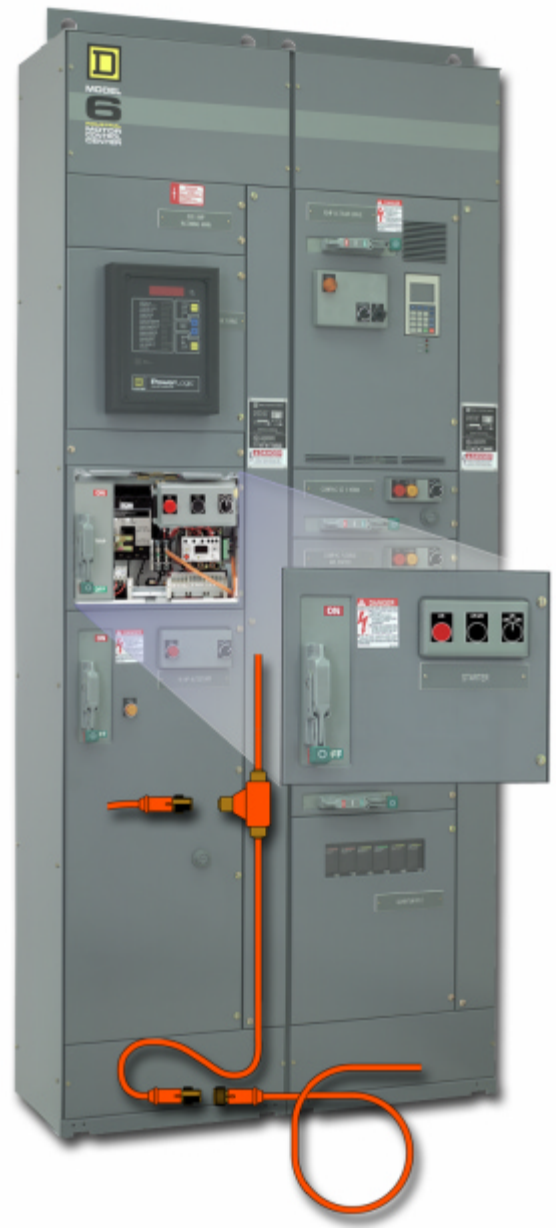
80445-108-01A
January 2001
Seneca, SC, USA

Instruction Bulletin

Model 6 OMNI-Center with MODBUS® Data Acquisition

Using MOTOR LOGIC PLUS™
Class 8998

Retain for future use.



SQUARE D

NOTICE

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, 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 serviced only by qualified electrical maintenance personnel. No responsibility is assumed by Square D for any consequences arising out of the use of this material.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designated to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction material, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

SYSTEMS INTEGRATION DISCLAIMER

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

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SECTION 1—INTRODUCTION

This bulletin includes setup and troubleshooting instructions for Model 6 Open Multi-Network Integration (OMNI) Centers manufactured by Square D. Because various communication protocols are used, and because your specific application may require a unique combination of components, we recommend that you use this bulletin primarily as a setup and troubleshooting guide.

The OMNI-Center is a fully integrated Model 6 MCC. The OMNI-Center is shipped with various other bulletins, each pertaining to the components specified by your order. Use these for additional information and troubleshooting.

For component repair, modification, or replacement, contact the Square D Customer Information Center by calling 1-888-Square D (1-888-778-2733).

Model 6 MCC Overview

Motor control centers provide the most suitable method for grouping electrical motor control and other related devices in a compact, economical, free-standing installation. A motor control center (MCC) 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 mm) lifting angle.

OMNI-Center Overview

The Model 6 OMNI-Center 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, depending on your configuration.

Four distinct OMNI-Center wiring categories are available:

OMNI-Center Flex

Uses SERIPLEX™ control bus only

OMNI-Center Basic

- *Standard*: Programmable Logic Control (PLC) only
- *With MODBUS®:* PLC with MODBUS data acquisition

OMNI-Center with MODBUS Data Acquisition

- Standalone option
- Uses MOTOR LOGIC PLUS™, drives, soft starts, and POWERLOGIC® components

OMNI-Center Enhanced

- Uses MOTOR LOGIC PLUS with MOMENTUM® base
- An OMNI-Center Enhanced MCC features one of three network options:
  - — MODBUS PLUS®
  - — Profibus®
  - — DeviceNet®

This bulletin includes instructions for the OMNI-Center with MODBUS Data Acquisition, both as its own category and as an option with OMNI-Center Basic.

Networks/Communications Overview

OMNI-Centers with MODBUS configuration contain Schneider Electric devices that have MODBUS communication ports. These ports provide MODBUS data acquisition. Following is a list of devices with MODBUS communication ports:

- Full Voltage Non-Reversing (FVNR) starters with MOTOR LOGIC PLUS Overloads
- Full Voltage Reversing (FVR) starters with MOTOR LOGIC PLUS Overloads
- Reduced Voltage Auto Transformer (RVAT) starters with MOTOR LOGIC PLUS Overloads
- Part winding starters with MOTOR LOGIC PLUS Overloads
- Two speed starters with MOTOR LOGIC PLUS Overloads
- Wye-delta open transition and wye-delta closed transition starters with MOTOR LOGIC PLUS Overloads
- ALTISTART 46 Soft Starters via the keypad communication port
- ALTIVAR 58 Drives with MODBUS communication card
- ALTIVAR 66 Drives with MODBUS communication card
- Power meters (Class 3020 Type PM - 600/620/650)
- Circuit monitors (CM2000 series) using mix mode SYMAX® protocol

Each of these devices has a unique internal register map (see “Square D Literature List” on page 11 for the individual device instruction bulletins). These devices may be linked together to a single monitoring point. Some devices also provide limited control via the MODBUS port.

The MODBUS protocol is a messaging structure that is used to establish communications between intelligent devices. This protocol defines a message structure that controllers will recognize and use, regardless of the type of networks over which they communicate. It describes the process a controller uses to detect errors and request and send information to other devices. During communication on a MODBUS network, the MODBUS protocol determines how each controller will

- Know its device address.
- Recognize a message addressed to it.
- Determine the type of action it needs to take.
- Extract information from the message.

The MODBUS protocol is independent from the underlying physical layer. It can be implemented using a variety of bridges for RS-232, RS-422, or RS-485 over a variety of media, such as fiber, radio, or cellular. For detailed information about the data and control functions of the MODBUS protocol, refer to the "MODICON MODBUS Protocol Reference Guide," Schneider Electric document number PI-MBUS-300 Rev. J (see the "Square D Literature List").

Square D Literature List

The following Square D publications may be useful in the setup, maintenance, and regular operation of your Model 6 OMNI-Center MCC. These documents are provided on the CD-ROM included with shipment. Upon request, your local Square D or Schneider Canada field office can provide them to you in print. Or, you can download these documents from the Technical Library at www.SquareD.com.

Product Type	Publication No.★	Title	Publication Type
Motor Control Centers Seneca, SC	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
	80442-507-1	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
	80445-108-01A	Model 6 OMNI-Center with MODBUS® Data Acquisition	Instruction Bulletin
	80445-109-01A	Model 6 OMNI-Center Enhanced	Instruction Bulletin
	80459-641-01_	Model 6 Motor Control Centers	Instruction Bulletin
	8998BR0001	Model 6 OMNI-Center—Open Multi-Network Integration in MCCs	Brochure
	8998CT9701	Motor Control Centers, Model 6	Catalog
	8998CT9801	Model 6 OMNI-Center with FLEX Control Bus Option	Catalog
	8998HO0001	Model 6 OMNI-Center—Flex Control Bus for the Model 6 MCC	Handout
	8998HO0002	MOTOR LOGIC PLUS™ Overload Relay in Model 6 Motor Control Centers	Handout
	8998HO9902	Model 6 OMNI-Center—Programmable Logic Controllers and Distributed I/O for MCCs	Handout
SERIPLEX® Raleigh, NC	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

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

Product Type	Publication No.★	Title	Publication Type
MODICON® Automation N. Andover, MA	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/0 Base User Guide	User Manual
	870USE10100 VER.3	MODICON® TSX Momentum M1 Processor Adapter and Option Adapter User Manual	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
MOTOR LOGIC PLUS™ Overload Raleigh, NC	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
ALTISTART® 46 Raleigh, NC	VD0C32S301_	ALTISTART® 46 Soft Start Controller User's Manual	Instruction Bulletin
	VD0C32S303	ALTISTART® 46 Communication Option	Instruction Bulletin
ALTIVAR™ 58 Raleigh, NC	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/UNITELWAY User's Guide	Instruction Bulletin
ALTIVAR™ 66 Raleigh, NC	VD0C06S304_	ALTIVAR™ 66 Adjustable Speed Drive Controllers for Asynchronous Motors User's Manual	Instruction Bulletin
	VD0C06S305_	ALTIVAR™ 66 User's Manual	Instruction Bulletin
	VD0C06S308	PCMCIA Communication Card Kit	Instruction Bulletin
	VD0C60S309	ALTIVAR™ 66 MODBUS PLUS® PCMCIA Communication Card Kit VW3A66305U	Instruction Bulletin

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

Product Type	Publication No.★	Title	Publication Type
POWERLOGIC® LaVergne, TN	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
	3020IM9807	POWERLOGIC® Circuit Monitor Installation and Operation	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
	63230-300-200	POWERLOGIC® Circuit Monitor Series 4000	Instruction Bulletin

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

SECTION 2—SAFETY PRECAUTIONS

Carefully read and follow the safety precautions outlined below before attempting to lift, move, install, use, or maintain Model 6 OMNI-Centers and their components.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified electrical personnel.
- Qualified electrical personnel must perform work in accordance with all applicable national and local electric codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- 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.
- Beware of potential hazards, wear personal protective equipment, and take adequate safety precautions.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, locked out, and/or tagged out. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Replace all devices, doors, and covers before turning on power to this equipment.

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

⚠WARNING

HAZARD OF LOSS OF CONTROL

- Carefully consider the potential failure modes of control paths. For certain critical control functions—such as Emergency Stop and Overtravel Stop—you must provide a means to achieve a de-energized state both during and after a path failure.
- The control paths of a system may include communication links. Give careful consideration to the possibility of unanticipated transmission delays or link failures.

Failure to follow these instructions can result in death or serious injury.

SECTION 3–RECEIVING, HANDLING, AND STORAGE

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 is 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).

8998-9830

Figure 1: Packaged Motor Control Center

Receiving

Inspect the MCC for damage as soon as it is received. Delivery of the equipment to a carrier at any of the Square D 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, regardless of freight payment. 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 installation.

Handling

⚠ 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 these instructions can result in death or serious injury.

Adequate equipment, such as a fork truck, crane, or rods and pipe rollers, must be available for handling MCCs. Table 1 shows approximate shipping weights of single sections equipped with typical units; use it to determine the type of handling equipment needed.

Table 1: Approximate MCC Shipping Weights

Enclosure Type	Depth	1 Section	2 Sections	3 Sections
NEMA Type 1, 1A, 12	15 in (381 mm)	600 lb (272 kg)	1200 lb (544 kg)	1800 lb (816 kg)
NEMA Type 3R Non-Walk-In	15 in (381 mm) (26.6 [676] overall)	900 lb (408 kg)	1800 lb (816 kg)	2700 lb (1225 kg)
NEMA Type 1, 1A, 12	20 in (508 mm)	750 lb (340 kg)	1500 lb (680 kg)	2250 lb (1021 kg)
NEMA Type 3R Non-Walk-In	20 in (508 mm) (31.6 [803] overall)	1050 lb (476 kg)	2100 lb (953 kg)	3150 lb (1429 kg)

Weights vary by enclosure type and depth. Up to three vertical sections are shipped on a single skid. To minimize the risk of injury and equipment damage while moving the MCC, review 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.

8998-9831

Figure 2: Moving the MCC with a Fork Truck

- Lifting angles are provided on each shipping block for handling the MCC with overhead cranes. Take the following precautions when using a crane:
  a. Handle 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.

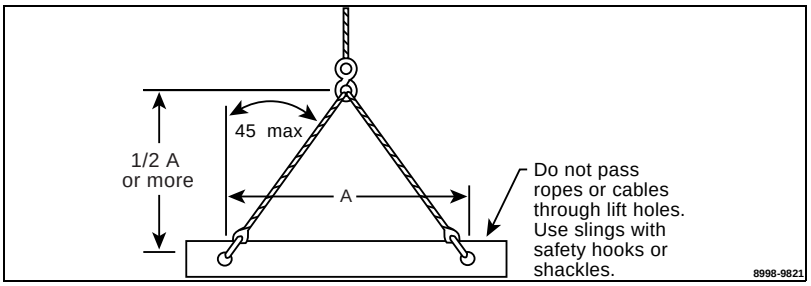


Figure 3: Proper Use of a Sling to Lift the MCC

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.

Storage

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 local Square D representative for specific requirements.

SECTION 4—INSTALLATION

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 8—Expansion” on page 69 or the information included with the shipment of the new device.

Location

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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” on page 18. The MCC has a high center of gravity, which may cause it to tilt.

Failure to follow these instructions 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). The enclosure must be protected from water or any moisture entering it.

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 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.

Alignment

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 made of a non-combustible material, unless bottom plates are installed in each vertical section.

Joining NEMA Type 1 and Type 12 Sections

Before positioning the MCC sections (see Figure 4), 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.

NOTE: A joining hardware kit is provided behind the top horizontal wireway cover on the left side of each shipping split. Captive splice bars are pre-assembled on the horizontal bus on the left side of each shipping split.

NOTE: For gasket installation instructions, see "Splice Gasket Installation for NEMA Type 1 Gasketed and NEMA Type 12 Enclosures" on page 24 before joining sections.

Position 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. Remove the top and bottom horizontal wire trough covers in all sections, providing access to the ground bus and section splicing bolts (see Figure 5).
2. Remove the two-piece bus barriers (see Figure 6) in the sections adjacent to a splice connection (section L and section R).

Figure 4: Motor Control Center

Figure 5: Top Horizontal Wire Trough Covers and Main Lug Unit Door Removed

Figure 6: Two-piece Bus Barriers Removed (splice connection made)

3. Make provisions for fastening the structure(s) to the floor. See page 24 for fastener locations.
4. Supporting the MCC by its base channels and/or lifting angles, lift it into place. Align the front edges of the base channels to form a continuous front.
5. Using the notches in the base channels, gradually move the sections into alignment with a crowbar (see Figure 7).

   NOTE: Use caution when moving MCC sections, as they are top heavy. See "Handling" on page 18 before moving the MCC.

Figure 7: Base Channel Notch

Joining Corner Channels

1. Open the wire trough door on section L. Remove the section joining hardware kit that is bagged and tied to the right front corner channel.
2. Locate the six rectangular notches on the inside surface of the corner channels (see Figure 8).
3. 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.
4. Repeat Steps 2 and 3 for connecting rear corner channels.

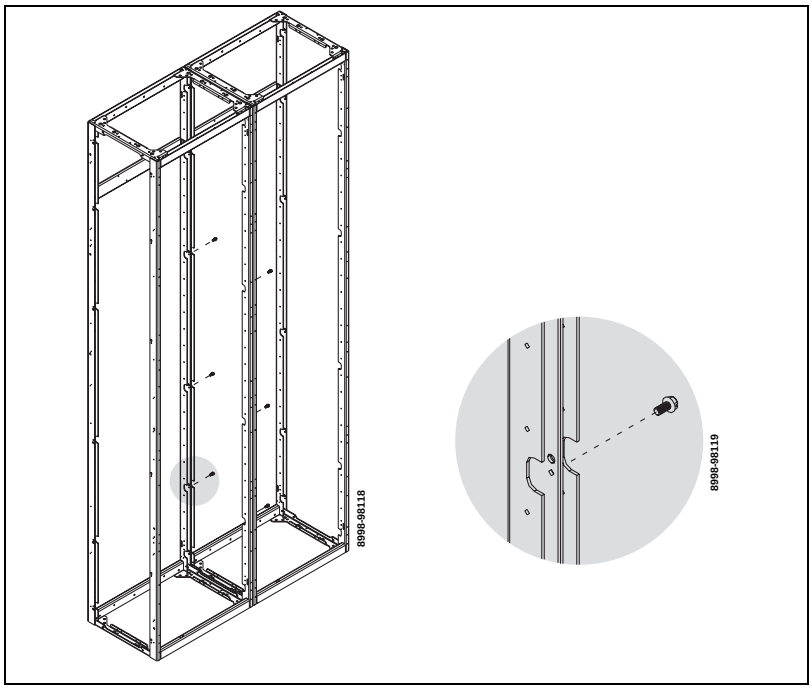


Figure 8: Bolting Sections Together

Securing Structures to the Floor

Fasten each section to the floor (see Figure 9) using 3/4 in. or 1/2 in. grade 5 or higher bolts and flat washers (furnished by the installer). The two 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 inhibits movement, thereby avoiding conduit connection damage.

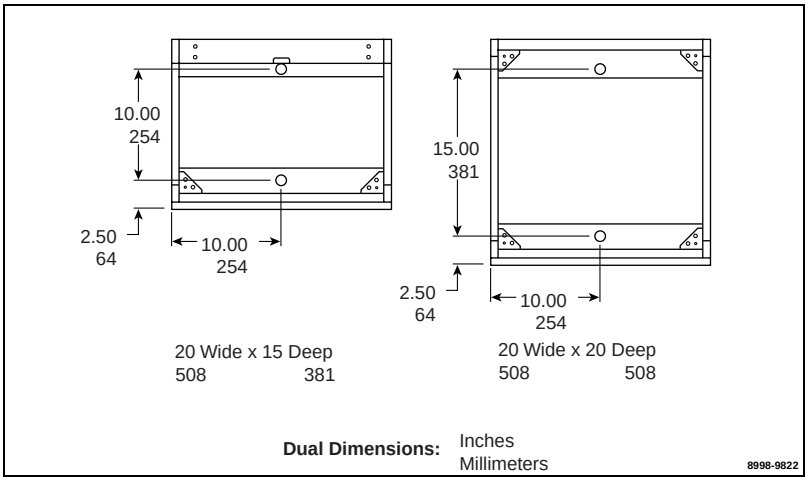


Figure 9: Base Channel Mounting

NOTE: For Seismic Zone 4 mounting requirements, contact your local Square D Field Sales Office.

