# CENTERLINE 2500 Low Voltage Motor Control Centers

Bulletin Number 2500

Allen-Bradley
by ROCKWELL AUTOMATION

**Installation Instructions** Original Instructions

# Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

**IMPORTANT** Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

## Notes:

## About This Publication

This publication provides procedures to the following:

- How to receive and handle a CENTERLINE® 2500 shipment.
- How to install the received columns.
- How to install cables.
- How to access internal components.
- How to install and remove units.
- How to start up (commission) a newly installed motor control center.
- How to maintain the motor control center.

## Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

## Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

| Topic | Page |
|---|---|
| Replaced E1 Plus and E3 Plus with E100™ as an available electronic overload relay. | 10 |
| Added last sentence to Locate the Bus Splice Kits subsection. | 23 |
| Added step 4 to the Remove the Covers subsection. | 24 |
| Added the Important table to step 4 of the Position the Motor Control Center subsection. | 25 |
| Swapped dimensions between columns A and B in Figure 10. | 26 |
| Removed IP42 from the Seal IP54 Enclosures Before Connection title and added it to the Tip table. | 27 |
| Added the introductory sentence to the Join Columns section. | 34 |
| Added the Join Back-to-back Columns in a Double Front Configuration subsection. | 34 |
| Revised step 4 to include the cross-reference to more information. | 35 |
| Added Table 7 to the Splice Kit Contents subsection. | 41 |
| Added Important information about crowfoot socket wrenches recommended in Figures 20 and 21. | 44, 45 |
| Changed the Tip table to another Important table in the Lug section, and added the second sentence. | 50 |
| Reduced maximum torque from 4.5 to 4 Nm for M6 bolts in Table 9. | 52 |
| Added SecureConnect™ content to Withdrawable Units section. | 67 |
| Added Components of Withdrawable Units with SecureConnect subsection. | 68 |
| Added SecureConnect information to Operating Positions for All Withdrawable Units subsection. | 72 |
| Revised step 11 to check factory-set trip settings for application requirements. | 81 |
| Added sub-steps b and c to step 18. | 81 |
| Updated the website URL address and tool to estimate the EtherNet/IP connections for a network. | 89 |

## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

| Resource | Description |
|---|---|
| Receiving, Handling, and Storing CENTERLINE® 2500 motor control centers, publication 2500-IN002 | Provides information to receive, handle, and store CENTERLINE 2500 Motor Control Centers (MCCs). |
| CENTERLINE 2500 EtherNet/IP™ Motor Control Centers, publication 2500-TD003 | Provides information about EtherNet/IP MCCs. |
| EtherNet/IP Network Devices User Manual, ENET-UM006 | Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network. |
| Ethernet Reference Manual, ENET-RM002 | Describes basic Ethernet concepts, infrastructure components, and infrastructure features. |
| CENTERLINE 2500 DeviceNet™ Motor Control Centers, publication 2500-TD002 | Provides information about DeviceNet MCCs. |
| System Security Design Guidelines Reference Manual, SECURE-RM001 | Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment. |
| DeviceNet Media Design User Manual, publication DNET-UM072 | Provides information to design, install, and troubleshoot a DeviceNet cable system. |
| IntelliCENTER® Software User Manual, publication MCC-UM002 | Provides information to install and use IntelliCENTER software on CENTERLINE MCCs. |
| Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1 | Provides general guidelines for installing a Rockwell Automation™ industrial system. |
| Safety Guidelines for the Application, Installation and Maintenance of Solid-state Controls, publication SGI-1.1 | Provides general guidelines to install and maintain solid-state control components. |
| Product Certifications website, rok.auto/certifications | Provides declarations of conformity, certificates, and other certification details. |

You can view or download publications at rok.auto/literature.

# System Overview

CENTERLINE® 2500 motor control centers (MCCs) are designed for applications that must comply with international standards and practices for low-voltage motor control centers. The CENTERLINE 2500 MCC is ideal for tough industrial applications where uptime and ease of maintenance is required.

The CENTERLINE power bus structure distributes line power throughout the MCC via an isolated bus work structure. A standard, center-fed, 300 A vertical bus supplies power to units above and below the horizontal bus, which results in an effective 600 A capacity and unrestricted unit arrangement. An optional 600 A vertical bus provides an effective rating of 1200 A.

## ArcShield Rating

The CENTERLINE MCC is also available with an ArcShield™ rating. This rating includes arc-resistant features for enhanced protection if internal arcing faults happen.

With the standard safety features of the CENTERLINE 2500 MCC, the ArcShield option provides the following:

- Spring latches
- Reinforced structure
- Pressure relief vent system through the top of the enclosure
- Protection up 300 ms at 480V/65 kA

**Table 1 - Conformity Ratings for CENTERLINE 2500 MCC with ArcShield**

| Value | Description |
|---|---|
| Ratings:<br>Ue<br>Ip arc<br>tarc<br>Ipc arc | <br>480V<br>65 kA<br>300 ms<br>65 kA |
| Protection | Personal and assembly protection suitable for limited continued operation; assembly protection is limited to outgoing units tested for conditional current under arcing conditions. |
| Requirements | Tested with third-party validation against the IEC/TR 61641 standard that defines tests under conditions of arcing due to internal fault. Comprehensive tests conducted under Edition 3.0, 2014-1 have passed the requirements for Class A (meets Criteria1...5) for the main bus and unit line side, and Class C (meets Criteria 1...7) for all unit load side tests. |

An ArcShield label is provided on the MCC with information about the accessibility level and arc fault ratings. See Figure 8 on page 18 for an example of this rating label and its location.

See Figure 4 on page 14 for the location of ArcShield structure protection and page 54 for ArcShield door latches.

# IntelliCENTER Software

CENTERLINE 2500 MCCs with IntelliCENTER® software provide an integrated hardware, software, and communication solution. Its preconfigured software provides real-time data, trending, component history, wiring diagrams, user manuals, and spare parts. IntelliCENTER offers plug and play setup, troubleshooting, hardware configuration changes without opening enclosure doors, and convenient change tracking. It also provides intelligent diagnostic and predictive failure information.

IntelliCENTER technology improves the intelligence of your MCC by using built-in networking to capture information used for predictive maintenance, process monitoring, and advanced diagnostics.

## IntelliCENTER Features

- Built-in networking
  - EtherNet/IP™ or DeviceNet™
  - Media helps protected behind barriers
  - Access ports in wireways
  - Topology lets you add and remove devices without interrupting any other device on the network
- Intelligent motor controls
  - PowerFlex® drives
  - SMC™-3 and SMC-Flex soft starters
  - E100™ and E300™ Electronic Overload Relays
- IntelliCENTER software
  - Distributed I/O
  - POINT I/O™ system/DSA
  - Virtual MCC
  - Parameter editor
  - Status dashboards
  - Documentation management
  - Spare parts information
- Factory configuration
  - IP address network media validation
  - IP address node configuration
  - Communication check
  - Network commissioning

## IntelliCENTER Software

IntelliCENTER MCCs can be provided with preconfigured IntelliCENTER software. This software views, manages, and configures multiple MCC lineups. The IntelliCENTER software communication driver lets the software be installed and operated on EtherNet/IP or DeviceNet. The IntelliCENTER software can function as a standalone software package or as an ActiveX control in a Human Machine Interface (HMI).

## Structure

CENTERLINE 2500 MCCs offer units with a full complement of AC drives, soft starters, and other devices. Pluggable power connections on the back of the unit plug into the vertical bus. A mechanical interlock helps prevent the unit door from being opened while the main switch is in the ON/I position. An additional mechanical interlock helps prevent the unit from being withdrawn or inserted when the unit main switch is closed. Separate vertical wireways isolate control and network cables from power wiring. Units are available as fixed or withdrawable.

**Figure 1 - CENTERLINE 2500 MCC**

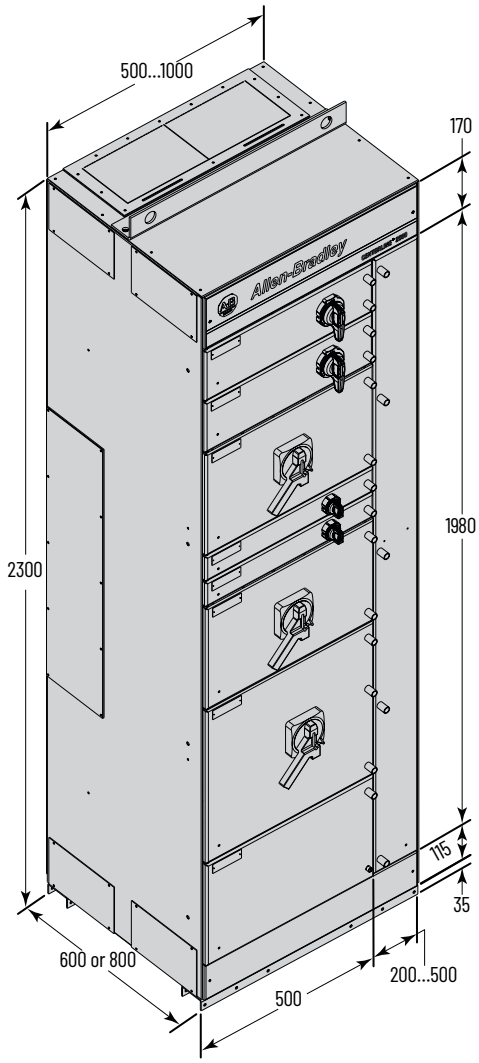

## Dimensions

CENTERLINE 2500 MCCs columns are designed in widths between 500...1000 mm. Each column is 2300 mm high and either 600 mm or 800 mm deep. Double front columns are also available. For additional options, see the tables in Figure 2.

Unit size is described in terms of modules. Each module is approximately 80 mm high. Columns can accommodate 24 modules of different unit combinations.

**Figure 2 - Typical Column Dimensions**

All measurements are in mm unless otherwise specified.
600 mm Deep Withdrawable Column with a 200 mm Wireway Shown.




## Table 2 - Widths

| Column with Wireway | | | Column without Wireway | |
|---|---|---|---|---|
| Fixed or Withdrawable Unit Width[1] | Vertical Wireway Width[2] | Total Column Width | Fixed Unit Width[3] | Total Column Width |
| 500 | 200 | 700 | 500 | 500 |
| | 300 | 800 | 600 | 600 |
| | 400 | 900 | 700 | 700 |
| | 500 | 1000 | 800 | 800 |
| | | | 900 | 900 |
| | | | 1000 | 1000 |

(1) Available from 1...24 modules.
(2) Recommended minimum wireway widths for the various forms of separation:
- For 3B, 300 mm wide
- For 4B Type 5, 400 mm wide
- For 4B Type 7, 500 mm wide

(3) Applies to a full column (24 modules).

## Table 3 - Depth

| Single-front | Double Front |
|---|---|
| 600 | 1200 |
| 800[1] | 1600[2] |

(1) Single-front IP42 configurations with a 3200 A bus (air circuit breaker units only) or 4000 A bus (all unit types) require a 100 mm air gap behind the column. In these instances, the overall depth is 900 mm.
(2) Double front IP42 configurations with a 3200 A bus (air circuit breaker units only) or 4000 A bus (all unit types) require a 400 mm air gap between the rear of the columns. In these instances, the overall depth is 2000 mm.

## Table 4 - Thickness, Nominal

| Description | Measurement |
|---|---|
| Side plates (all depths) | 2 |
| Back plates (all widths) | 2.5 |
| Bottom mounting channel[1] | 3.5 |
| Top plates (all widths) | 2 |
| Bottom plates | 2 |
| Horizontal wireway covers | 2 |
| Wireway doors | 2 |
| Doors[2] | 2, 2.5 |
| ArcShield 480V doors[3] | 2.5, 3 |

(1) Front and rear.
(2) 2 mm for 1...22 modules, 2.5 mm for 24 modules.
(3) 2.5 mm for 1...22 modules, 3 mm for 24 modules.

## Table 5 - Weight, kg[1]

| | Column Depth | |
|---|---|---|
| Column Width | 600 mm | 800 mm |
| 600, 700 | 350 | 450 |
| 800 | 400 | 525 |
| 900 | 450 | 575 |
| 1000 | 500 | 650 |

(1) Weights that are shown are for an MCC column with six units. Many factors (number of units, horizontal power bus, wireway width, column depth, and shipment packaging) affect the actual weight. The packing slip shipped with an MCC unit shows the exact shipping weights.

## Table 6 - Height

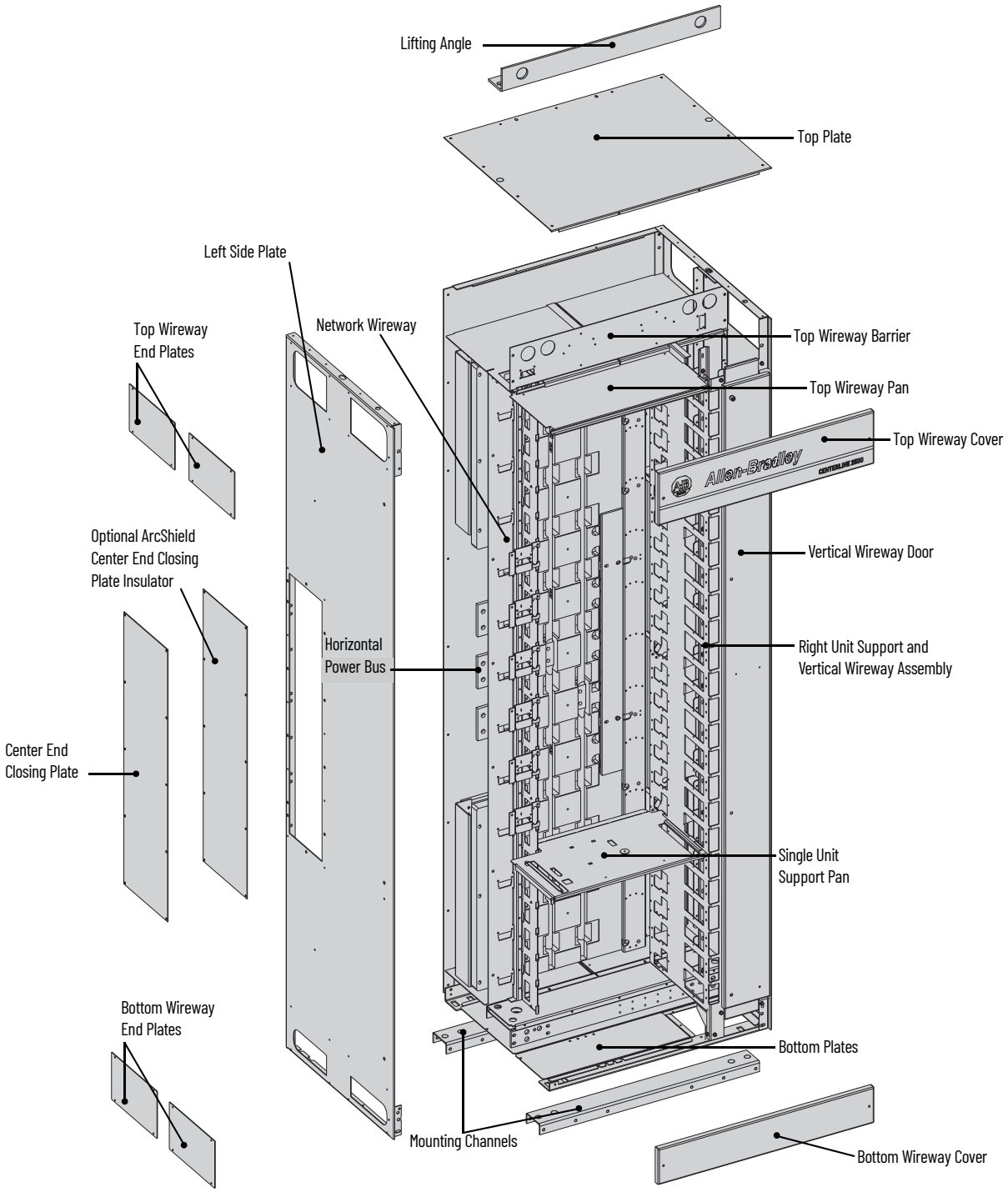
| Dimension | Measurement |
|---|---|
| Total unit height<br>• With top gland plate<br>• With ventilation hood<br>• With lift angle<br>• With lift angle on gland plate | 2300<br>2306<br>2370<br>2375<br>2387 |
| Available unit height | 1980 |
| Top horizontal wireway | 170 |
| Bottom horizontal wireway | 115 |
| External mounting channel | 35 |

## Typical Column Construction

Columns are rigid, freestanding structures with heavy-duty, external mounting channels. Columns are secured at the installation site by bolting through clearance holes in the mounting channel or by welding.

The standard for internal sheet metal parts is Z275 galvanized metal for Series D CENTERLINE 2500 motor control centers.

**Figure 3 - Typical Column**



Additional bracing is provided for ArcShield columns.

**Figure 4 - ArcShield Column Protection Hardware**

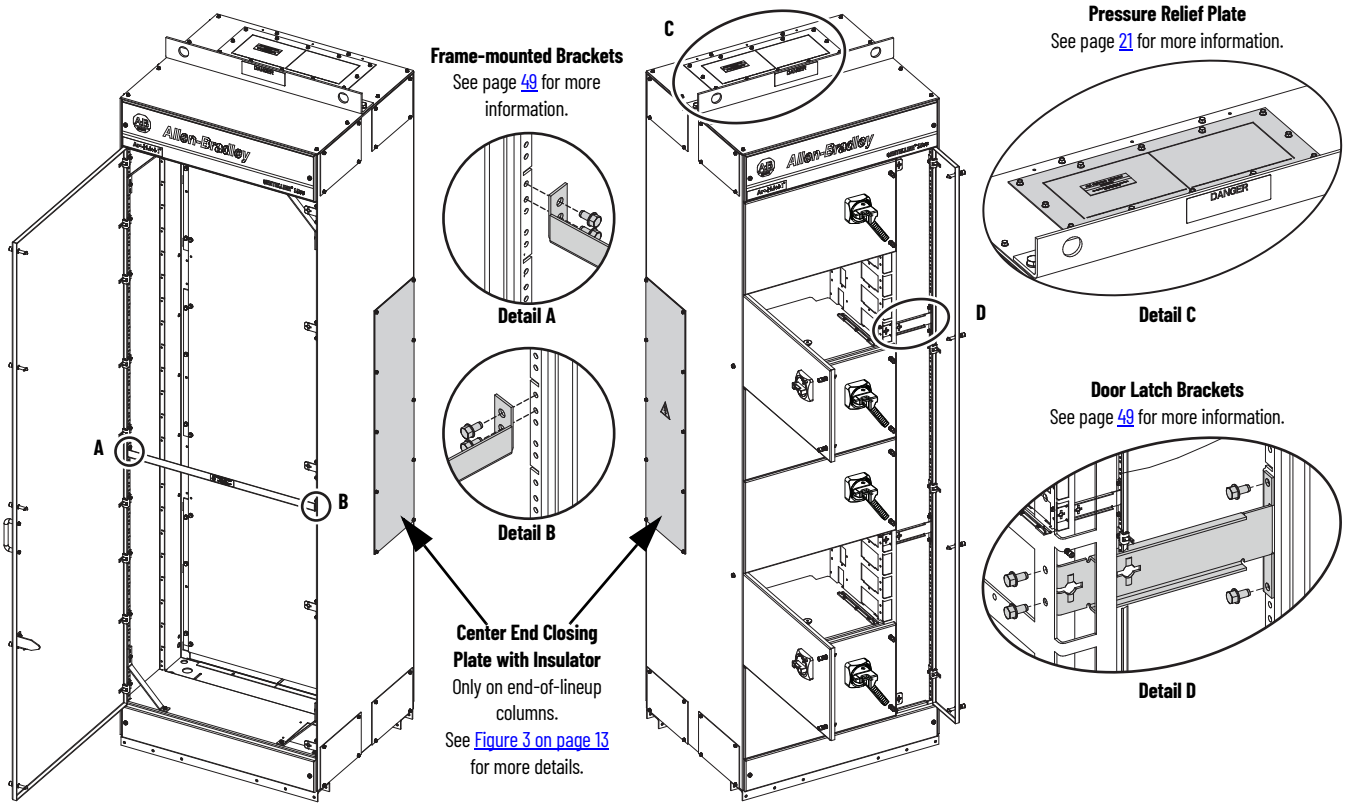
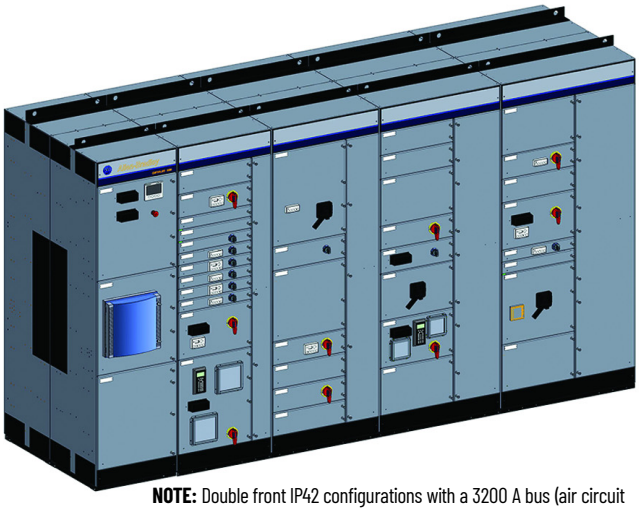



**Figure 5 - Column Configuration**

Columns Installed in a Single-front Configuration

**NOTE:** Single-front IP42 configurations with a 3200 A bus (air circuit breaker units only) or 4000 A bus (all unit types) require a 100 mm air gap behind the column.

