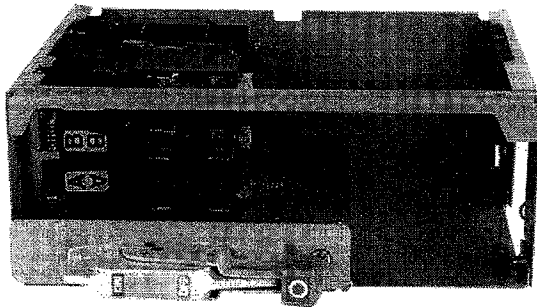
Refer to the torque label on the right inside wall of the unit for load terminal wire and torque requirements (see Figure 97).

Figure 97: Unit Torque Label

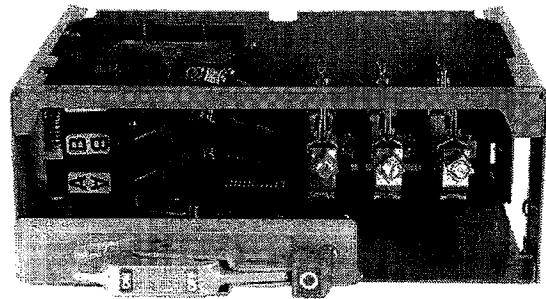


Fuse clips in six-inch units accommodate 600 V, Class J fuses only. The switch mounted fuse base (see Figure 98) is configured either for 30 A or 60 A fuses. The bottom plate mounted fuse base accepts 100 A fuses.

Figure 98: Fuse Bases



Switch Mounted Fuse Base



Bottom Plate Mounted Fuse Base

Compac™ 6 Control Unit Installation

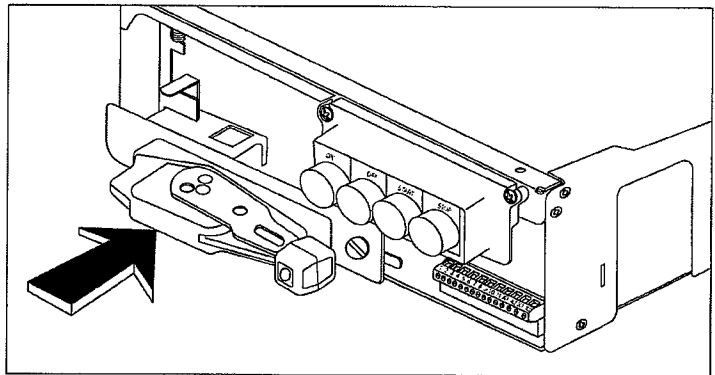
If Compac 6 control units have been removed from the structure, reinstall them when maintenance work on them is complete. For control unit replacement, follow these instructions:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Ensure that the operator handle of the control unit is in the OFF position.
3. Place the control unit into the structure in the proper location.
4. Slide the control unit toward the rear of the structure and, with a firm push on the operator handle, ensure that the bus stabs fully engage the vertical bus (Figure 99).

NOTE: The interlock is spring loaded and engages automatically when the control unit is inserted with a firm push to the operator handle. Pressing the structure interlock release is not necessary.

5. Retrieve the pull-apart terminal block from the vertical wire trough in through the wiring port.

Figure 99: Reinstalling the Compac 6 Control Unit



6. Connect the pull-apart terminal block to the control unit. If necessary, remove the control panel. Replace the control panel when the connection is made.
7. Refer to the termination tags placed during removal of the control unit (Step 4 on page 50) to properly connect the power wiring to the starter terminals.
8. Shut the door and tighten the quarter-turn fasteners (see Detail B of Figure 88 on page 84).

SECTION 11—TROUBLESHOOTING

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

The following table lists problems encountered with MCCs, their causes, and remedies. This table is of a general nature and covers only the main causes of problems.

Misapplication of a device can result in serious problems; however, rather than list this cause repeatedly below, note that misapplication is a major cause of motor control problems and must always be questioned when a device is not functioning properly.

Actual physical damage or broken parts can usually be quickly located and replaced. Damage caused by water or flood conditions requires special treatment. Contact your Schneider Electric field sales representative.

Table 19: Motor Control Center Troubleshooting Chart

Part	Problem	Cause	Remedy
Contacts	Contact Chatter (also see Noisy Magnet)	<ol style="list-style-type: none"> Poor contact in the control circuit. Low voltage. 	<ol style="list-style-type: none"> Replace the contact device or use a holding circuit interlock (3-wire control). Check the coil terminal voltage and voltage dips during starting.
	Welding or Freezing	<ol style="list-style-type: none"> Abnormal inrush of current. Rapid jogging. Insufficient tip pressure. Low voltage which prevents the magnet from sealing. Foreign matter prevents the contacts from closing. Short circuit or ground fault. 	<ol style="list-style-type: none"> Check for grounds, shorts, or excessive motor load current, or use larger contactor. Install a larger device rated for jogging service. Replace contacts and springs. Check contact carrier for deformation or damage. Check the coil terminal voltage and voltage dips during starting. Clean the contacts with an environmentally safe (CFC-free) contact cleaner. Remove the fault. Ensure that the fuse and circuit breaker sizes are correct.
	Short Trip Life or Overheating or Trips	<ol style="list-style-type: none"> Filing or dressing. Interrupting excessively high currents. Excessive jogging. Weak tip pressure. Dirt or foreign matter on the contact surface. Short circuit or ground fault. Loose connection in the power circuit. Sustained overload. 	<ol style="list-style-type: none"> Do not file the silver tips; rough spots or discoloration do not harm tips or impair their efficiency. Install a larger device or check for grounds, shorts, or excessive motor currents. Install a larger device rated for jogging service. Replace contacts and springs; check the contact carrier for deformation or damage. Clean contacts with an environmentally safe (CFC-free) contact cleaner. Reduce the entry of foreign matter into the enclosure. Remove the fault; ensure that the fuse and circuit breaker sizes are correct. Clear and tighten the connection. Check for excessive motor load current or install a larger device.
Coils	Open Circuit	Mechanical damage.	Replace the coil; handle and store replacement coils carefully.
	Overheated Coil	<ol style="list-style-type: none"> Overvoltage or high ambient temperature. Incorrect coil. Shorted turns caused by mechanical damage or corrosion. Undervoltage; failure of the magnet to seal in. Dirt or rust on the pole faces. Mechanical obstruction. 	<ol style="list-style-type: none"> Check the coil terminal voltage. It should not exceed 110% of the coil rating. Install the correct coil. Replace the coil. Check the coil terminal voltage. It should be at least 85% of the coil rating. Clean the pole faces. With power <i>off</i>, check for free movement of the contact and armature assembly.
Thermal Overload Relays	Tripping	<ol style="list-style-type: none"> Sustained overload. Loose or corroded connection in the power circuit. Incorrect thermal units. Excessive coil voltage. 	<ol style="list-style-type: none"> Check for excessive motor currents or current unbalance; correct cause. Clean and tighten the connection. Replace the thermal units with the correct size for the application. Voltage should not exceed 110% of the coil rating.
	Failure To Trip	<ol style="list-style-type: none"> Incorrect thermal units. Mechanical binding, dirt, corrosion, etc. Relay previously damaged by a short circuit. Relay contact welded or not in series with the contactor coil. 	<ol style="list-style-type: none"> Check the thermal unit selection table. Install the proper thermal units. Replace the relay and thermal units. Replace the relay and thermal units. Check circuit for a fault and correct the condition. Replace the contact or the entire relay as necessary.

Table 19: Motor Control Center Troubleshooting Chart (continued)

Part	Problem	Cause	Remedy
Motor Logic® Overload Relays	Overload relay trips on start-up (after more than 3 seconds).	<ol style="list-style-type: none"> 1. Load is too heavy for motor horsepower. 2. Wrong overload trip class selected for application. 3. Incorrect overload FLA setting. 4. Use of electronic DC injection brake. 	<ol style="list-style-type: none"> 1. Remove excessive motor load or resize motor. 2. Use Trip Class 20 overload relay instead of Trip Class 10. 3. Set FLA adjustment according to motor full-load current. 4. Do not use electronic DC injection brakes with solid-state overload relay.
	Overload relay trips on start-up (in less than 3 seconds).	<ol style="list-style-type: none"> 1. Motor branch circuit fuse blown. 2. Loose motor branch circuit. 3. Motor circuit is not 3-phase. 4. Voltage unbalance on feeder. 5. Motor winding damage in one or more windings. 6. Phase loss in primary of wye-delta or delta-wye transformer. 7. One or more load lead(s) is not routed through relay window or is routed in opposite direction. 8. Number of load lead passes are different. 	<ol style="list-style-type: none"> 1. Replace blown motor branch circuit fuse(s). 2. Tighten motor branch circuit connection. 3. Select different type of overload relay for non 3-phase applications. 4. Correct voltage unbalance in feeder. 5. Check motor winding impedance. Rewind if necessary. 6. Replace blown fuses or tighten connections. 7. Pass each load lead through its respective window in the same direction. 8. Each load lead must be looped the same number of passes.
	Overload relay trips while running normally.	<ol style="list-style-type: none"> 1. Load is too heavy for motor horsepower. 2. Incorrect overload FLA setting. 3. Use of electronic DC injection brake. 4. Incorrect overload FLA setting.(Multiple pass applications.) 	<ol style="list-style-type: none"> 1. Remove excessive motor load or resize motor. 2. Set FLA adjustment according to motor full-load current. 3. Do not use electronic DC injection brakes with solid-state overload relay. 4. Recalculate FLA adjustment and set according to motor full-load current and number of looped passes.
Magnetic And Mechanical Parts	Noisy Magnet	<ol style="list-style-type: none"> 1. Broken shading coil. 2. Dirt or rust on magnet faces. 3. Low voltage. 	<ol style="list-style-type: none"> 1. Replace the magnet and armature. 2. Clean the magnet with a clean, dry cloth. 3. Check the coil terminal voltage and voltage dips during starting.
	Failure To Pick Up and Seal	<ol style="list-style-type: none"> 1. No control voltage. 2. Low voltage. 3. Mechanical obstruction. 4. Open or overheated coil. 5. Wrong coil. 	<ol style="list-style-type: none"> 1. Check the control circuit wiring for a loose connection or poor contact continuity. 2. Check for the proper coil terminal voltage and voltage dips during starting. 3. With the power off, check for free movement of the contact and armature assembly. 4. Replace the coil. 5. Replace the coil.
	Failure To Drop Out	<ol style="list-style-type: none"> 1. Gummy substance on the pole faces. 2. Voltage not removed. 3. Worn or corroded parts causing binding. 4. Residual magnetism due to the lack of an air gap in the magnet path. 5. Welded contacts. 	<ol style="list-style-type: none"> 1. Clean the pole faces with a clean, dry cloth. 2. Check the coil terminal voltage and the control circuit. 3. Replace the parts. 4. Replace the magnet and armature. 5. See Contacts—Welding or Freezing
Pneumatic Timers	Erratic Timing	Foreign matter in the valve.	Replace the complete timing head, or return the timer to the factory for repair and adjustment.
	Contacts Do Not Operate	<ol style="list-style-type: none"> 1. Maladjustment of the actuating screw. 2. Worn or broken parts in the snap switch. 	<ol style="list-style-type: none"> 1. Adjust according to the instructions in the service bulletin. 2. Replace the snap switch.
Limit Switches	Broken Parts	Overtravel of the actuator.	Use a resilient actuator, or operate within the tolerance of the device.
Manual Starters	Failure To Reset	Latching mechanism worn or broken.	Replace the starter.