Splice Gasket Installation for NEMA Type 1 Gasketed and NEMA Type 12 Enclosures

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

Standard Section Splicing Instructions

1. If splicing to an existing MCC, remove the end plate and any gasketing from the existing MCC.
   NOTE: If splicing to the right of an existing relay section, refer to the "Special Section Splicing" on page 25.
2. Remove the white paper backing from the new gasket to expose the adhesive. This adhesive temporarily holds the gasket in place while the sections are being positioned.
3. Apply the gasket to the front vertical corner channel with the adhesive side (Item 2, Figures 10 and 11) toward the new MCC section. Position the gasket as shown in Figure 10 for existing MCCs manufactured *after* May, 1992 (D gasket), or Figure 11 for existing MCCs manufactured *before* May, 1992 (P gasket).
4. Ensure that the gasket edge is flush with the top of the corner channel.

5. Using thumb pressure, firmly press the gasket in place from top to bottom. Verify that the gasket is flat along the entire length.
6. Join sections together, following the appropriate steps beginning in "Joining NEMA Type 1 and Type 12 Sections" on page 22 and continuing through page 24.

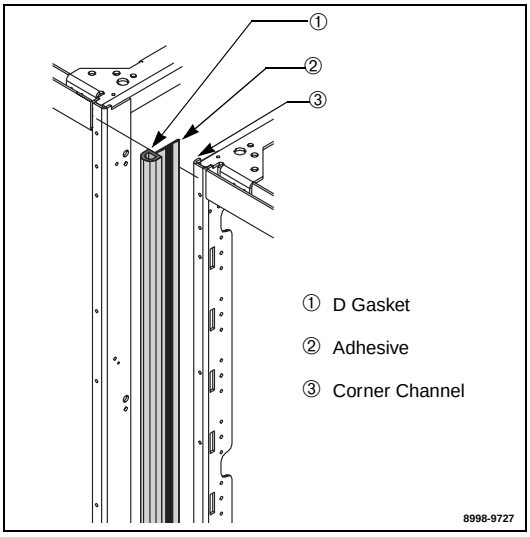


Figure 10: Model 6 on the Right Splicing to a Model 5 (manufactured after May, 1992) or a Model 6

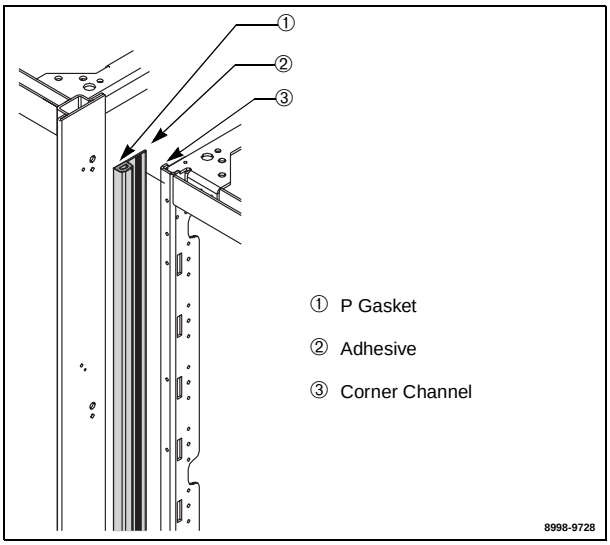


Figure 11: Model 5 or Model 6 on the Right Splicing to an Existing Model 4 or Model 5 (manufactured before May, 1992)

Special Section Splicing

For purposes of this instruction bulletin, a special section is an MCC section without vertical bus mounted in it. A special section may contain a main device, a branch device, a starter unit, or a removable relay mounting pan.

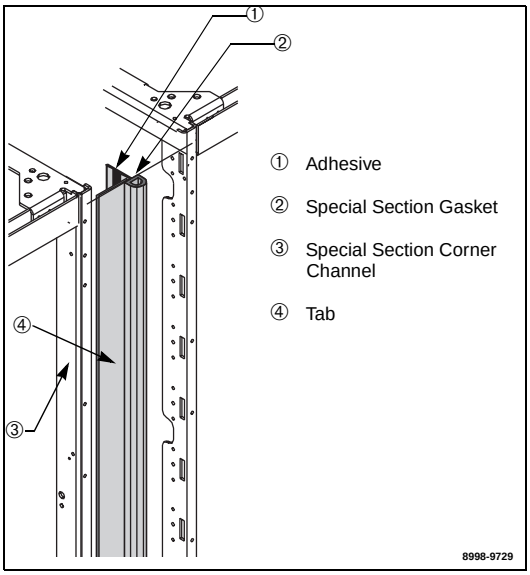


Figure 12: Special Section Splicing (special section on left)

To splice an existing MCC to a special section, follow these instructions:

1. Remove the side plate, gasketing, and top and bottom front covers from the existing MCC.
2. Remove the white paper backing from the new relay gasket to expose the adhesive. This adhesive temporarily holds the gasket in place while the sections are being positioned.
3. Apply the gasket to the front right vertical corner channel of the special section as shown in Figure 12.
4. Verify that the gasket edge is flush with the top of the corner channel and that the tab is flat on the front of the existing corner channel.
5. Using thumb pressure, firmly press the gasket in place from top to bottom. Verify that the gasket is flat along the entire length.
6. Join sections together following the appropriate steps beginning in "Joining NEMA Type 1 and Type 12 Sections" on page 22 and continuing through page 24.

Joining NEMA Type 3R Sections

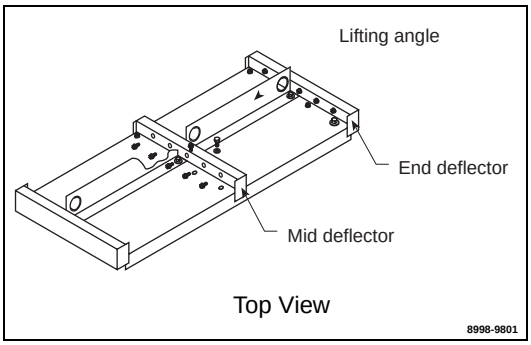


Figure 13: Remove Mid and End Deflector Caps from the Top of the MCC

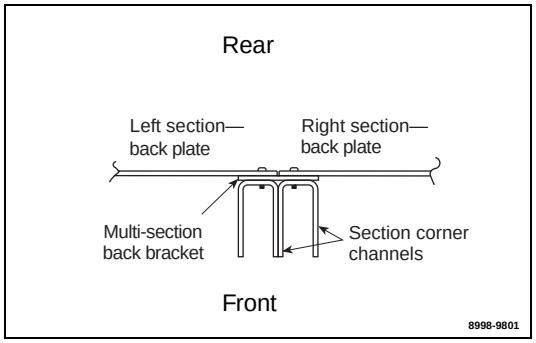


Figure 14: Attach the Multi-section Bracket

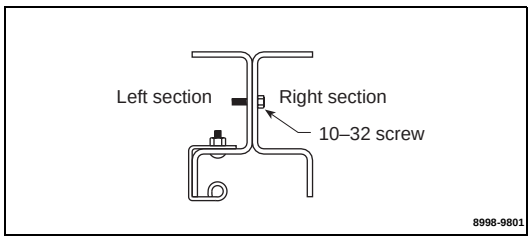


Figure 15: Secure the Vertical Channels

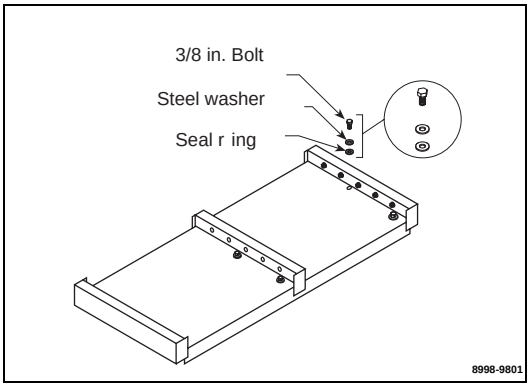


Figure 16: Replace Lifting Angle Hardware

This section provides instructions for joining NEMA Type 3R MCC sections (manufactured after February 1998), to the right of the existing MCC line-up.

NOTE: All NEMA Type 3R sections manufactured after February 1998 are approximately 93 inches (2362 mm) from the bottom of the section to the top of the deflector. Consult your local Square D Field Sales Office if adding to an existing NEMA Type 3R MCC manufactured before February 1998.

1. Remove the right section (see Figure 14) back plate.

   NOTE: Steps 2 and 3 apply only if a new section is being added to an existing MCC line-up. If installing a new line-up, skip to Step 4.

2. Remove the end deflector cap from the right side of the existing NEMA Type 3R section (see Figure 13). Also, remove the mid deflector cap from the section being added to the right.
3. Remove the end closing plate from the right side of the existing section.
4. After placing the structures side-by-side, join them as described in “Joining NEMA Type 1 and Type 12 Sections” on page 22.
5. Re-attach the back plate (removed in step 1) to the right section using the additional hardware supplied. Attach the right side to the multi-section bracket (see Figure 14).
6. Install the mid deflector, ensuring both top plate flanges are covered (see Figure 13).
7. Using the six 10-32 screws supplied, secure the left front vertical channel of the NEMA Type 3R extension to the right front vertical channel of the NEMA Type 3R extension (see Figure 15).
8. If the lifting angle will be removed from the sections after installation, replace all hardware in the order shown (see Figure 16).

Splicing Power Bus for NEMA Type 1 and Type 12 Enclosures

To splice the power bus, follow these steps:

1. Remove the horizontal bus covers and barriers from sections L and R (see Figure 6 on page 22).

   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 far rear splice link contains the captive nuts.
2. Remove the two left bolts. Loosen, but do not remove, the two right bolts on the splice assembly (see Figure 17).

   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 17: Removing the Left Bolts and Loosening the Right Bolts on the Splice Assembly

3. 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 19 on page 28).
4. 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 18 and Figure 20 on page 28). Torque all bolts, on both ends, to 31–32 lb-ft (41.87–43.22 N•m).

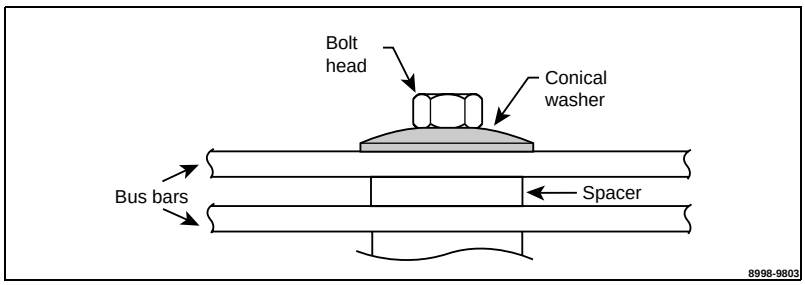
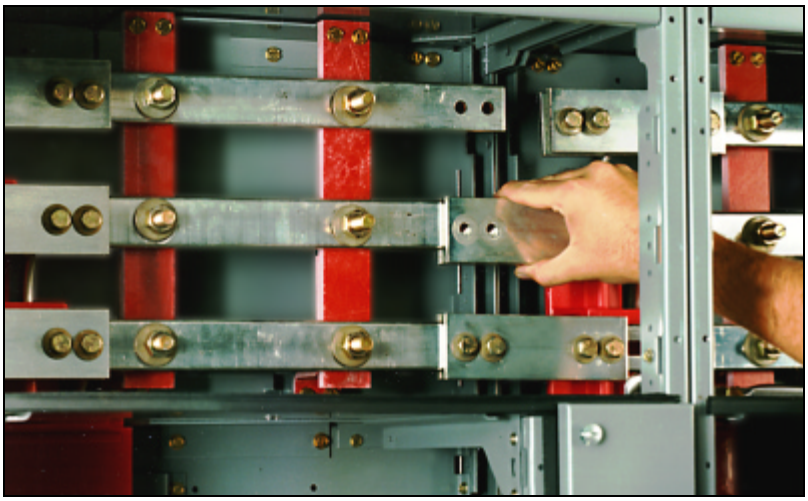


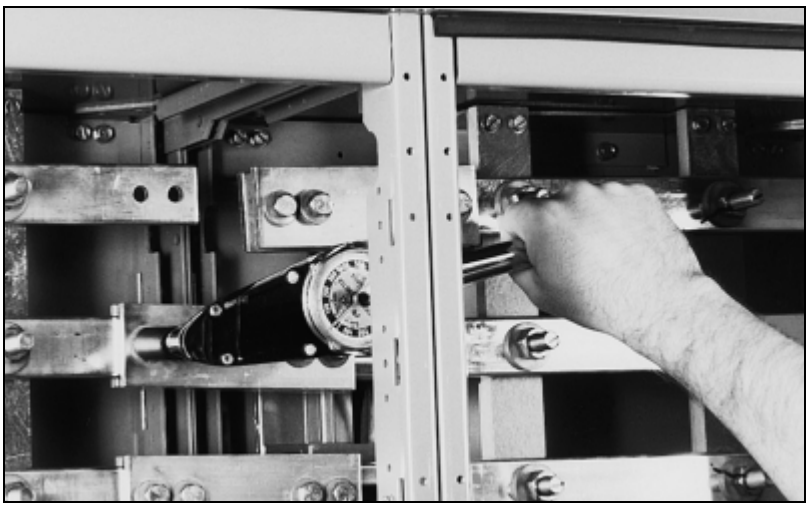
Figure 18: Place a Conical Washer under the Bolt Head

5. Repeat Steps 1 through 4 for all phases and the neutral bus (if supplied).
6. Before energizing the equipment, replace all covers and barriers.



8998-9206

Figure 19: Aligning the Splice and Bus Holes



8998-9207

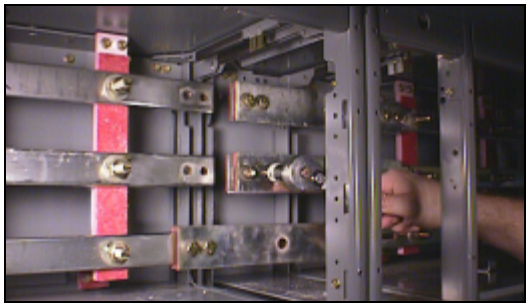
Figure 20: Torquing the Bolts

Splicing Power Bus in NEMA Type 3R Sections

This section describes how to splice the power bus of a NEMA Type 3R section (manufactured after February 1998) to the power bus of another NEMA Type 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 Type 3R enclosures.

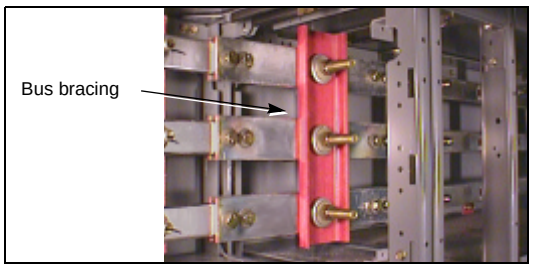
PBFIG1

Figure 21: Bus Covers Removed



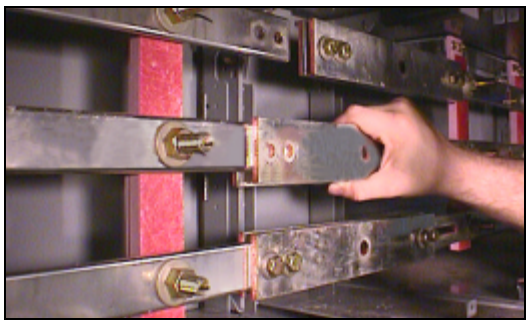
PBFIG2

Figure 22: Loosen Bolts



PBFIG5

Figure 23: Optional 85,000 A Bus Bracing



PBFIG3

Figure 24: Slide the Splice Assembly to the Left

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

To splice power bus, follow these steps.

1. Remove the horizontal bus covers from the left and right sections (see Figure 21).

   NOTE: All splice connections have one more splice bar than the number of laminations of the horizontal bus. The far rear splice bar contains captive nuts.
2. 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 22). If the bus has optional 85,000 A bus bracing supplied (see Figure 23), 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.
3. 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 24).
4. 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 25 on page 30).

5. Torque the bolts to 31–32 lb-ft (41.87–43.22 N•m) (see Figure 20 on page 28). If the optional 85,000 A bus bracing is supplied, torque the center nut to 70 lb-ft (94.92 N•m). Repeat steps 1–4 for all phases and the neutral bus (if supplied).
6. Before energizing the equipment, replace all covers and barriers.