Columns Installed in a double front Configuration



**NOTE:** Double front IP42 configurations with a 3200 A bus (air circuit breaker units only) or 4000 A bus (all unit types) require a 400 mm air gap between the rear of the columns.

# Technical Data

This table provides the technical specifications for the 2500 MCC.

The following certifications (2500-CTOxx) can be found at the Rockwell Automation Literature Library: https://www.rockwellautomation.com/global/literature-library/overview.page.

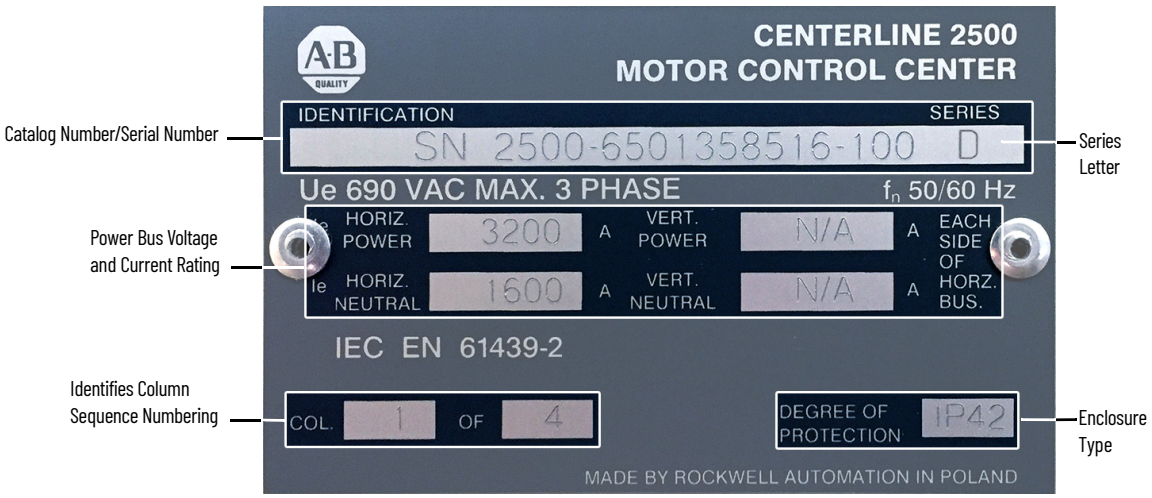
| | | |
|---|---|---|
| Standards | EN 60204-1:2006 + A1:2009 | Safety of machinery – Electrical equipment of machines; Part 1: General requirements |
| | IEC 61439-1 | Low-voltage switchgear and controlgear assemblies; Part 1: General requirements |
| | IEC 61439-2 | Low-voltage switchgear and controlgear assemblies; Part 2: Power switchgear and controlgear assemblies |
| | IEC/TR 61641 Ed. 3.0, 2014-1, parts 1...7 | Enclosed low-voltage switchgear and controlgear assemblies; Guide for testing under conditions of arcing due to internal fault |
| EC Directives | 2011/65/EU | RoHS Directive |
| | 2004/108/EC | EMC Directive |
| | 2006/95/EEC | Low Voltage Directive |
| Certifications and Markings | ABS and ABS shipboard | 2500-CT015, 2500-CT016, and 2500-CT017 |
| | CE Conformance Marked | 2500-CT008 and 2500-CT009 |
| | China Compulsory Certificate (CCC) | 2500-CT010, 2500-CT011, 2500-CT012, 2500-CT013, and 2500-CT022 |
| | DEKRA | 2500-CT018, 2500-CT019, 2500-CT020, and 2500-CT021 |
| | EAC | MCC-CT001 |
| | SII Approval | 2500-CT014 |
| Rated Voltages | Rated operating voltage, $U_e$ | Up to 690V, 3-phase |
| | Rated frequency, $f_n$ | 50...60 Hz |
| | Rated insulation voltage, $U_i$ | 1000V, 3-phase |
| Rated Currents | Continuous current rating, $I_e$ | Horizontal bus up to 4000 A; vertical bus up to 1200 A per column(1) |
| | Short circuit peak withstand, $I_{pk}$ | Horizontal bus up to 210 kA |
| | Short time withstand rating, $I_{cw}$ | Horizontal bus up to 100 kA for 1 second |
| | Neutral (N) | Full or half-rated |
| Creepage Distances and Clearances | Rated impulse withstand voltage, $U_{imp}$ | 6 kV, 8 kV, or 12 kV |
| | Material group (overvoltage category) | IIIa (175 </= CTI < 400) |
| | Pollution degree | 3 |
| Bus Material and Plating | Horizontal power bus | Copper (optional tin plating) |
| | Vertical distribution bus | Copper with tin plating |
| | Protective earth conductor (PE) | Copper (optional tin plating) |
| Degrees of Protection | IEC 60529 | IP20, IP42, or IP54 |
| Forms of Separation | IEC 61439-2 | Forms 2b, 3b, 4b, or 4b Type 7 |
| Column Dimensions | Height, width, and depth | See page 12 |
| Units | Module size (approx) | 80 mm high x 500 mm wide = 1 module |
| | Modules per column, max | 24 of varied unit combinations |
| | Withdrawable unit sizes | 1, 2, 4, 6, 8, 10, and 12 modules |
| Structural Surface Treatments | Interior | Z275 galvanized metal (painted interior available as custom option) |
| | Exterior | RAL 7032 Pebble Grey paint (additional colors available by request) |
| Environment | Storage temperature | -25...+55 °C |
| | Operating (ambient) temperature | -5...+40 °C(2) with up to 95% noncondensing humidity |
| | Altitude | Up to 1000 m without derating: derating over 1000 m |

(1) Up to 600 A top and bottom, effective 1200 A per column.
(2) The average temperature over a 24-hour period must not exceed 35 °C.

## Nameplate Data

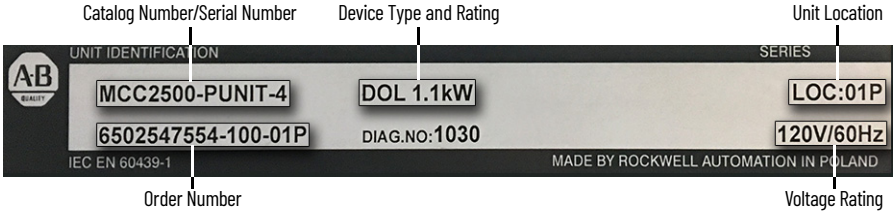
In compliance with EN 61439-1, each CENTERLINE 2500 MCC column is supplied with a nameplate on the enclosure or vertical wireway door.

**Figure 6 - Column Nameplate**




Each unit also has an identification label. On withdrawable units, the unit identification label is on the interior of the bottom plate of the unit. On fixed units, the unit identification label is on the interior right side plate.

**Figure 7 - Unit Identification Label**




The catalog number or serial number and series letter are required to identify the equipment properly to sales or factory personnel.

## MCC Column-number Sequence

| | |
|---|---|
| **IMPORTANT** | CENTERLINE 2500 MCCs are designed to function in any column-number sequence. However, **we recommend that columns be installed in sequential order**. |

Each CENTERLINE 2500 MCC column nameplate identifies column-number sequence, for example, MCC column 1 of 1 or 1 of 5. See Figure 6 for where to find column-number sequence information.

Columns are numbered to match factory-supplied MCC elevation drawings and to identify MCC columns and units easily. If there are questions about column numbering during field installation, inspection, or operation, the following instructions can provide guidance.

| | |
|---|---|
| **IMPORTANT** | Leftmost column must be installed in the proper location for the bus to splice. (Both ends of double-front MCCs must be installed as ends for splicing.) |

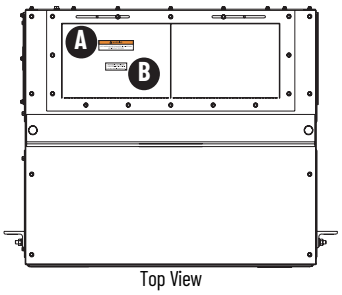
The most important criteria for additions of columns to existing MCCs is matching the horizontal bus, enclosure type, and network capabilities for the complete MCC line up. The voltage, current rating, short circuit withstand, and IP rating for all columns must be consistent.

## ArcShield Labels

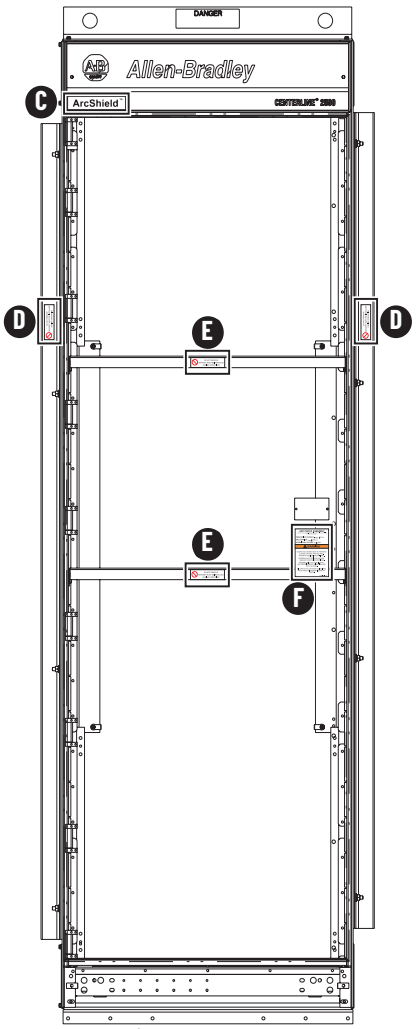
MCC columns with arc proof assembly have a rating label (Detail E in Figure 8 on page 18) below the nameplate. There are also labels on other parts that must be in place before operating an MCC with ArcShield; see Figure 8 on page 18.

At the end of a lineup, CENTERLINE 2500 MCCs with ArcShield have a back-corner baffle and insulation on the center side closing-plate; see Figure 4 on page 14 for more details. They also have external vertical support angles at each end of the lineup.

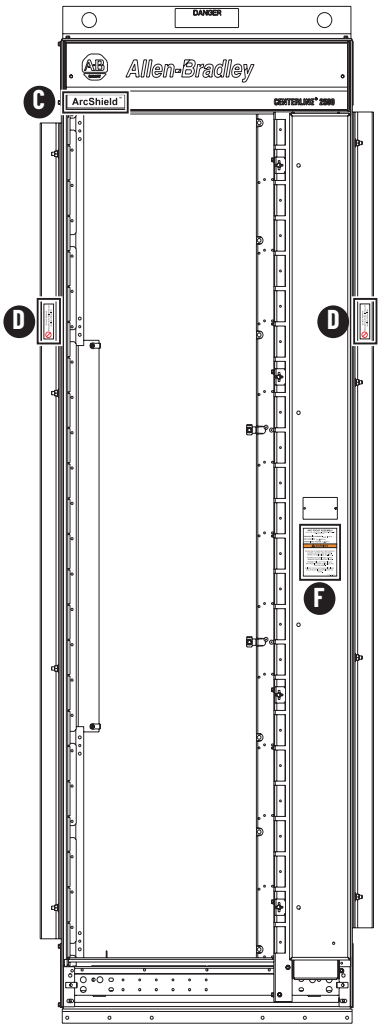
## Figure 8 - ArcShield Label Locations




Top View




Front View – Frame Mount




Front View – Withdrawable

**NOTE:** All labels are external except for 'E.'

**A**

**⚠ WARNING**

HOT GASES MAY BE EXHAUSTED IF AN INTERNAL ARCING FAULT OCCURS

**B**

**DO NOT MODIFY PLATE OR INSTALL CABLE/CONDUIT IN THIS LOCATION.**

**PLATE MUST REMAIN UNOBSTRUCTED.**

**C**

**ArcShield™**

**D**
**E**

DO NOT REMOVE
BRACKET MUST BE INSTALLED
DURING OPERATION

**F**

**ARC PROOF ASSEMBLY**

PERSONAL AND ASSEMBLY PROTECTION UNDER ARCING CONDITIONS PER IEC/TR 61641:2008

**PROSPECTIVE CURRENT**, $I_{p\ arc}$ ≤ 65 kA
**ARC DURATION**, $t_{arc}$ ≤ 300 ms
**OPERATIONAL VOLTAGE**, $U_e$ ≤ 480 V

**⚠ WARNING**

DOORS AND COVERS MUST BE PROPERLY CLOSED, LATCHED, AND SECURED. REFER TO PUBLICATION 2500-IN001.

ASSEMBLY MUST BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS.

ASSEMBLY WILL NOT FUNCTION AS ARC PROOF IF ABOVE GUIDELINES ARE NOT FOLLOWED.

FAILURE TO FOLLOW THESE GUIDELINES COULD RESULT IN SEVERE INJURY OR DEATH.

41006-403-01 (1)

# Receiving, Handling, and Storage

See Receiving, Handling, and Storing CENTERLINE® 2500 Motor Control Centers Instructions, publication 2500-IN002, for additional instructions. This publication is shipped with each MCC, attached to the outside of the MCC within the layer of clear polyethylene encasement (polywrap).

**ATTENTION:** MCCs are top and front heavy. To avoid personal injury or structural damage, lift or move the MCC by only the methods that are outlined in Receiving, Handling, and Storing CENTERLINE 2500 Motor Control Centers, publication 2500-IN002.

## Receiving

CENTERLINE 2500 MCCs are shipped upright as one or two column shipping blocks or two or four double front column shipping blocks. Each CENTERLINE 2500 MCC shipping block is provided with a lifting angle. Each column in a shipping block is bolted to the shipping skid with removable shipping angles and covered with clear plastic wrap. Protection is for upright shipping and is not waterproof or water-resistant. Equipment that extends from the structures is also protected.

Heavy-duty export packaging is similar to standard packaging, but uses a polywrap suitable for occasional water spray. In addition, wood framing and sheeting surround the columns. The heavy-duty export packaging is not water-resistant, waterproof, or intended for long-term storage.

Upon delivery of the MCC, see the packing slip shipped with your MCC for sizes and exact shipping weights. Inspect the shipment for lost or damaged items. If lost or damaged items are detected, see the steps that are described in publication 2500-IN002.

## Handling

The following are acceptable methods of handling MCC columns within the receiving facility. These methods are described in publication 2500-IN002.

- Use of a forklift
- Overhead lifting (crane or hoist)
- Sling lifting

MCC columns must be handled in the upright vertical position. Failure to comply with this method can lead to busbar, unit, and enclosure damage.

The MCC must remain bolted to the shipping skid until delivered to its final installation area.

**ATTENTION:** MCCs are top and front heavy. To avoid personal injury or structural damage, never attempt to lift or move the MCC by any means other than the methods outlined in Receiving, Handling, and Storing CENTERLINE 2500 Motor Control Centers, publication 2500-IN002.

## Storage

Store CENTERLINE 2500 MCCs, units, and related equipment in a clean, dry environment with ambient temperatures ranging from -25...+55 °C (-13...+131 °F). For short periods (less than 24 hours), temperatures of up to 70 °C (158 °F) are allowed. Take care to help prevent damage from exposure to excessive humidity, vibration, and shock.

Store MCCs with the plastic covering in place to help prevent dirt and dust from entering the structure. Check periodically for condensation build-up and, if necessary, install space heaters. To order space heaters, contact your Rockwell Automation representative.

# Install Columns

## Location Planning

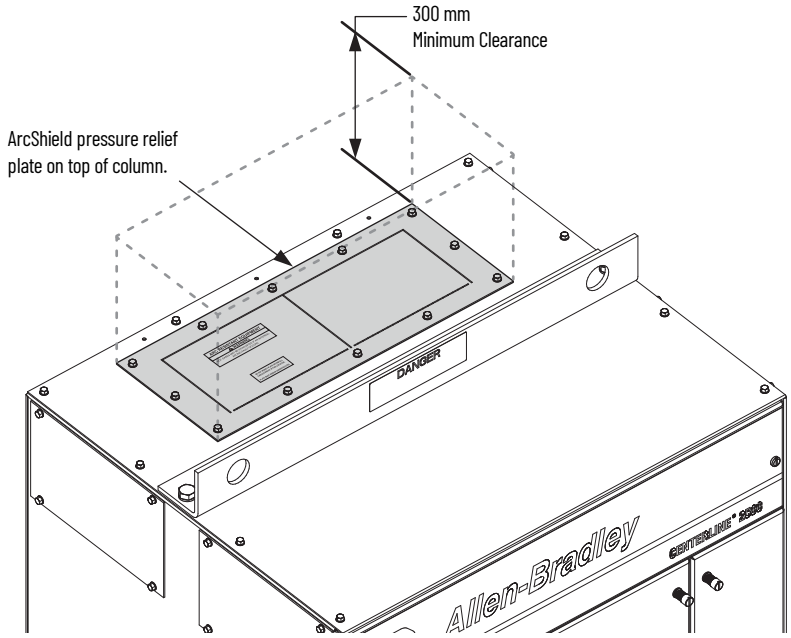
When you plan the location for your CENTERLINE® 2500 MCC, consider the following:

- Cable entry and exit points (see Appendix B on page 105)
- Busways
- Overall height of installation area
- Alignment with other equipment
- Future needs
- Environment

The area must be level and the environment must be compatible with the degree of protection that is provided by the enclosure.

### ArcShield™ Clearance Space

Provide a minimum 300 mm of clearance space above the MCC to vent the pressure relief plates if there is an arc flash.




**ATTENTION:** Do not step on the pressure relief plate, which can cause it not to work properly during arc flash.

## Environment

CENTERLINE 2500 MCCs are designed to operate under the service conditions described in IEC 61439-1. Variations in temperature and relative humidity can potentially cause occasional condensation.

*Temperature*

When you operate an MCC, ambient air temperature must remain in the range of -5...+40 °C (23...104 °F). The average temperature over a 24-hour period must not exceed 35 °C (95 °F).

*Humidity*

Noncondensing humidity is permissible up to 95% at the maximum temperature of 40 °C (104 °F), with the average temperature not to exceed 35 °C (95 °F) over a 24-hour period.

*Altitude*

The CENTERLINE 2500 MCC is designed to operate at installation sites at altitudes up to 1000 m (3281 ft) above sea level without derating. If the altitude at your installation site exceeds 1000 m (3281 ft) above sea level, contact your Rockwell Automation® representative for derating information.