Thermal Overload Unit Selection

This section identifies the thermal overload units needed for the starters specified in an order. Tables are based on motor full-load amps and provide the catalog number for the appropriate thermal units to be used at that current rating.

Melting Alloy Overload Selection Tables for Combination Starter Units

Size 1

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
0.56–0.63	B 0.81	3.23–3.49	B 4.85
0.64–0.68	B 0.92	3.50–3.85	B 5.50
0.69–0.77	B 1.03	3.86–4.11	B 6.25
		4.12–4.70	B 6.90
0.78–0.85	B 1.16		
0.86–0.97	B 1.30	4.71–5.21	B 7.70
0.98–1.09	B 1.45	5.22–5.53	B 8.20
1.10–1.21	B 1.67	5.54–6.17	B 9.10
		6.18–7.02	B 10.2
1.22–1.33	B 1.88		
1.34–1.53	B 2.10	7.03–7.92	B 11.5
1.54–1.73	B 2.40	7.93–8.61	B 12.8
1.74–1.89	B 2.65	8.62–9.17	B 14
		9.18–10.0	B 15.5
1.90–2.17	B 3.00		
2.18–2.53	B 3.30	10.1–11.0	B 17.5
2.54–2.87	B 3.70	11.1–11.8	B 19.5
2.88–3.22	B 4.15	11.9–13.5	B 22
		13.6–15.3	B 25
		15.4–17.4	B 28
		17.5–19.4	B 32
		19.5–22.2	B 36
		22.3–25.1	B 40
		25.2–27.0	B 45

Size 2

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
3.94–4.45	B 6.90	11.5–12.3	B 19.5
4.46–4.97	B 7.70	12.4–13.9	B 22
		14.0–15.8	B 25
4.98–5.28	B 8.20	15.9–17.9	B 28
5.29–5.97	B 9.10		
5.98–6.89	B 10.2	18.0–19.9	B 32
6.90–7.92	B 11.5	20.0–22.8	B 36
		22.9–25.4	B 40
7.93–8.71	B 12.8	25.5–28.9	B 45
8.72–9.27	B 14.0		
9.28–10.2	B 15.5	29.0–30.8	B 50
10.3–11.4	B 17.5	30.9–32.5	B 56
		32.6–34.9	B 62
		35.0–39.7	B 70
		39.8–44.7	B 79

Melting Alloy Overload Selection Tables for Combination Starter Units (cont.)

Size 3

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
14.0–14.9	CC 20.9	34.1–36.8	CC 54.5
15.0–16.2	CC 22.8	36.9–39.8	CC 59.4
16.3–17.2	CC 24.6	39.9–42.3	CC 64.3
17.3–18.7	CC 26.3	42.4–45.7	CC 68.5
18.8–20.2	CC 28.8	45.8–49.2	CC 74.6
20.3–21.7	CC 31.0	49.3–52.8	CC 81.5
21.8–23.3	CC 33.3	52.9–56.8	CC 87.7
23.4–25.2	CC 36.4	56.9–61.2	CC 94.0
25.3–27.1	CC 39.6	61.3–66.1	CC 103
27.2–29.4	CC 42.7	66.2–71.2	CC 112
29.5–31.6	CC 46.6	71.3–76.7	CC 121
31.7–34.0	CC 50.1	76.8–82.9	CC 132
		83.0–90.0	CC 143

Size 4

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
44.0–46.8	CC 64.3	73.0–78.1	CC 112
46.9–50.6	CC 68.5	78.2–83.9	CC 121
50.7–54.5	CC 74.6	84.0–91.1	CC 132
54.6–58.4	CC 81.5	91.2–97.5	CC 143
58.5–62.9	CC 87.7	97.6–104	CC 156
63.0–67.7	CC 94.0	105–113	CC 167
67.8–72.9	CC 103	114–133	CC 180

Size 5 without CT Type Overloads

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
88.2–95.1	DD 112	171–180	DD 220
95.2–101	DD 121	181–197	DD 240
102–111	DD 128	198–204	DD 250
112–119	DD 140	205–213	DD 265
120–131	DD 150	214–237	DD 280
132–149	DD 160	238–243	DD 300
150–170	DD 185	244–266	DD 320

Size 5 with CT Type Overloads and Circuit Breakers

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
40.8–45.5	B 1.03	105–114	B 2.65
45.6–49.9	B 1.16	115–128	B 3.00
51.0–57.5	B 1.30	129–140	B 3.30
57.6–65.9	B 1.45	141–160	B 3.70
66.0–73.1	B 1.67	161–193	B 4.15
73.2–81.5	B 1.88	194–209	B 4.85
81.6–92.3	B 2.10	210–232	B 5.50
92.4–104	B 2.40	233–248	B 6.25
		249–266	B 6.90

Size 5 with CT Type Overloads and Fusible Switch Disconnects

Motor Full-Load Current (A)	Thermal Unit Number	Max. Fuse Rating (A)	Motor Full-Load Current (A)	Thermal Unit Number	Max. Fuse Rating (A)
40.8–45.5	B 1.03	90	115–128	B 3.00	250
45.6–49.9	B 1.16	100	129–140	B 3.30	250
51.0–57.5	B 1.30	110	141–160	B 3.70	300
57.6–65.9	B 1.45	125	161–193	B 4.15	350
66.0–73.1	B 1.67	125	194–209	B 4.85	400
73.2–81.5	B 1.88	150	210–232	B 5.50	400
84.6–92.3	B 2.10	175	233–248	B 6.25	400
92.4–104	B 2.40	200	249–266	B 6.90	400
105–114	B 2.65	225			

Melting Alloy Overload Selection Tables for Combination Starter Units (cont.)

Size 6

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
133-148	B 1.30	272-308	B 2.65
149-174	B 1.45	309-348	B 3.00
175-195	B 1.67	349-397	B 3.30
196-219	B 1.88	398-429	B 3.70
220-239	B 2.10	430-495	B 4.15
240-271	B 2.40	496-520	B 4.85

Melting Alloy Overload Selection Tables for Part Winding Combination Starter Units

Size 1

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
1.12–1.27	B 0.81	6.46–6.99	B 4.85
1.28–1.37	B 0.92	7.00–7.71	B 5.50
1.38–1.55	B 1.30	7.72–8.23	B 6.25
		8.24–9.41	B 6.90
1.56–1.71	B 1.16		
1.72–1.95	B 1.30	9.42–10.43	B 7.70
1.96–2.19	B 1.45	10.44–11.07	B 8.20
2.20–2.43	B 1.67	11.08–12.35	B 9.10
		12.36–14.05	B 10.2
2.44–2.67	B 1.88		
2.68–3.07	B 2.10	14.06–15.85	B 11.5
3.08–3.47	B 2.40	15.86–17.23	B 12.8
3.48–3.79	B 2.65	17.24–18.35	B 14
		18.36–20.1	B 15.5
3.80–4.35	B 3.00		
4.36–5.07	B 3.30	20.2–22.1	B 17.5
5.08–5.75	B 3.70	22.2–23.7	B 19.5
5.76–6.45	B 4.15	23.8–27.1	B 22
		27.2–30.7	B 25
		30.8–34.9	B 28
		35.0–38.9	B 32
		39.0–44.5	B 36
		44.6–50.3	B 40
		50.4–54.0	B 45

Size 3

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
28.0–29.9	CC 20.9	68.2–73.7	CC 54.5
30.0–32.5	CC 22.8	73.8–79.7	CC 59.4
32.6–34.5	CC 24.6	79.8–84.7	CC 64.3
34.6–37.5	CC 26.3	84.8–91.5	CC 68.5
37.6–40.5	CC 28.8	91.6–98.5	CC 74.6
40.6–43.5	CC 31.0	98.6–105.7	CC 81.5
43.6–46.7	CC 33.3	105.8–113.7	CC 87.7
46.8–50.5	CC 36.4	113.8–122.5	CC 94.0
50.6–54.3	CC 39.6	122.6–132.3	CC 103
54.4–58.9	CC 42.7	132.4–142.5	CC 112
59.0–63.3	CC 46.6	142.6–153.5	CC 121
63.4–68.1	CC 50.1	153.6–165.9	CC 132
		166.0–180.0	CC 143

Size 2

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
7.88–8.91	B 6.90	23.0–24.7	B 19.5
8.92–9.95	B 7.70	24.8–27.9	B 22
		28.0–31.7	B 25
9.96–10.57	B 8.20	31.8–35.9	B 28
10.58–11.95	B 9.10		
11.96–13.79	B 10.2	36.0–39.9	B 32
13.80–15.85	B 11.5	40.0–45.7	B 36
		45.8–50.9	B 40
15.86–17.43	B 12.8	51.0–61.7	B 45
17.44–18.55	B 14.0		
18.56–20.5	B 15.5	61.8–65.1	B 50
20.6–22.9	B 17.5	65.2–69.9	B 56
		70.0–79.5	B 62
		79.6–89.4	B 70

Size 4

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
105–112	CC 74.6	170–181	CC 132
113–122	CC 81.5	182–195	CC 143
123–131	CC 87.7	196–209	CC 156
132–142	CC 94.0	210–227	CC 167
143–153	CC 103	228–247	CC 180
154–157	CC 112	248–266	CC 196
158–169	CC 121		

Melting Alloy Overload Selection Tables for Part Winding Combination Starter Units (cont.)