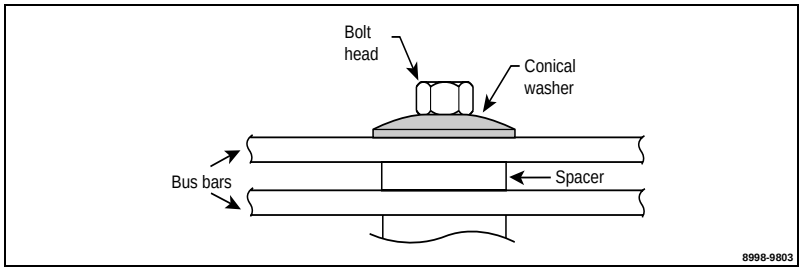


Figure 25: Place a Conical Washer Under the Bolt Head

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

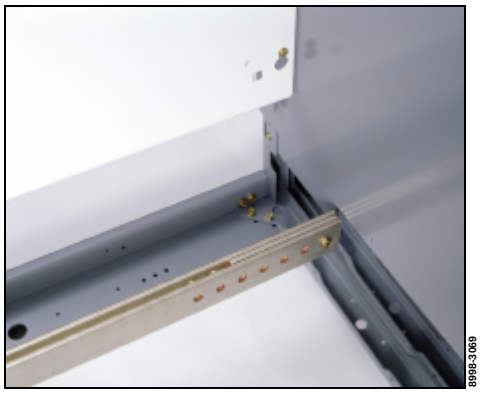


Figure 26: Ground Bar Bolt Removed

Figure 27: Ground Bar Bolt Replaced

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

To splice the ground bus, follow these steps:

1. Remove the ground bar bolt from section R and loosen the bolt in section L (see Figure 26).
   NOTE: Do not remove the bolt in section L. Doing so will permit the spacers to fall from the assembly.
2. Position the ground splice bar into section R, aligning the mounting holes.
3. Replace the ground bar bolt in section R (see Figure 27). Torque both bolts to 60–75 lb-in (6.75–8.44 N•m).
4. Replace all covers and barriers and close all doors.

Splicing Offset Horizontal Bus (Left Side of Structure Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions 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 will 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 far rear splice bar contains captive nuts.

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

1. Join sections together, following the appropriate steps beginning with “Location” on page 21 and continuing through page 26. This provides proper alignment of the horizontal bus.
2. Position the rear splice bar (bar with captive nuts; see Figure 28) against the back face of the rear horizontal bus bar.
3. 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 28).
4. Align the four mounting holes in the splice bus and the horizontal bus.
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 25 on page 30). Torque these bolts to 31–32 lb-ft (41.87–43.22 N•m) (see Figure 20 on page 28). If the optional 85,000 A bus bracing is supplied, torque the center nut to 70 lb-ft (94.92 N•m).
6. Repeat steps 1–6 for each of the three horizontal bus phases.
7. Before energizing the equipment, replace all covers and barriers.

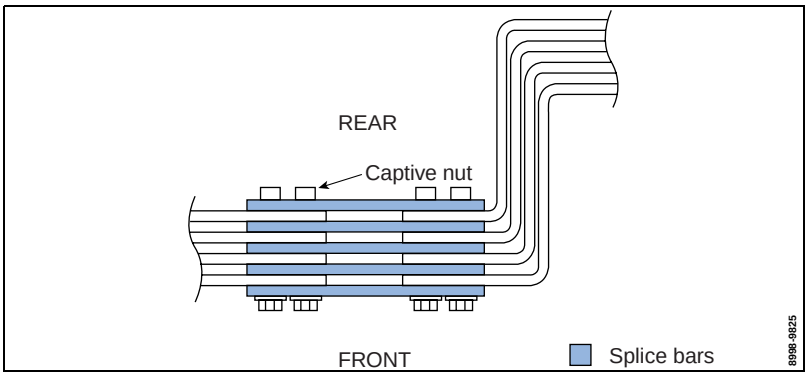


Figure 28: Splicing Offset Horizontal Bus

Conductor Entry

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions 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 2 and Table 3 on page 33.

Load and Control Wiring

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 29). 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. Grommeted 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 30). When cutting, be sure not to damage the wires located near the grommet.

Pull-apart control terminals (see Figure 31) 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.

8998-9208

Figure 29: Wiring in the Top Horizontal Wire Trough

8998-9209b

Figure 30: Vertical Wire Trough Grommet

8998-9849

Figure 31: Pull-apart Type Terminal Blocks

Cable Connection Torque Values

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

Table 2: 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 3: Connection Torque Values for Main and Branch Feeders

Frame Size	Ampere Rating	Torque
FA	15–30 A 35–100 A	35 lb-in. (3.94 N•m) 80 lb-in. (9.00 N•m)
FC	20–30 A 40–100 A	35 lb-in. (3.94 N•m) 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	125–400 A	200 lb-in. (22.51 N•m)
MA	200–400 A 450–1000 A	300 lb-in. (33.76 N•m) 300 lb-in. (33.76 N•m)
PA	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 OMNI-Center instruction information packet included in shipment.

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” on page 84. Select the proper thermal overloads from the applicable starter size tables.

Fuse Clip Location

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions 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 switch has five sets of mounting holes for this purpose. Mount the lower fuse base in the proper mounting holes (see Figure 32). Additional clips and bases may be required if changing fuse class.

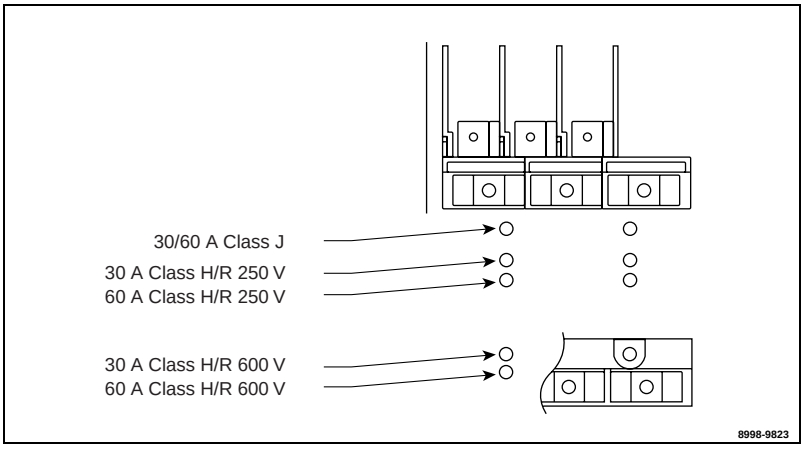


Figure 32: Size 1 and 2 Fuse Clip Location

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

Connecting the MCC Cabling System

CAUTION

HAZARD OF EQUIPMENT DAMAGE

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

Failure to follow this instruction can result in equipment damage.

Units within OMNI-Centers 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 OMNI-Center 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 OMNI-Center.

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 4.

Table 4: 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	Square D	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	Square D	Converter: 3090-MCI-101	MCI-101

* See “Square D Literature List” on page 11.

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 OMNI-Center, 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 “Square D Literature List” on page 11).

Terminating Resistors

In order for the MODBUS communications network to operate properly, terminating resistors are required on each end of the network. See “Appendix B—OMNI-Center Cabling Replacement Parts” on page 97 for a list of available terminating resistors. If your OMNI-Center 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 4 on page 35). Connectivity varies depending on the type of PLC used.

Direct Cable Connection

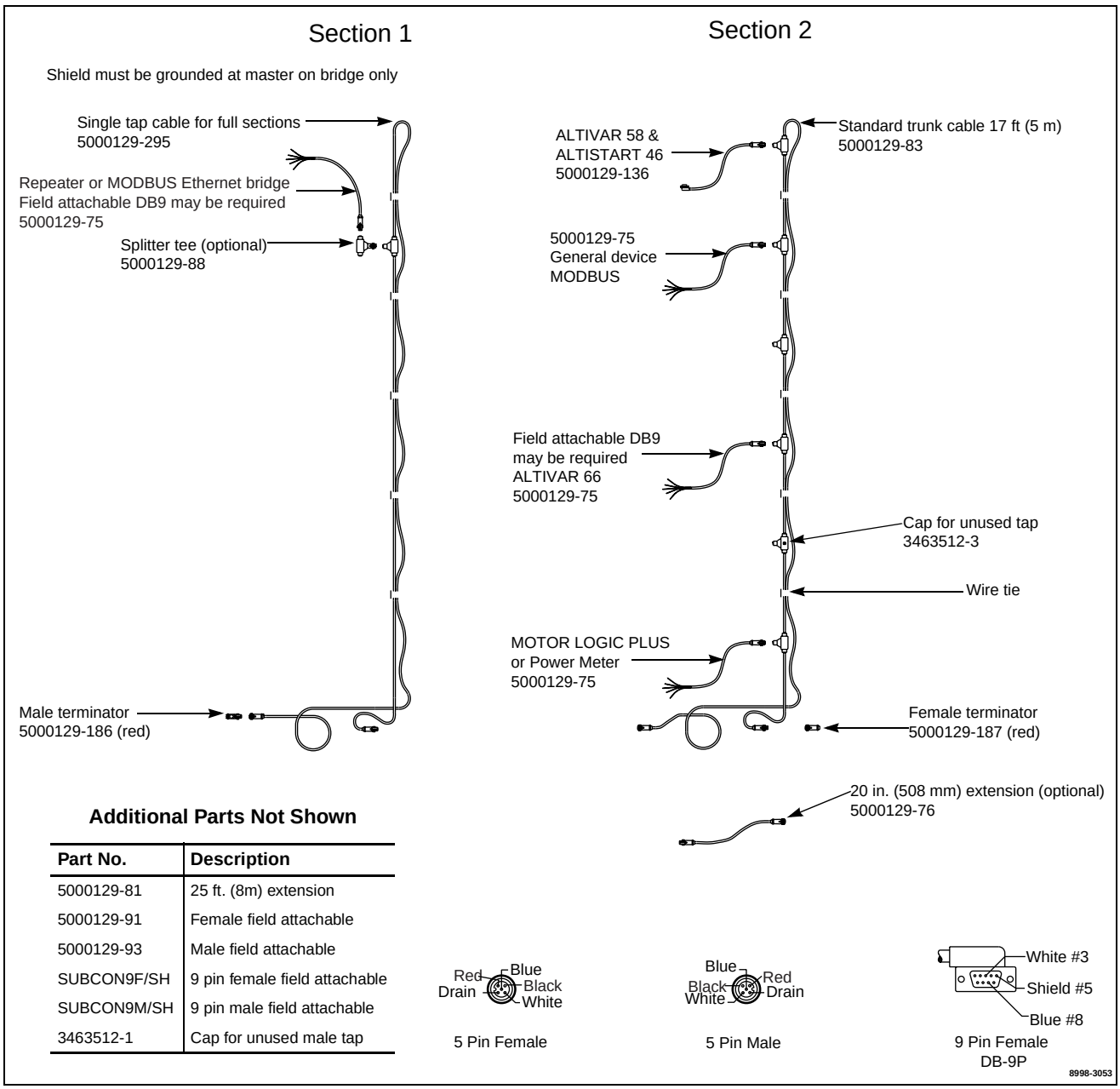
Follow the steps below to connect a cable directly to the MODBUS network via the MCC custom cable.

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

   NOTE: The female field attachable is Square D–Seneca part # 5000129-91, and the male field attachable is Square D–Seneca part # 5000129-93.

2. Strip back the communication cabling insulation.
3. Use the following table to match the field cabling communications terminations with MCC color coding.

Field Connection Termination	5-Pin Female/Male
Pin # 1	Shield
Pin # 2	Red
Pin # 3	Black
Pin # 4	White
Pin # 5	Green/Blue



Additional Parts Not Shown

Part No.	Description
5000129-81	25 ft. (8m) extension
5000129-91	Female field attachable
5000129-93	Male field attachable
SUBCON9F/SH	9 pin female field attachable
SUBCON9M/SH	9 pin male field attachable
3463512-1	Cap for unused male tap

Figure 33: Typical Cabling Scheme for MODBUS 4-Wire

SECTION 5—OPERATION

This section contains pre-operation checklists, energizing procedures, and remote and local programming procedures for MOTOR LOGIC PLUS™, POWERLOGIC® Power Meter, POWERLOGIC® Circuit Monitor, ALTIVAR™ 58, ALTIVAR™ 66, and ALTISTART® 46.

For COMPAC™ 6 operating instructions, see “COMPAC™ 6” on page 72. For MAG-GARD® circuit breaker operating instructions and selection information, see “Section 7–MAG-GARD® Circuit Breaker Settings” on page 67.

Pre-operation Checklists

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

MCC Structure

- ❏ Complete the maintenance procedures beginning on page 55 and continuing up to “Insulation Test” on page 64. 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 64).
- ❏ 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.
- ❏ Check the timers for the proper interval and contact operation.
- ❏ 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.

OMNI-Center 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 OMNI-Center 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 “Square D Literature List” on page 11).
- ❑ 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 34 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 5: 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 53 for specific addressing parameters).

PC/PLC Connections

- ❑ Refer to Table 5 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, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 37, and verify that all items check out.

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

To energize the MCC:

1. Review the "Pre-operation Checklists" on page 37 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 Square D bulletin # 30072-013-98A and # 30072-013-102C (see "Square D Literature List" on page 11) for more information about the MOTOR LOGIC PLUS SSOLR.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- 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 these instructions 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. Connect a 9 V supply to the "P" and "G" terminals using the supplied connector, part # 80445-519-50 (see Figure 34).
2. Turn the "Mode Select" switch to the parameter you are programming. Refer to bulletin # 30072-013-98_ (see "Square D Literature List" on page 11) for a list of parameters.
3. 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.
4. Turn the "Display/Program" dial to the desired setting as shown on the LED display.
5. Release the "Reset/Program" button.
6. Turn the "Mode Select" switch back to the "Run" position.
7. Disconnect the 9 V supply and its connector.

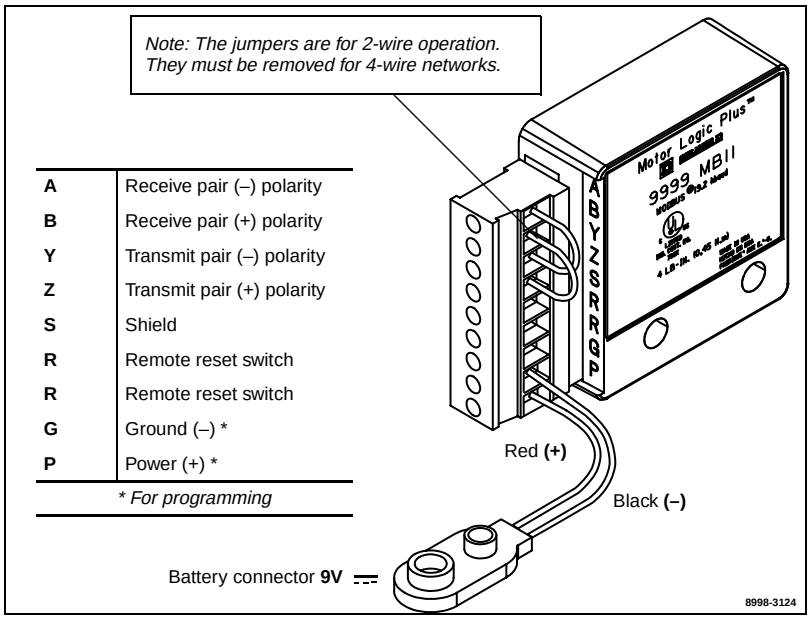


Figure 34: MOTOR LOGIC PLUS Communication Module Terminals

Error messages are displayed on the 3-digit LED display when harmful conditions are detected. Table 6 contains a list of the error message codes and their definitions.

Table 6: 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 7 for a register map with a list of parameters. For more detailed information, refer to bulletin # 30072-013-102_. See Table 9 and Table 10 to determine the location and addressing of parameters within the MOTOR LOGIC PLUS™ register map.
4. Restart the overload by using code “01H.”

Table 7: 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

★ Required for POWERLOGIC® software.

Table 7: MOTOR LOGIC PLUS™ Address Descriptions (Continued)

Operation	Address		Code	Description	Notes
	RAM	Relative★			
	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	1Bo	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 8 (write only)
	C8	1B4	Scale	POWERLOGIC® scale parameter (read only)	0, 1, 2; 16-bit signed word (2's complement, read only)
Read only (all registers are 16-bit words)	CA	1B5	LV	Low voltage threshold	170 V~ to HV (600 V~ model; 450 V~ a HV)
	CC	1B6	HV	High voltage threshold	LV to 528 V~ (600 V~ model; LV to 660 V~)
	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

★ Required for POWERLOGIC® software.

Table 7: MOTOR LOGIC PLUS™ Address Descriptions (Continued)

Operation	Address		Code	Description	Notes
	RAM	Relative★			
Read only (all registers are 16-bit words)	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 8: Command Line Codes

Code	Command
01H	Start/reset
02H	Stop
03H	Display lock
04H	Display unlock
05H	Network program enable
06H	Network program disable
07H	Network watchdog enable★
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 9: 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 balance	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

★ Must be used with POWERLOGIC software
★★ Can only be viewed via network

Table 9: Read Only Registers (Continued)

RAM Address	Relative Address★	Code	Description	Notes		
				Bit #	**TRIPRN**	**ERCODE**
AE	1A7	ERCODE/ TRIPRN	Bit-real time errors & trip indicator	0	Fault lockout	Low voltage
				1	Remote stop	High voltage
				2	Contactor 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	The four-fault history is based on the following scheme: 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1, 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:		
				01		High voltage
				02		Low voltage
				03		N/A
				04		Contactor 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		

★ Must be used with POWERLOGIC software
★★ Can only be viewed via network

Table 9: Read Only Registers (Continued)

RAM Address	Relative Address★	Code	Description	Notes
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 10: 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%	

★ Can only be viewed via network

Table 10: Read/Write Registers (Continued)

RAM Address	Relative Address	Code	Description	Range	Default	
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

POWER LOGIC® Power Meter

Instructions for performing local and remote programming for the Power Meter are contained in Square D instruction bulletin # 3020IM9503 R6/98 (see “Square D Literature List” on page 11).

POWER LOGIC® Circuit Monitor

Instructions for performing local and remote programming for the Circuit Monitor 2000 are contained in Square D instruction bulletin # 3020IM9807 (see “Square D Literature List” on page 11).

ALTIVAR™ 58

To accomplish local setpoint programming and fault readout for the ALTIVAR™ 58, refer to Square D instruction bulletin # VVDED397047US R7/00 (see “Square D Literature List” on page 11).