*Pollution Degree*

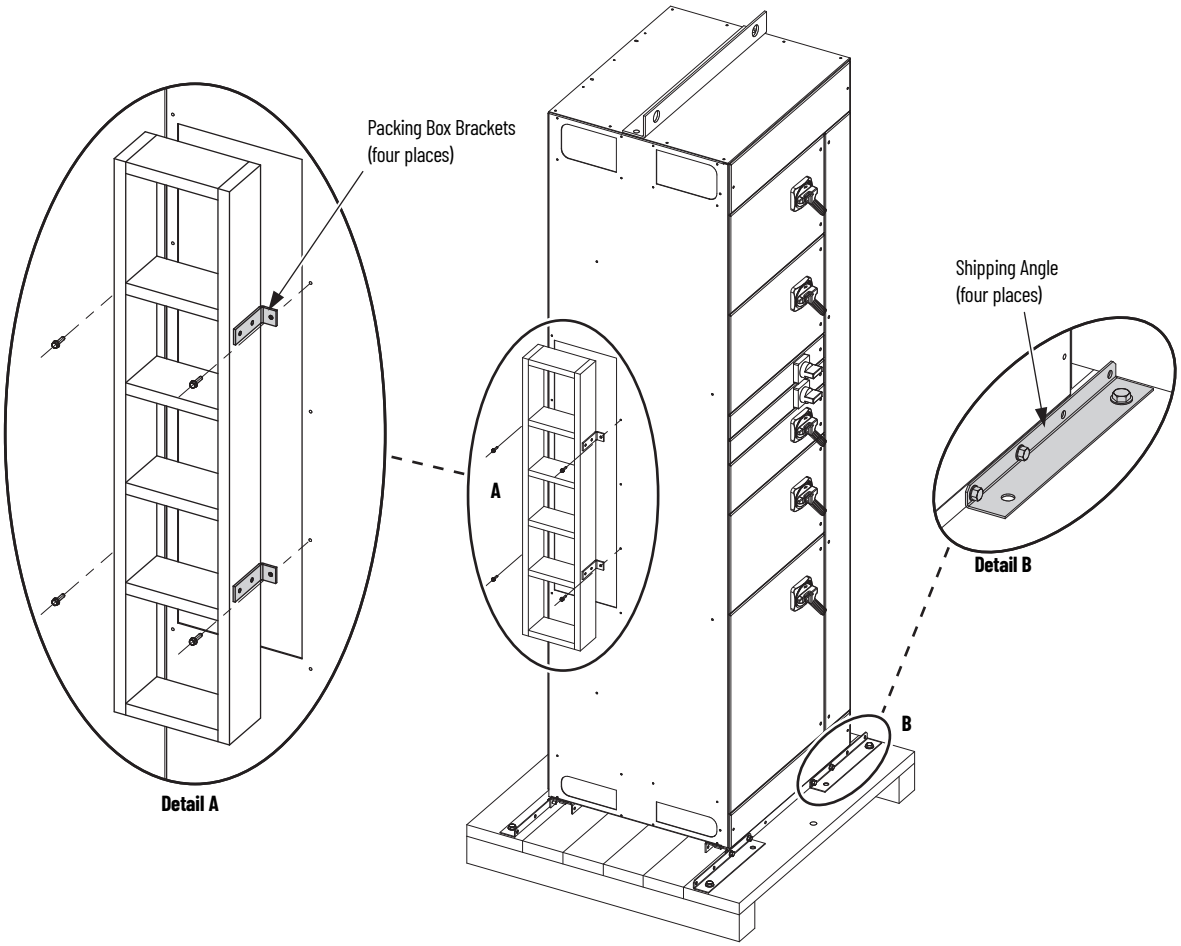
CENTERLINE 2500 MCCs are designed for use in a pollution degree 3 environment. IEC 61439-1 defines pollution degree 3 as, "conductive pollution occurs or dry, non-conductive pollution occurs that become conductive due to condensation."

# Remove Packing Materials

When the MCC has been delivered to the site of installation, remove the packaging material. Save any manuals and data sheets for future reference.

**ATTENTION:** To avoid personal injury, use caution when the motor control center is not secured. Motor control centers are top and front heavy.

1. Remove the packing box around the horizontal bus if present and remove the four brackets as shown (Detail A).




2. Remove the bolts that secure each shipping angle (Detail B) from the shipping skid.

**ATTENTION:** Once the bolts are removed from the shipping angles, the MCC is no longer secured on the skid.

3. Remove the shipping angles from the MCC.
   You can now remove the MCC from the shipping skid.

## Locate Bus Splice Kits

A fluorescent pink, removable label (on the outside of the column) designates where provided power bus splice kits are stored. PE splice kits are in the bottom horizontal wireway, which is fastened to the horizontal PE conductor.

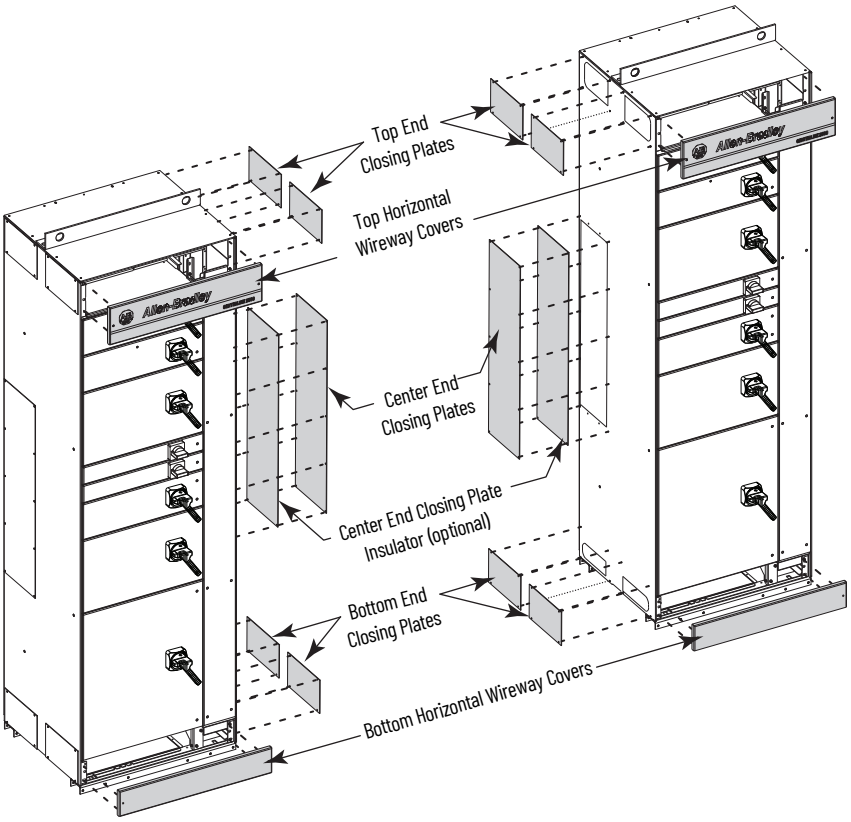

Locate the splice kits and set aside for later use. For the splice kit contents, see Table 7 on page 41.

## Removing the Covers

Follow these procedures for removing the covers on the MCC.

1. Remove the top and bottom horizontal wireway covers from the MCC.
2. If present, remove the top, bottom, and center end closing plates, on the sides of the two columns that are to be joined.

**Figure 9 - Wireway Covers and Closing Plates to Remove From the MCC**




3. If ArcShield is present, remove the center end closing plate insulators.

| IMPORTANT | When you plan MCC cable routing, consider cable replacement in your plans. |
|---|---|

For more information about cable installation, see Chapter 4 on page 49.

4. **For double front applications**, remove the backplate of each MCC column before you begin to position them.

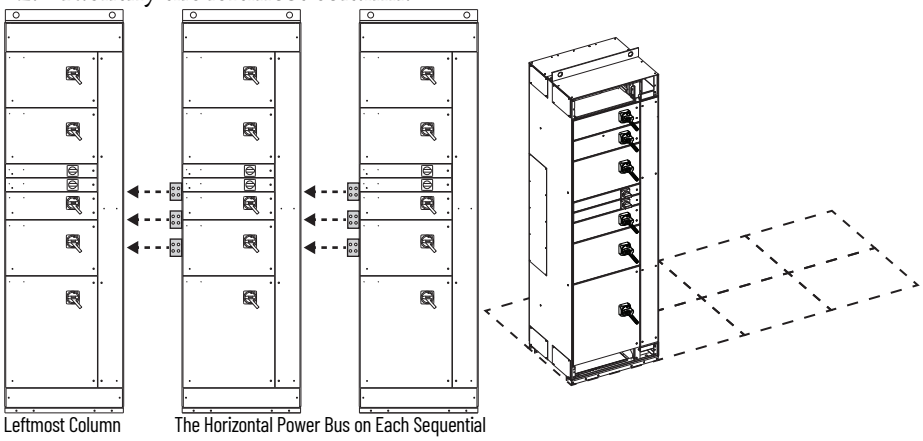
| IMPORTANT | Save the M6 hardware removed from the backplate. It is used in Join Back-to-back Columns in a Double Front Configuration on page 34. |
|---|---|

## Position the Motor Control Center

Follow these procedures to position your MCC.

**IMPORTANT** Certain IP42 configurations require column air gaps. For more information, see Figure 5 on page 14.

1. Documentation packages that are shipped with assembled MCCs include an MCC elevation drawing of a floor plan layout. Locate and use this floor plan layout to position your MCC columns.
2. Identify the leftmost column.




The horizontal power bus does not extend past the leftmost MCC column. For sequential columns, the horizontal power bus extends past the MCC.

3. Position the MCC in the location where it is to be installed.

**IMPORTANT** The floor surface must be level.

4. Depending on the installation site, begin with the leftmost or right-most column and install one shipping block at a time.

**ATTENTION:** For MCC handling guidelines, see Receiving, Handling, and Storing CENTERLINE 2500 Motor Control Centers Instructions, publication 2500-IN002, which is provided with shipped MCC units. Use these guidelines to help avoid personal injury and equipment damage during handling, and to facilitate moving the MCC at the installation site.

# Secure a Motor Control Center

Documentation packages that are shipped with assembled MCCs include an MCC elevation drawing of a floor plan layout. To secure a column to the foundation, see the provided floor plan layout and the following procedures.

See Chapter 4 for cable and conduit routing instructions.

**IMPORTANT** Certain IP42 configurations require column air gaps. For more information, see Figure 5 on page 14.

## Securing Methods

MCC columns or shipping blocks can be bolted or welded to a foundation. Two mounting channels on the bottom of each MCC column are used for either securing method.

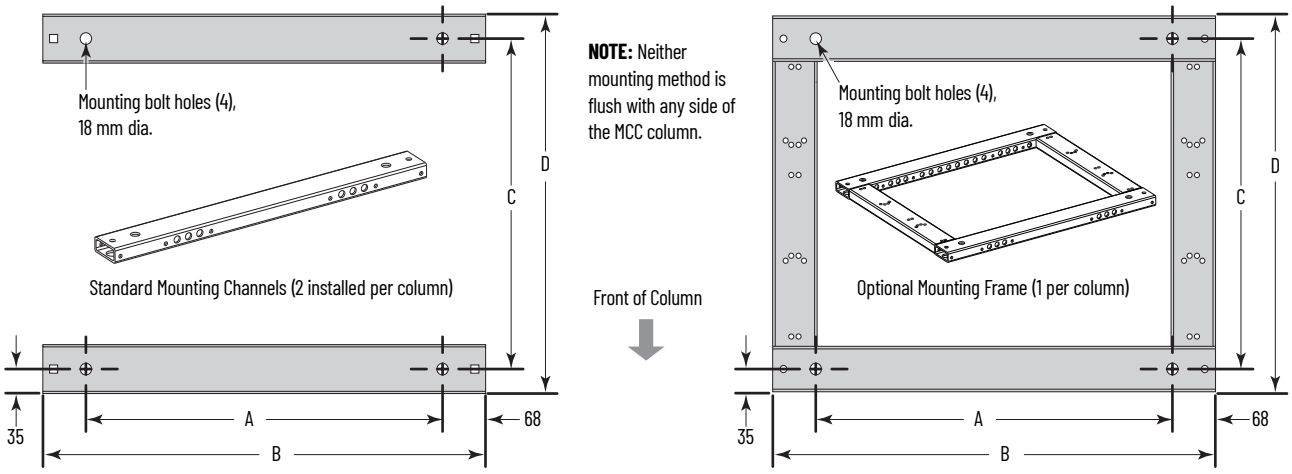
### *Weld Down Method*

See Figure 12 on page 32 to weld an MCC column or shipping block to a foundation.

### *Bolt Down Method*

Two mounting channels are provided for each MCC column. An optional mounting frame is also available. Both mounting methods can be fastened with up to four steel M12 bolts (minimum Property Class 8.8). For best results, pre-locate and embed the bolts in the foundation before you install each MCC column. For more information about mounting bolt locations, see page 27 through page 29.

**Figure 10 - Mounting Channel Dimensions and Bolt Locations**




All dimensions are mm.

| MCC Column Width | A | B |
|---|---|---|
| 500[1] | 361 | 497 |
| 600 | 461 | 597 |
| 700 | 561 | 697 |
| 800 | 661 | 797 |
| 900 | 761 | 897 |
| 1000 | 861 | 997 |

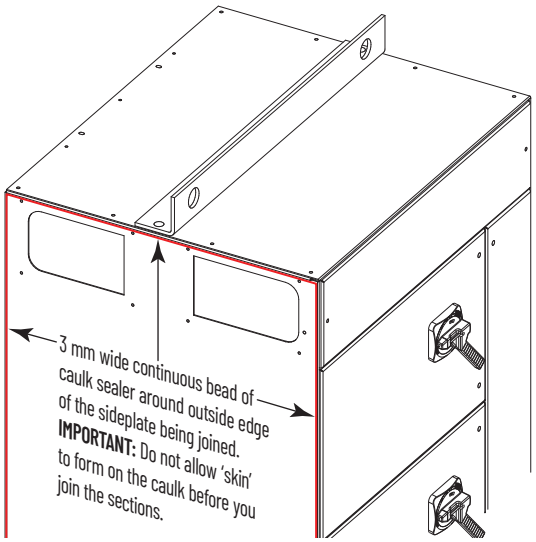
| MCC Column Depth | C | D |
|---|---|---|
| 600 | 512 | 582 |
| 800 | 712 | 782 |

(1) Available only with the optional welded frame.

## Seal IP54 Enclosures Before Connection

The following steps do not apply to IP20 and IP42 enclosures.

1. Remove the tube of caulk (mastic) sealer from the splice kit and read the application directions on the tube.
2. Cut the nozzle at the first notch, 3 mm from the end.
3. Apply a continuous bead of caulk, 3 mm wide, around the outside edge of the sideplate of the fixed motor control center.




4. Slide the columns together.
   Verify that the cabinets are level and joining holes are aligned.

| IMPORTANT | If you removed the lifting angle from the IP54 enclosure, then you must also seal the lifting angle bolt holes with the caulk sealer. |
|---|---|

## Secure Single Front, One Column-wide Shipping Blocks

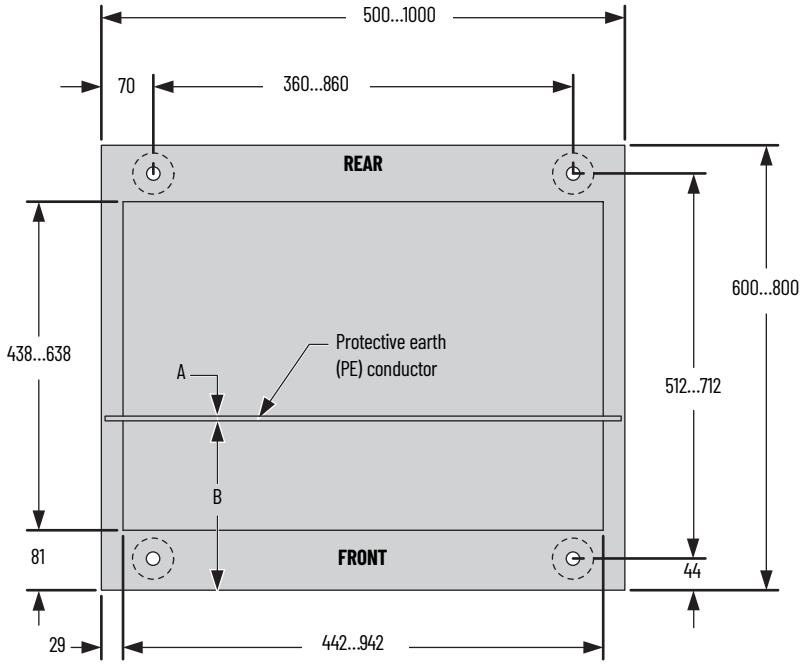
The following instructions are to bolt down the MCC. See Figure 12 on page 32 for weld down requirements.

| IMPORTANT | Verify that there is adequate clearance on the sides of columns to access the rear mounting bolt locations.<br>Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. |
|---|---|

1. To locate the front mounting channel, remove the bottom wireway cover. See Figure 3 on page 13 for cover location.
2. Secure the front of the MCC to the foundation with the mounting dimensions in the following illustration and the mounting channel requirements on page 26.
3. Reinstall the bottom wireway cover.
4. To locate the rear mounting channel, remove the bottom wireway end plate near the back of the unit. See Figure 3 on page 13 for end plate location.

5. Secure the rear of the MCC to the foundation with the mounting dimensions in the following illustration and the mounting channel requirements on page 26.
6. Reinstall the bottom wireway end plate.

Dimensions are in mm.
Diagram shows top view of 600 mm and 800 mm column depths.




| Input Power, A | Material Thickness, mm | Distance, mm |
|---|---|---|
| | A | B |
| Up to 1600 | 6 | 234 |
| 2000...2500 | 12 | 228 |

| Input Power, A | Material Thickness, mm | Distance, mm |
|---|---|---|
| | A | B |
| 3200 | 18 | 222 |
| 4000 | 24 | 216 |

## Secure Single Front, Two Column-wide Shipping Blocks

The following instructions are to bolt down the MCC. See Figure 12 on page 32 for weld down requirements.

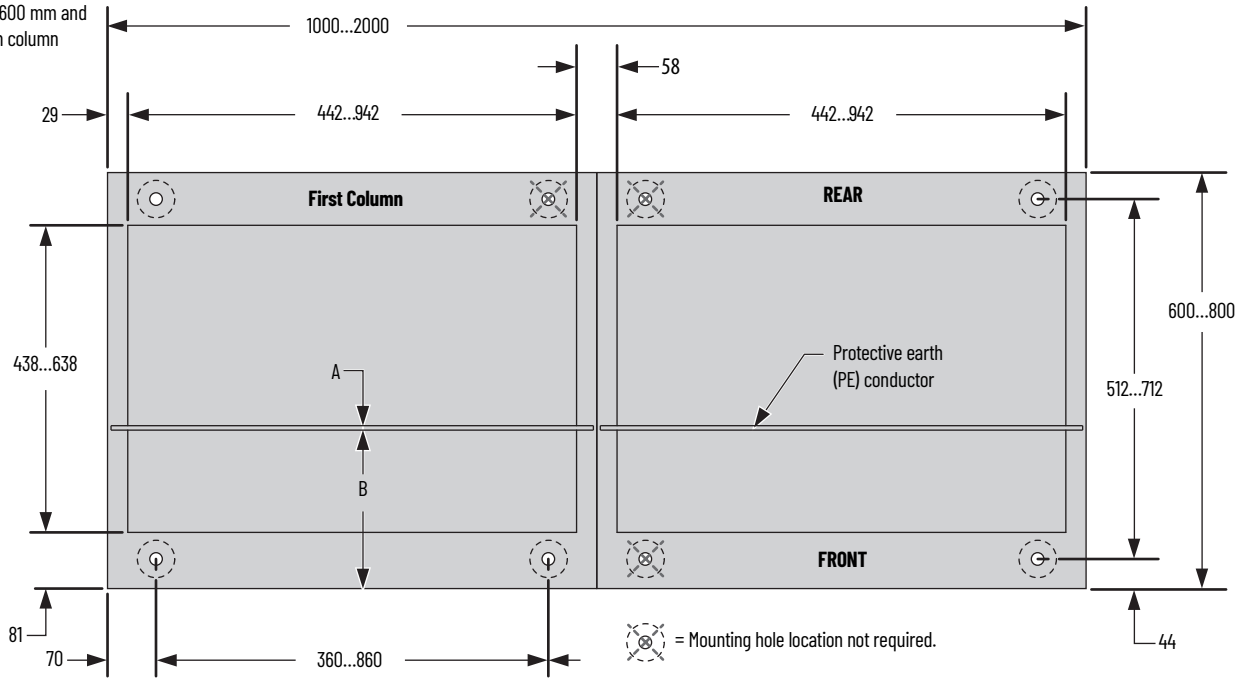
**IMPORTANT** Verify that there is adequate clearance on the exposed sides of columns to access the rear mounting bolt locations.

Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used.**

1. To locate the front mounting channel, remove the bottom wireway cover. See Figure 3 on page 13 for cover location.
2. Secure the front of the MCC to the foundation with the mounting dimensions in the following illustration and the mounting channel requirements on page 26.
3. Reinstall the bottom wireway cover.
4. To locate the rear mounting channel, remove the bottom wireway end plate near the back of the unit. See Figure 3 on page 13 for end plate location.

5. Secure the rear of the MCC to the foundation with the mounting dimensions in the following illustration and the mounting channel requirements on page 26.
6. Reinstall the bottom wireway end plate.