Size 5 without CT Type Overloads

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
176-190	DD 112	342-361	DD 220
191-203	DD 121	362-395	DD 240
204-223	DD 128	396-409	DD 250
224-239	DD 140	410-427	DD 265
240-253	DD 150	428-475	DD 289
254-299	DD 160	476-487	DD 300
300-341	DD 185	488-532	DD 320

Size 5 with CT Type Overloads and Circuit Breakers

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
81.6-91.1	B 1.03	230-257	B 3.00
91.2-101	B 1.16	258-281	B 3.30
102-115	B 1.30	282-321	B 3.70
116-131	B 1.45	322-387	B 4.15
132-146	B 1.67	388-419	B 4.85
147-163	B 1.84	420-465	B 5.50
164-184	B 2.10	466-497	B 6.25
185-209	B 2.40	498-532	B 6.90
210-229	B 2.65		

Size 5 with CT Type Overloads and Fusible Switch Disconnects

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
81.6-91.1	B 1.03	230-257	B 3.00
91.2-101	B 1.16	258-281	B 3.30
102-115	B 1.30	282-321	B 3.70
116-131	B 1.45	322-387	B 4.15
132-146	B 1.67	388-419	B 4.35
147-163	B 1.88	420-465	B 5.60
164-184	B 2.10	466-497	B 6.25
185-209	B 2.40	498-532	B 6.90
210-229	B 2.65		

Ambient-Compensated Bimetallic Overload Selection Tables for Combination Starter Units

Size 1

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
0.57–0.60	AR 1.05	3.46–3.81	AR 5.8
0.61–0.66	AR 1.15	3.82–4.20	AR 6.4
0.67–0.73	AR 1.26	4.21–4.65	AR 7.0
0.74–0.81	AR 1.39	4.66–5.29	AR 7.7
0.82–0.90	AR 1.53	5.30–5.84	AR 8.5
0.91–1.05	AR 1.68	5.85–6.27	AR 9.3
1.06–1.15	AR 1.85	6.28–6.97	AR 10.2
1.16–1.25	AR 2.04	6.98–7.59	AR 11.2
1.26–1.35	AR 2.24	7.60–7.89	AR 12.4
1.36–1.47	AR 2.46	7.90–8.95	AR 13.6
1.48–1.58	AR 2.71	8.96–10.3	AR 15.4
1.59–1.74	AR 2.98	10.4–11.7	AR 17.6
1.75–1.94	AR 3.28	11.8–13.3	AR 20.5
1.95–2.20	AR 3.62	13.4–15.2	AR 23
2.21–2.47	AR 3.98	15.3–17.2	AR 27
2.48–2.76	AR 4.37	17.3–19.7	AR 30
2.77–3.07	AR 4.80	19.8–22.4	AR 35
3.08–3.45	AR 5.3	22.5–26.0	AR 40

Size 2

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
4.24–4.62	AR 8.5	16.5–18.9	AR 35
4.63–5.05	AR 9.3	19.0–21.6	AR 40
5.06–5.54	AR 10.2	21.7–23.3	AR 44
5.55–6.13	AR 11.2	23.4–24.9	AR 47
6.14–6.44	AR 12.4	25.0–26.9	AR 51
6.45–7.48	AR 13.6	27.0–29.1	AR 55
7.49–8.55	AR 15.4	29.2–31.3	AR 60
8.56–9.74	AR 17.6	31.4–33.5	AR 66
9.75–11.1	AR 20.5	33.6–36.9	AR 72
11.2–12.7	AR 23	37.0–39.1	AR 79
12.8–14.4	AR 27	39.2–40.9	AR 86
14.5–16.4	AR 30	41.0–45.0	AR 94

Size 3

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
27.1–30.0	E 67	47.0–51.5	E 74
30.1–33.2	E 69	51.6–57.0	E 76
33.3–35.7	E 70	57.1–62.8	E 77
35.8–39.4	E 71	62.9–69.1	E 78
39.5–43.4	E 72	69.2–75.0	E 79
43.5–46.9	E 73	75.1–83.3	E 80

Size 4

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
50–55.9	E 88	82–86.9	E 96
56–60.9	E 89	87–92.9	E 97
61–65.9	E 91	93–97.9	E 98
66–69.9	E 92	98–107.9	E 99
70–75.9	E 93	108–113.9	E 101
76–81.9	E 94	114–125.9	E 102

Size 5

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
105–116	AR 3.28	166–184	AR 4.80
117–132	AR 3.62	185–207	AR 5.3
133–148	AR 3.98	208–229	AR 5.8
149–165	AR 4.37	230–266	AR 6.4

Size 6

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
146–169	AR 1.68	280–311	AR 3.28
170–185	AR 1.85	312–353	AR 3.62
186–201	AR 2.04	354–396	AR 3.98
202–217	AR 2.24		
218–236	AR 2.46	397–442	AR 4.37
237–253	AR 2.71	443–492	AR 4.80
254–279	AR 2.98	493–520	AR 5.3

Ambient-Compensated Bimetallic Overload Selection Tables for Part Winding Combination Starter Units

Size 1

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
1.14–1.21	AR 1.05	6.92–7.63	AR 5.8
1.22–1.33	AR 1.15	7.64–8.41	AR 6.4
1.34–1.47	AR 1.26	8.42–9.31	AR 7.0
1.48–1.63	AR 1.39	9.32–10.59	AR 7.7
1.64–1.81	AR 1.53	10.60–11.69	AR 8.5
1.82–2.11	AR 1.68	11.70–12.55	AR 9.3
2.12–2.31	AR 1.85	12.56–13.95	AR 10.2
2.32–2.51	AR 2.04	13.96–15.19	AR 11.2
2.52–2.71	AR 2.24	15.20–15.79	AR 12.4
2.72–2.95	AR 2.46	15.80–17.91	AR 13.6
2.96–3.17	AR 2.71	17.92–20.7	AR 15.4
3.18–3.49	AR 2.98	20.8–23.5	AR 17.6
3.50–3.89	AR 3.28	23.6–26.7	AR 20.5
3.90–4.41	AR 3.62	26.8–30.5	AR 23
4.42–4.95	AR 3.98	30.6–34.5	AR 27
4.96–5.53	AR 4.37	34.6–39.5	AR 30
5.54–6.15	AR 4.80	39.6–44.9	AR 35
6.16–6.91	AR 5.30	45.0–52.0	AR 40

Size 2

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
8.48–9.25	AR 8.5	33.0–37.9	AR 35
9.26–10.11	AR 9.3	38.0–43.3	AR 40
10.12–11.09	AR 10.2	43.4–46.7	AR 44
11.10–12.27	AR 11.2	46.8–49.9	AR 47
12.28–12.89	AR 12.4	50.0–53.9	AR 51
12.90–14.97	AR 13.6	54.0–58.3	AR 55
14.98–17.11	AR 15.4	58.4–62.7	AR 60
17.12–19.49	AR 17.6	62.8–67.1	AR 66
19.50–22.3	AR 20.5	67.2–73.8	AR 72
22.4–25.5	AR 23	74.0–78.3	AR 79
25.6–28.9	AR 27	78.4–81.9	AR 86
29.0–32.9	AR 30	82.0–90.0	AR 94

Size 3

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
54.2–60.1	E 67	94.0–103.1	E 74
60.2–66.5	E 69	103.2–114.1	E 76
66.6–71.5	E 70	114.2–125.7	E 77
71.6–78.9	E 71	125.8–138.3	E 78
79.0–86.9	E 72	138.4–150.1	E 79
87.0–93.9	E 73	150.2–166.6	E 80

Size 4

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
100–111.9	E 88	164–173.9	E 96
112–121.9	E 89	174–185.9	E 97
122–131.9	E 91	186–195.9	E 98
132–139.9	E 92	196–215.9	E 99
140–151.9	E 93	216–227.9	E 101
152–163.9	E 94	228–251.9	E 102

Size 5

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
210–233	AR 3.28	332–369	AR 4.8
234–265	AR 3.62	370–415	AR 5.3
266–297	AR 3.98	416–459	AR 5.8
298–331	AR 4.37	460–532	AR 6.4