To perform remote setpoint programming and fault readout, refer to Square D instruction bulletin # VVDED397054US (see “Square D Literature List” on page 11).

For ALTIVAR™ 58 hardware troubleshooting, refer to Square D instruction bulletin # VVDED397048US R4/99 (see “Square D Literature List” on page 11).

See Table 9 on page 43 and Table 10 on page 45 to determine the location and addressing of parameters within the ALTIVAR™ 58 register map.

ALTIVAR™ 66

Refer to Square D instruction bulletin # VD0C06305_ for instructions on performing local programming for ALTIVAR™ 66 (see “Square D Literature List” on page 11).

For information regarding remote programming and parameters for the ALTIVAR™ 66, refer to Square D instruction bulletin # VD0C06S308 (see “Square D Literature List” on page 11).

ALTISTART® 46

The ALTISTART 46 is factory set to operate without adjustment along with many applications. At the factory, the ALTISTART 46 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.

Table 11: ALTISTART® 46 Function Index Table

Description	Type[1]	Characteristics	Code	Address[2]
Return to factory settings	C	Active on positive edge	CMD, INT	W4060, D
Control loop	F	Select closed loop (torque control) open loop (voltage regulation)	CLP	W4035, 0
	C	Run command	CMD, RUN	W4060, 5
	A	Acceleration ramp time	ACC	W4043
	A	Initial torque during acceleration	TQ0	W4037
	A	Max. torque during acceleration	TLI	W4036
	A	Limit current	ILT	W4039
	A	Boost level	BST	W4028
Start	A	Start time too long	TLS	W4033
	A	Stator loss compensation	LSC	W4027
	D	Controller ready	ETA, RDY	W4061, 1
	D	Steady state	ETA, 8	W4061, 8
	D	Short-circuited	ETA, 9	W4061, 9
	D	Current limited	ETA, LIM	W4061, D
	D	Acceleration phase	ETA, B	W4061, B
	C	Freewheel stop command	CMD, CAL	W4060, 8
	C	Decelerated stop command	CMD, CAD	W4060, 7
	C	Braked stop command	CMD, CAF	W4060, 6
	C	Control motor deceleration in cascade	DMC	W4060, 3
Stop	A	Decel: deceleration ramp slope	DEC	W4044
	A	final torque during deceleration	EDC	W4038
	A	Braking: braking current	BRC	W4041
	A	adjustment of braking time	EBA	W4042
	D	Stop phase	ETA, A	W4061, A
	C	Reset thermal state	CMD, RTH	W4060, A
	A	Trip threshold (underload)	TLS	W4031
Motor protection	A	Motor nominal current	In	W4026
	F	Motor thermal protection	THP	W4034
	D	Motor thermal state	LTH	W4064
Controller protection	F, A	Trip current threshold	OIL	W4040
	F	Default assignment of phase rotation	PHR	W4032
	D	Phase rotation state	PHE	W4065
Mains supply	D	No mains supply	ETA, E	W4061, E
	D	Mains supply frequency	ETA, F	W4061, F
	D	Current	LCR	W4062
	D	Cos (φ) motor power factor	COS	W4067
Measurements	D	Torque	LTR	W4063
	D	Elapsed time meter	TFR	W4068
	D	Reset elapsed time meter	TRE	W4060, C
Special operation	F	Test on low power motors	SST	W4035, 5
	C	Cascade motor operation	CSC	W4035, 6

[1] Types: C=Command F=Configuration A=Adjustment D=Display

[2] When using MODBUS protocol, add 1 to the address.

Table 11: ALTISTART® 46 Function Index Table (Continued)

Description	Type[1]	Characteristics	Code	Address[2]
	F	Assignment of logic input LI	LI	W4022
	F	Assignment of logic output LO1	LO1	W4023
	F	Assignment of logic output LO2	LO2	W4035, 3
	F	Assignment of analog output AO	AO	W4024
	A	Analog output scale	ASC	W4025
	F	Analog output range	AO1	W4035, 4
	F	Assignment of relay R1	R1	W4035, 2
	D	State of I/O: Logic input LI	LIO	W4066
I/O management	D	Logic output LO1		W4066, 1
	D	Logic output LO2		W4066, 2
	D	Relay R1		W4066, 3
	D	Relay R2		W4066, 4
	D	Vigithem		W4066, 5
	D	Logic input LI_RUN		W4066, 6
	D	Logic input LI_STOP		W4066, 7
	D	Operating duty switch		W4066, 8
	D	Value of analog output AO	SAO	W4070
	C	Assignment of online commands	DLI	W4060, 1
	C	Store adjustments in EEPROM	MRE	W4060, E
	C	Recall adjustments from EEPROM	RRE	W4060, F
	F	Product address	ADR	W2290
Communication & terminal block management	F	Protocol	PRO	W2291
	F	Transmission speed	SPD	W2292
	F	Character format	FOR	W2293
	D	In local/line mode	LOC	W4061, 0
	D	Stopped after request via terminal block	ETA, 3	W4061, 3
	D	Local control	FLO	W4061, 5

[1] Types: C=Command F=Configuration A=Adjustment D=Display

[2] When using MODBUS protocol, add 1 to the address.

Table 11: ALTISTART® 46 Function Index Table (Continued)

Description	Type[1]	Characteristics	Code	Address[2]
Fault and alarm management	C	External fault command	EFL	W4060, 2
	C	Controller reset command	RST	W4060, 0
	C	No time out SLF	NTO	W4060, 4
	F	Automatic reset	ARS	W4035, 1
	D	Controller faulted	FAI	W4061, 2
	D	Communication check inhibited	NTO	W4061
	D	Current threshold alarm		W4061, 7
	D	Motor thermal alarm	OVL	W4061, C
	D	Internal fault	INF	W4069, 1
	D	Short-circuit fault	OCF	W4069, 2
	D	Phase inversion fault	PIF	W4069, 3
	D	Serial link fault	SLF	W4069, 5
	D	External fault	ETF	W4069, 6
	D	Start too long fault	STF	W4069, 7
	D	Mains failure and start request fault	USF	W4069, 8
	D	Phase fault	PHF	W4069, 9
	D	Controller thermal fault	OHF	W4069, A
	D	Locked rotor in steady state fault	LRF	W4069, B
	D	Motor thermal overload fault	OLF	W4069, C
	D	Mains frequency fault	FRF	W4069, D
	D	Underload fault	ULF	W4069, F
	D	Time before starting alarm	TBS	W4071, 0
Fault history	D	Fault order	PTR	W4090
	D	Fault register repetition	DFT	W4091
	D	Time counter repetition		W4092

[1] Types: C=Command F=Configuration A=Adjustment D=Display

[2] When using MODBUS protocol, add 1 to the address.

Table 12: ALTISTART® 46 Function Index Table by Address

Address[1]	Description	Type[2]	Characteristics	Code
W2290	Communication & terminal block management	F	Product address	ADR
W2291	Communication & terminal block management	F	Protocol	PRO
W2292	Communication & terminal block management	F	Transmission speed	SPD
W2293	Communication & terminal block management	F	Character format	FOR
W4022	I/O management	F	Assignment of logic input LI	LI
W4023	I/O management	F	Assignment of logic output LO1	LO1
W4024	I/O management	F	Assignment of analog output AO	AO
W4025	I/O management	A	Analog output scale	ASC
W4026	Motor protection	A	Motor nominal current	In
W4027	Start	A	Stator loss compensation	LSC
W4028	Start	A	Boost level	BST

[1] When using MODBUS protocol, add 1 to the address.

[2] Types: C=Command F=Configuration A=Adjustment D=Display

Table 12: ALTISTART® 46 Function Index Table by Address (Continued)

Address[1]	Description	Type[2]	Characteristics	Code
W4031	Motor protection	A	Trip threshold (underload)	TLS
W4032	Mains supply	F	Default assignment of phase rotation	PHR
W4033	Start	A	Start time too long	TLS
W4034	Motor protection	F	Motor thermal protection	THP
W4035, 0	Control loop	F	Select closed loop (torque control) open loop (voltage regulation)	CLP
W4035, 1	Fault & alarm management	F	Automatic reset	ARS
W4035, 2	I/O management	F	Assignment of relay R1	R1
W4035, 3	I/O management	F	Assignment of logic output LO2	LO2
W4035, 4	I/O management	F	Analog output range	AO1
W4035, 5	Special operation	F	Test on low power motors	SST
W4035, 6	Special operation	C	Cascade motor operation	CSC
W4036	Start	A	Maximum torque during acceleration	TLI
W4037	Start	A	Initial torque during acceleration	TQ0
W4038	Stop	A	Decel: final torque during deceleration	EDC
W4039	Start	A	Limit current	ILT
W4040	Controller protection	F, A	Trip current threshold	OIL
W4041	Stop	A	Braking: braking current	BRC
W4042	Stop	A	Braking: adjustment of braking time	EBA
W4043	Start	A	Acceleration ramp time	ACC
W4044	Stop	A	Decel: deceleration ramp slope	DEC
W4060, 0	Fault & alarm management	C	Controller reset command	RST
W4060, 1	Communication & terminal block management	C	Assignment of online commands	DLI
W4060, 2	Fault & alarm management	C	External fault command	EFL
W4060, 3	Stop	C	Control motor deceleration in cascade	DMC
W4060, 4	Fault & alarm management	C	No time out SLF	NTO
W4060, 5	Start	C	Run command	CMD, RUN
W4060, 6	Stop	C	Braked stop command	CMD, CAF
W4060, 7	Stop	C	Decelerated stop command	CMD, CAD
W4060, 8	Stop	C	Freewheel stop command	CMD, CAL
W4060, A	Motor protection	C	Reset thermal state	CMD, RTH
W4060, C	Measurements	D	Reset elapsed time meter	TRE
W4060, D	Return to factory settings	C	Active on positive edge	CMD, INT
W4060, E	Communication & terminal block management	C	Store adjustments in EEPROM	MRE
W4060, F	Communication & terminal block management	C	Recall adjustments from EEPROM	RRE

[1] When using MODBUS protocol, add 1 to the address.

[2] Types: C=Command F=Configuration A=Adjustment D=Display

Table 12: ALTISTART® 46 Function Index Table by Address (Continued)

Address[1]	Description	Type[2]	Characteristics	Code
W4061	Fault & alarm management	D	Communication check inhibited	NTO
W4061, 0	Communication & terminal block management	D	In local/line mode	LOC
W4061, 1	Start	D	Controller ready	ETA, RDY
W4061, 2	Fault & alarm management	D	Controller faulted	FAI
W4061, 3	Communication & terminal block management	D	Stopped after request via terminal block	ETA, 3
W4061, 5	Communication & terminal block management	D	Local control	FLO
W4061, 7	Fault & alarm management	D	Current threshold alarm	
W4061, 8	Start	D	Steady state	ETA, 8
W4061, 9	Start	D	Short-circuited	ETA, 9
W4061, A	Stop	D	Stop phase	ETA, A
W4061, B	Start	D	Acceleration phase	ETA, B
W4061, C	Fault & alarm management	D	Motor thermal alarm	OVL
W4061, D	Start	D	Current threshold	ETA, LIM
W4061, E	Mains supply	D	No mains supply	ETA, E
W4061, F	Mains supply	D	Mains supply frequency	ETA, F
W4062	Measurements	D	Current	LCR
W4063	Measurements	D	Torque	LTR
W4064	Motor protection	D	Motor thermal state	LTH
W4065	Mains supply	D	Phase rotation state	PHE
W4066	I/O management	D	State of I/O: Logic input LI	LIO
W4066, 1	I/O management	D	Logic output LO1	
W4066, 2	I/O management	D	Logic output LO2	
W4066, 3	I/O management	D	Relay R1	
W4066, 4	I/O management	D	Relay R2	
W4066, 5	I/O management	D	Vigithem	
W4066, 6	I/O management	D	Logic input LI_RUN	
W4066, 7	I/O management	D	Logic input LI_STOP	
W4066, 8	I/O management	D	Operating duty switch	
W4067	Measurements	D	Cos (φ) motor power factor	COS
W4068	Measurements	D	Elapsed time meter	TFR
W4069, 1	Fault & alarm management	D	Internal fault	INF
W4069, 2	Fault & alarm management	D	Short-circuit fault	OCF
W4069, 3	Fault & alarm management	D	Phase inversion fault	PIF
W4069, 5	Fault & alarm management	D	Serial link fault	SLF
W4069, 6	Fault & alarm management	D	External fault	ETF
W4069, 7	Fault & alarm management	D	Start too long fault	STF
W4069, 8	Fault & alarm management	D	Mains failure and start request fault	USF
W4069, 9	Fault & alarm management	D	Phase fault	PHF
W4069, A	Fault & alarm management	D	Controller thermal fault	OHF
W4069, B	Fault & alarm management	D	Locked rotor in steady state fault	LRF

[1] When using MODBUS protocol, add 1 to the address.

[2] Types: C=Command F=Configuration A=Adjustment D=Display

Table 12: ALTISTART® 46 Function Index Table by Address (Continued)

Address[1]	Description	Type[2]	Characteristics	Code
W4069, C	Fault & alarm management	D	Motor thermal overload fault	OLF
W4069, D	Fault & alarm management	D	Mains frequency fault	FRF
W4069, F	Fault & alarm management	D	Underload fault	ULF
W4070	I/O management	D	Value of analog output AO	SAO
W4071, 0	Fault & alarm management	D	Time before starting alarm	TBS
W4090	Fault history	D	Fault order	PTR
W4091	Fault history	D	Fault register repetition	DFT
W4092	Fault history	D	Time counter repetition	

[1] When using MODBUS protocol, add 1 to the address.

[2] Types: C=Command F=Configuration A=Adjustment D=Display

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 POWER LOGIC or Solutions—is available for communication with your intelligent Model 6 OMNI-Center components. For setup, operating, and maintenance instructions, consult the user manual included with your software package.

SECTION 6—MAINTENANCE

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified electrical personnel.
- Qualified electrical personnel must perform work in accordance with all applicable national and local electric codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- 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.
- Beware of potential hazards, wear personal protective equipment, and take adequate safety precautions.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, locked out, and/or tagged out. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- 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.

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, electrical fault, or unusual occurrence.

Enclosure

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.

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. Remove the top and bottom horizontal wire trough covers in each section.
2. Expose the bus and bus connections by removing the two-piece bus barrier in each section.
3. Examine all bus bars and connectors. Replace any parts that are badly discolored, corroded, or pitted. Also replace parts subjected to excessive temperatures.
4. Check, and tighten if necessary, all bolts at the bus connection points indicated by a hexagon in Figure 35. Although one specific type of compartment or bus is shown in Figure 35, perform this maintenance on all bolted connections. Refer to Table 13 for torque values.

Table 13: 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)

⚠ 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 these instructions can result in injury or equipment damage.

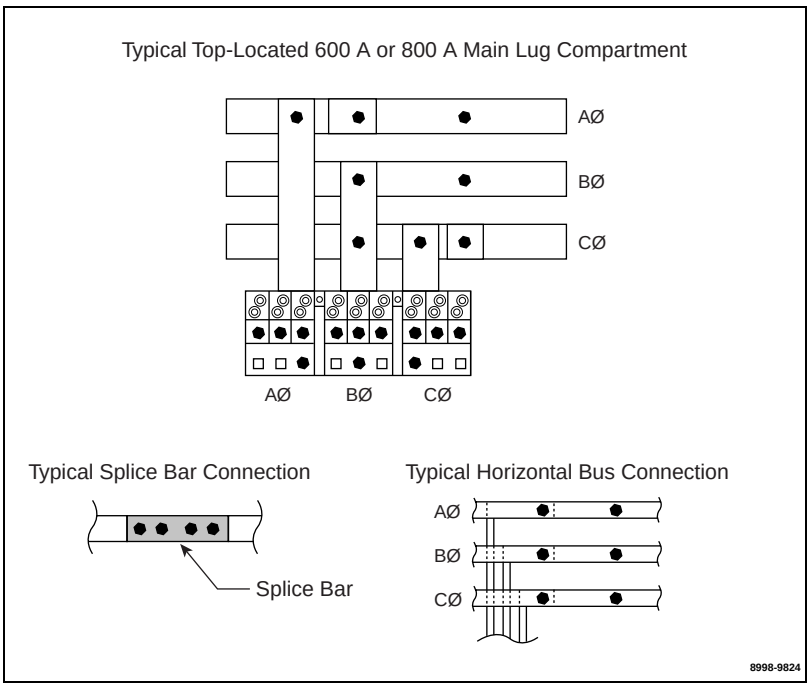


Figure 35: Typical Bus Connection Points

5. Check, and tighten if required, all main lug, circuit breaker or fusible switch set screws holding incoming conductors in main lugs (see Figure 36). Using a torque wrench and a 3/8 in. allen bit, torque the lug set screws to the appropriate value (see “Cable Connection Torque Values” on page 33).
6. Inspect all insulators, braces, and barriers; replace any that show signs of arcing damage, tracking, excessive heat, or cracking.