Dimensions are in mm.
Diagram shows top view of 600 mm and 800 mm column depths.




| Input Power, A | Material Thickness, mm | Distance, mm |
|---|---|---|
| | A | B |
| Up to 1600 | 6 | 234 |
| 2000...2500 | 12 | 228 |

| Input Power, A | Material Thickness, mm | Distance, mm |
|---|---|---|
| | A | B |
| 3200 | 18 | 222 |
| 4000 | 24 | 216 |

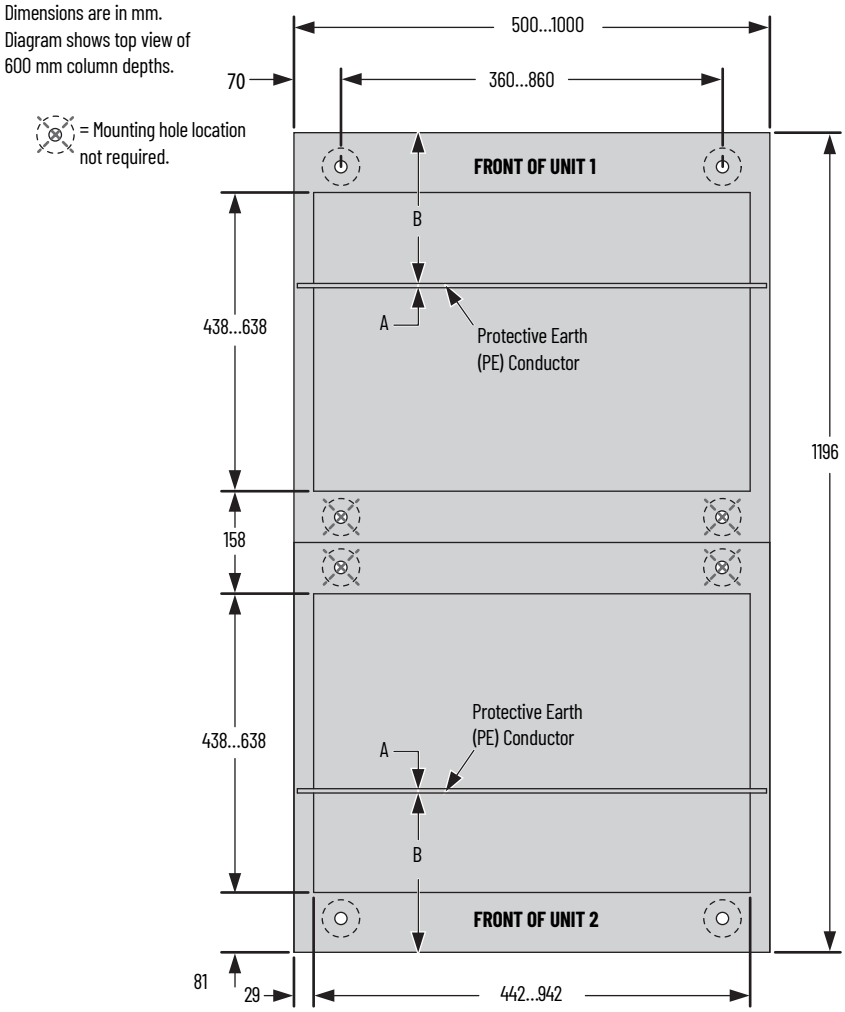
## Secure Double Front, One Column-wide Shipping Blocks

The following instructions are to bolt down the MCC. See Figure 12 on page 32 for weld down requirements.

**IMPORTANT** Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used.**

1. To locate the front mounting channel, remove the bottom wireway cover. See Figure 3 on page 13 for cover location.
2. Secure the front of the MCC to the foundation according to the dimensions in the following illustration and the mounting channel requirements on page 26.
3. Reinstall the bottom wireway cover.

4. Repeat step 1 through step 3 for the other side of the double front shipping block.




| Input Power, A | Material Thickness, mm | Distance, mm |
|---|---|---|
| | A | B |
| Up to 1600 | 6 | 234 |
| 2000...2500 | 12 | 228 |

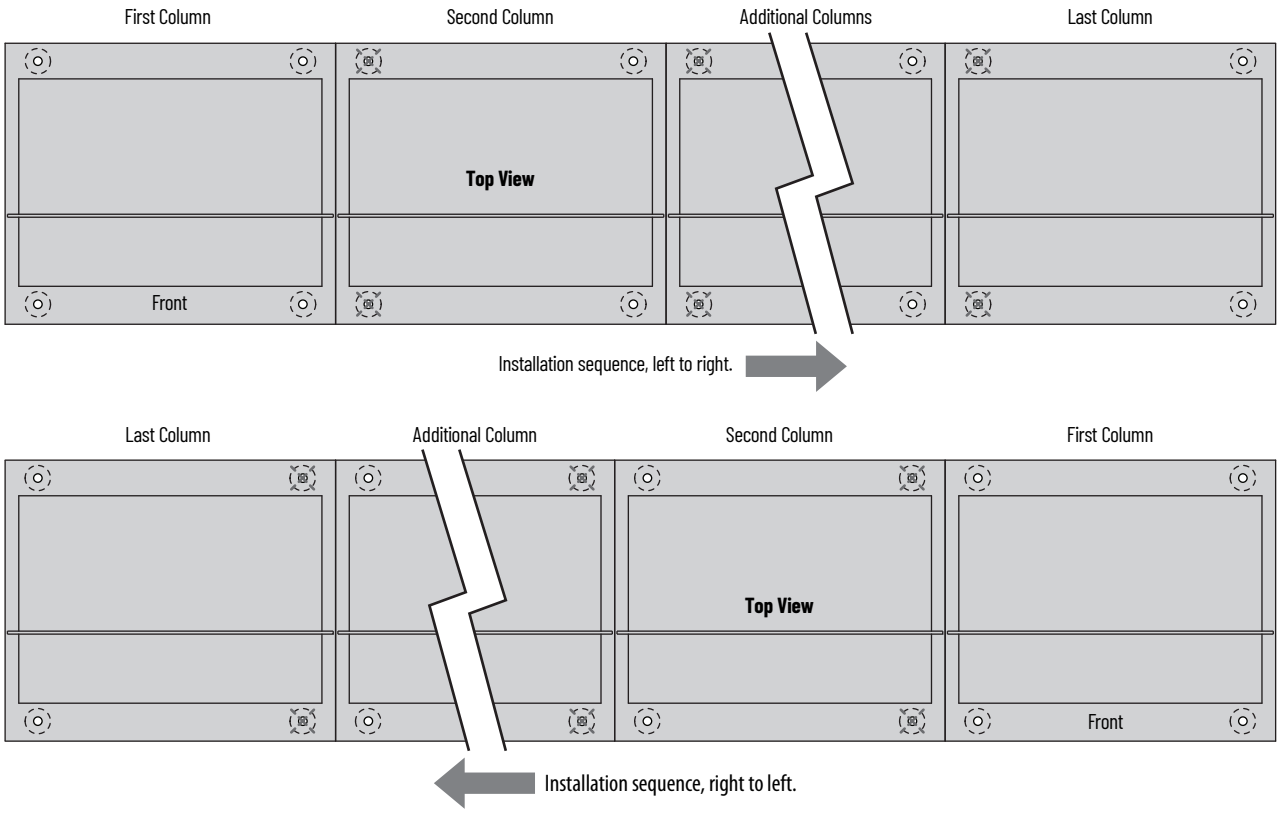
| Input Power, A | Material Thickness, mm | Distance, mm |
|---|---|---|
| | A | B |
| 3200 | 18 | 222 |
| 4000 | 24 | 216 |

## Secure Multiple Column-wide Shipping Blocks

Figure 11 and Figure 12 are to bolt down a multiple-column shipping block. For weld down requirements, see Figure 13 on page 33.

| | |
|---|---|
| **IMPORTANT** | Verify that there is adequate clearance on the exposed sides of columns to access the rear mounting bolt locations.<br>Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used**. |

**Figure 11 - Bolt-down Requirements for Single Front, Multiple Column-wide Shipping Blocks**

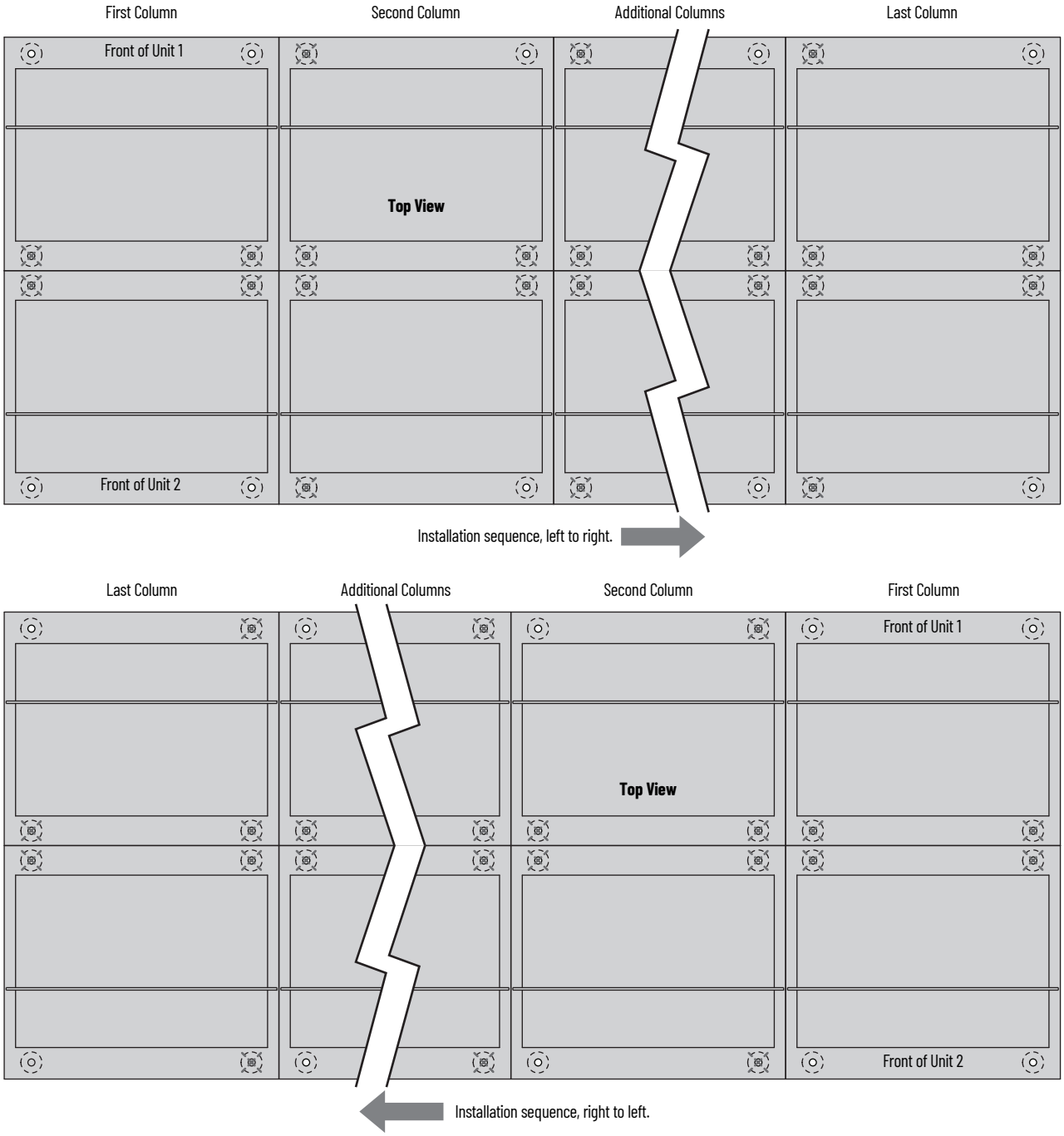



= Mounting hole locations not required.

**ATTENTION:** The figure shows which bolts are required for multiple-column shipping blocks. Drawings with specific dimensions are supplied with each multiple-column shipping block.

**Figure 12 - Bolt-down Requirements for Double Front, Multiple Column-wide Shipping Blocks**

**IMPORTANT** Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used**.

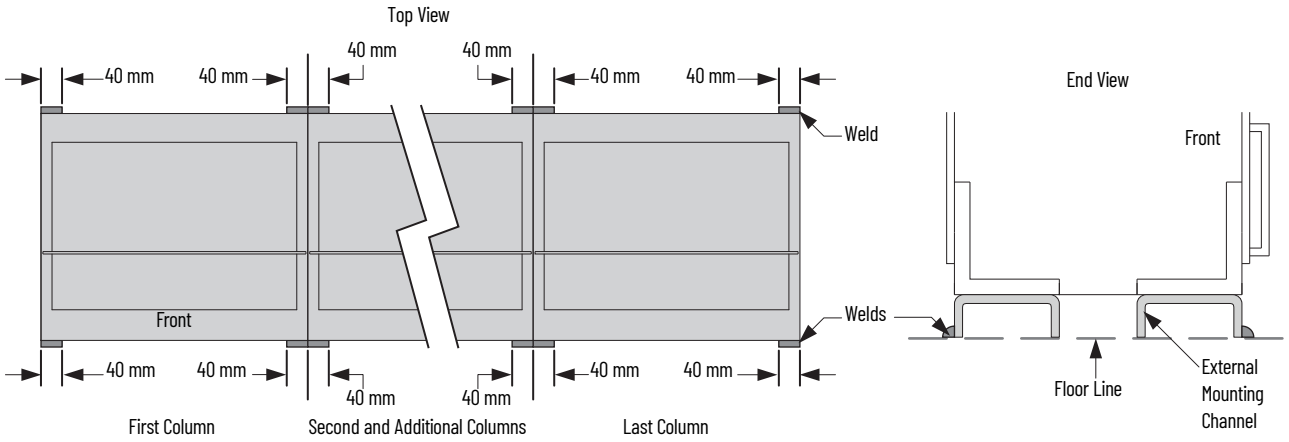



= Mounting hole locations not required.

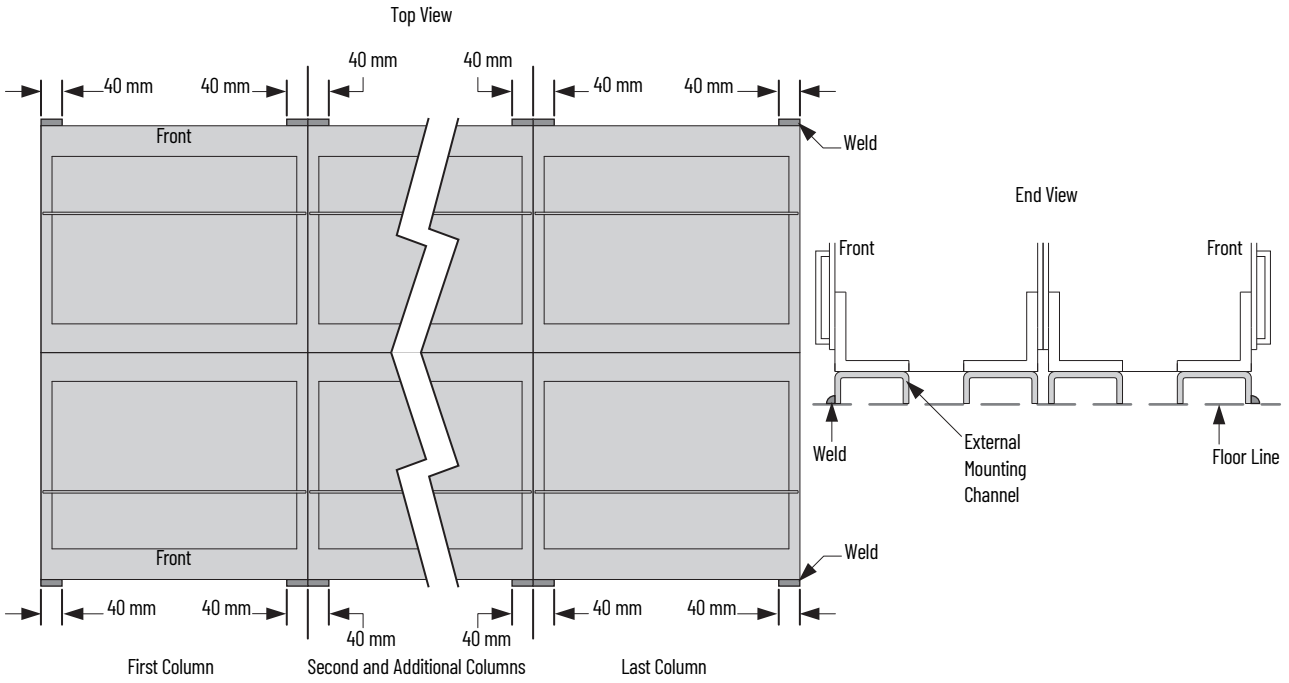
**ATTENTION:** The figure shows which bolts are required for multiple-column shipping blocks. Drawings with specific dimensions are supplied with each multiple-column shipping block.

**Figure 13 - Weld-down Requirements for Various Configurations**

**Single Front Configurations**




**Double Front Configurations**



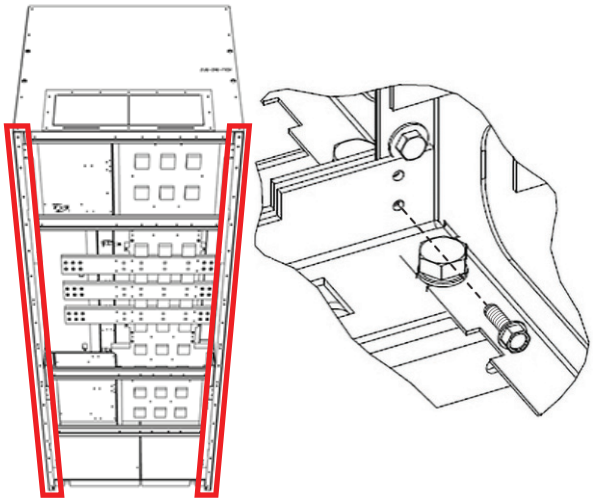
# Join Columns

**ATTENTION:** Join columns is done **after** all columns/shipping blocks have been secured to a foundation.
Do not use the hardware to draw columns together.

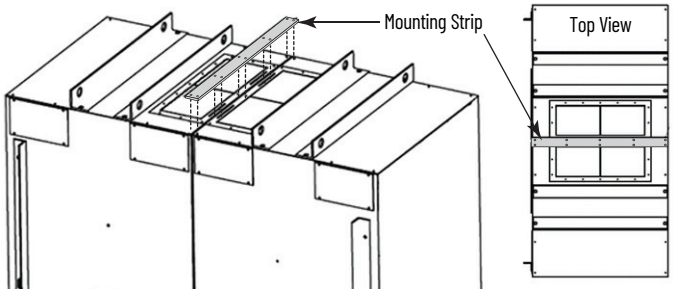
For double front applications, you must first join back-to-back columns before you join the side columns.

## Join Back-to-back Columns in a Double Front Configuration

1. Verify what holes are accessible and aligned between the two back-to-back columns.
2. Starting with the leftmost column, use the M6 hex head cap screws that you saved from removing the backplates to fasten the corresponding back-to-back columns to each other.



3. Torque all M6 hex head cap screws to 5.6 N•m (50 lb•in.).
4. After all back-to-back columns are fastened to each other, install the provided mounting strip and M5 taptite screws on the top of each joined column set.

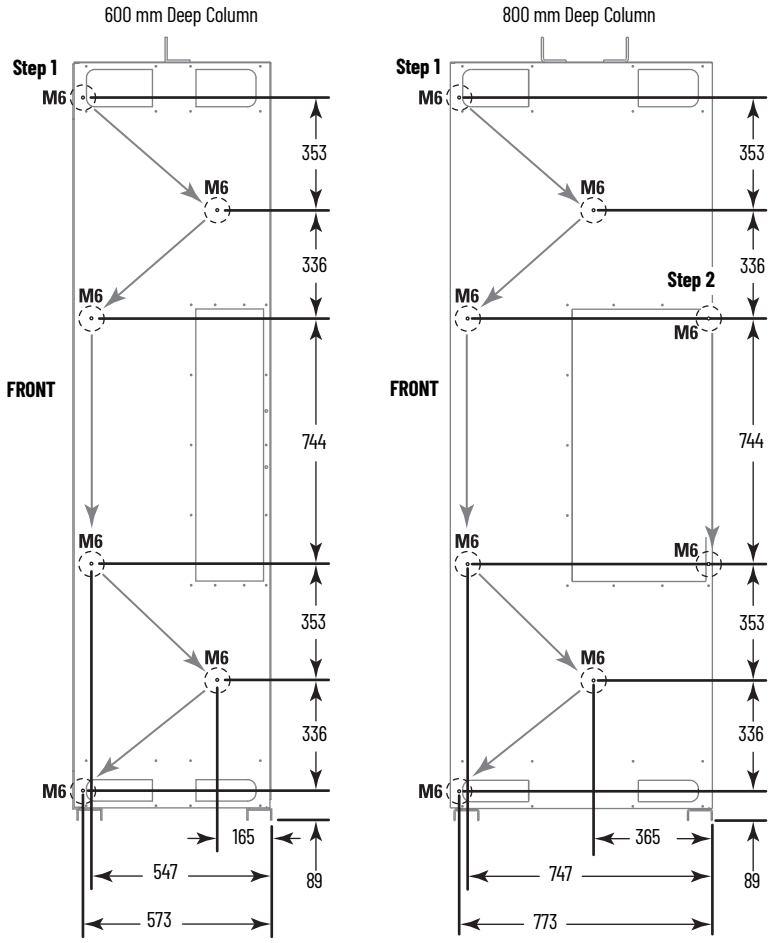



5. Torque the M5 taptite screws to 3.6 N•m (32 lb•in.).
6. After each back-to-back column has been joined, inspect and clean them before closing. For the recommended procedures, see step 20 on page 82.