SECTION 13—CIRCUIT BREAKER AND FUSIBLE SWITCH REPLACEMENT

For F-frame and K-frame circuit breakers and 100/200 A fusible switches, Schneider Electric recommends replacing the entire disconnect assembly instead of replacing the circuit breaker or fusible switch. The disconnect assembly includes the operating mechanism and the appropriate circuit breaker or switch. Replacing the entire disconnect assembly requires the removal of three screws (two from the left side of the assembly and one inside the back of the assembly). This procedure is much simpler and quicker than replacing an individual circuit breaker or switch. See Schneider Electric bulletin Disconnect Assembly Replacement (80439-666-01) for disconnect assembly installation instructions.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

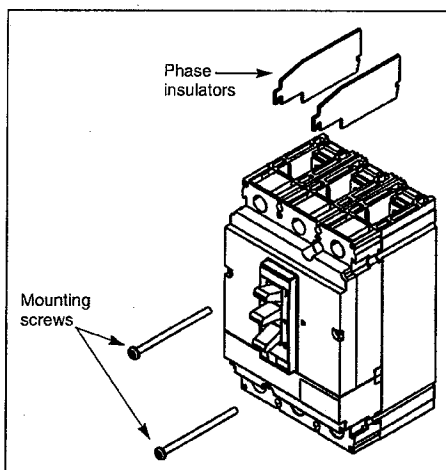
For PowerPact® H-frame and J-Frame circuit breakers, order a replacement circuit breaker only. To replace the circuit breaker:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm power is off.
2. Remove the control unit from the MCC. See "Removing the Control Unit" on page 46.
3. Open the line insulator tabs.
4. Loosen the screw lugs for the line/load cables; detach the cables.
5. Remove the two circuit breaker mounting screws (see Figure 100).
6. Remove the circuit breaker from the unit and then remove the phase insulators from the breaker (see Figure 100).
7. Unpack the new circuit breaker and reinstall the circuit breaker phase insulators in the slots provided on the circuit breaker.
8. Place the circuit breaker in the mounting pan, making sure that the line insulator is in position under the circuit breaker. Secure the circuit breaker with the two mounting screws provided.
9. Attach the line/load cables to the breaker using the screw lugs removed in step 4; torque the screw lugs to the value indicated on the circuit breaker.
10. Close the line insulator tabs.
11. Reinstall the control unit in the MCC. Close and fasten the door.

Always use replacement devices of the same type and rating as the device being removed. Using a different type of disconnect or one with a different rating may alter the short circuit ratings of the motor control center.

Contact the MCC Technical Assistance Group (TAG) before installing a circuit breaker with a different rating. See "Appendix D—Technical Support" on page 118 for the MCC TAG technical support number.

Figure 100: Circuit Breaker Replacement



APPENDIX A—REMOVAL AND INSTALLATION OF HORIZONTAL BUS BARRIER PANELS

This appendix contains installation and removal instructions for the horizontal bus barrier panels in 15-inch (381 mm) and 20-inch (508 mm) deep Model 6 Motor Control Centers manufactured by Schneider Electric.

▲ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

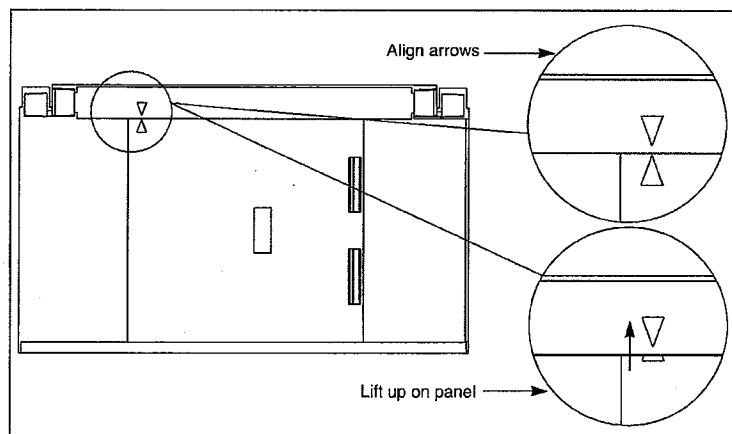
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Removal

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. With one hand, slide the left panel to the right until it unsnaps from the right panel.
3. Align the arrows on the left panel and top track as shown in Figure 101. Lift the panel out of the bottom track, and remove the panel.
4. Align the arrows on the right panel and top track as shown in Figure 101. Lift the panel out of the bottom track, and remove the panel.

Figure 101: Aligning the Arrows on the Panels



Installation

NOTE: The horizontal bus barrier contains two identical panels with arrows at the top. The "handle" on the left panel faces the front of the MCC section. The "handle cavity" on the right panel faces the front of the MCC section (see Figure 102).

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Align the arrows on the right panel and top track as shown in Figure 103.
3. Lift the panel up into the rear groove of the top track.
4. Lower the panel into the rear groove of the bottom track.
5. Slide the panel to the far right.
6. Align the arrows on the left panel and top track.
7. Repeat Steps 3 and 4 using the left panel and front groove.
8. Slide the panel to the left until it locks (snaps) into place.
9. Verify that the barrier is completely closed by making sure that the wiring compartment is isolated from the bus compartment.

Figure 102: Right Panel (Side View)

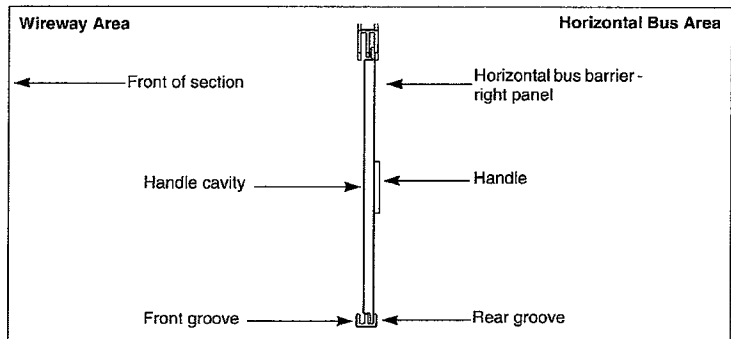
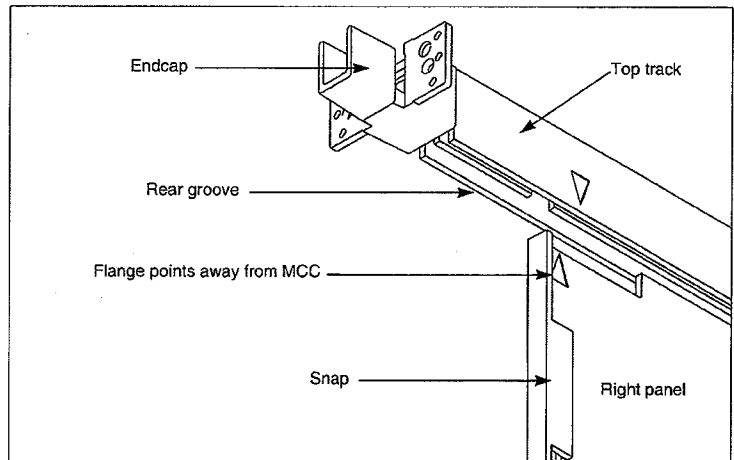


Figure 103: Installing the Right Panel into the Rear Groove



APPENDIX B—NON-CONDUCTIVE HORIZONTAL BUS BARRIER RETROFIT KIT

This appendix contains installation instructions for non-conductive horizontal bus barrier retrofit kits manufactured by Schneider Electric. These kits are for use in 15-inch (381 mm) and 20-inch (508 mm) deep Models 5 and 6 Motor Control Centers.

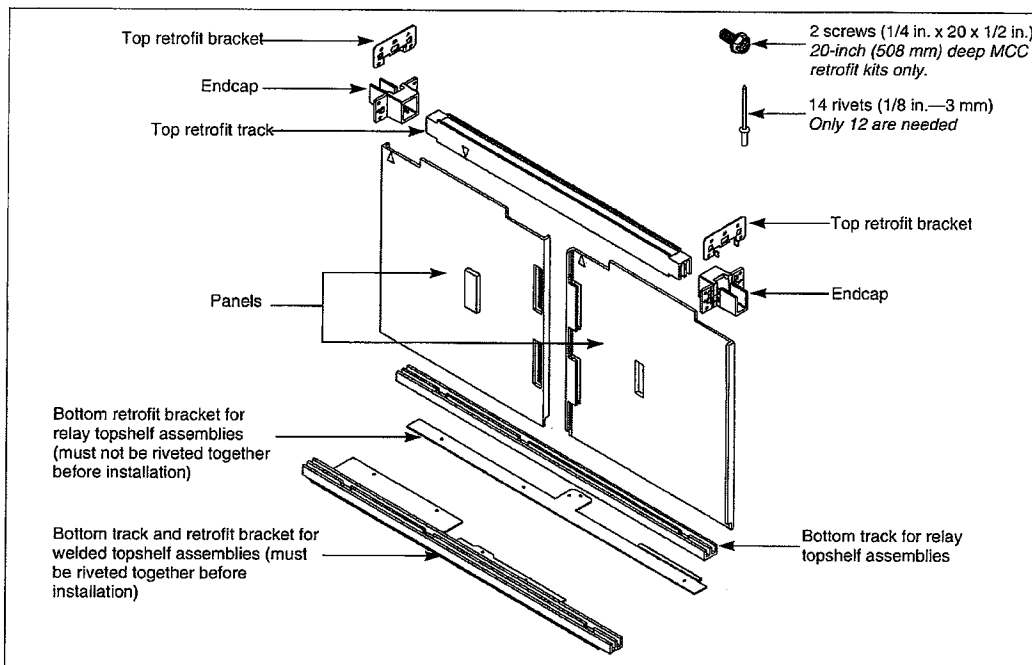
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- After removing rivets and screws, verify that the compartment is free of loose particles.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 104: Retrofit Kit Components (not drawn to scale)



REMOVE EXISTING COMPONENTS

Follow these instructions to remove the existing top horizontal wireway cover, bus barriers, units below the topshelf, and brackets (15-inch deep MCC):.