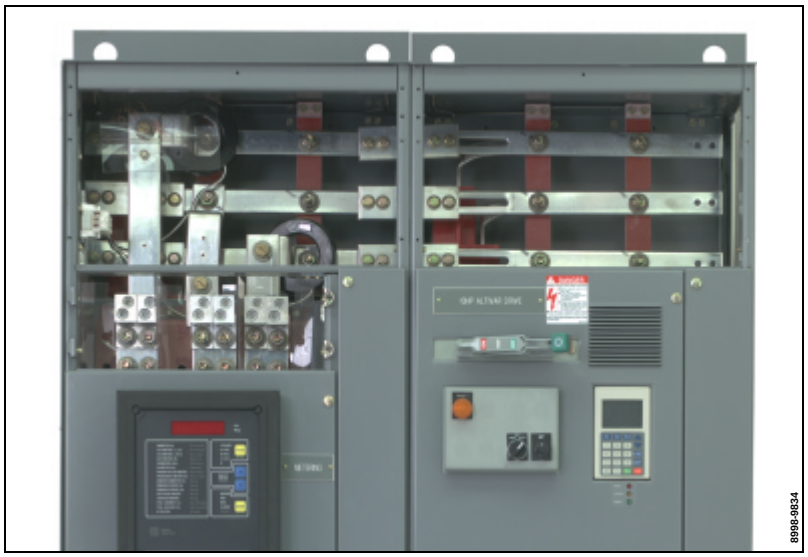


Figure 36: Top-located Main Lug Compartment

Control Unit Maintenance

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified electrical personnel.
- Qualified electrical personnel must perform work in accordance with all applicable national and local electric codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- 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.
- Beware of potential hazards, wear personal protective equipment, and take adequate safety precautions.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, locked out, and/or tagged out. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions 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 37) is being removed from the MCC for maintenance, begin with “Control Unit Removal” below. If maintenance is performed with the control unit installed, begin with “Circuit Breaker or Disconnect Switch” on page 62.

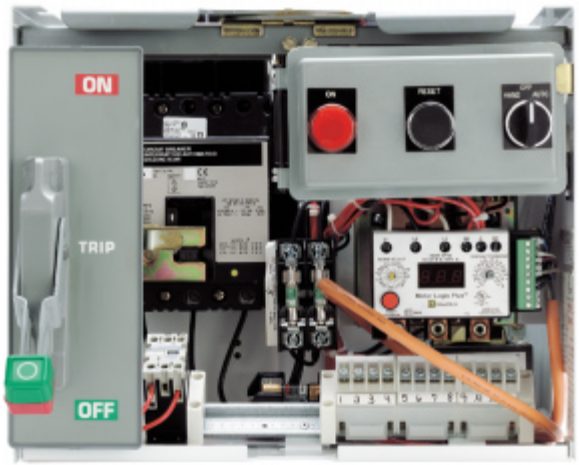


Figure 37: 12-Inch Control Unit

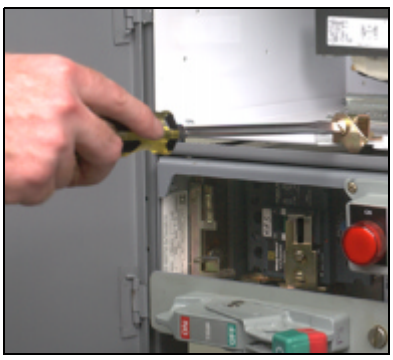
Control Unit Removal

8998-9832

Figure 38: Operating Mechanism in the *Off* Position

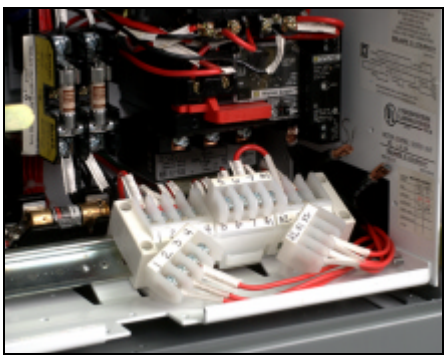
8998-9850

Figure 39: Loosening Captive Quarter-turn Fasteners



8998-9847

Figure 40: Releasing the Lock-in Device (when supplied)



8998-9838

Figure 41: Disconnected Terminal Blocks

8998-9217

Figure 42: Power Leads and Top of Terminal Blocks Fed Through Wiring Port

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- 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.

Failure to follow these instructions 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:

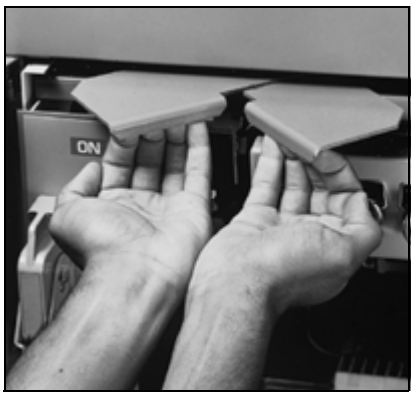
1. Move the operating mechanism to the *off* position (see Figure 38).

   NOTE: To clear the door cutout on the circuit breaker disconnect units, fully press the handle operator while opening the door.
2. Loosen the captive quarter-turn fasteners (see Figure 39) on the door and open it. Use a properly rated voltmeter to check for live circuits. De-energize any voltage sources.
3. 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 40).
4. Disconnect the power wiring from the starter terminals or, if provided, the power terminal blocks. Tag the terminations for re-installation (see Figure 41).

   Remove the top portion of the pull-apart control terminal blocks to which field wiring is connected.
5. 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 42).
6. When applicable, unscrew the MODBUS tap cable from the OMNI-Center trunk line cabling. Feed the tap cable through the wiring port and into the starter unit.
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 43).

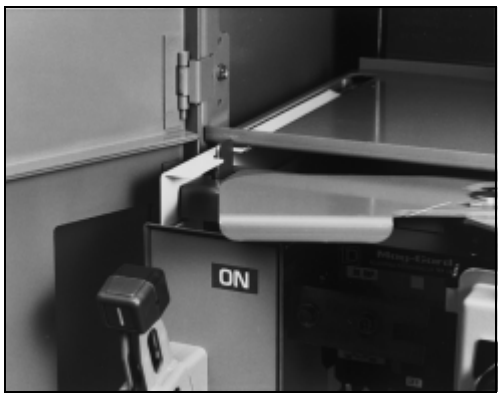
This action disconnects the power stabs from the vertical bus. Continue pulling forward until the handles are fully extended.

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 44).
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 45).



8998-9249

Figure 43: Pulling the Twin Handle Cam Mechanism Forward



8998-9218

Figure 44: Operating the Mechanism-to-Structure Interlock

8998-9839

Figure 45: Locked Out Device

10. Remove the control unit from the structure for servicing (see Figure 46). 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 47).
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 48). Remove the bottom hinge pin first.

8998-9241

Figure 46: Control Unit Removed

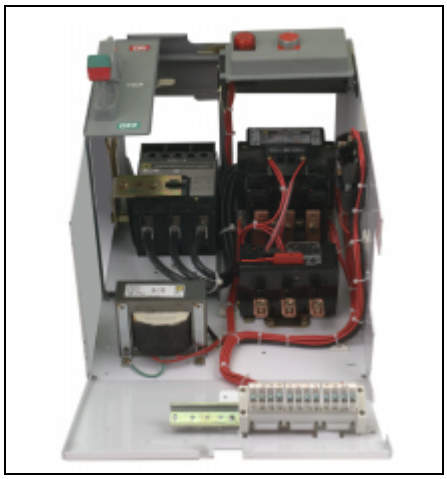

8998-9853

Figure 47: Control Unit Bottom Plate Folded Down

8998-9841

Figure 48: Driving Out Hinge Pin

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

COMPAC™ 6 Control Unit Maintenance

The following maintenance information is specific to COMPAC 6, six-inch units. For more information regarding COMPAC™ 6, six-inch units, refer to “COMPAC™ 6” on page 72, or the information included with the shipment of the new device.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

COMPAC 6 Unit Removal

1. Move the operating mechanism to the OFF position (see Figure 49).
2. Loosen the captive quarter-turn fasteners (see Figure 50) 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 3 and 4. To remove the control station plate, follow these steps:

   a. Loosen the captive mounting screws that hold the plate to the front of the unit.
   b. Remove the plate from the unit (see Figure 50).
   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.

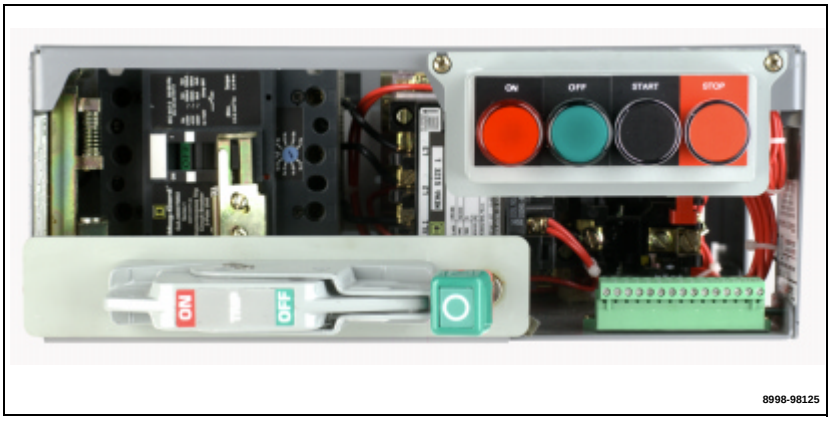


Figure 49: Operator Handle in the Off Position

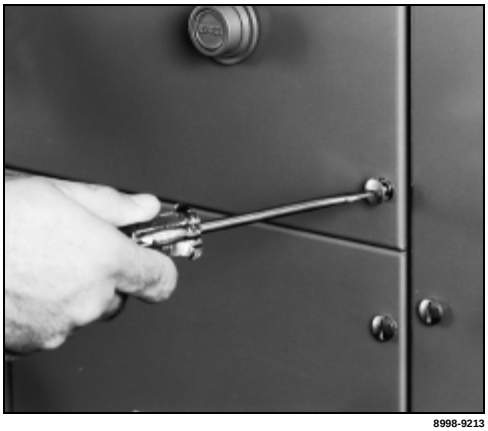


Figure 50: Loosening Captive Quarter-turn Fasteners

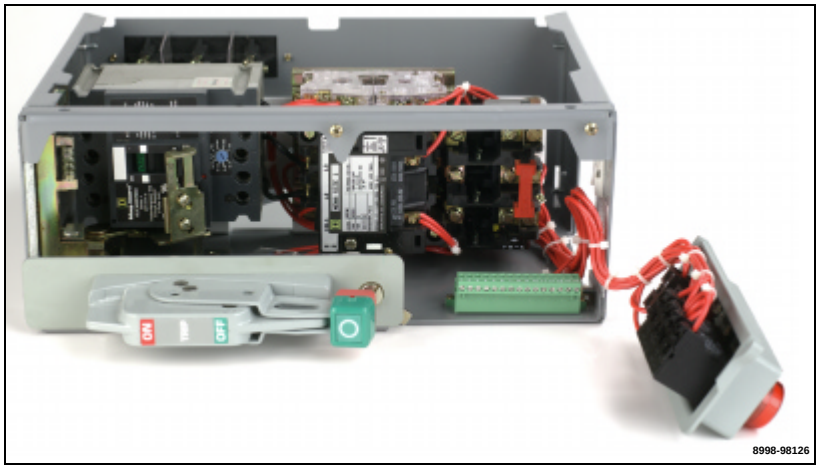


Figure 50: Control Station Plate Removed

3. Disconnect the power wiring from the starter terminals. Tag the terminations for re-installation.
4. Remove the top portion of the pull-apart control terminal block to which field wiring is connected.
5. 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.
6. Grasp the operating handle flange and press down on the structure interlock release (see Figure 51).

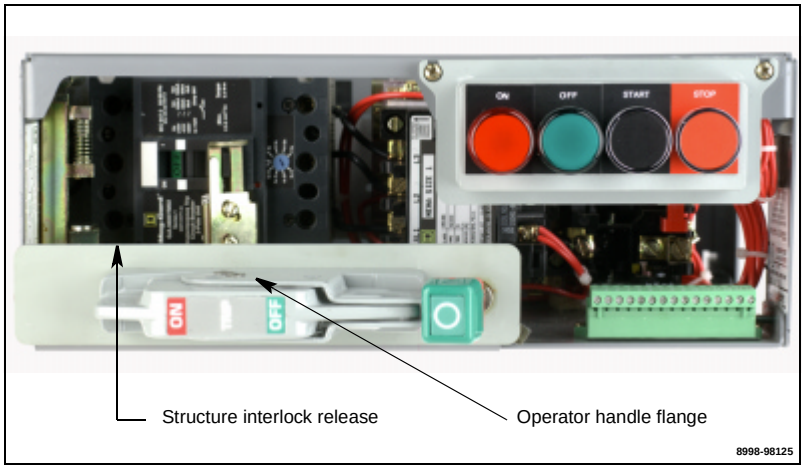


Figure 51: Operator Handle and Interlock Release

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

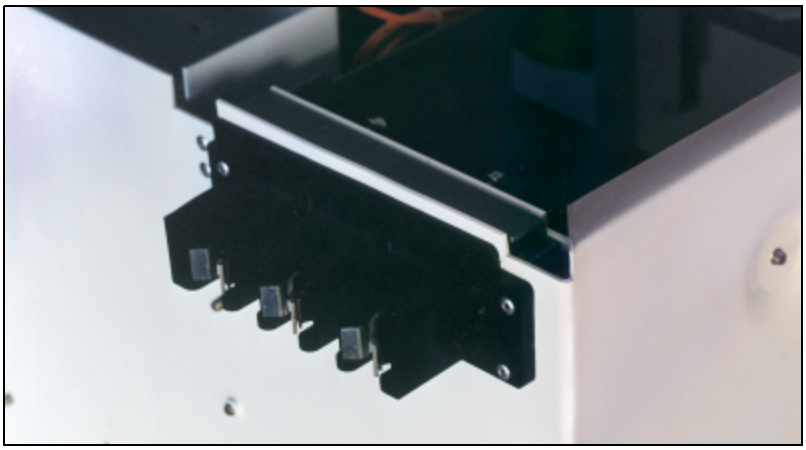
Do not remove the protective lubricant from the stabs. If additional lubricant is required, order Square D electrical joint compound #PJC-7201.

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 52) for signs of arcing or overheating. Replace the disconnect assembly immediately if overheating has occurred. For replacement disconnect assemblies, see “Section 11—Circuit Breaker and Fusible Switch Selection” on page 91.

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



8998-9245

Figure 52: Stab Assembly

Circuit Breaker or Disconnect Switch—Check the circuit breaker or disconnect switch for proper operation. 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—Check for proper operation of the operator mechanism. Test for proper *on*, *off*, *trip*, and *reset* positions (see Figure 53 on page 63). Check for 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 54 on page 63). Replace any parts showing signs of overheating or arcing.

Starter Contacts—Check the starter contacts (see Figure 55). Replace any that are badly worn or pitted. (See the contactor instruction bulletin included with the original shipment.)

8998-9224

Figure 53: Operator Mechanism in the Tripped Position

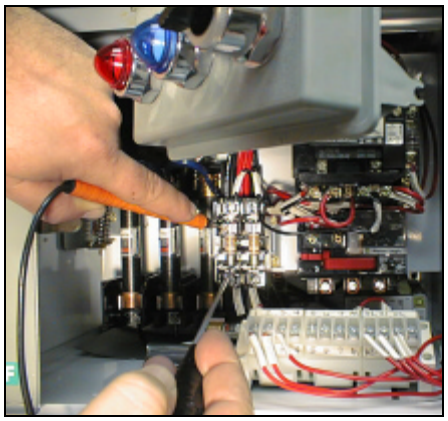

8998-98127

Figure 54: Inspecting Fuses

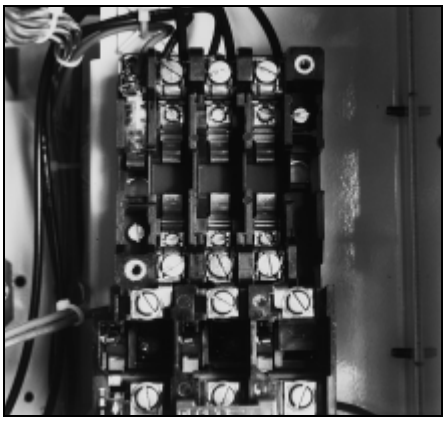
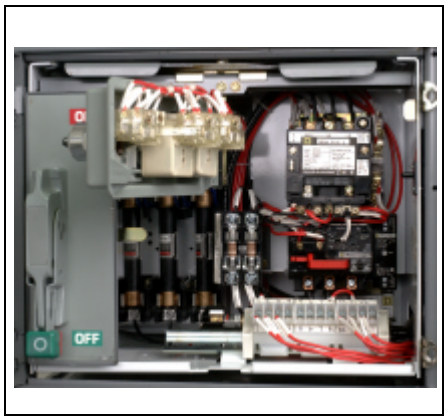

8998-9226

Figure 55: Starter Contacts

Control Devices—Check for proper operation of starters, relays, timers, and other control devices (see Figure 56).

Overload Relay—For melting alloy and bimetallic types, manually trip the overload relay to ensure proper operation (see Figure 57). Check 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.

Wiring and Electrical Connections—Check all electrical connections; tighten them if necessary (see Figure 58). Also inspect all power and control wiring, replacing any wire that has worn insulation or shows signs of overheating or cracking.