## Join Side Columns in Single Front and Double Front Applications

1. Starting with the first column, use M6 x 1.0 hardware that is provided in the power bus splice kit to fasten the six joining holes together (step 1 in the figure).
2. **800 mm deep columns:** use a M6 hex head bolt, washer, and nut that is provided in the power splice kit to fasten the two joining holes together (step 2 in the figure).

Dimensions are in mm.




3. Torque all fastened bolts to 5.6 N•m.
4. After side columns have been joined, inspect and clean them before closing. For the recommended procedures, see step 20 on page 82.

## Seismic Capabilities

Actual CENTERLINE 2500 MCC units have been seismically qualified by dynamic (triaxial multi-frequency testing) seismic tests by using ICC–ES AC156[(a)] acceptance criterion that covers general equipment and supports the seismic certification of electrical systems such as Motor Control Centers (MCCs). The testing was conducted in accordance with ICC–ES AC156 criteria and supports data for the following qualification requirements:

- 2006 and 2009 International Building Code, International Code Council
- 1997 Uniform Building Code, Structural Engineering Design Provisions, Zone 4
- ASCE Standards SEI/ASCE 7-05 and SEI/ASCE 7-10, Minimum Design Loads for Buildings and Other Structures

The ICC–ES AC156 parameters for an $S_{DS}$ level of 1.63 g at the roof level or below is in the following table.

| Test Criteria | $S_{DS}$ (1) (g) | z/h (1) | Horizontal | | | Vertical | | | Rp/Ip |
|---|---|---|---|---|---|---|---|---|---|
| | | | AFLEX (1) | ARIG(1) | AFLEX/ARIG | AFLEX (1) | ARIG(1) | AFLEX/ARIG | |
| ICC-ES-AC156 | 1.63 | 1.0 | 2.608 | 1.956 | 1.33 | 1.092 | 0.440 | 2.48 | 1.0 |

(1) Equipment is qualified for $S_{DS}$ and z/h values shown. Qualifications can be valid for higher $S_{DS}$ where z/h is less than 1.0.

CENTERLINE 2500 MCC units demonstrated compliance with the following:

- 100% g level of Uniform Building Code 1997 (UBC) Zone 4 (the maximum UBC Zone)
- 100% g level of the International Building Code 2009 (IBC), (SEI/ASCE: $S_{DS} \geq 1.5$ g @ 5 Hz and $S_{D1} \geq 2$ g @ 1 Hz) when subjected to a UBC Zone 4 earthquake or the IBC seismic event

Throughout the seismic testing, the MCC units were under power and operated before, during, and after the seismic tests.

To obtain an IBC or UBC seismic withstandability, each individual CENTERLINE 2500 MCC lineup (including any in double-front applications) must be mounted on an adequate seismic foundation. Installation must be conducted per the anchoring requirements as indicated in this instruction manual. All columns in the MCC lineup must also be bolted together per instructions in Join Columns on page 34.

In the CENTERLINE 2500 MCC lineup, mounting channels are incorporated in the standard design. As an alternative to bolt down anchoring, these mounting channels can be welded to an adequate seismic foundation. For seismic weld down applications, see Figure 12 on page 32.

## Splice the Power Bus

**ATTENTION:** To help prevent severe injury or death, de-energize all power sources to the MCC before you join and splice columns. Follow EN 50110 requirements, and local codes and guidelines.

**IMPORTANT** When you splice the horizontal power bus, always begin by splicing from the lowest phase busbar and work from the bottom up.

(a) *Acceptance Criteria for Seismic Certification by Shake-Table of Non-structural components (AC156)*, International Code of Council Evaluation Service (ICC-ES), October 2010.

| IMPORTANT | **NO-OX-ID Use**– Do not get any busbar corrosion inhibitor on the bus splicing hardware. It keeps the hardware from being properly torqued and damage can occur. |
|---|---|

Power bus consists of the main horizontal bus and neutral bus (if present). Based on the current rating of the power bus, the splice kit contains the appropriate splice bars and corresponding hardware. The following procedures describe methods for splicing power buses that are based on the ampere rating of the busbars.

For additional splicing information related to specific MCCs, see the elevation drawing that is shipped with the MCC in the documentation package.

If necessary, remove units and unit support pans for the appropriate access to splice the power bus.

## Access the Power Bus

How to access the power bus depends on the column type. Follow the procedures that are specific to your MCC columns.

*For Columns with Main Units (see Figure 14, and Figure 15 on page 38)*

1. Open the main unit door.
2. Depending on your unit, there are one or two splice covers with handles to the side of the main, as shown in Figure 14 and Figure 15.
3. Remove the four M6 screws that secure each splice cover (step 1 in Figure 14, or steps 1 and 2 in Figure 15).
4. For one splice cover, follow the removal sequence in Figure 14.
   For two splice covers, follow the removal sequence in Figure 15.
5. Reinstall all M6 screws.

The power busbars are now accessible.

**Figure 14 - Remove Splice Cover on Main Unit (Frames 1 and 2) With Two Splice Covers**

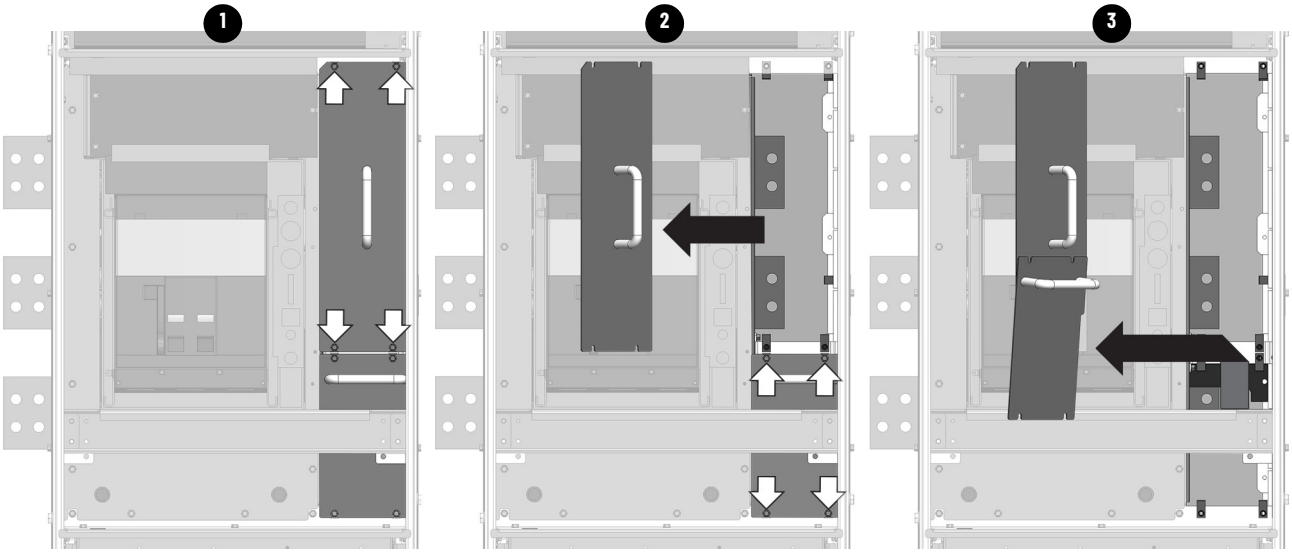
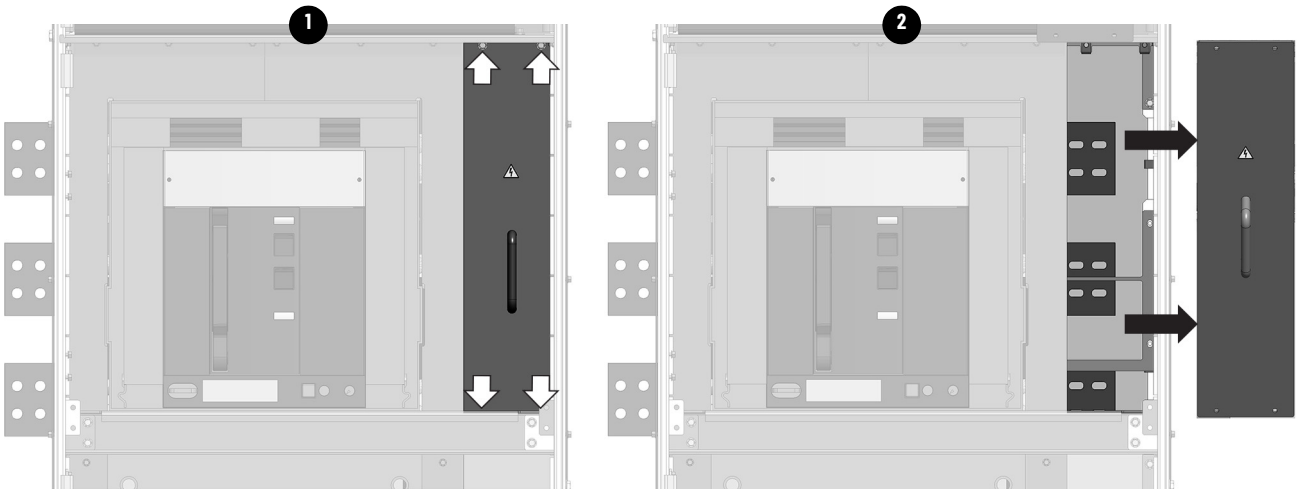


Figure 15 - Remove Splice Covers on Main Unit (Frame 4) With One Splice Cover




*For Withdrawable Unit Columns with Vertical Wireways (see Figure 16 on page 39)*

1. Open the vertical wireway door.
2. Locate and loosen the four M6 screws that secure the secondary splice cover, as shown in step 1 of Figure 16.
3. Slide the secondary splice cover so the four loosened screws align with the entry hole of each keyhole slot, as shown in step 2 of Figure 16.
4. Remove the secondary splice cover.
5. Locate the M6 screws for the primary splice cover, as shown in step 3 of Figure 16.

   For vertical wireways up to 300 mm wide, there are only two screws with keyhole slots that secure the primary splice cover.

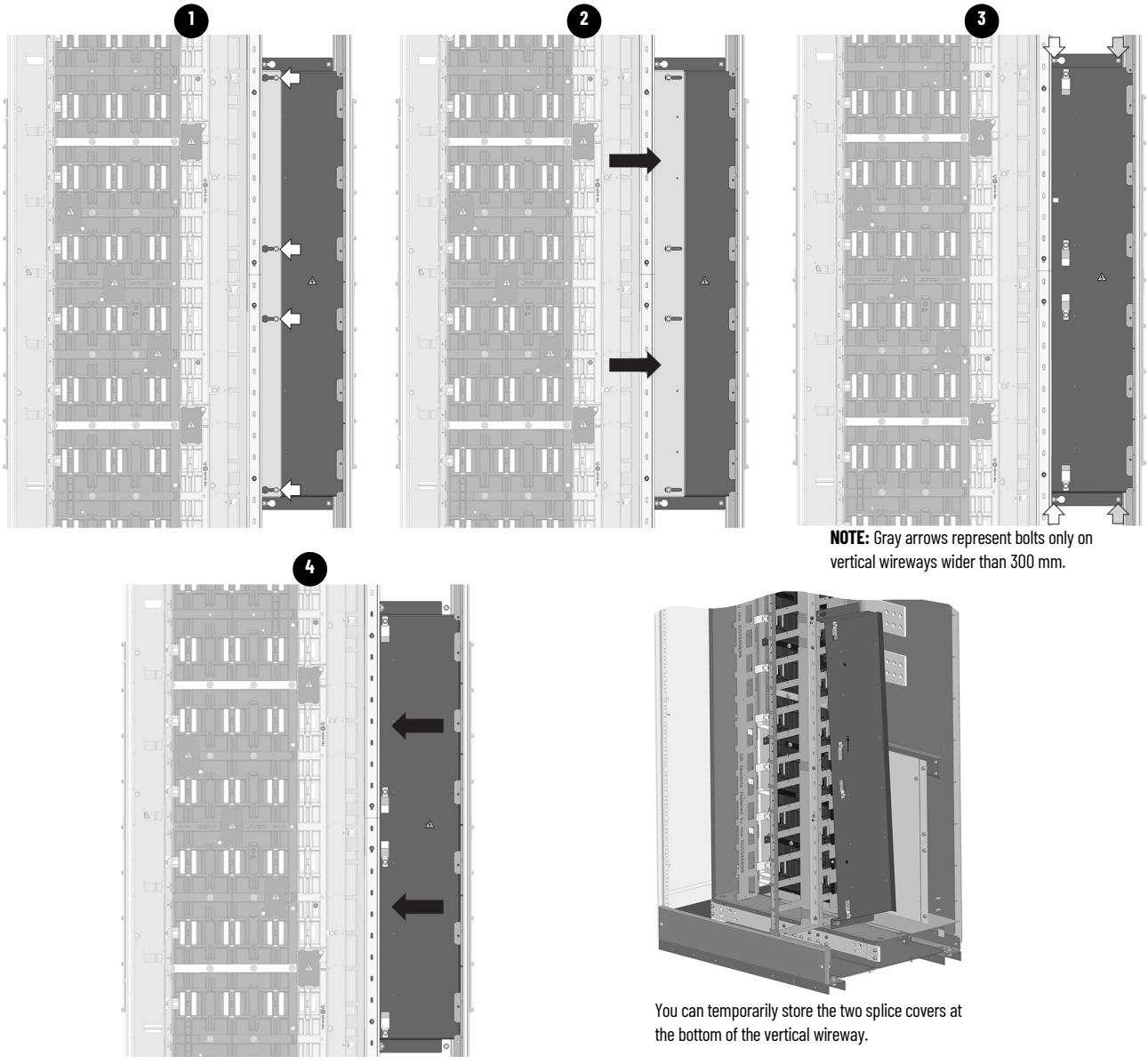
   For vertical wireways wider than 300 mm, there are four screws that secure the primary splice cover. The two additional screws must be removed before you can remove the primary splice cover.
6. Slide the primary splice cover so the two loosened screws align with the entry hole of each keyhole slot, as shown in step 4 of Figure 16.
7. Remove the primary splice cover.

8. Reinstall any removed screws for the primary splice cover.

   You can temporarily store the two splice covers in the bottom of the vertical wireway, as shown in Figure 16.

The power busbars are now accessible.

**Figure 16 - Remove Splice Covers on Withdrawable Units With Air Circuit Breaker (ACB) and Vertical Wireways**




**NOTE:** Gray arrows represent bolts only on vertical wireways wider than 300 mm.

You can temporarily store the two splice covers at the bottom of the vertical wireway.

*For Withdrawable Unit Columns with Type 4b Vertical Wireways (see Figure 17 on page 40)*

1. Open the vertical wireway door.
2. Locate and loosen the three M6 screws that secure the top splice cover, as shown in step 1 of Figure 17.
3. Remove the top splice cover.

   You can temporarily store the top splice cover in the top of the vertical wireway, as shown in step 2 of Figure 17.
4. Locate the three M6 screws for the bottom splice cover, as shown in step 3 of Figure 17.

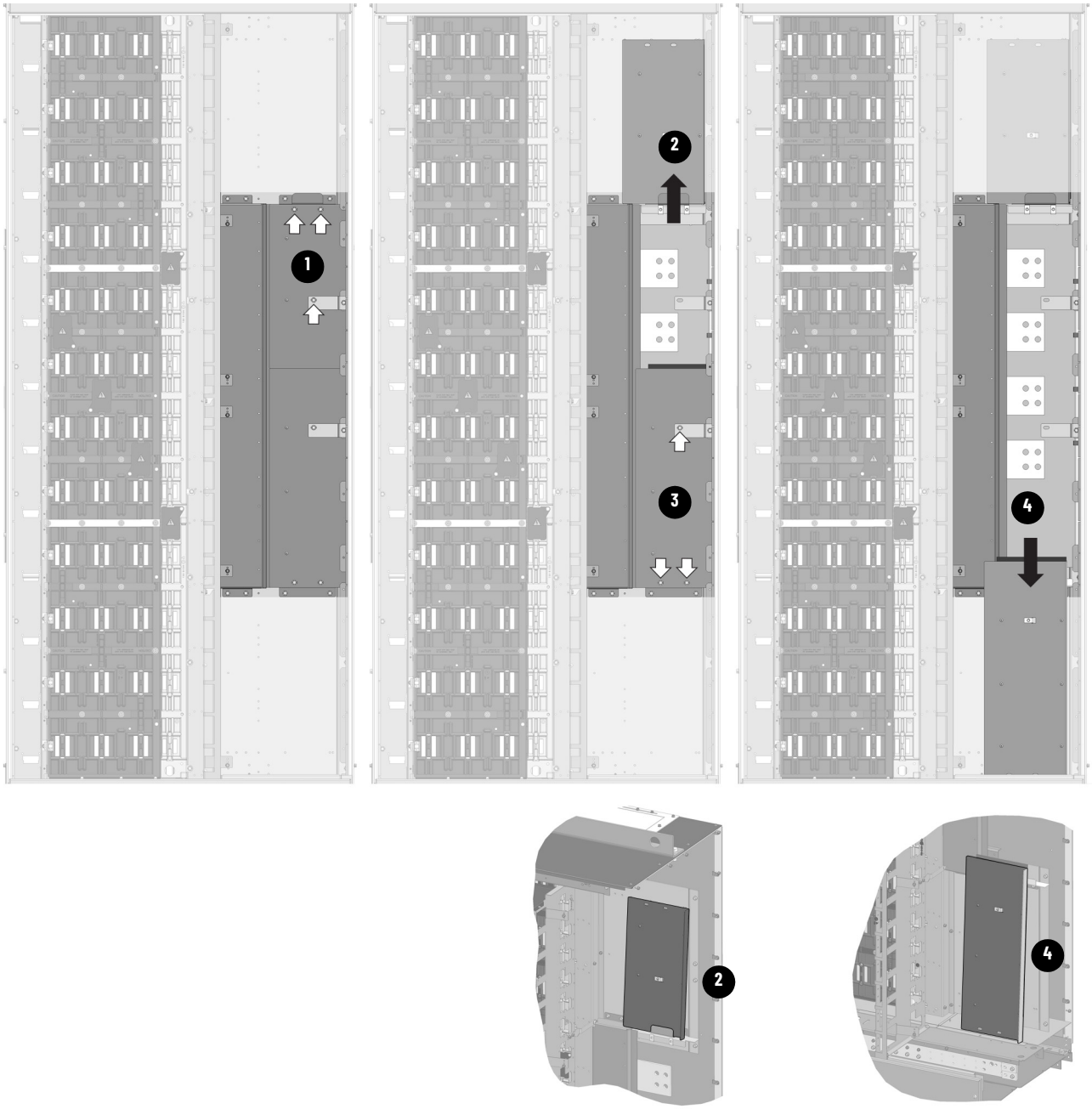
5. Remove the bottom splice cover.

   You can temporarily store the bottom splice cover in the bottom of the vertical wireway, as shown in step 4 of Figure 17.

6. Reinstall any removed screws for the two splice covers.

The power busbars are now accessible.

**Figure 17 - Remove Splice Covers on Withdrawable Units With Type 4b Vertical Wireways**



## Splicing The Power Bus

Follow these procedures to splice the power bus.

1. Open the bus splice kit that you removed from the MCC as instructed in Locate Bus Splice Kits on page 23.

   The bus splice kit contains the following hardware.