Horizontal Wireway Cover

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm power is off.
2. Remove the screws that secure the top horizontal wireway cover to the structure, and then remove the cover.

Horizontal Bus Barriers

1. Remove the screw located at the top of the two-piece bus barriers.
2. Remove the screw located at the bottom of the two-piece bus barriers.
3. Pull the two metal barriers out of the MCC and discard them.

Units Below the Topshelf

If applicable, remove the plug-in unit below the topshelf (see Figure 105).

Refer to either the Model 5 MCC Installation and Maintenance Manual (# 8998IM9101R5/92) or "Removing the Control Unit" on page 46 of this bulletin for unit removal instructions. If necessary, contact your local Schneider Electric field sales representative to obtain this bulletin.

Existing Brackets: 15-inch (381 mm) Deep MCC Only

If the MCC is 15 inches (381 mm) deep, use a 1/8-inch drill bit to remove the rivets that hold the right and left horizontal bus barrier brackets in place (see Figure 105). Discard the brackets after removal.

NOTE: Discard all retrofit brackets if the existing bus barrier bracket "B" (see Figure 105) is present on the 15-inch deep MCC. All holes are already present for direct mounting of the horizontal bus barrier.

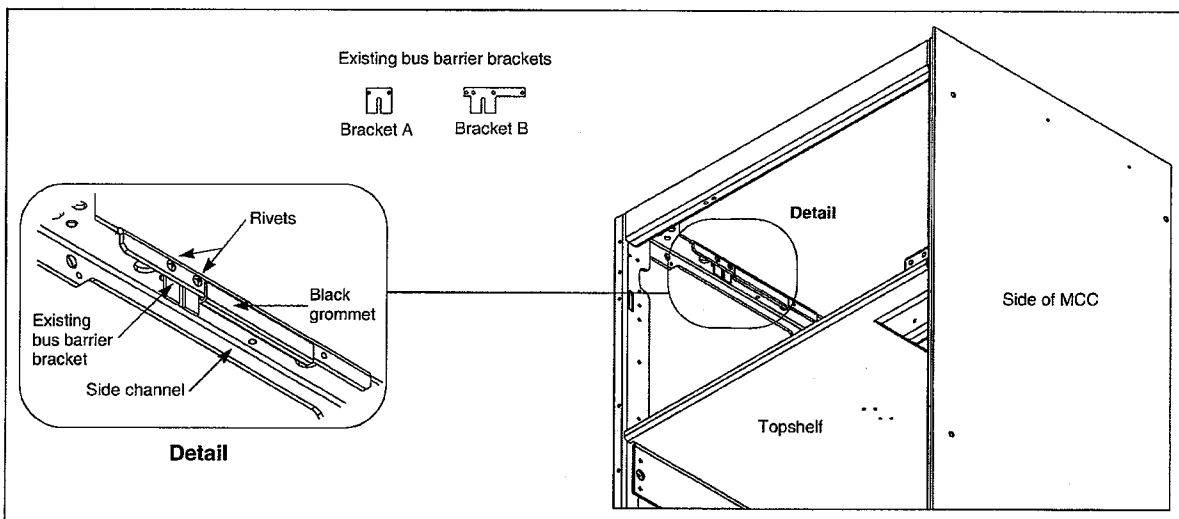
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Drilling increases the chance of loose particles in the MCC. Confirm that the compartment is free of loose particles before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Figure 105: Remove Existing Brackets on the 15-inch (381 mm) Deep MCC



INSTALL THE RETROFIT KIT

Retrofit Brackets and Endcaps

Follow the applicable instructions below to install retrofit brackets into 15-inch (381 mm) or 20-inch (508 mm) deep MCCs. The top retrofit bracket must sit flush against the side channel. Slide the black grommets toward the back of the MCC.

- 15-inch (381 mm) deep MCC: Use a rivet gun and two rivets in the retrofit kit to attach the retrofit brackets to the left and right side channels (see Figure 106).
- 20-inch (508 mm) deep MCC: Use the screws provided in the retrofit kit to attach the retrofit brackets to the left and right side channels. Align the holes in the bracket and side channel as shown in Figure 107.

NOTES:

- Even if the holes are present for a direct mounting of the endcap to the side channels, use the top retrofit bracket on 20-inch deep MCCs.
- Before tightening the screws, push the bracket away from you so that the rear bracket hole is properly aligned with the side channel hole.

Figure 106: 15-Inch (381 mm) Deep MCC Retrofit Bracket

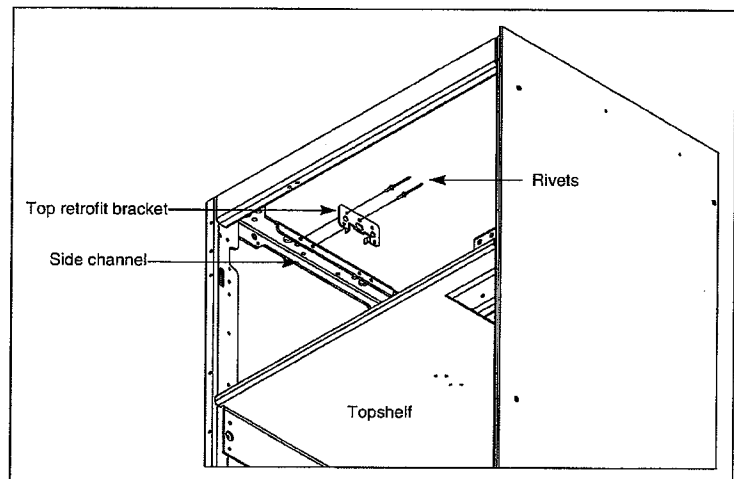
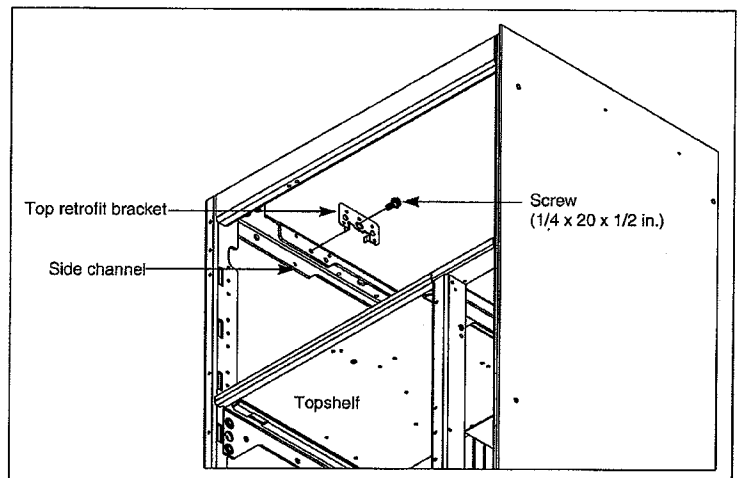


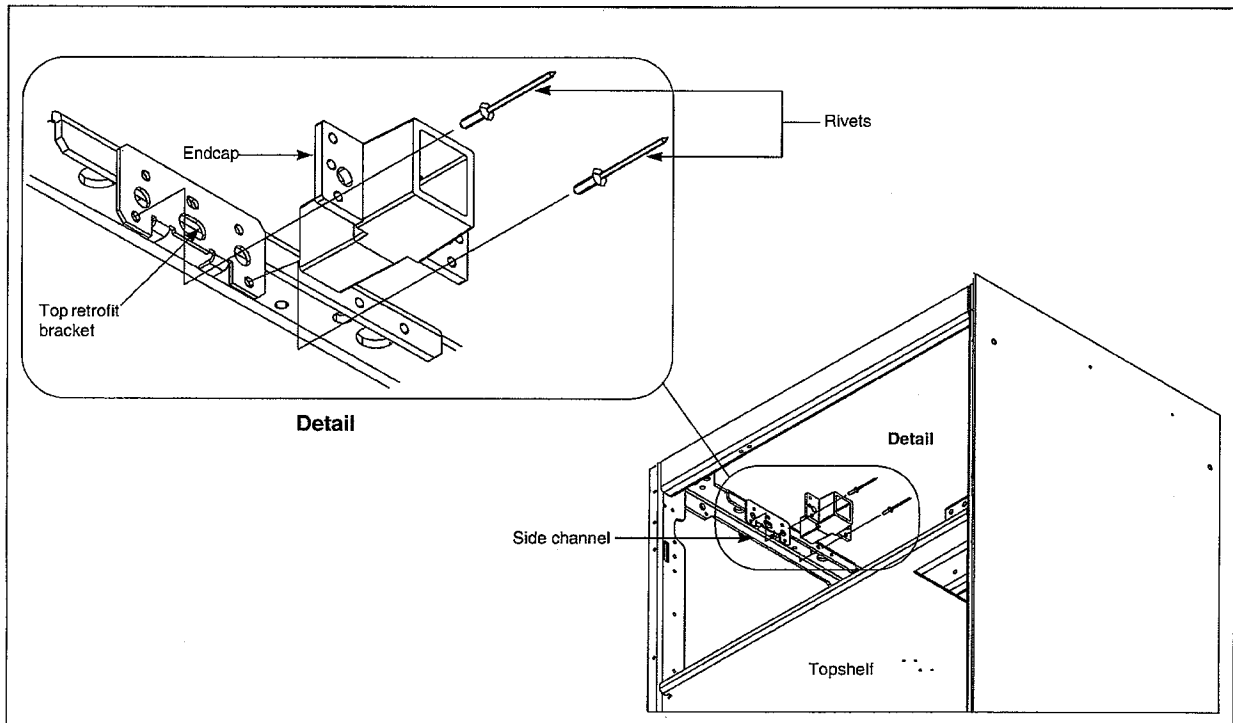
Figure 107: 20-Inch (508 mm) Deep MCC Retrofit Bracket



Follow the steps below to install the endcaps (see Figure 108).