8998-9844

Figure 56: Control Devices

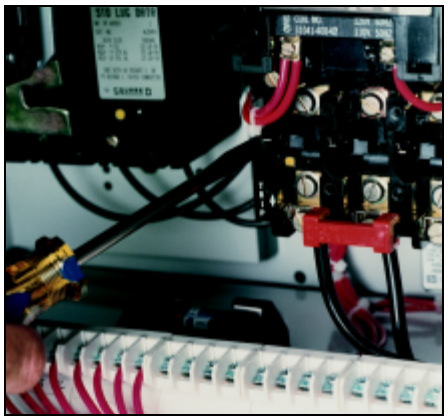

8998-9228

Figure 57: Tripping the Overload Relay

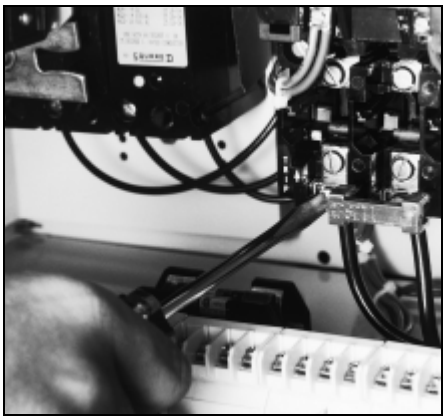

8998-9229

Figure 58: Tightening Electrical Connections

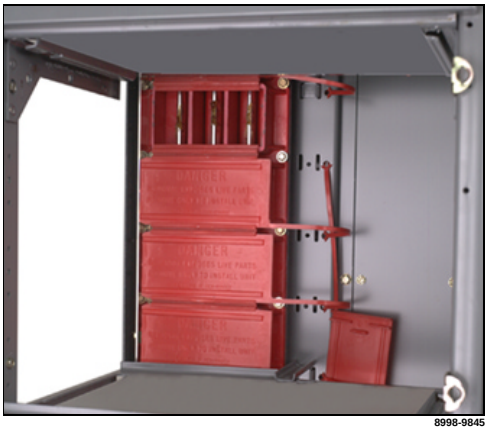


Figure 59: Manual Bus Shutter

⚠DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

⚠CAUTION

HAZARD OF EQUIPMENT DAMAGE

- Do not use a megohmmeter on solid state devices, capacitor units, or any devices that are not designed to withstand megohmmeter voltage.
- Disconnect all solid state devices before performing megohmmeter tests on the MCC.

Failure to follow these instructions can result in injury or equipment damage.

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

Barriers/Insulators—Inspect all insulators, braces, and barriers (see Figure 59); replace any that show signs of arcing damage, tracking, excessive heat, or cracking.

Special Units—Follow the manufacturer's recommended maintenance procedures for special units (e.g. 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 1–11 in "Control Unit Removal" on page 58 for unit replacement.
2. Replace all barriers and cover plates and close and fasten all doors.

Insulation Test

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 megohm meter 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 startup. 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 megohm meter 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 startup.

Record all megohm meter readings on the Insulation Resistance Log on page 83. 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 megohm meter readings are below 5 megohms (one megohm during startup) consult your local Square D field office.

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" on page 39).

Maintenance After a Fault Has Occurred

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

8998-9214

Figure 60: Operating Door Interlock Defeat Mechanism

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 local Square D field office.

After any fault, perform all maintenance procedures, starting on page 55 and continuing to “Insulation Test” on page 64. Also perform the following procedures after a fault:

1. If the fault occurred downstream from the MCC, perform the 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 **Enclosure** on page 55.
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 the maintenance procedures for control units. Begin with “Control Unit Maintenance” on page 57, and continue to “Insulation Test” on page 64. 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.

      NOTE: If the unit door must be opened while the unit is energized, authorized personnel must operate an interlock defeat mechanism (see Figure 60).
   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 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” on page 64) before placing the MCC back into service.
7. Complete the “Pre-operation Checklists” on page 37.
8. Re-energize the equipment. See “Energizing the MCC” on page 39.

SECTION 7–MAG-GARD® CIRCUIT BREAKER SETTINGS

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® adjustable magnetic trip-only circuit breakers are optional in Model 6 OMNI-Centers with MODBUS Data Acquisition.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

Adjusting MAG-GARD Magnetic Trip Setting

The adjustable magnetic trip setting is factory-set at “Lo.” This setting may need to be adjusted for proper motor startup. Refer to the magnetic trip setpoint limits outlined in the applicable national standards.

Accessing MAG-GARD

To access the MAG-GARD® trip adjustment dial:

1. Place the unit handle in the “Off” position and open the door.
2. While pushing the door interlock lever forward, trip the circuit breaker by pressing the yellow test button (see Figure 62). The disconnect handle will automatically move up, allowing access to the adjustment dial.

8998-9211

Figure 62: MAG-GARD® Magnetic Trip Adjustment in a Standard Unit

After obtaining the motor FLC 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 pushing the handle completely down.

NOTE: Select replacement MAG-GARD circuit breakers for MCCs using the voltage and current ratings listed in the Model 6 MCC Catalog (8998CT9701) in addition to the MAG-GARD selection table in the Square D Digest.

NOTE: 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 Square D/Schneider Canada representative.

SECTION 8—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 starter 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

Installing Additional MCC Units

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

1. Position the mid-shelf (Item A, Figure 63 on page 70) in the appropriate area of the structure.
2. 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, (Item D, Detail A).

3. Install the hinge leaves (Detail A, Item E) into the hinge slots (Item G), which are on the structure corner channel. With hex head screws (Item H), fasten the hinge leaves to the structure corner channel.
4. Install quarter turn fastener receptacles (Item J) into the bracket slots (Item K) and fasten with hex head screws (Detail B, Item H).

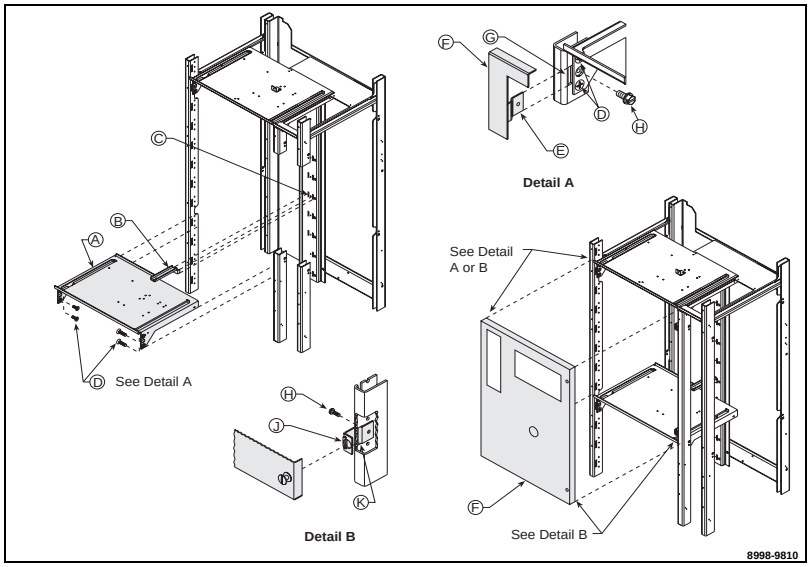


Figure 63: Shelf and Door Installation

5. If a grommeted wireway barrier is supplied, locate the vertical wire trough grommet (see Figure 64) 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” beginning on page 32.
6. Remove the manual bus shutter(s) (see Figure 65) to make room for the new control unit; slide out the top bus shutter.
7. Make certain that the twin handles of the cam mechanism unit are extended fully forward (see Figure 66). 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.
8. Press the handles inward until they are flush with the face of the MCC (see Figure 67).

   NOTE: COMPAC™ 6 units do not have the twin handle cam mechanism.

Figure 64: Cutting the Vertical Wire Trough Grommet (when supplied)

Figure 65: Removing the Manual Bus Shutter

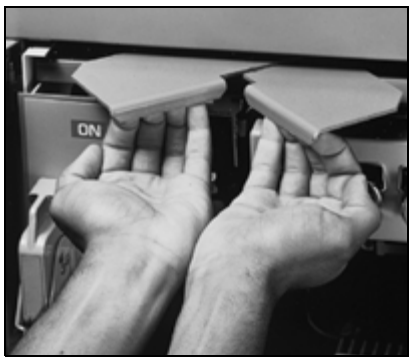


Figure 66: Pulling the Twin Handles of the Cam Mechanism Forward

Figure 67: Handles Flush with the Front of the MCC

9. 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 68).
10. 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 69).

    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 70).
11. 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 70).
12. Close the unit door and secure the quarter-turn fasteners.

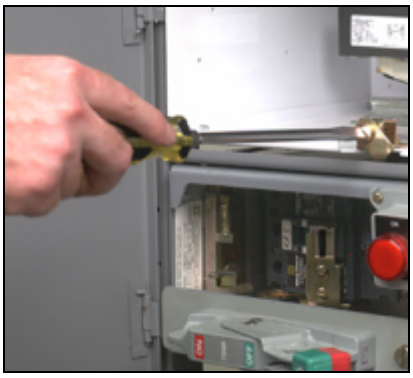


Figure 68: Tightening the Control Unit Lock-in Device (when supplied)

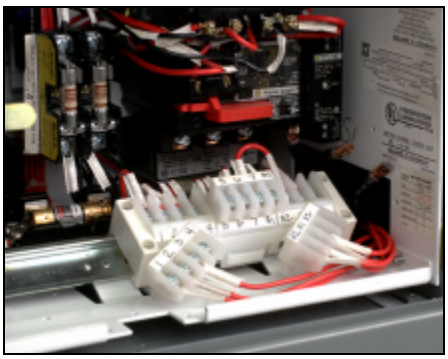


Figure 69: Power Leads Connected to Power Terminals

Figure 70: Connecting Control Leads to the Terminal Blocks

COMPAC™ 6

This section describes how to add a COMPAC™ 6, six-inch (152 mm) unit to an MCC section. Before installing these units, read and understand the safety precautions at the beginning of this section. For complete details about MCC installation, refer to “Section 4—Installation” beginning on page 21.

Control and Load Wiring

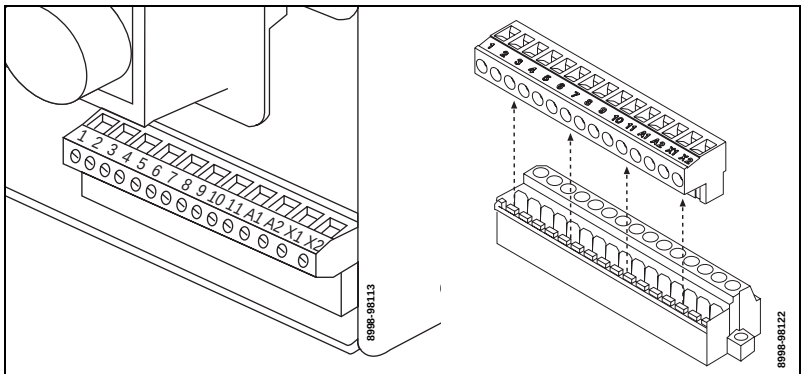
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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 these instructions will result in death or serious injury.

Pull-apart control terminals 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.



10 A Control Wire Terminal Block

To separate or remove the top portion of the terminal block from its base, grasp the top half and pull apart as shown.

Each terminal is rated for one 16-12 AWG wire or two 16 AWG wires.

Torque terminal screws to 5 lb-in. (1 n•m)

Figure 71: 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.

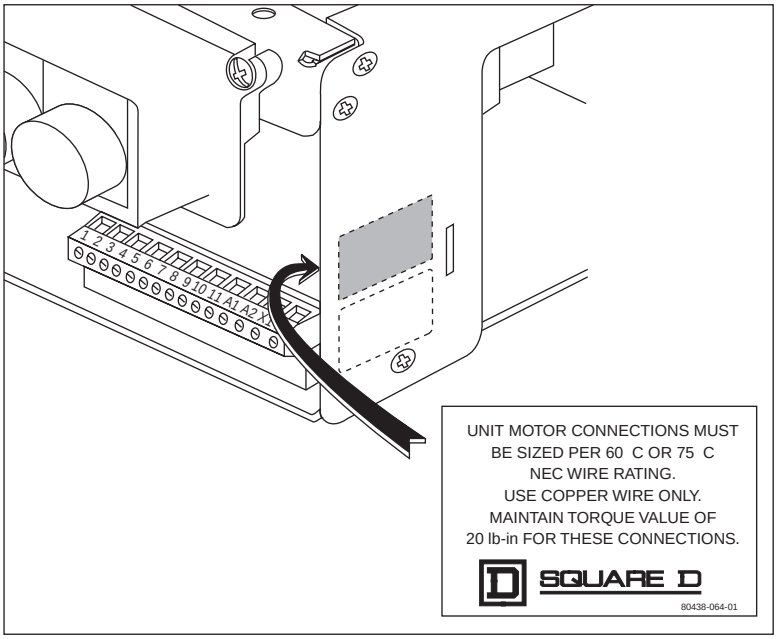


Figure 72: Unit Torque Label

Fuse Clip Location

Fuse clips in six-inch units accommodate 600 V, Class J fuses only. The switch mounted fuse base (see Figure 73) is configured either for 30 A or 60 A fuses. The bottom plate mounted fuse base (see Figure 74) accepts 100 A fuses.

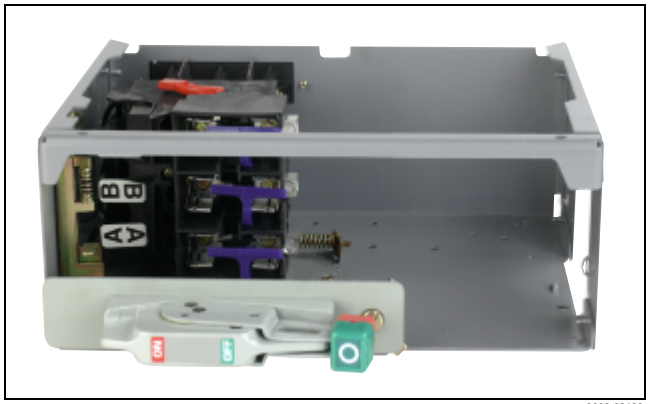


Figure 73: Switch Mounted Fuse Base

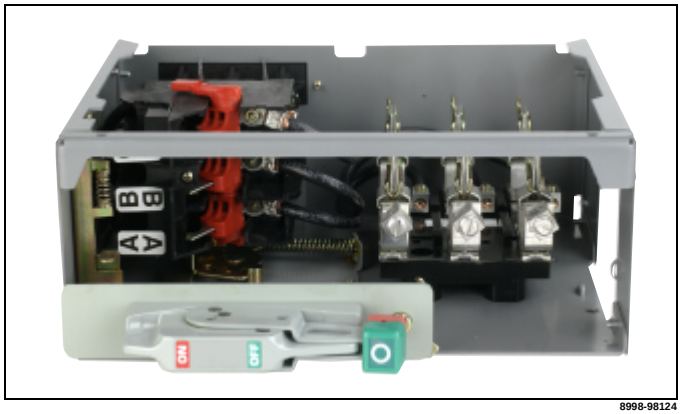


Figure 74: Bottom Plate Mounted Fuse Base

Control Unit Installation

If units have been removed from the structure, reinstall them when maintenance work on them is complete. (See “COMPAC™ 6 Control Unit Maintenance” beginning on page 60) For unit replacement, follow these instructions.

1. Ensure that the operator handle of the unit is in the *off* position.
2. Place the unit into the structure in the proper location.
3. Slide the 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 75).

   NOTE: The interlock is spring loaded and engages automatically when the unit is inserted with a firm push to the operator handle. Pressing the structure interlock release is not necessary.
4. Retrieve the pull-apart terminal block from the vertical wire trough in through the wiring port.

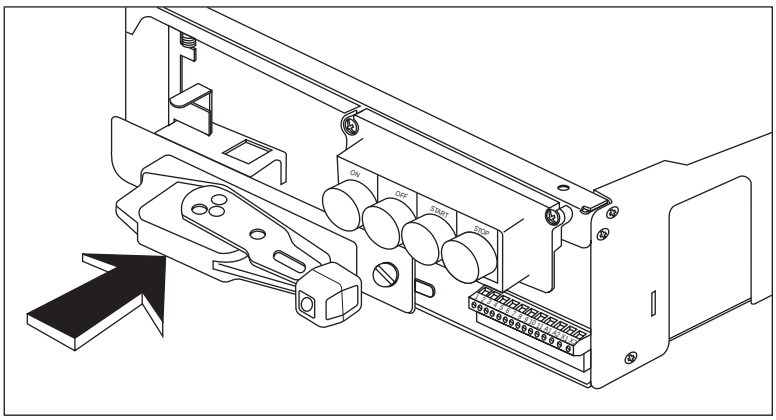


Figure 75: Reinstalling the Unit

5. Connect the pull-apart terminal block to the unit. If necessary, remove the control panel. Replace the control panel when the connection is made.

6. Follow the termination tags (placed in step 3 of "COMPAC 6 Unit Removal" beginning on page 60) to connect the power wiring to the starter terminals.
7. Shut the door and tighten the quarter-turn fasteners (see Figure 63 on page 70).

Replacement Parts

If the stab assembly, circuit breaker, or fusible switch needs to be replaced, contact your local Square D field office to obtain replacement parts.

Melting Alloy Overload Selection Table for NEMA COMPAC™ 6, Six-inch Starter Units

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Do not exceed maximum fuse rating shown opposite the thermal unit selection. Time delay fuses may be necessary to permit motor starting. Units have provisions for class J fuses only.

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

For continuous-rated motors having service factors of 1.15 to 1.25, select thermal units from this table. Use 100% of full-load current shown on the motor nameplate. For continuous-rated motors having a service factor of 1.0, use 90% full-load current shown on the motor nameplate.

The trip current rating in 40° C (140° F) ambient temperature is 1.25 times the minimum full-load current shown for the thermal unit selected from the table below. Instructions given here apply only if the motor and its controller are located in approximately the same ambient temperature. For other conditions, consult Square D.

NOTE: Application Rated starter units contain Telemecanique D-LINE® contactors and overload relays.