   **Table 7 - Splice Kit Hardware for IP20, IP42, and IP54 Enclosures**

| Item Description | Total Quantity |
|---|---|
| M6 x 1 x 12 screw | 6 |
| Self-wrenching bolt | 2 |
| Split lock washer | 2 |
| M6 x 1 x 5.2 hex nut | 2 |
| Flat washer | 4 |
| Vinyl trim edge, fits 0.5 mm (0.188 in.) | 1.5 m (5 ft.) |
| Silicon adhesive sealant(1) | 1 |

   (1) Supplied with only IP54 splice kits.

2. Assemble splice bars and hardware. Depending on our configuration, see, Figure 18 on page 42 or Figure 20 on page 44.

   Repeat for each phase of busbar and, if present, the neutral bar.

3. Tighten hardware to torque specifications.

   See Torque Requirements for Hardware Connections on page 48.

   **IMPORTANT** Do not grease or lubricate hardware.

4. Reinstall the splice covers and check that the bolts and nuts are secure.
5. Reinstall the units and unit support pans in their respective stations if they were removed.

**Figure 18 - Power Bus Splicing Configurations With Straight Splice Bars**

**IMPORTANT** Only for units with air circuit breaker (ACB). For other units, see page 46.

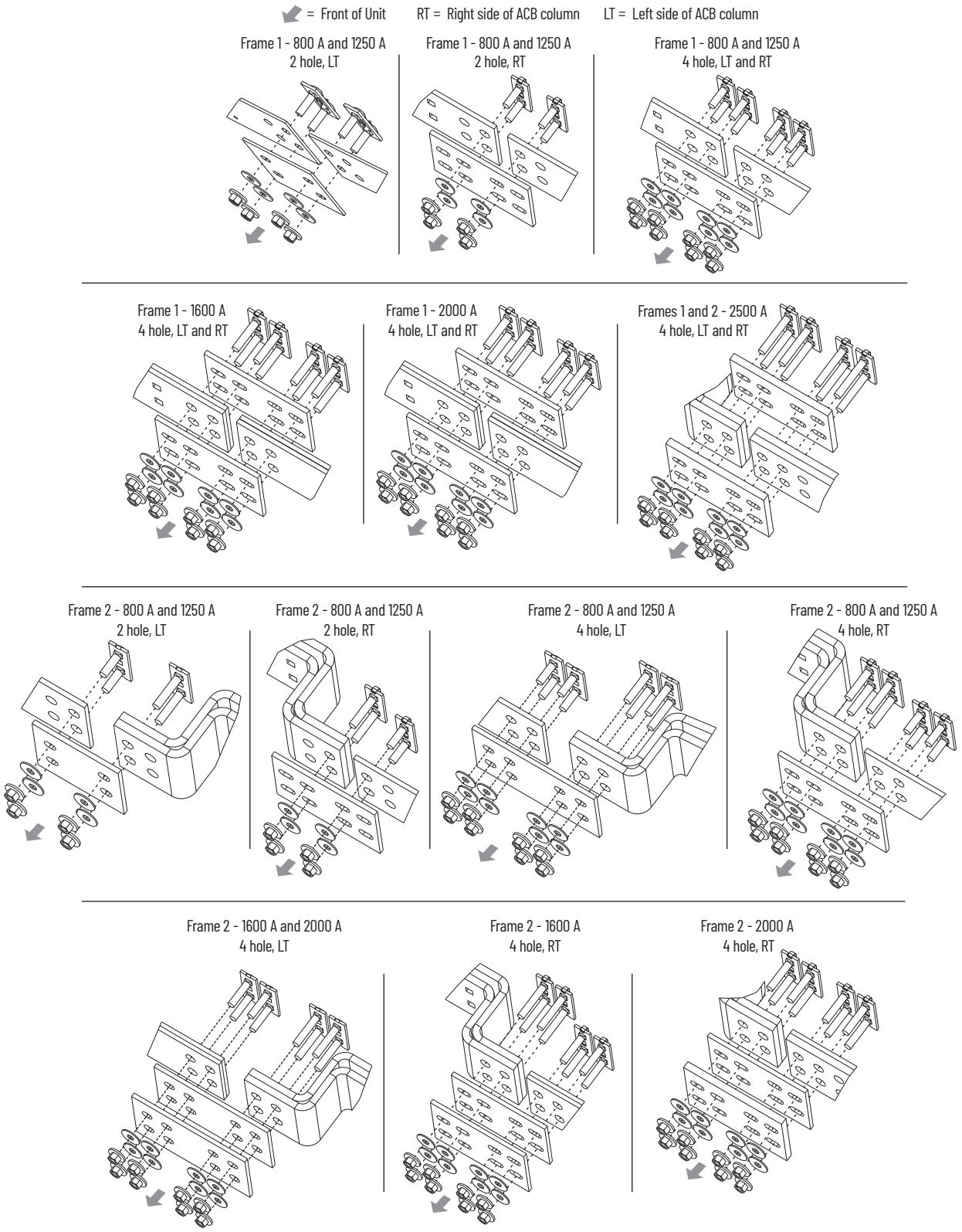


**Figure 19 - Power Bus Splicing Configurations With Straight Splice Bars (continued)**

**IMPORTANT** Only for units with ACB. For other units, see page 46.

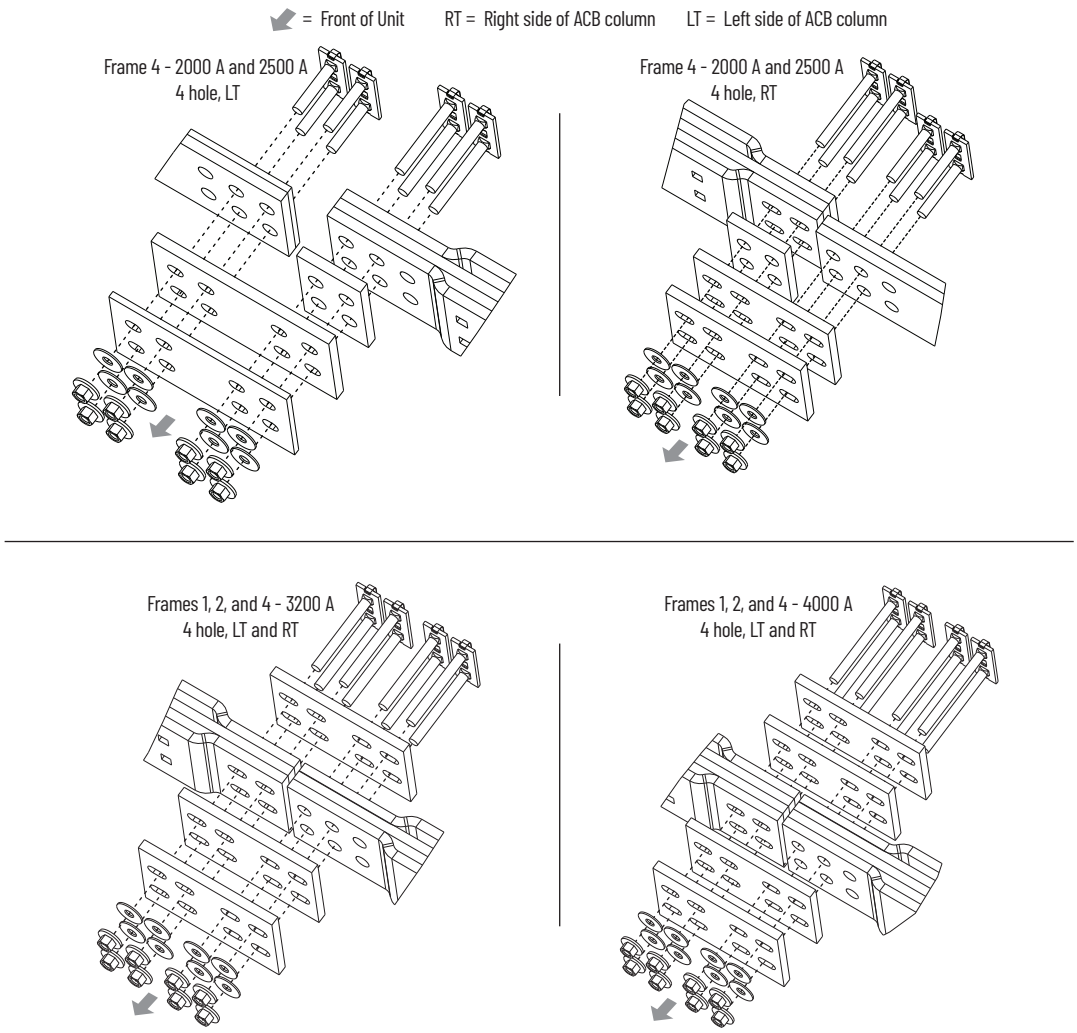


**Figure 20 - Power Bus Splicing Configurations With Z-splice Bars**

**IMPORTANT** Only for units with ACB. For other units, see page 46.
Crow foot wrenches are recommended to assemble these splice bars.

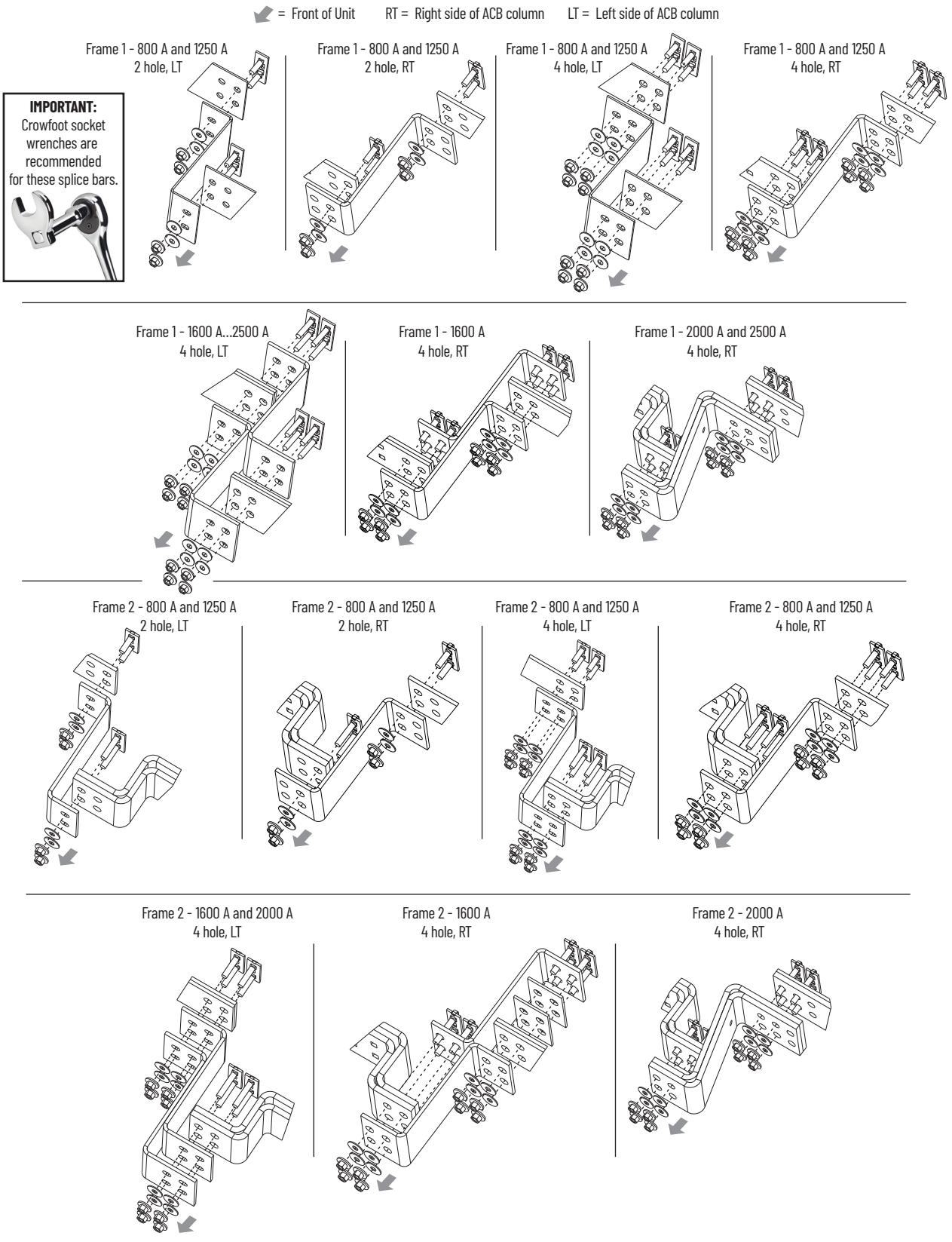


**Figure 21 - Power Bus Splicing Configurations With Z-splice Bars (continued)**

**IMPORTANT** Only for units with ACB. For other units, see page 46.
Crow foot wrenches are recommended to assemble these splice bars.

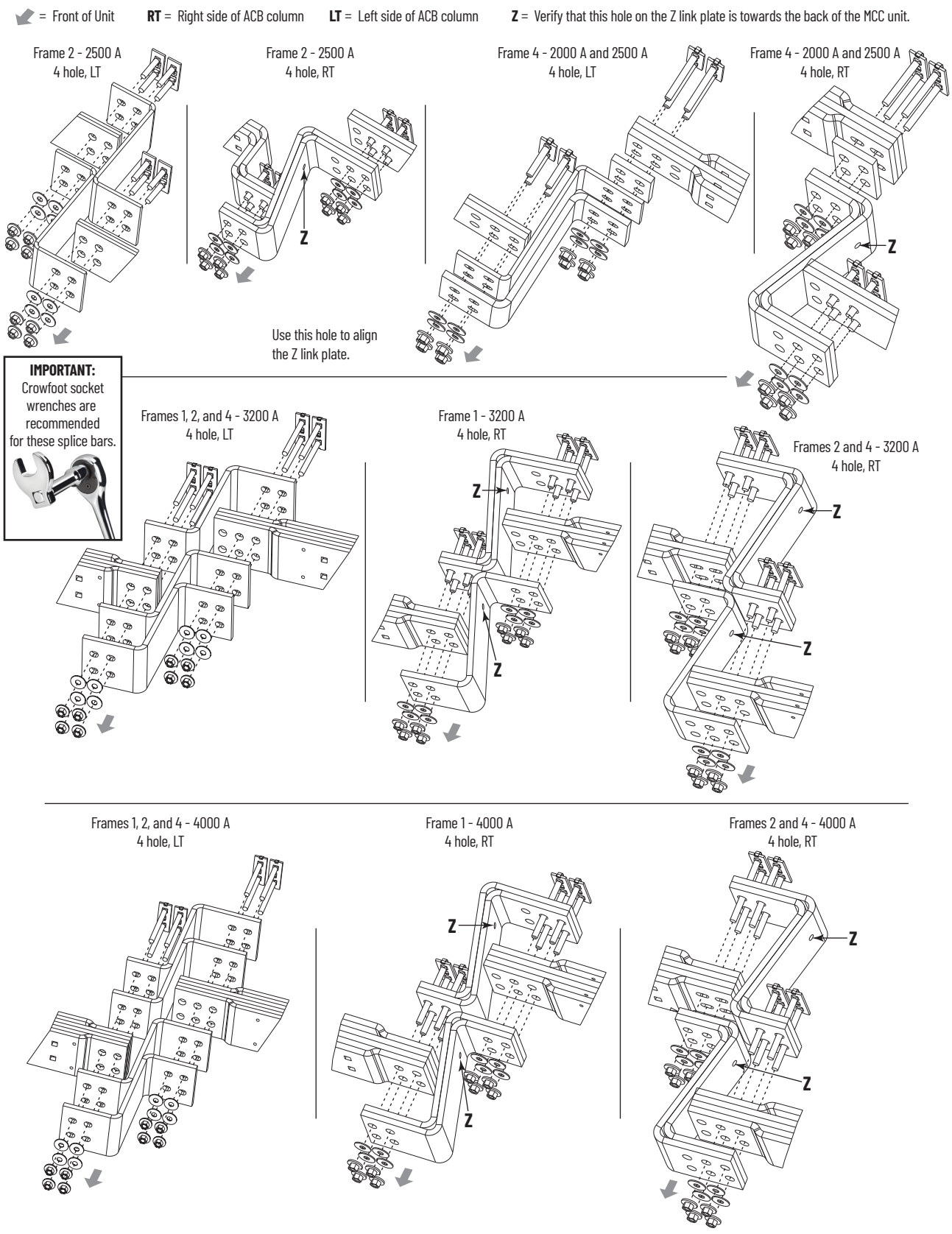
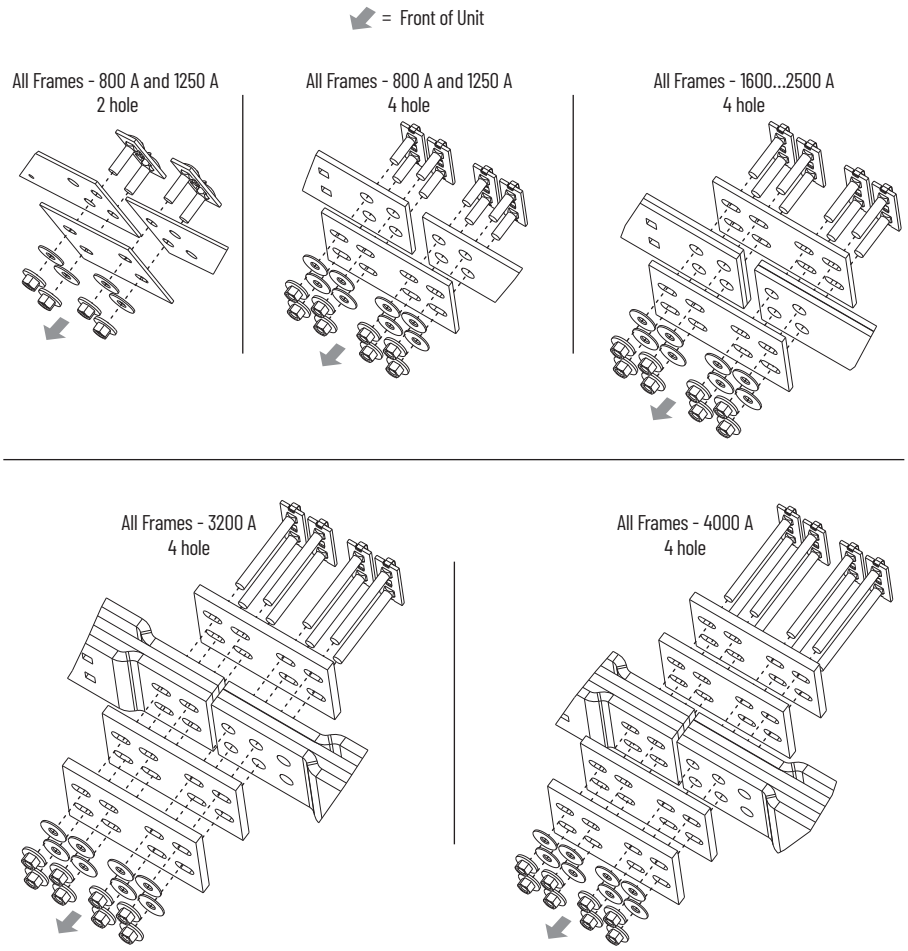


**Figure 22 - Power Bus Splicing Configurations With Straight Splice Bars**

**IMPORTANT** Not for units with ACB. For those units, see page 42.



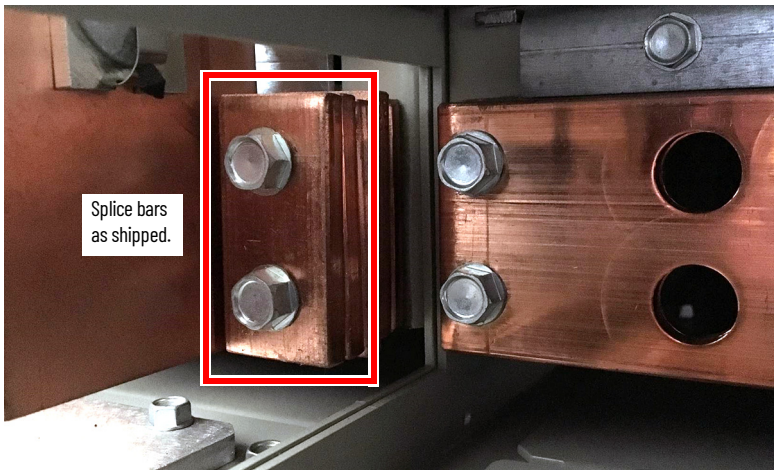

## Splice the Protective Earth (PE) Conductor

The PE conductor is in the bottom horizontal wireway of an MCC column. Up to four PE conductors can be present. To access the PE conductor, remove the bottom horizontal wireway cover.