1. Rivet one endcap into place on the retrofit bracket or the side channel, either to the right or left side of the structure.
2. Insert one end of the top track into the attached endcap.
3. Place the other endcap on the opposite end of the top track, and slide the top track into place.
4. Rivet the second endcap to the retrofit bracket.

Figure 108: Endcap Placement



Bottom Track and Bottom Retrofit Bracket

1. Using a 1/8-inch (3 mm) drill bit, drill out both of the rivets on the horizontal bus barrier bracket (the L-shaped bracket located on the topshelf—see Figure 109). Remove the bracket and discard it.
2. To install the bottom retrofit track, follow step a if you have a welded topshelf, or step b if you have a relay topshelf (see Figure 110):
 - a. Welded topshelf: Align the holes of the shelf with those on the bottom track (see Figure 110). Rivet the track and the retrofit bracket to the topshelf.

NOTE: If the bus contains four laminations, access the rivet holes from underneath the topshelf.

- b. Relay topshelf: Align the two holes on the relay shelf with the bottom retrofit bracket holes (see Figure 110). Mark the places where you will drill other holes to secure the bottom track to the shelf. Drill the holes using a drill bit ranging from 0.136 in.–0.147 in. (3 mm–4 mm) in diameter. Rivet the track and retrofit bracket to the topshelf.

NOTE: The bottom retrofit track can be riveted directly onto the relay topshelf only if the relay assembly topshelf has two holes instead of four.

Figure 109: Horizontal Bus Barrier (L-shaped) Bracket

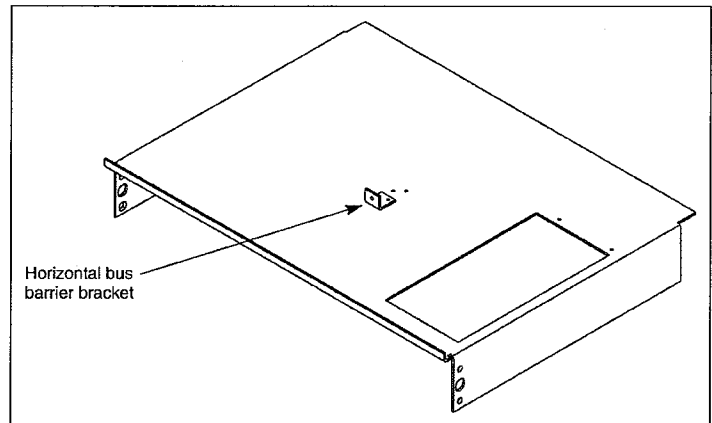
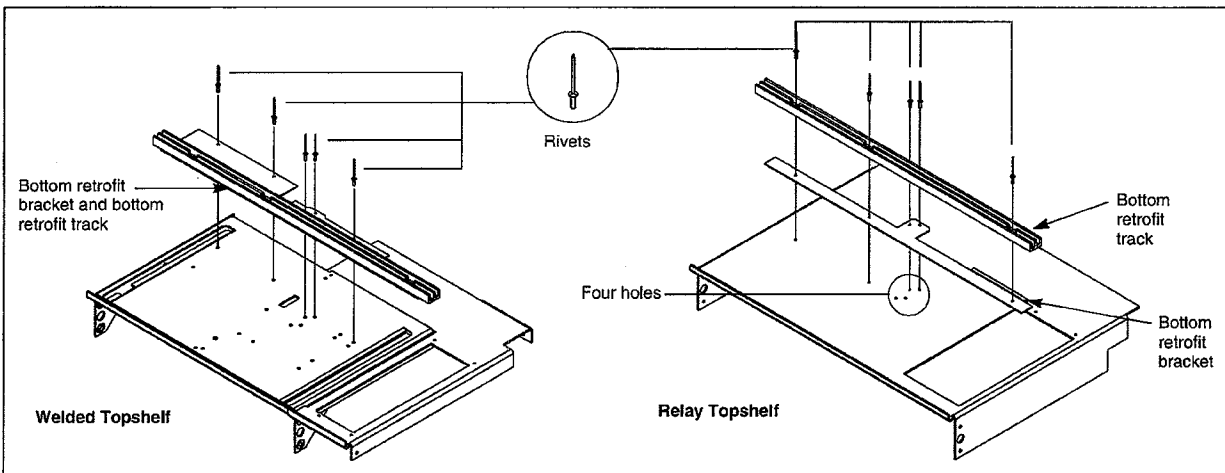


Figure 110: Welded and Relay Topshelf Assemblies



Left and Right Panels

Installation

NOTE: The horizontal bus barrier contains two identical panels with arrows at the top. The "handle" on the left panel faces the front of the MCC section. The "handle cavity" on the right panel faces the front of the MCC section (see Figure 111).

1. Align the arrows on the right panel and top track as shown in Figure 112.
2. Lift the panel up into the rear groove of the top track.
3. Lower the panel into the rear groove of the bottom track.
4. Slide the panel to the far right.
5. Align the arrows on the left panel and top track.
6. Repeat Steps 2 and 3 using the left panel and front groove.
7. Slide the panel to the left until it locks (snaps) into place.
8. Verify that the barrier is completely closed by making sure that the wiring compartment is isolated from the bus compartment.

Figure 111: Right Panel (Side View)

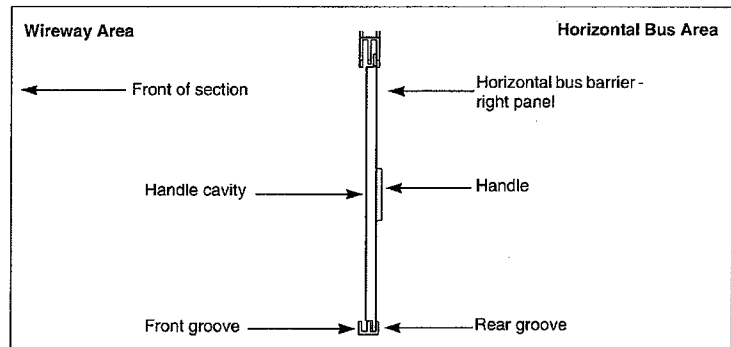
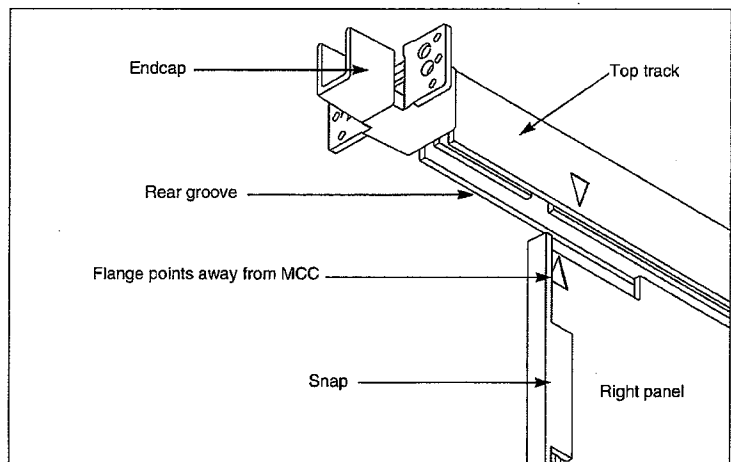


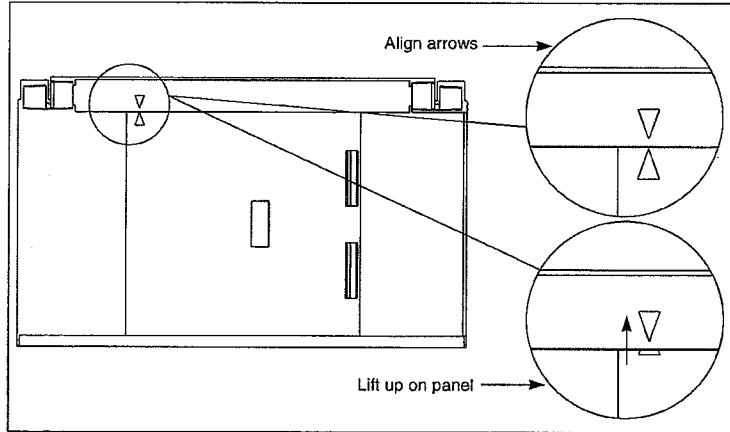
Figure 112: Installing the Right Panel into the Rear Groove



Removal (when required)

1. With one hand, slide the left panel to the right until it unsnaps from the right panel.
2. Align the arrows on the left panel and top track as shown in Figure 113. Lift the panel out of the bottom track, and remove the panel.
3. Align the arrows on the right panel and top track as shown in Figure 113. Lift the panel out of the bottom track, and remove the panel.

Figure 113: Aligning the Arrows on the Panels



REPLACE COMPONENTS

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Follow the steps below to replace the components of the MCC.

1. Install the unit you removed in the section, "Units Below the Topshelf" on page 105. Refer to either the Model 5 MCC Installation and Maintenance Manual (# 8998IM9101R5/92) or "Removing the Control Unit" on page 46 of this bulletin for instructions on installing units in an MCC.
2. Replace the top horizontal wireway cover.
3. Replace or close all other covers or doors before turning on the power to the MCC.