Table 14: Melting Alloy Overload Selection Table

Motor Full-Load Current (AMP)	Thermal Unit Number	Maximum Fuse Rating (AMP)	Motor Full-Load Current (AMP)	Thermal Unit Number	Maximum Fuse Rating (AMP)	Motor Full-Load Current (AMP)	Thermal Unit Number	Maximum Fuse Rating (AMP)	
0.65–0.73	B 1.03	1.50	2.80–3.13	B 4.15	5.60	8.54–9.34	B 15.5	17.5	
0.74–0.82	B 1.16	1.50	3.14–3.36	B 4.85	6.00	9.35–10.1	B 17.5	17.5	
0.93–0.91	B 1.30	1.60	3.37–3.69	B 5.50	7.00	10.2–10.8	B 19.5	20.0	
0.92–1.04	B 1.45	2.00	3.70–3.92	B 6.25	7.00	10.9–12.0	B 22.0	25.0	
1.05–1.16	B 1.67	2.00	3.93–4.42	B 6.90	8.00	12.1–13.0	B 25.0	25.0	
1.17–1.26	B 1.88	2.25	4.43–4.99	B 7.70	9.00	13.1–15.5	B 28.0	30.0	
1.27–1.47	B 2.10	2.60	5.00–5.27	B 8.20	10.0			600 V	250 V
1.48–1.65	B 2.40	3.00	5.28–5.84	B 9.10	12.0			Max	Max
1.66–1.89	B 2.65	3.50	5.85–6.61	B 10.2	12.0	15.6–17.9	B 32.0	30	30
1.90–2.17	B 3.00	4.00	6.62–7.42	B 11.5	15.0	18.0–21.4	B 36.0	30	40
2.18–2.49	B 3.30	4.50	7.43–8.02	B 12.8	15.0	21.5–25.1	B 40.0	30	40
2.50–2.79	B 3.70	5.00	8.03–8.53	B 14.0	15.0	25.2–27.0	B 45.0	30	40

Ambient Compensated Bimetallic Overload Relay Selection Table for Application Rated COMPAC™ 6, Six-inch Starter Units

For continuous-rated motors having service factors of 1.15 to 1.25, select an overload relay from this table. Use 100% of full-load current shown on the motor nameplate.

Table 15: D-LINE™ Bimetallic Overload Relay Selection Table

Motor Full-Load Current (AMP)	Overload Relay Number	Maximum Fuse Rating (AMP)	Motor Full-Load Current (AMP)	Overload Relay Number	Maximum Fuse Rating (AMP)
0.63–1.00	LR2D1305	1.80	9.01–12.0	LR2D1316	25.0
1.01–1.60	LR2D1306	2.80	12.1–17.5	LR2D1321	30.0
1.61–2.50	LR2D1307	4.50	17.6–23.0	LR2D1322	40.0
2.51–4.00	LR2D1308	7.00	23.1–30.0	LR2D2353	50.0
4.01–5.50	LR2D1310	10.0	30.1–37.0	LR2D3355	60.0
5.51–7.00	LR2D1312	12.0	37.1–42	LR2D3357	60.0
7.01–9.00	LR2D1314	17.5			

SECTION 9—TROUBLESHOOTING

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.

General MCC Troubleshooting

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 local Square D/Schneider Canada field office.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified electrical personnel.
- Qualified electrical personnel must perform work in accordance with all applicable national and local electric codes.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- 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.
- Beware of potential hazards, wear personal protective equipment, and take adequate safety precautions.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, locked out, and/or tagged out. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Replace all devices, doors, and covers before turning on power to this equipment.

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

Table 16: Motor Control Center Troubleshooting Chart

Part	Problem	Cause	Remedy
CONTACTS	Contact Chatter (see Noisy Magnet also)	1. Poor contact in the control circuit.	1. Replace the contact device or use a holding circuit interlock (3-wire control).
		2. Low voltage.	2. Check the coil terminal voltage and voltage dips during starting.
	Welding or Freezing	1. Abnormal inrush of current.	1. Check for grounds, shorts, or excessive motor load current, or use larger contactor.
		2. Rapid jogging.	2. Install a larger device rated for jogging service.
		3. Insufficient tip pressure.	3. Replace contacts and springs. check contact carrier for deformation or damage.
		4. Low voltage which prevents the magnet from sealing.	4. Check the coil terminal voltage and voltage dips during starting.
		5. Foreign matter prevents the contacts from closing.	5. Clean the contacts with an environmentally safe (CFC-free) contact cleaner.
		6. Short circuit or ground fault.	6. Remove the fault. Ensure that the fuse and circuit breaker sizes are correct.
	Short Trip Life or Overheating or Trips	1. Filing or dressing.	1. Do not file the silver tips; rough spots or discoloration do not harm tips or impair their efficiency.
		2. Interrupting excessively high currents.	2. Install a larger device or check for grounds, shorts, or excessive motor currents.
		3. Excessive jogging.	3. Install a larger device rated for jogging service.
		4. Weak tip pressure.	4. Replace contacts and springs; check the contact carrier for deformation or damage.
		5. Dirt or foreign matter on the contact surface.	5. Clean contacts with an environmentally safe (CFC-free) contact cleaner. Reduce the entry of foreign matter into the enclosure.
		6. Short circuit or ground fault.	6. Remove the fault; ensure that the fuse and circuit breaker sizes are correct.
		7. Loose connection in the power circuit.	7. Clear and tighten the connection.
		8. Sustained overload.	8. 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	1. Overvoltage or high ambient temperature.	1. Check the coil terminal voltage. It should not exceed 110% of the coil rating.
		2. Incorrect coil.	2. Install the correct coil.
		3. Shorted turns caused by mechanical damage or corrosion.	3. Replace the coil.
		4. Undervoltage; failure of the magnet to seal in.	4. Check the coil terminal voltage. It should be at least 85% of the coil rating.
		5. Dirt or rust on the pole faces.	5. Clean the pole faces.
		6. Mechanical obstruction.	6. With power *off*, check for free movement of the contact and armature assembly.
THERMAL OVERLOAD RELAYS	Tripping	1. Sustained overload.	1. Check for excessive motor currents or current unbalance; correct cause.
		2. Loose or corroded connection in the power circuit.	2. Clean and tighten the connection.
		3. Incorrect thermal units.	3. Replace the thermal units with the correct size for the application.
		4. Excessive coil voltage.	4. Voltage should not exceed 110% of the coil rating.
	Failure to Trip	1. Incorrect thermal units.	1. Check the thermal unit selection table. Install the proper thermal units.
		2. Mechanical binding, dirt, corrosion, etc.	2. Replace the relay and thermal units.
		3. Relay previously damaged by a short circuit.	3. Replace the relay and thermal units.
		4. Relay contact welded or not in series with the contactor coil.	4. Check circuit for a fault and correct the condition. Replace the contact or the entire relay as necessary.

Table 16: Motor Control Center Troubleshooting Chart (Continued)

Part	Problem	Cause	Remedy
MOTOR LOGIC OVERLOAD RELAYS	Overload relay trips on startup (after more than 3 seconds).	1. Load is too heavy for motor horsepower.	1. Remove excessive motor load or resize motor.
		2. Wrong overload trip class selected for application.	2. Use Trip Class 20 overload relay instead of Trip Class 10.
		3. Incorrect overload FLA setting.	3. Set FLA adjustment according to motor full-load current.
		4. Use of electronic DC injection brake.	4. Do not use electronic DC injection brakes with solid-state overload relay.
	Overload relay trips on startup (in less than 3 seconds).	1. Motor branch circuit fuse blown.	1. Replace blown motor branch circuit fuse(s).
		2. Loose motor branch circuit.	2. Tighten motor branch circuit connection.
		3. Motor circuit is not 3-phase.	3. Select different type of overload relay for non 3-phase applications.
		4. Voltage unbalance on feeder.	4. Correct voltage unbalance in feeder.
		5. Motor winding damage in one or more windings.	5. Check motor winding impedance. Rewind if necessary.
		6. Phase loss in primary of wye-delta or delta-wye transformer.	6. Replace blown fuses or tighten connections.
		7. One or more load lead(s) is not routed through relay window or is routed in opposite direction.	7. Pass each load lead through its respective window in the same direction.
		8. Number of load lead passes are different.	8. Each load lead must be looped the same number of passes.
	Overload relay trips while running normally.	1. Load is too heavy for motor horsepower.	1. Remove excessive motor load or resize motor.
		2. Incorrect overload FLA setting.	2. Set FLA adjustment according to motor full-load current.
		3. Use of electronic DC injection brake.	3. Do not use electronic DC injection brakes with solid-state overload relay.
		4. Incorrect overload FLA setting. (Multiple pass applications.)	4. Recalculate FLA adjustment and set according to motor full-load current and number of looped passes.
MAGNETIC AND MECHANICAL PARTS	Noisy Magnet	1. Broken shading coil.	1. Replace the magnet and armature.
		2. Dirt or rust on magnet faces.	2. Clean the magnet with a clean, dry cloth.
		3. Low voltage.	3. Check the coil terminal voltage and voltage dips during starting.
	Failure to Pick Up and Seal	1. No control voltage.	1. Check the control circuit wiring for a loose connection or poor contact continuity.
		2. Low voltage.	2. Check for the proper coil terminal voltage and voltage dips during starting.
		3. Mechanical obstruction.	3. With the power off, check for free movement of the contact and armature assembly.
		4. Open or overheated coil.	4. Replace the coil.
		5. Wrong coil.	5. Replace the coil.
	Failure to Drop Out	1. Gummy substance on the pole faces.	1. Clean the pole faces with a clean, dry cloth.
		2. Voltage not removed.	2. Check the coil terminal voltage and the control circuit.
		3. Worn or corroded parts causing binding.	3. Replace the parts.
		4. Residual magnetism due to the lack of an air gap in the magnet path.	4. Replace the magnet and armature.
		5. Welded contacts.	5. See **CONTACTS**—Welding or Freezing on page 78.
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	1. Maladjustment of the actuating screw.	1. Adjust according to the instructions in the service bulletin.
		2. Worn or broken parts in the snap switch.	2. Replace the snap switch.
LIMIT SWITCHES	Broken Parts	Overtravel of the actuation.	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.

OMNI-Center/Communications Troubleshooting

Use the following checklist, table, wiring diagram, and ALTISTART 46 information to troubleshoot communications problems in your OMNI-Center.

Communications Checklist

- ❑ Verify that all cabling connections are secure.
- ❑ Consult Figure 76 on page 81 and MODBUS Device Connections on page 80 to verify that the cabling is accurate.
- ❑ If there are MODBUS communications faults, verify that terminating resistors have been correctly installed.
- ❑ If a specific OMNI-Center component is not functioning properly, consult the troubleshooting section of the reference material for that component (see “Square D Literature List” on page 11).

ALTISTART® 46

If there is a communication failure, use the keypad to read fault information. Follow the steps below to install and use the keypad.

1. Remove serial link module # VW3G46301 by removing the screw on the front of the module.
2. Place the module at the bottom of the unit.
3. Install serial link module # VW3A16104 (provided in shipment) in the location of the previous serial link module. Screw the module into place.
4. Refer to the ALTISTART 46 instruction bulletin # 80438-069-01_ (see “Square D Literature List” on page 11).

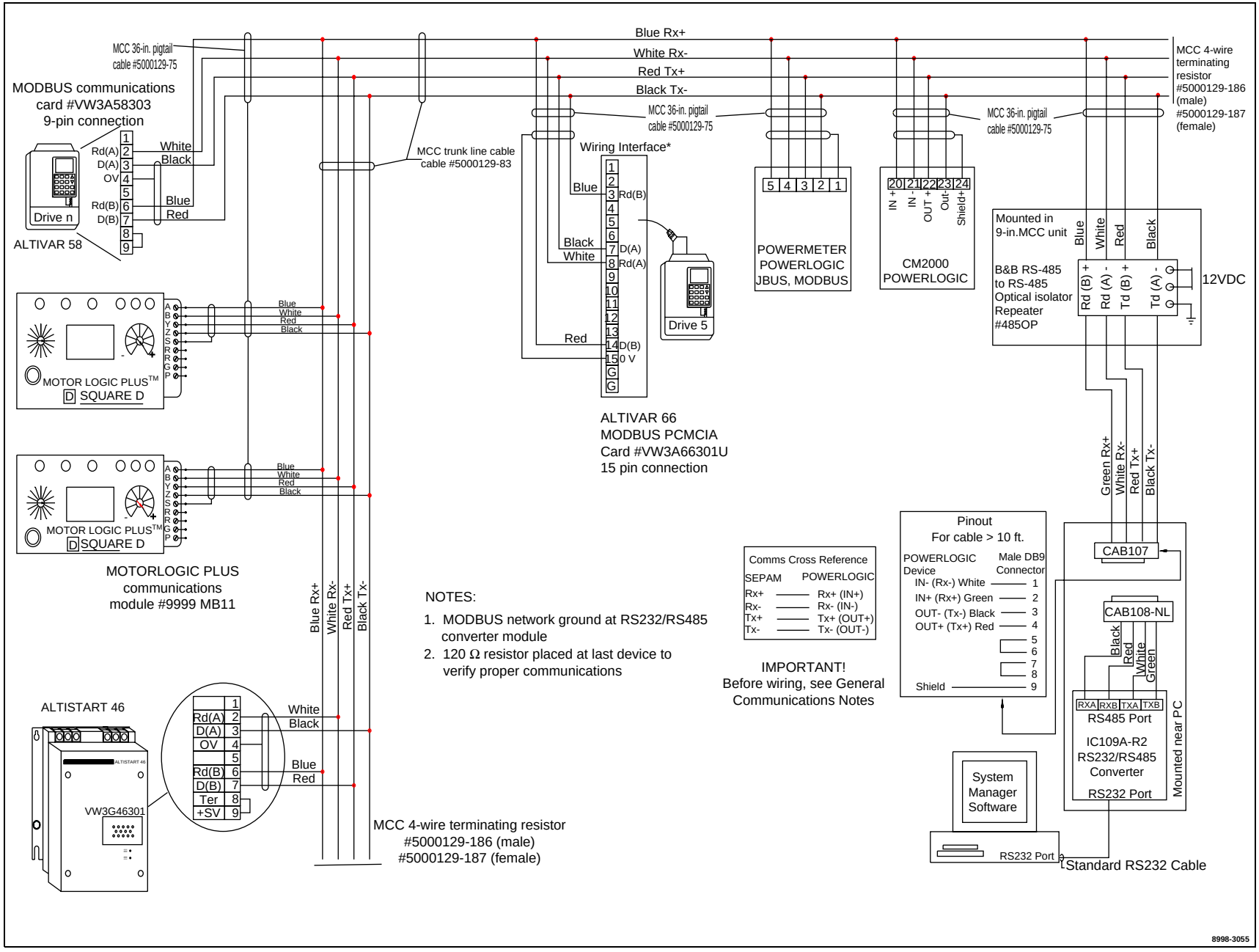
Table 17: MODBUS Device Connections

Parameter/ Device Type	Typical Bridge/Master	Momentum Master 170ADM54080	MOTOR LOGIC PLUS SSOLR	ALTIVAR 58 with MODBUS Card	ALTIVAR 66 with MODBUS	ALTISTART 46	POWER METER (PM600 Series)	Circuit Monitor
Default protocol		MODBUS	JBUS	MODBUS	MODBUS	MODBU	MODBUS	SYMAX
Device address			Faceplate Settable (1–99)	Set by dip switch (1–31)	Set on keypad or software (1–64)	Set by software	Set on faceplate (1–198)	Set on faceplate (1–198)
Configuration software		Concept, Taylor, Modsoft	Solutions Software	VW3A58104	VW3A66331	VW3G46105	SMS-3000	SMS-3000
Communication connections		Terminal strip	Terminal strip	9-pin sub-D	15-pin sub-D	9-pin sub-D	Terminal strip	Terminal strip (spade)
2-wire: RS-485 [1]								
Jumpers		Required	Required		Not required	Not required	Required	
Green/blue	D(B)+	1: RX HI	A: RD+	7: D(B)	14: D(B)	7: D(B)	5: IN+	N/A
White	D(A)-	2: RX Lo	B: RD-	3: D(A)	7: D(A)	3: (D)A	4: IN-	
Bare	to ground	5: PE	S: Shld	4: 0V	15: 0V	4: 0V	1: Shld	
4-wire: RS-422/485 [2]								
Green/blue	TX(B)+	3: TX HI	A: RD+	6: RD(B)	3: RD(B)	6: RD(B)	5: IN+	IN+: 20
White	TX(A)-	4: TX Lo	B: RD-	2: RD(A)	8: RD(A)	2: RD(A)	4: IN-	IN-: 21
Red	RX(B)+	1: RX HI	Y: TD+	7: D(B)	14: D(B)	7: D(B)	3: OUT+	OUT+: 22
Black	RX(A)-	2: RX Lo	Z: TD-	3: D(A)	7: D(A)	3: D(A)	2: OUT-	OUT-: 23
Bare	to ground	5: PE	S: Shld	4: OV	15: 0V	4: 0V	1: Shld	SHLD: 24

[1] Non-standard OMNI-Center with MODBUS MCC configuration

[2] Standard OMNI-Center with MODBUS MCC configuration

Figure 76: Typical Schematic for a Model 6 OMNI-Center with MODBUS Data Acquisition (not drawn to scale)



SECTION 10—INSULATION RESISTANCE LOG AND THERMAL OVERLOAD UNIT SELECTION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only 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.
- Follow the instructions in “Insulation Test” on page 64.