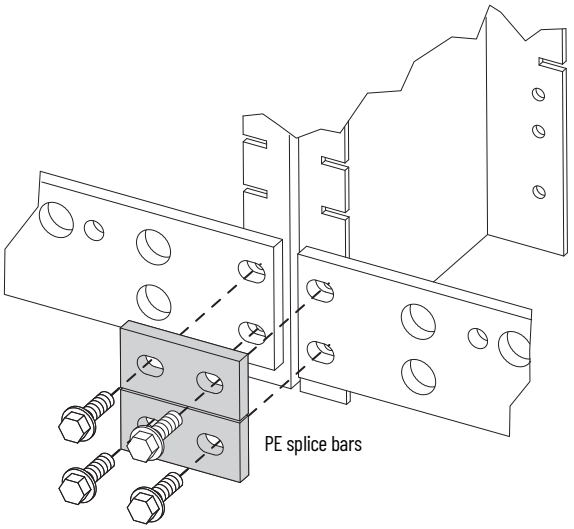
Follow these procedures to splice the Protective Earth Conductor.

1. Locate the PE splice bars.

PE splice bars are secured to the end of the horizontal PE during shipping.




2. Use the PE splice bars to join the horizontal PE of each column and assemble the splice bars and hardware as shown.




3. Tighten hardware to torque specifications. See Torque Specifications on page 48.

**IMPORTANT** Do not grease or lubricate hardware.

4. Reinstall the horizontal wireway cover and check that the bolts are secure.

## Control and Network Cables

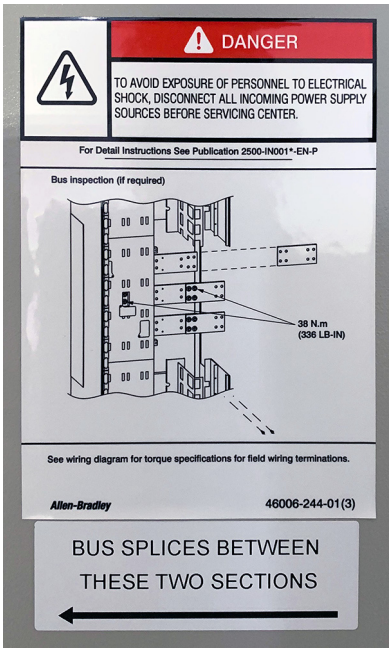
After you finish joining and splicing columns, make sure to connect network and other control cables as necessary.

See Appendix B on page 105 for the cable entry and exit points of various unit configurations.

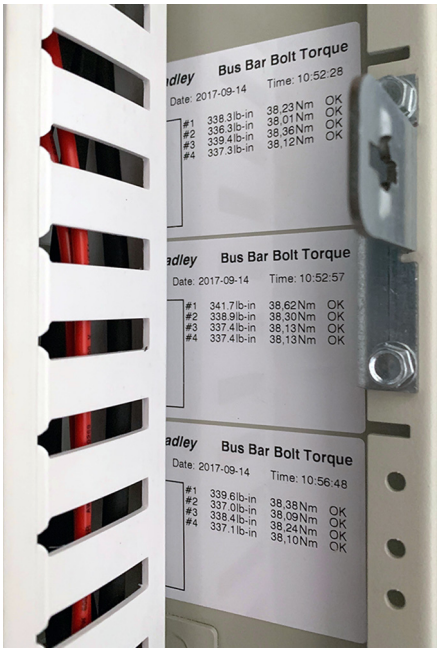
See Chapter 9 on page 89 for IntelliCENTER® options.

# Torque Specifications

Tighten bus splice connections with a torque wrench according to the table. Torque values can be found on the information label inside a vertical wireway door or on the interior right side plate of fixed units.




Example of an information label inside a vertical wireway door.




Example of an information label on the interior right side plate of a fixed unit.

| Hardware Description | Hardware Size | Torque |
|---|---|---|
| Incoming line lug attachment bolts | M12 x 1.75 | 61 N•m |
| Horizontal power bus to vertical distribution bus connection(1) | M10 x 1.5 | 38 N•m |
| Horizontal power bus splice connection | M10 x 1.5 | 38 N•m |
| Protective earth conductor (PE) splice connection | M6 x 1.0 | 7.3 N•m |
| Column joining hardware | M6 x 1.0 | 6.2 N•m |
| DeviceNet splice cable screws | – | 0.55 N•m |
| I/O terminal blocks | – | 0.45 N•m |

(1) The factory-made power bus connections are tightened by a computer-controlled torquing system. The following connections do not need to be retorqued:
- Vertical to horizontal bus connections
- Power conductor to horizontal bus connections

These factory-made connections do not require servicing for the life of the MCC.

# Install Cable

When you install cable, verify that it is installed according to appropriate codes and standards. Multi-conductor cables, cable trays, cable ducts, and conduit are all acceptable methods of routing cable to your MCC.

| | |
|---|---|
| **IMPORTANT** | All installed cable is installed must be compatible with the enclosure rating of the MCC. Cable entry and exit points must be properly sealed so water and moisture cannot enter or accumulate inside the enclosure. |

Inside the MCC enclosure, route cable away from the PE conductor to avoid damage. Position cable so bends are minimized and relative vertical alignment to incoming connections is maintained. Final cable connections must not place any additional strain on the termination blocks.

See the documentation package shipped with your MCC for the following information:

- Approximate cable entry locations
- Space availability for incoming cables
- PE conductor locations
- Wiring schemes for main fusible disconnects, main circuit breakers, and incoming line compartments

Install cable per supplied instructions. Size cable to appropriate codes and standards.

## Install ArcShield Protection After Wiring

You can temporarily remove ArcShield™ latch brackets to maker it easier to connect load cables.

Consider removing a unit if you cannot access the screw on the left side of the bracket.

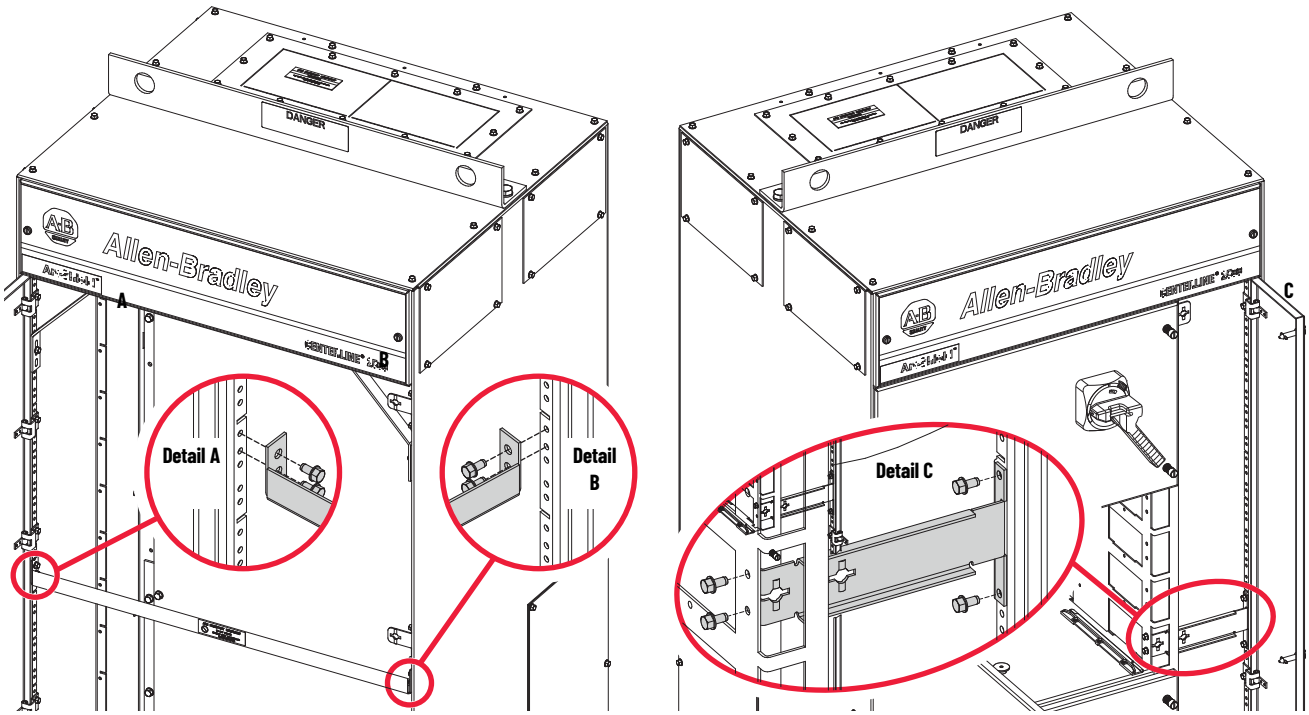
Follow these procedures to install the door latch bracket/frame stiffener in the wireway.

1. Open the door.
2. Install door latch bracket and frame stiffener bracket (if latter was removed).

   Verify that the latch bracket is in the correct orientation before you install it. See Detail C in the following figure.
3. Torque all bracket screws to 3.6 N•m (32 lb•in).

Frame Stiffener Bracket

Wireway Latch Bracket




## Lugs

| | |
|---|---|
| **IMPORTANT** | Install lugs so proper spacing is used between phases. Hardware must be tightened per the torque specifications. For more information, see Torque Specifications on page 48. |

Verify that the compatibility of wire size, type, and stranding for the power lugs is furnished. Use correct lugs in all applications. Crimp compression lugs with manufacturer recommended tools.

| | |
|---|---|
| **IMPORTANT** | Use the MCC electrical schematics and wiring diagrams to verify field wiring connection points.<br>The minimum cable size for customer wiring is 2.5 $mm^2$ (14 AWG). |

## Incoming Line Lug Compartment

Top or bottom incoming line lug compartments are available. Base the lug selection on the size, number, and type of conductor.

The following guidelines to select lugs are based on incoming line available short circuit current, $I_{sc}$.

$I_{sc} \leq$ 50,000 amperes RMS symmetrical use **mechanical screw** or **crimp/compression** type lugs.

$I_{sc}$ > 50,000 amperes RMS symmetrical **crimp/compression** type lugs are recommended.

## Main Disconnecting Means

For information on incoming termination, see the documentation package that is shipped with your MCC.

For main disconnects or circuit breakers, use the lugs provided.

## Cable Bracing

The CENTERLINE® 2500 MCC bus work system has been tested and is qualified to withstand forces that exceed the short circuit withstand ratings for the MCC. Incoming line cables and outgoing feeder cables must be supported to withstand the same short circuit forces. Follow appropriate codes and standards when bracing incoming and outgoing cables.

There are many sizes and types of cables, and different means by which the cables can be supported. Cabling must be secured or braced for the weight of the cable and if there is a fault.

| | |
|---|---|
| **IMPORTANT** | Position cable so bends are minimized and relative vertical alignment to incoming connections is maintained. Final cable connections must not place any additional strain on the termination blocks. |

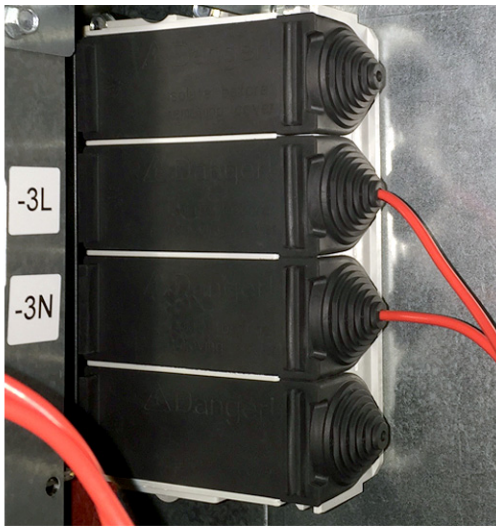
Follow the guidelines addressed in IEC Standard 60364-5-52.

## Secure Load Wires

Standard internal separation within the MCC is IEC 61439-2 Form 3b. The following IEC 61439-2 separation forms are also available as options.

- Form 4b Type 5: Terminals for external conductors are enclosed in a metal or plastic frame within the vertical wireway. Terminals are separated by insulated coverings.
- Form 4b Type 7: Terminals for external conductors are enclosed in metallic partitions. The termination for each functional unit has its own integral glanding facility.


Form 3b




Form 4b Type 5


Form 4b Type 7

Support each wire as you install it so a strong connection is made. Do not overtighten the screws to fasten the wires. Torque the screws to the values in Table 9.

**Table 9 - Torque Values for Separation Forms**

| Cap Screw Size | N•m (Lb•in) | |
|---|---|---|
| | Target Torque | Acceptable Torque Range |
| M6 x 16 hex head socket | 3.6 (32) | 2.7...4 (24...35) |
| M8 x 20 hex head | 5.6 (50) | 4.2...7 (38...63) |

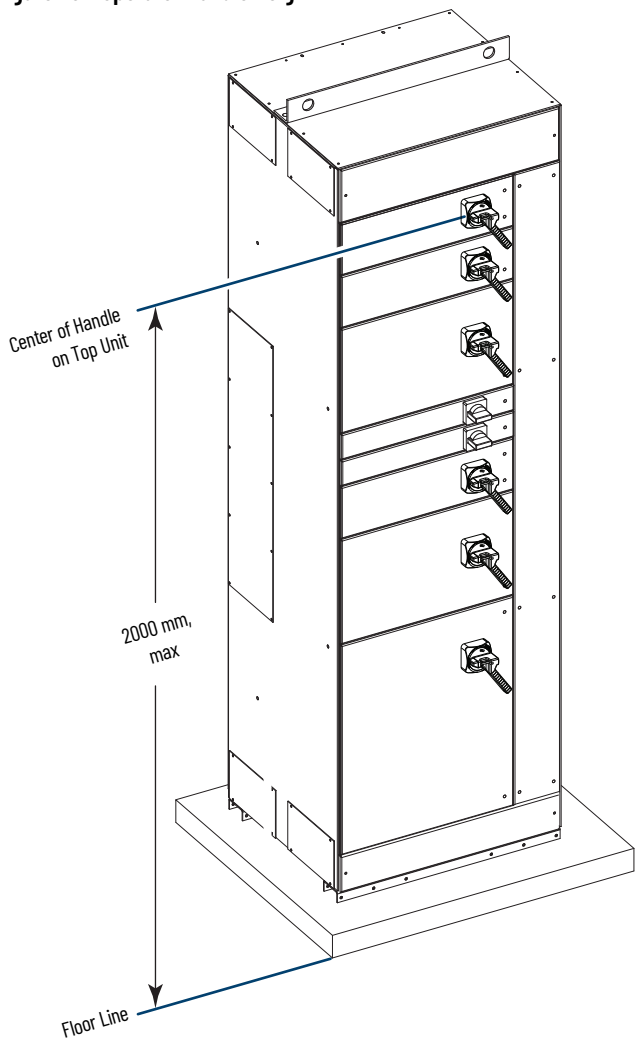
**IMPORTANT** You can strip the holes if you over-torque the screws.

# Door Latches, Operator Handles, and Unit Interlocks

## Height Considerations

In accordance with EN 61439-1, operating devices (push buttons and handles) must be no more than 2000 mm above floor level. If the MCC is mounted on an elevated surface, the height from the floor to the center of the top handles must be checked for compliance.

**Figure 23 - Operator Handle Height**

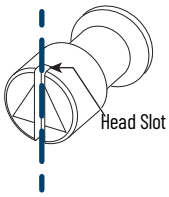


# Door Latches

There are two types of door latches available for the CENTERLINE® 2500 MCC: quarter-turn door latches and ArcShield™ door latches.

## Quarter-turn Door Latches

Latches are provided on each unit door to hold the door closed and isolate the column. You can rotate the door latches by using a standard slotted screwdriver in the head slot.



Latch shown in vertical (closed) position.

Open the door latches as follows.

1. Rotate each door latch a quarter turn (90°) until its head slot is horizontal.
2. Open the door once all latches are in the open position.

Close and lock the door latches as follows.

1. Close the door.
2. Use a slotted screwdriver to rotate each door latch a quarter turn (90°) until all slots are vertical.

## ArcShield Door Latches

The sleeved ArcShield door latches are specialized spring-loaded latches. They are designed to manage the pressure generated during an arc blast.

Follow the same procedures in the Quarter-turn Door Latches to open or close a door with ArcShield door latches.

| | |
|---|---|
| **IMPORTANT** | ArcShield door latches are spring-loaded. When you close a door, push in each latch as you turn it so it locks correctly for ArcShield protection. |

# Rotary-operator Handles

Rotary-operator handles are available in three sizes for CENTERLINE 2500 MCCs. Because of their design and functionality, each size can require different instructions to modify or to lock in different positions.

The following table details the different rotary-operator handle sizes.

**Table 10 -**

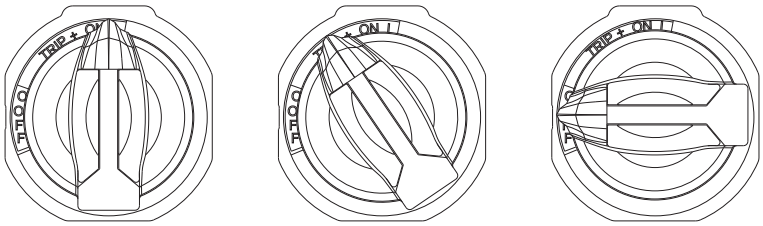
| Handle Size[1] | Cat. No. | Color |
|---|---|---|
| Small  | • 140M-SB<br>• 140M-SY | • Black<br>• Red/yellow |
| Medium  | • 140U-PB<br>• 140U-PY | • Black<br>• Red/yellow |
| Large  | • 140U-HM4<br>• 140U-HM4E | • Black<br>• Red/yellow |

(1) Handle pictures are not to scale.

## Small Rotary-operator Handles (Cat. Nos. 140M-SB and 140M-SY)

The following is a brief summary of operating instructions for small rotary-operator handles. For additional information, see publication 140M-IN022.

**Figure 24 - Small Rotary-operator Handle Positions**




Handle in ON/I Position | Handle in TRIP/+ Position | Handle in OFF/O Position

### *Open the Unit Door*

1. Turn the small rotary-operator handle to the OFF/O position.
2. Release the door latches.
3. Grasp the small rotary-operator handle and pull the unit door toward you to open.

### *Close the Unit Door*

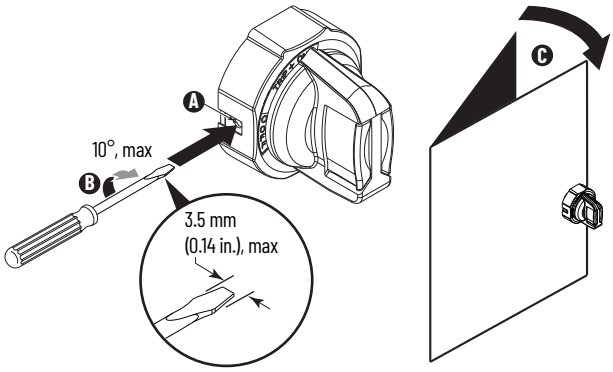
1. Verify that the small rotary-operator handle is in the OFF/O position.
2. Close the unit door.
3. Secure the door latches.

### *Open the Unit Door in the ON/I Position*

**ATTENTION:** Follow local codes and guidelines with requirements of EN 50110 when you work on energized equipment.

When the unit door is closed and the small rotary-operator handle is in the ON/I or TRIP/+ position, a defeater screw must be deliberately operated to open the unit door.

1. Release the door latches.
2. Locate the defeater screw on the side of the small rotary-operator handle near the OFF/O position (A).
3. Use a screwdriver to turn the defeater screw 10° (max) clockwise (B).




4. Carefully open the unit door (C).

### *Operator Handles for Circuit Breakers*

If there is a circuit breaker fault, the circuit breaker operator handle moves to the TRIP/+ position. Only reset the circuit breaker after the cause of the fault has been determined and corrected.

Follow these procedures to reset the circuit breaker.

1. Turn the small rotary-operator handle to the OFF/O position.
2. After the fault has been corrected, verify that it is safe to re-energize the unit and turn the small rotary-operator handle to the ON/I position.

### *Lock Units in the OFF/O Position*

**ATTENTION:** Follow all company safety and lockout procedures, and local codes when you perform this procedure.

Follow these procedures to lock a unit in the OFF/O position.


1. Turn the small rotary-operator handle to the OFF/O position.
2. Push and hold the middle section of the operator handle.

   The lock opening is now visible.
3. Insert and secure the lock.

   Up to three 8 mm (shackle diameter) locks can be inserted.

### *Lock Units in the ON/I Position*

Locking units in the ON/I position requires user modification.