APPENDIX C—AUTOMATIC VERTICAL BUS SHUTTER

INTRODUCTION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

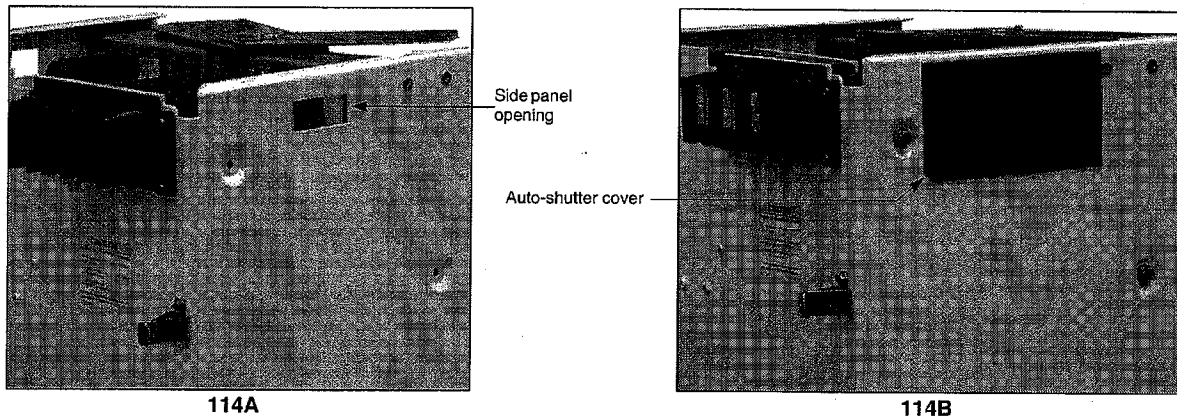
The automatic vertical bus shutter is an optional feature for the Model 6 motor control center (MCC) vertical bus. The shutters are pre-assembled and installed as part of the MCC line-up.

Automatic bus shutters open and close the vertical bus connection point when units are inserted and removed from the structure. The shutters can be located throughout the MCC and placed in 6 in. (152 mm) increments. They mount to the left edge of each midshelf.

The automatic shutter assembly requires an updated midshelf to allow clearance for the shutter above the plug-in unit:

- NOTES:**
- *MCC structures shipped before January 2003 cannot use the top 3-in. (76 mm) space with the automatic vertical bus shutter option. A 3-in. (76 mm) cover plate is required to cover the opening.*
 - *Compac 6 units shipped before January 2003 cannot be used with the automatic vertical bus shutter option.*
 - *Variable frequency drive and soft starter units 45 in. or taller that shipped before July 2003 with a side-panel opening as shown in Figure 114A, require an auto-shutter cover (Square D Seneca part #80451-765-01). The auto-shutter cover aligns with the back edge of the center-most flat head screw as shown in Figure 114B.*

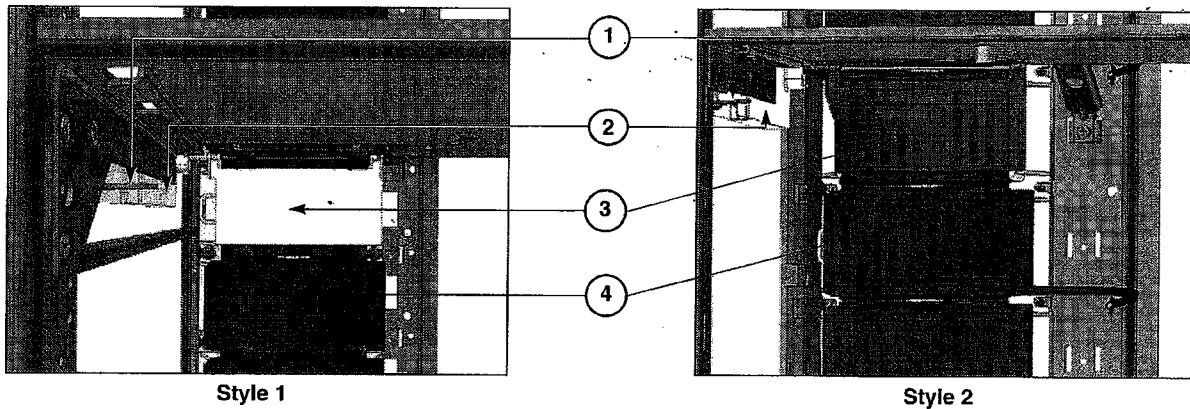
Figure 114: Location of Auto-Shutter Cover for Side-Panel Opening



There are four main components of the automatic vertical bus shutter:

1. **Operator Mechanism:** Operates the vertical bus shutter, allowing the plug-in unit to engage the vertical bus.
2. **Mechanism Housing:** Protects the mechanism from incidental foreign material that could obstruct the intended operation.
3. **Vertical Bus Door and Clip:** Provides a barrier against incidental contact with the MCC vertical bus.
4. **Manual Shutter:** Prevents access to the unused vertical bus openings. The manual shutter is held in place by a built-in locking feature that holds the shutter in the closed position during shipping, set-up, and daily operations.

Figure 115: Automatic Vertical Bus Shutter in an MCC (front view)



Compare the field-installed midshelf to the two designs above. If the field-installed midshelf matches Style 1, follow the installation and removal instructions starting below. If the field-installed midshelf matches Style 2, follow the instructions starting on page C-5.

INSTALLATION—STYLE 1

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Follow these instructions to install the automatic vertical bus shutter assembly to an existing midshelf identified as Style 1:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Position the midshelf (Figure 116, Item A on page 113) in the appropriate area of the structure.
3. Place the mounting foot (Item B) of the shelf into the mounting pan slots (Item C). Secure the shelf on the left and right with flat head screws (Detail A, Item D).
4. Install the hinge leaves (Detail A, Item E) and the door (Item F) into the hinge slots (Item G), which are on the structure corner channel. Fasten the hinge leaves to the structure corner channel using hex head screws (Item H).
5. Install the quarter turn fastener receptacles (Detail B, Item J) into the bracket slots (Item K) and fasten with hex head screws (Item H).
6. Install the automatic bus shutter assembly by rotating the mechanism housing upward to clear the front corner channel of the structure. See Figure 117 on page 113.
7. Slide the automatic shutter assembly upward so that it fits snugly to the left edge of the midshelf.
8. Loosely insert the two 10-32 x 3/8 in. mounting screws through the inner left edge of the midshelf and into the square nuts in the housing. See Figure 117.

Figure 116: Shelf Installation—Style 1

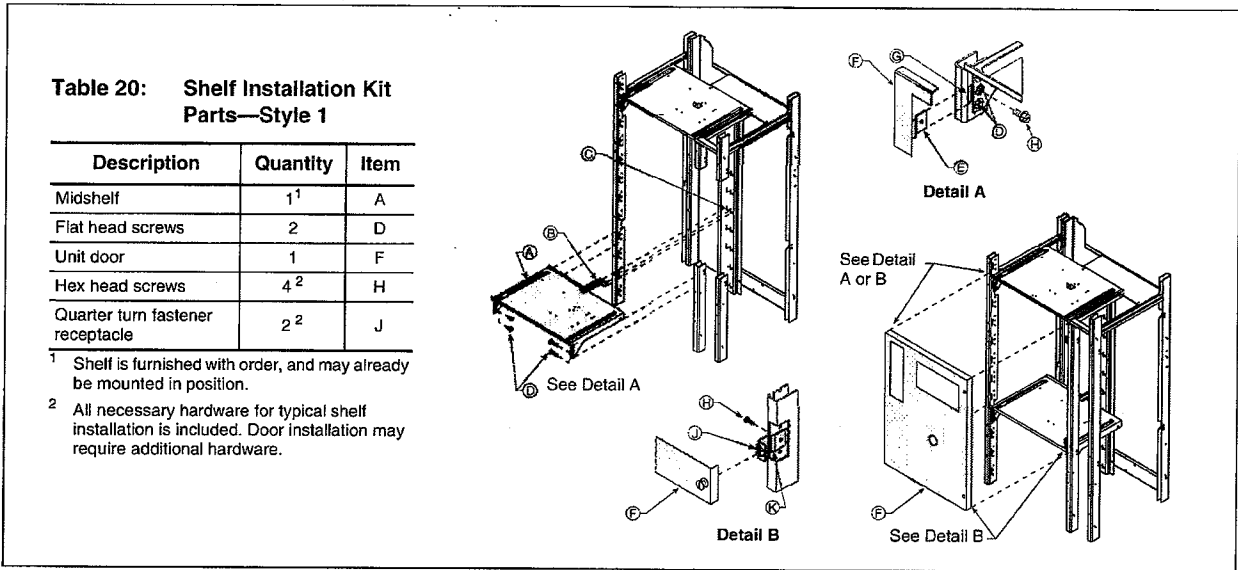
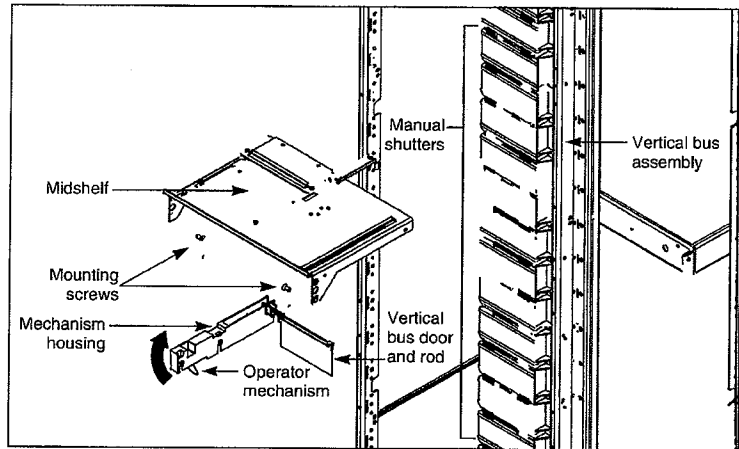


Figure 117: Automatic Vertical Bus Shutter Installation—Style 1



9. Remove the manual shutter from the vertical bus assembly. Allow the manual shutter to hang next to the vertical bus assembly.
10. Snap the automatic shutter rod onto the vertical bus clip located on the front of the vertical bus assembly.
11. Tighten the two 10-32 x 3/8 in. mounting screws inserted in Step 8.
12. Push the operator mechanism to the rear, ensuring the shutter rotates upward into the pocket of the midshelf above the unit. See Figure 117.
13. Insert the unit into the MCC. Follow the procedures in "Section 4—Installing the MCC".
14. Replace all devices, doors, and covers before turning on the power to the equipment.