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

	Phase-To-Phase			Phase-To-Ground		
All Disconnects Open						
Date	**A-B**	**B-C**	**C-A**	**A-ground**	**B-ground**	**C-ground**
All Disconnects Closed						
Date	**A-B**	**B-C**	**C-A**	**A-ground**	**B-ground**	**C-ground**

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 (Continued)

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

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 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 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

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

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

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		

Size 5

Motor Full-Load Current (A)	Thermal Unit Number	Motor Full-Load Current (A)	Thermal Unit Number
176–190	DD 112	175	176–190
191–203	DD 121	200	191–203
203–223	DD 128	225	203–223
224–239	DD 140	250	224–239
240–253	DD 150	250	240–253
254–299	DD 160	250	264–299
300–341	DD 185	300	300–341
342–361	DD 220	350	342–361
362–395	DD 240	400	362–395
396–409	DD 250	400	396–409
410–427	DD 265	400	410–427
428–475	DD 289	400	428–475
476–487	DD 300	400	476–487
488–532	DD 320	400	488–532

Size 5 with CT Type Overloads

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	230–257	B 3.00

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	397–442	AR 4.37
218–236	AR 2.46	443–492	AR 4.80
237–253	AR 2.71	493–520	AR 5.3
254–279	AR 2.98		

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 11—CIRCUIT BREAKER AND FUSIBLE SWITCH SELECTION

Square D recommends replacing the entire disconnect assembly instead of replacing a circuit breaker or switch. The disconnect assembly includes the operating mechanism and the appropriate circuit breaker or switch. Replacing the entire assembly requires only the removal of four screws, a procedure that is much simpler and quicker than replacing an individual circuit breaker or switch. 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.

NEMA/EEMAC SIZE 1–4 combination starters with MAG-GARD® magnetic only circuit breakers,
NEMA/EEMAC Size 5 combination starters with KA frame (250 A maximum) MAG-GARD magnetic only circuit breakers

To replace this circuit breaker:	Order this disconnect assembly:	To replace this circuit breaker:	Order this disconnect assembly:
FAP3600311M	M6DSAMG003M11	FAP3610018M	M6DSAMG100M18
FAP3600712M	M6DSAMG007M12	KAP3625025M	M6DSAMG250M25
FAP3601513M	M6DSAMG015M13	KAP3625029M	M6DSAMG250M29
FAP3603015M	M6DSAMG030M15	KAP3625031M	M6DSAMG250M31
FAP3605016M	M6DSAMG050M16		

NOTE: See page 92 for modifications.

NEMA/EEMAC SIZE 1–4 combination starters with thermal-magnetic circuit breakers,
NEMA/EEMAC Size 5 combination starters with KA frame (250 A maximum) thermal-magnetic circuit breakers,
main and branch feeder circuit breakers through 250 A. For dual-mounted circuit breaker units, contact Square D or Schneider Canada representatives.

To replace this circuit breaker:	Order this disconnect assembly:	To replace this circuit breaker:	Order this disconnect assembly:
FAP36015	M6DSATM015M	FAP36100	M6DSATM100M
FAP36020	M6DSATM020M	KAP36110	M6DSATM110M
FAP36030	M6DSATM030M	KAP36125	M6DSATM125M
FAP36040	M6DSATM040M	KAP36150	M6DSATM150M
FAP36050	M6DSATM050M	KAP36175	M6DSATM175M
FAP36060	M6DSATM060M	KAP36200	M6DSATM200M
FAP36070	M6DSATM070M	KAP36225	M6DSATM225M
FAP36080	M6DSATM080M	KAP36250	M6DSATM250M
FAP36090	M6DSATM090M		

NOTE: See page 92 for modifications.

NEMA/EEMAC SIZE 1–4 combination starters with fusible switches

To replace this size switch:	Order this disconnect assembly:	To replace this size switch:	Order this disconnect assembly:
30 A	M6DSAFS030M ①	100 A	M6DSAFS100M ②
60 A	M6DSAFS060M ①	200 A	M6DSAFS200M ②

Main and branch feeder fusible switches through 200 A

To replace this size switch:	Order this disconnect assembly:	To replace this size switch:	Order this disconnect assembly:
30 A	M6DSAFS030M ①	100 A	M6DSAFS100M ②
30 A	M6DSAFS030M ①	200 A	M6DSAAS250M ②
60 A	M6DSAFS060M ①		
60 A	M6DSAFS060M ①		

① Voltage form must be added:

U212: 0–250 V
U213: 600 V

② Does not include fuse clips.

NOTE: See page 92 for modifications.

Replacement of the operating mechanism is not required for NEMA/EEMAC Size 5 combination starters with LA frame (400 A max.) circuit breakers, NEMA/EEMAC Size 5 combination fusible starters, NEMA/EEMAC Size 6 combination starters, main and branch circuit breakers over 250 A, or for main and branch switches over 200 A. Order a replacement circuit breaker or automatic molded case switch of the same type as the original device.

To order an FH/KH type high interrupting circuit breaker instead of the standard FA/KA type circuit breaker, add form Y532 to the disconnect assembly number.

Example: To replace an FHP36100, order an M6DSATM100M Y532.

These modifications may also be added to disconnect assemblies when required:

Y74 Single pole interlock on operating mechanism

Y301 Current limiting module (for starter units Size 1–3)

Y303 Current limiting module (for 15–100 A branch feeders)

Y312 Class R fuse clips

Y316 Class J fuse clips

Y532 High interrupting circuit breaker

U203 Disconnect for NEMA/EEMAC Type 12 units

U341 Extra high interrupting circuit breaker

APPENDIX A—TYPICAL SPECIFICATIONS

This section includes requirements for a Model 6 OMNI-Center Basic MCC with the MODBUS Data Acquisition option.

General

A. The MCC shall be provided with a Class 2 factory wired and factory tested PLC system.

B. Automation equipment mounted in the MCC shall be MODICON® Automation Series with design support for QUANTUM™, COMPACT®, Premium, and Momentum product lines or an approved equal.

C. Unless otherwise indicated, I/O will be 120 VAC. Control power shall be provided by individual unit control power transformers in each unit.

D. The MCC shall be Square D Model 6 OMNI-Center or its equivalent.

Communication Cabling System

A. The MCC shall employ a pre-engineered communication cabling system to interconnect units within the MCC.

B. The cabling system will be UL 498 Listed for 600V.

C. The system will be constructed of molded PVC material using five 22 AWG conductors:

4-wire RS-485:

- Green/blue—RD+
- White—RD-
- Red—TD+
- Black—TD-
- Bare—Shield

D. The assemblies will utilize 5-pole Micro-style connectors with a single keyway and comply with SAE-H1738-2 specifications.

E. Connectors are to be epoxy-coated for 500-hour salt-spray test per MIL-Std. 202F.

F. The coupler design shall include a vibration-resistant ratchet to prevent loosening.

G. An extended ground pin shall ensure first make/last break ground connection.

H. The cabling system shall consist of individual trunk line segments in each MCC section. A trunk/tap topology will be used. The trunk line segments are routed from the lower wire-way into each vertical section. Unused tee connectors are capped at the factory.

I. A 36-inch (3-foot) “pigtail” cable connects the tap in the trunk cable to the communication device in each MCC unit. One end of the pigtail cable terminates in a Micro-style connector and is attached to the trunk. The other end terminates at the communication device in the MCC unit.

J. Addition, removal, or rearrangement of units shall not interrupt the trunk line and shall not affect the cabling of other units attached to the trunk line.

Starters

A. Starter units shall employ [fusible switches/thermal magnetic circuit breakers] for short circuit protection. [Circuit breaker units 100 amps and lower shall have non-adjustable magnetic trip points to eliminate the need to adjust trip settings in the field.]

B. Starters shall have the following I/O points available:

1. [PLC Digital Output for start/stop control (Start=1)]
2. [PLC Digital Input indicating run status (Run=1)]
3. [PLC Digital Input indicating Overload trip status (Trip=1)]
4. [PLC Digital Input indicating Hand-Off Auto position (Auto=1)]
5. [PLC Digital Input 120VAC Control Power Available (Power On=1)]

C. Reversing Starters shall include the following I/O points:

1. [PLC DIgital Output to control additional reversing contactor (Start=1)]
2. [PLC Digital Input indicating reversing run status (Run=1)]

D. The I/O system shall feature pull-apart connectors, allowing the removal of the I/O terminal blocks without disturbing the wiring in each starter unit.

E. Transient suppressors shall be supplied for all coils in each individual starter unit.

F. NEMA size 3 or larger starters require an interposing relay to electrically isolate the starter coil from the output. *[Optional]* Momentum I/O outputs shall require an interposing relay on all starter units.

G. *[Optional]* A removable jumper shall be provided to allow an external emergency stop circuit to be field wired in series with the motor control circuit.

Overloads

A. All motor starters shall include fully programmable electronic overload relays. Overloads shall provide a 4.5:1 adjustment range matched to NEMA contactor sizes 00-6. Overload relays shall monitor all 3 individual phases for current and voltage.

B. Programming via network communications shall be supported. Overload relays shall provide 19.2K baud MODBUS RS485 communications capability.

C. Overloads shall include an alphanumeric LED display for local programming and diagnostic information. Local programming must be possible by applying 9 VDC to facilitate bench programming or programming without control power available.

D. Automatic, network, electronic, and manual reset functions shall be supported.

E. The following protective functions shall be provided based on user configurable parameters:

- Over load/under load/jam
- High/low voltage
- Phase unbalance and reversal (voltage and current)
- Ground fault
- Rapid cycling

F. The overload shall provide the following user configurable parameters:

- Trip class (5, 10, 15, 20, 30)
- Command (Trip, Reset/Run, Display Lock, Network Config Enable)
- Rapid Cycle Timer (RDI)
- Overload and Phase Unbalance Restart Delay (RD2)
- Underload Restart Delay (RD3–Dry Well Recovery Timer)
- Number of restarts after faults (Automatic Reset Mode)
- Number of restarts after Underload fault (Automatic Reset Mode)
- Underload Trip Delay

G. The overload shall provide the following diagnostic and operational information:

- Error and Trip Indicators
- Ground Fault, L1, L2, L3, and 3-Phase Average Currents
- L1-L2, L2-L3, L1-L3, and 3-Phase Average Voltages
- Voltage and Current Unbalance
- Power Factor Angle
- Thermal Capacity Remaining
- Fault History (last 4 faults)
- Product Identifier/Scale Factor
- RD1, RD2, and RD3 Timer Value

Mains and Branches

[Optional] Specified main and branch feeder units shall be equipped with a digital-metering device capable of communication on MODBUS. Meters shall be Square D Power Meter Model 620 or equivalent.

Drives

Drives shall be capable of being configured for control and data acquisition over MODBUS. Optional drive control and speed control via PLC hardwired I/O shall include:

1. [MODBUS speed reference signal]
2. [MODBUS speed feedback signal]
3. [PLC digital output drive start control]
4. [PLC digital outputs for drive preset speed control]
5. [PLC digital input drive run (Run=1)]
6. [PLC digital input drive fault (Fault=1)]

PLC Mounting Configurations

PLC components shall be mounted as [a unit mount configuration which may be mounted in any unit configuration within the MCC/a full section configuration to provide increased space for mounting additional components. Two full sections may be joined together to provide maximum mounting space.]

(Select the appropriate mounting option):

Unit Mounting Features

A. Automation equipment not to exceed 4.25 inches in depth to allow for unit mount configuration of automation equipment with a fold-down rack.
B. Factory interwired to pull-apart terminal blocks in starter units
C. Standard saddle design featuring fold-down rack to mount automation components and terminal blocks.
D. Space available for interposing terminal blocks (as required)
E. PLC I/O wiring shall not cross shipping splits.
F. Standard saddle design to accommodate a 10-slot backplane in 18-, 24-, 30-, and 36-inch designs. These saddles shall mount in the bottom of a section and no vertical wireway shall be available next to these units.

G. Optional Viewing window may be supplied for inspection of equipment.

Full Section Mounting Features

A. Automation equipment shall be mounted in standard design 20-, 25-, 30- or 35-inch wide automation sections.
B. Full sections shall be part of the MCC line-up, including horizontal bus located at the top of section (optional to omit bus).
C. Space available for interposing terminal blocks (as required).
D. Interwiring between section and pull-apart terminal blocks in starter units completed at the factory.
E. Interwiring shall be factory labeled and coiled back for ease of field installation.
F. Convenience lighting and outlets available.
G. Optional Viewing window may be supplied for inspection of equipment.

Automation Power Supplies

A. 24 Vdc automation power supply shall be provided in a 6-inch unit with GJL circuit breaker, 150 VA, 480/120 V, control power transformer, 24 Vdc switching power supply, and appropriate fusing.
B. 120 Vac automation power supply shall be provided in a 6-inch unit with GJL circuit breaker, 500 VA, 480/120 V control power transformer, and appropriate fusing.
C. Automation power supplies are mounted in full section when full section automation mounting is selected.

Testing

All system components shall be wired and tested prior to shipment. Testing shall be designed to verify system operation, including as a minimum verification of the following:

1. Drawings and bill of materials
2. I/O addressing
3. Correct device operation by I/O address
4. Control network interface
5. MODBUS Network Communications

APPENDIX B—OMNI-CENTER CABLING REPLACEMENT PARTS

OMNI-Center Standard Cabling Assemblies Parts List

Part #	Description	Use
3463512-1	Female threaded cap	Unused male taps all networks (approximately 2 per MCC)
3463512-3	Female 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-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 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 ALTISTART 46 unit taps (1 per unit)

* For 2 SERIPLEX modules, cut cable 4 inches, remove jacket, shrink tube, and splice with double ferrule # AZ5DE005.

APPENDIX C—OMNI-CENTER CABLING SYSTEM SPECIFICATIONS

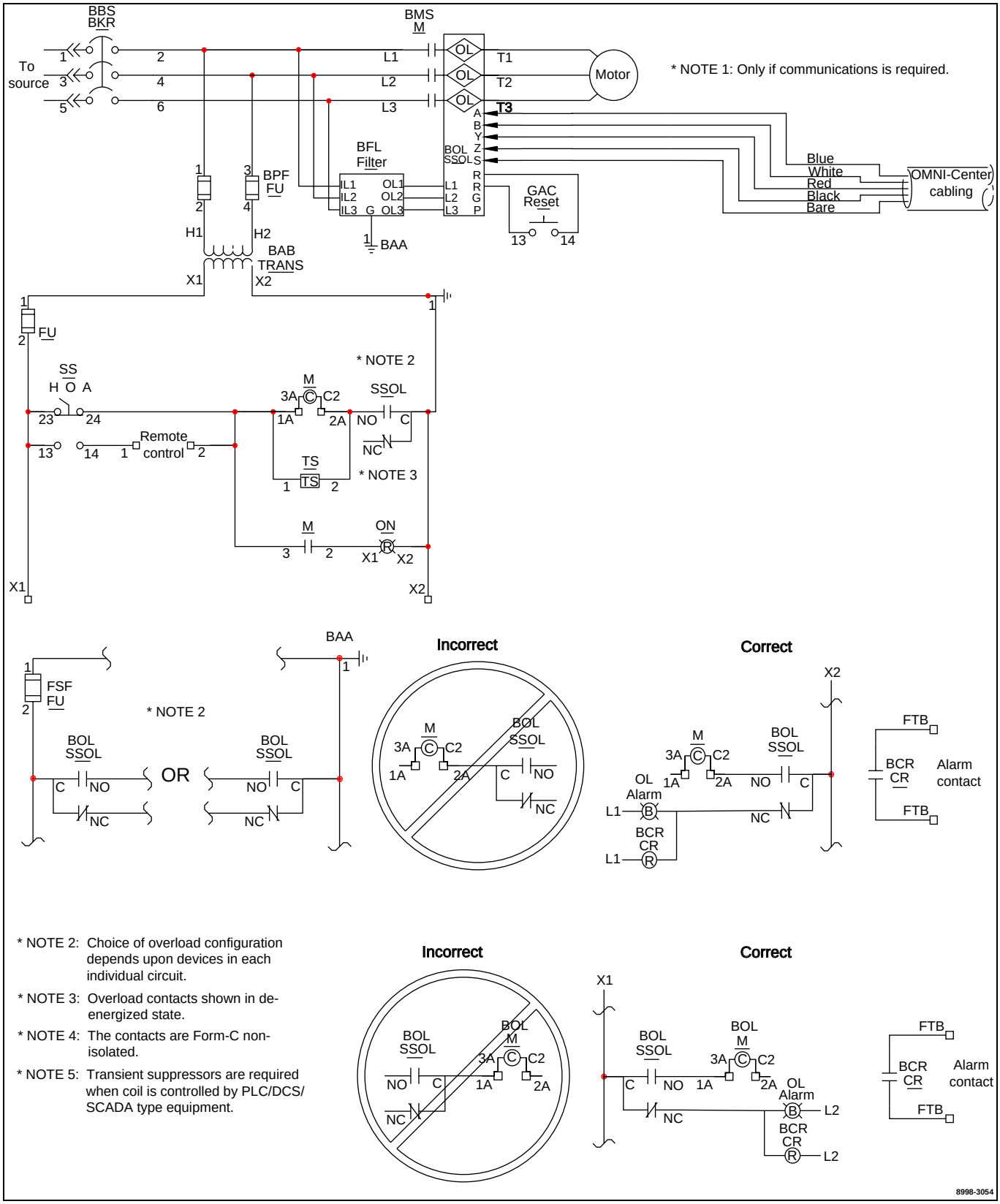
The Model 6 OMNI-Center uses a dedicated MCC network cable assembly. This cable assembly is UL498 Listed for 3 A at 600 V. The assembly is 100% dielectrically tested at a minimum of 2000 V for 1 second. The cable carries a stand-alone 600 V AWM rating (UL style 1990). The individual conductor insulation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

Table 18: Model 6 OMNI-Center 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 1581, E 151405, AWM 600 V, CM, Class 2, CUL, CM 4/C 22, AWG 18 PF/ft
Flame test	FT-1

APPENDIX D—WIRING DIAGRAM

Typical OMNI-Center FVNR with MODBUS Communications



* NOTE 2: Choice of overload configuration depends upon devices in each individual circuit.

* NOTE 3: Overload contacts shown in de-energized state.

* NOTE 4: The contacts are Form-C non-isolated.

* NOTE 5: Transient suppressors are required when coil is controlled by PLC/DCS/SCADA type equipment.

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APPENDIX E—TECHNICAL SUPPORT

The Model 6 OMNI-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	LaVergne, 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 & 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/Square D sales office.

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