REMOVAL—STYLE 1

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

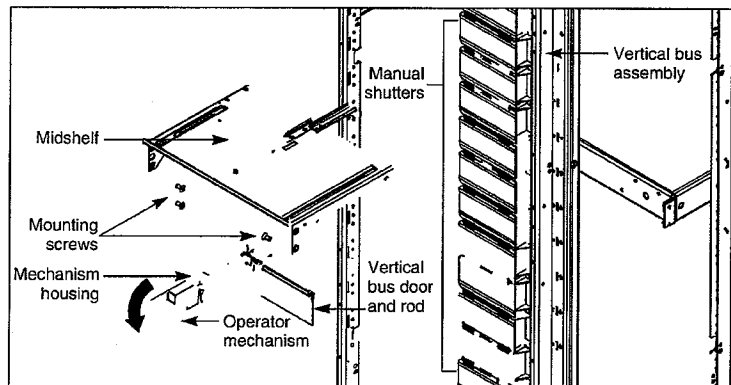
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Follow these instructions to rearrange a Model 6 MCC unit or to remove the automatic vertical bus shutter assembly from an existing midshelf identified as Style 1 on page 112:

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the unit from the MCC structure. Follow the procedures in "Section 4—Installing the MCC".
3. Remove the automatic vertical bus shutter rod from the vertical bus clip located on the front of the vertical bus assembly.
4. Insert the manual shutter into the vertical bus assembly.
5. Remove the two 10-32 x 3/8 in. mounting screws located on the inner left edge of the midshelf. See Figure 118.
6. Slide the automatic shutter assembly downward, clearing the midshelf.
7. Rotate the assembly downward to clear the front corner channel of the structure. See Figure 118.
8. Remove the automatic shutter assembly.
9. Replace all devices, doors, and covers before turning on the power to the equipment.

Figure 118: Automatic Vertical Bus Shutter Removal—Style 1



INSTALLATION—STYLE 2

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

Follow these instructions to install the automatic vertical bus shutter assembly to an existing midshelf identified as Style 2 on page 112:

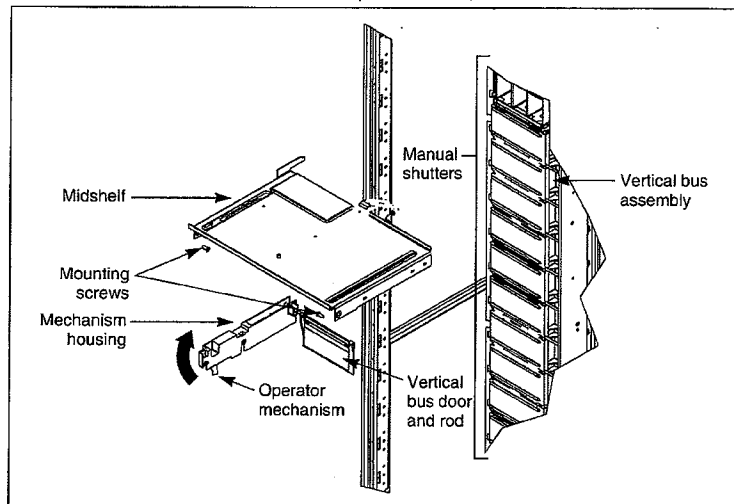
1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Position the midshelf (Figure 119, Item A) in the appropriate area of the structure.
3. Place the mounting foot (Item B) of the shelf into the mounting pan slots (Item C). Secure the shelf at the mounting foot end, the left side, and the right side with flat head screws (Detail A, Item D).
4. Install the hinge leaves of the door (Detail A, Item E) into the hinge slots (Item G), which are on the structure corner channel. Fasten the hinge leaves to the structure corner channel using hex head screws (Item H).
5. Install quarter-turn fastener receptacles (Detail B, Item J) into the bracket slots (Item K) and fasten with hex head screws (Item H).
6. Install the automatic bus shutter assembly by rotating the mechanism housing upward to clear the front corner channel of the structure. See Figure 120 on page 116.
7. Slide the automatic shutter assembly upward so that it fits snugly to the left edge of the midshelf.
8. Loosely insert a 10-32 x 3/8 in. mounting screw through the inner left edge of the midshelf and into the square nuts in the housing. See Figure 120 on page 116.

Figure 119: Shelf Installation—Style 2

Description	Quantity	Item
Midshelf	2 [Ⓢ]	A
Flat head screws	3	D
Unit door	1	F
Hex head screws	4 [Ⓢ]	H
Quarter turn fastener receptacle	2 [Ⓢ]	J

[Ⓢ] Shelves are furnished with order. Structure may already have shelf mounted in position.
[Ⓢ] All necessary hardware for typical shelf installation is included. Door installation may require additional hardware.

Figure 120: Automatic Vertical Bus Shutter Installation—Style 2



9. Remove the manual shutter from the vertical bus assembly. Allow the manual shutter to hang next to the vertical bus assembly.
10. Snap the automatic shutter rod onto the vertical bus clip located on the front of the vertical bus assembly.
11. Tighten the 10-32 x 3/8 in. mounting screw inserted in step 8.
12. Push the operator mechanism to the rear, ensuring the shutter rotates upward into the pocket of the midshelf above the unit. See Figure 120.
13. Insert the unit into the MCC. Follow the procedures in "Section 4—Installing the MCC".
14. Replace all devices, doors, and covers before turning on the power to the equipment.

REMOVAL—STYLE 2

Follow these instructions to rearrange a Model 6 MCC unit or to remove the automatic vertical bus shutter assembly from an existing midshelf identified as Style 2 on page C-112:

⚠ DANGER

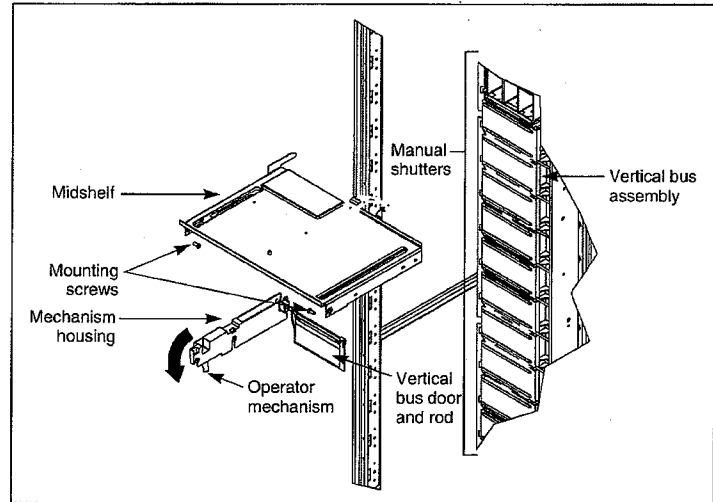
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced only by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow this instruction will result in death or serious injury.

1. Turn off all power supplying this equipment before working on or inside the equipment, and follow lockout/tagout procedures. Always use a properly rated voltage sensing device to confirm the power is off.
2. Remove the unit from the MCC structure. Follow the procedures contained in "Section 4—Installing the MCC".
3. Remove the automatic vertical bus shutter rod from the vertical bus clip located on the front of the vertical bus assembly.
4. Insert the manual shutter into the vertical bus assembly.
5. Remove the 10-32 x 3/8 in. mounting screw located on the inner left edge of the midshelf. See Figure 121 on page 117.
6. Slide the automatic shutter assembly downward, clearing the midshelf.
7. Rotate the assembly downward to clear the front corner channel of the structure. See Figure 121.
8. Remove the automatic shutter assembly.
9. Replace all devices, doors, and covers before turning on the power to the equipment.

Figure 121: Automatic Vertical Bus Shutter Removal—Style 2



OPERATION—STYLES 1 AND 2

Inserting a Unit

When a unit is inserted into the Model 6 MCC structure, the operator mechanism opens the automatic bus shutter, allowing the unit stabs to connect with the vertical bus.

Removing a Unit

The automatic shutter will close when a unit is removed from the structure. The shutter door provides a barrier against incidental contact with the MCC vertical bus.

APPENDIX D—TECHNICAL SUPPORT

The Model 6 Motor Control Center incorporates many Schneider Electric products within one package. Following are the Technical Support numbers for some of these products:

Device Name	Location	Technical Support No.
Motor Control Centers*	Seneca, SC: MCC Technical Assistance Group (TAG)	(800) 634-2003
PowerLogic® Equipment SMS-3000 Software	La Vergne, TN: PowerLogic Technical Assistance	(615) 287-3400
Variable Frequency Drives Soft Starters Starters/Contactors/Overloads	Raleigh, NC: Raleigh Help Desk	(919) 266-8600
Schneider Automation Equipment and Software	North Andover, MA: Customer Central	(800) 468-5342
Seriplex®	Raleigh, NC: Seriplex Technology Organization	(800) 775-9462
Industrial Application Team	Raleigh, NC	(800) 468-5342
Field Services Organization Support	Florence, KY	(800) 634-2003

* The MCC Technical Assistance Group is your first point of contact for any MCC questions. Or, contact your local distributor/Schneider Electric field sales office.

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**Instruction Bulletin
Model 6 Motor Control Centers**

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