**ATTENTION:** Locking a small rotary-operator handle in the ON/I position can conflict with local codes and emergency shutdown requirements.

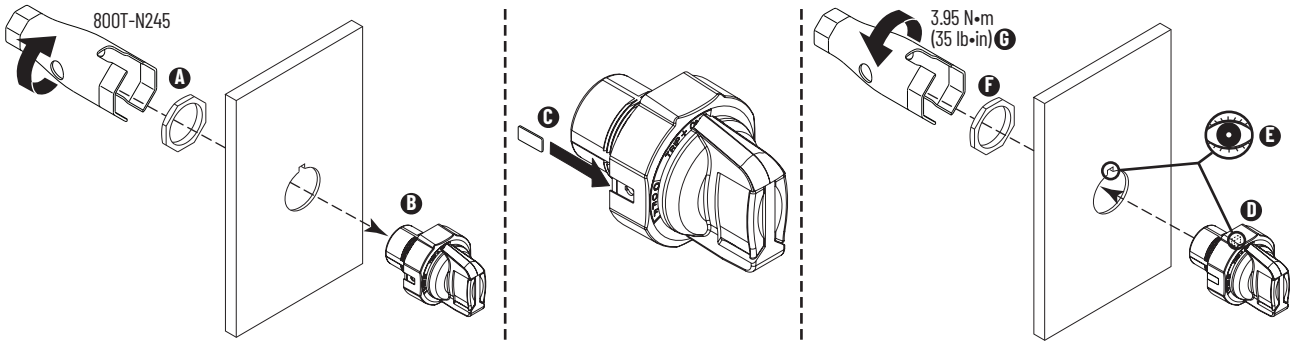
To modify the operator handle so it remains locked in the ON/I position, perform the following steps.

**WARNING:** To help prevent electrical shock, disconnect from the power source before you modify any small rotary-operator handle.

1. Verify that the small rotary-operator handle to be modified is in the ON/I position.
2. Release the door latches.
3. Open the door to access the locking nut that secures the small rotary-operator handle to the door.
4. With the appropriate tool, remove the locking nut from the small rotary-operator handle body (A in Figure 25 on page 58).
5. Remove the small rotary-operator handle from the door (B).
6. Slide the provided defeater plug into the slot to prohibit access to the defeater screw (C).
7. Reinstall the small rotary-operator handle into the door (D).

   For proper installation, align the notch on the back of the small rotary-operator handle with the corresponding slot in the door (E).
8. With the appropriate tool, reinstall the locking nut on the small rotary-operator handle (F).
9. Torque the locking nut to 3.95 N•m (G).
10. Close the door.
11. Secure the door latches.

**Figure 25 - Lock Small Rotary-operator Handles in the ON/I Position**




## Medium Rotary-operator Handles (Cat. Nos. 140U-PB and 140U-PY)

The following is a brief summary of operating instructions for medium rotary-operator handles.

*Open the Unit Door*

1. Turn the medium rotary-operator handle to the OFF/O position.
2. Release the door latches.
3. Grasp the medium rotary-operator handle and pull the unit door toward you to open.

*Close the Unit Door*

1. Verify that the medium rotary-operator handle is in the OFF/O position.
2. Close the unit door.
3. Secure the door latches.

*Lock Units in the OFF/O Position*

**ATTENTION:** Follow all company safety and lockout procedures and local codes when you perform this procedure.

Follow these procedures to lock a unit in the OFF/O position.

1. The medium rotary-operator handle must be in the OFF/O position.
2. Push and hold the middle section of the operator handle.

   The lock opening is now visible.
3. Insert and secure a lock.

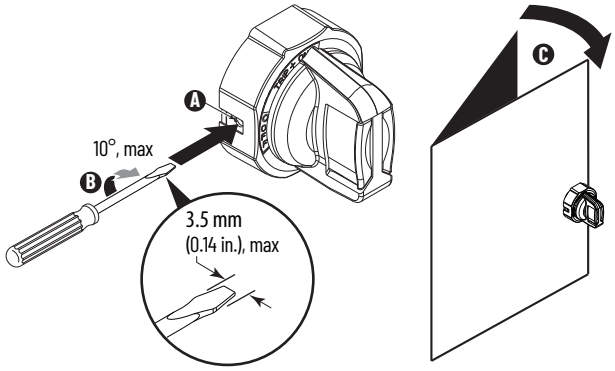
   Up to three 8 mm (shackle diameter) locks can be inserted.

### *Open the Unit Door in the ON/I Position*

**ATTENTION:** Follow local codes and guidelines with requirements of EN 50110 when you work on energized equipment.

When the unit door is closed and the small rotary-operator handle is in the ON/I or TRIP/+ position, a defeater screw must be deliberately operated to open the unit door.

1. Release the door latches.
2. Locate the defeater screw on the side of the small rotary-operator handle near the OFF/O position (A).
3. Use a screwdriver to turn the defeater screw 10° (max) clockwise (B).




4. Carefully open the unit door (C).

### *Lock Units in the ON/I Position*

With medium rotary-operator handles, there are two ways to lock units in the ON/I position. Both ways require user modification.

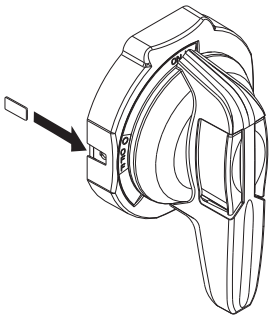
**ATTENTION:** Locking a medium rotary-operator handle in the ON/I position can conflict with local codes and emergency shutdown requirements.

To modify the operator handle so it remains locked in the ON/I position, perform either of the following ways.

**WARNING:** To help prevent electrical shock, disconnect from the power source before you modify any medium rotary-operator handle.

### Lock the Unit in the ON/I Position With a Defeater Plug

1. Verify that the medium rotary-operator handle to be modified is in the ON/I position.
2. Release the door latches.
3. Open the door to access the backside of the medium rotary-operator handle.
4. With a screwdriver, remove the two screws that secure the medium rotary-operator handle body to the door (A in Figure 26 on page 61).
5. Remove the small rotary-operator handle from the door.
6. Slide the provided defeater plug into the defeater screw slot to help prevent access to the defeater screw.

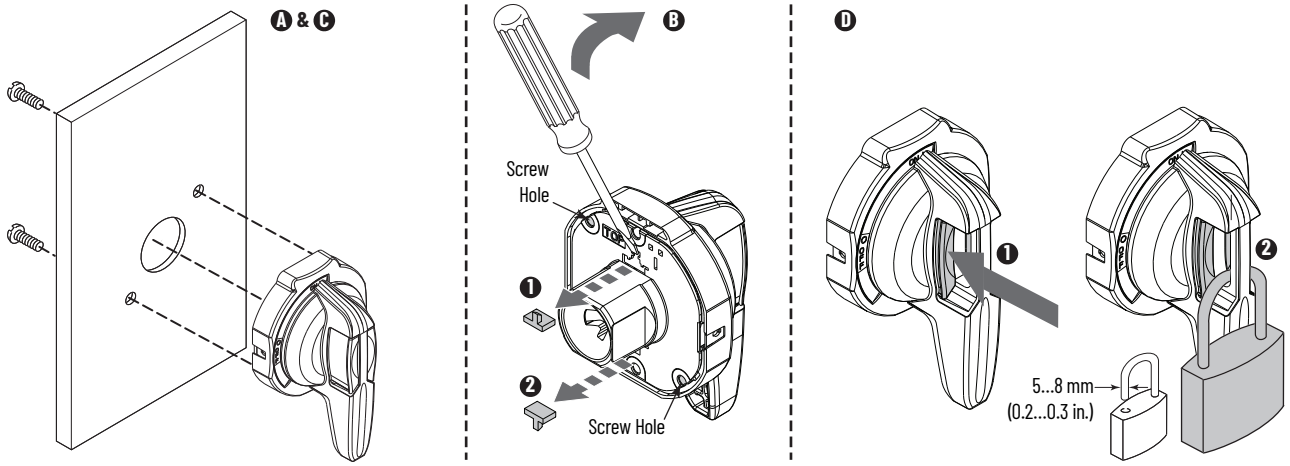


7. With the two screws that you previously removed, reinstall the medium rotary-operator handle into the door (C in Figure 26 on page 61).
8. Close the door.

### Lock the Unit in the ON/I Position With Locks

1. Verify that the medium rotary-operator handle to be modified is in the ON/I position.
2. Release the door latches.
3. Open the door to access the backside of the medium rotary-operator handle.
4. With a screwdriver, remove the two screws that secure the medium rotary-operator handle body to the door (A in Figure 26).
5. Remove the small rotary-operator handle from the door.
6. With the screwdriver, remove the two tabs (B in Figure 26).
7. With the two screws that you previously removed, reinstall the medium rotary-operator handle into the door (C in Figure 26).
8. Close the door.
9. Push and hold the middle section of the operator handle.
   The lock opening is now visible (1 in D of Figure 26).
10. Insert and secure a lock (2 in D of Figure 26).
    Up to three 8 mm (shackle diameter) locks can be inserted.

**Figure 26 - Lock Medium Rotary-operator Handles in the ON/I Position**

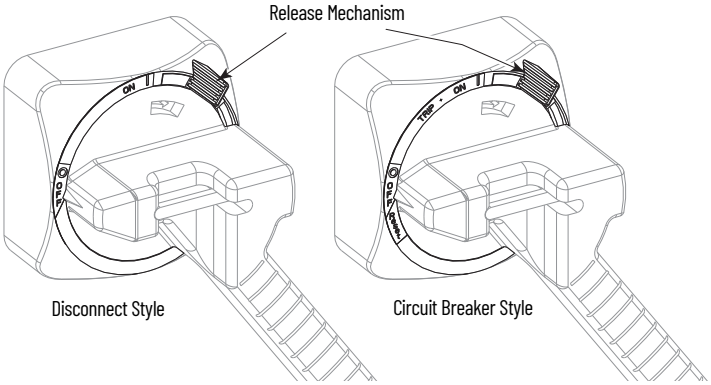



## Large Rotary-operator Handles (Cat. Nos. 140U-HM4 and 140U-HM4E)

The following is a brief summary of operating instructions for large rotary-operator handles available for disconnects or circuit breakers.

For additional disconnect handle information, see publication 190-IN007.

**Figure 27 - Large Rotary-operator Handle Styles**




*Open the Unit Door*

Follow these procedures to open the unit door.


1. Verify that the large rotary-operator handle is in the OFF/O position.
2. Release the door latches.
3. Hold the large rotary-operator handle in the OFF/O position while you push the release mechanism down.
4. Carefully open the unit door.

*Close the Unit Door*

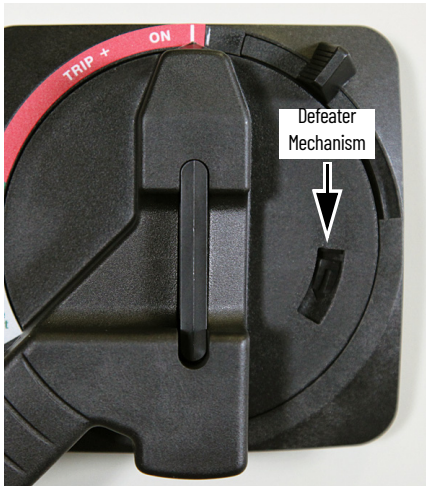
1. Verify that the large rotary-operator handle is in the OFF/O position.
2. Slowly close the door until contact with the large rotary-operator handle is made.
3. Hold the large rotary-operator handle in the OFF/O position while you close the door.
4. Close the door and secure the door latches.

*Open the Unit Door in the ON/I Position*

**ATTENTION:** Follow local codes and guidelines, and the requirements of EN 50110 when you work on energized equipment.

When the unit door is closed and the large rotary-operator handle is in the ON/I position, a defeater mechanism must be deliberately operated to open the unit door (for example, to open the door of an energized unit).

Follow these procedures to open a door with the large rotary-operator handle in the ON/I position.

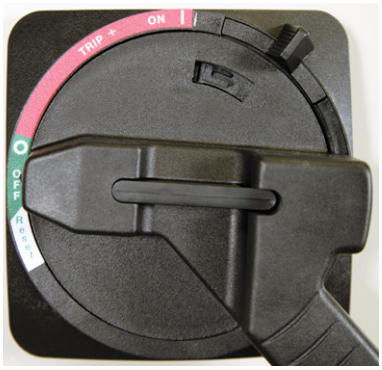



1. Release the door latches.
2. Locate the defeater mechanism on the right side of the handle.
3. Use a screwdriver to push the defeater mechanism in the direction of the arrow.
4. Carefully open the unit door.

### *Operator Handles for Circuit Breakers*

If there is a circuit breaker fault, the circuit breaker operator handle moves to the TRIP/+ position. Only reset the circuit breaker after the cause of the fault has been determined and corrected.

Follow these procedures to reset the circuit breaker.




1. Turn the circuit breaker handle from the TRIP/+ position to the OFF/O position.
2. Turn the circuit breaker handle from the OFF/O position to the RESET position.
3. Locate and correct the fault.
4. Verify that it is safe to re-energize the unit.
5. Turn the handle from the RESET position to the ON/I position.

### *Lock Units in the OFF/O Position*

**ATTENTION:** Follow all company safety and lockout procedures and local codes when performing this procedure.

1. The large rotary-operator handle must be in the OFF/O position.
2. Pull the middle section of the operator handle toward you.
   The lock opening is now visible.
3. Insert and secure the lock.
   Up to three 8 mm (shackle diameter) locks can be inserted.

### *Lock Units in the ON/I Position*

Locking units in the ON/I position requires user modification.

**ATTENTION:** Locking an operating handle in the ON/I position can conflict with local codes and emergency shutdown requirements.

1. Verify that the large rotary-operator handle to be modified is in the ON/I position.
2. Release the door latches.
3. Open the door to access the backside of the large rotary-operator handle.
4. With a screwdriver, remove the four screws that secure the large rotary-operator handle body to the door (A in Figure 28 on page 65).
5. Remove the large rotary-operator handle from the door.

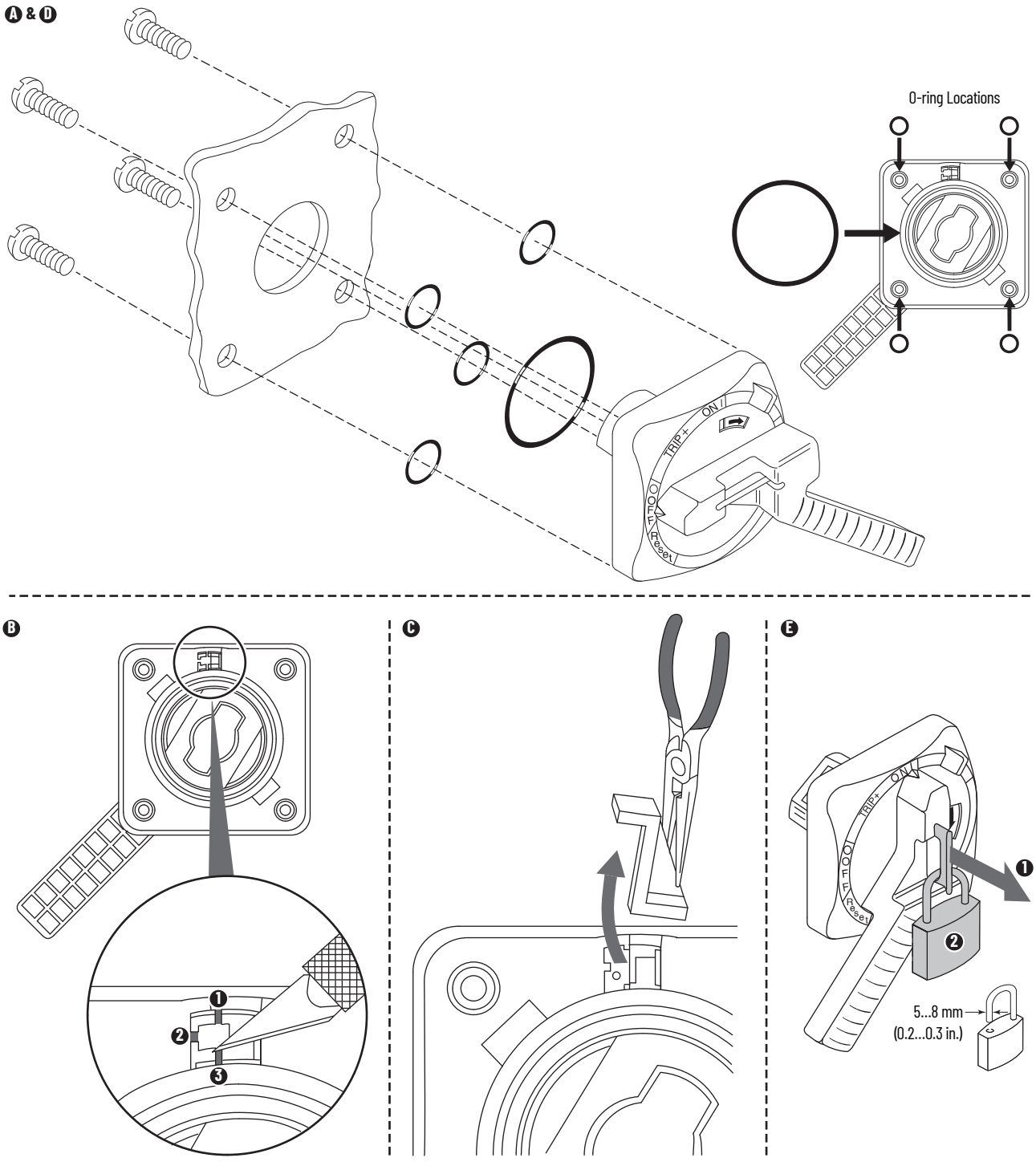
   **IMPORTANT** Place the four screws and the five O-rings aside so they can be reinstalled.

6. With a sharp blade, cut the three stems that anchor the locking tab (B in Figure 28 on page 65).
7. With a long nose plier, remove the locking tab from the large rotary-operator handle (C in Figure 28 on page 65).
8. Reinstall the five O-rings in the appropriate locations on the backside of the large rotary-handle (A in Figure 28 on page 65).
9. With the flour screws that you previously removed, reinstall the large rotary-operator handle into the door (D in Figure 28 on page 65).
10. Close the door.
11. Push and hold the middle section of the operator handle.

    The lock opening is now visible (1 in E of Figure 28 on page 65).
12. Insert and secure an 8 mm lock (2 in E of Figure 28 on page 65).

    Up to three 8 mm (shackle diameter) locks can be inserted.

Figure 28 - Lock Large Rotary-operator Handles in the ON/I Position




## Unit Interlocks

**ATTENTION:** Do not attempt to install or remove a unit while the unit main switch is in the ON/I position.

A unit interlock is provided with each plug-in unit. Unit interlocks help prevent units from being removed from or inserted into a column while the operator handle is in the ON/I position.

## Notes:

# Install and Remove Units

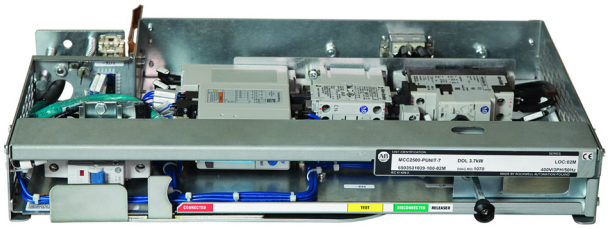
## Unit Size

Unit size is described in terms of modules. One module is 80 mm high by 500 mm wide. Withdrawable units are available in 1, 2, 4, 6, 8, 10, and 12 modules. Fixed units are available in 2, 4, 6, 8, 10, 12, 14, and 16 modules.

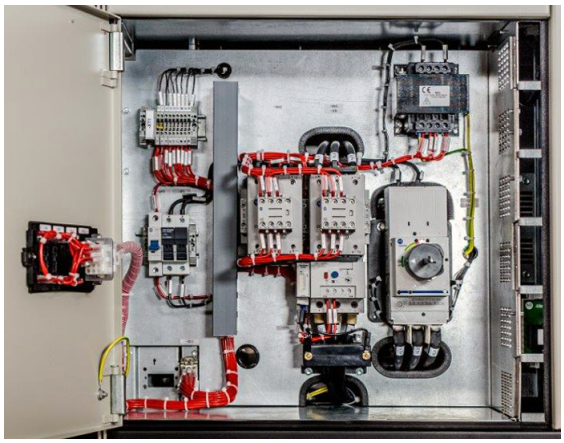
Any unit size above one module must be in even increments. Therefore, you cannot have a unit that is 11 modules high.

CENTERLINE® 2500 MCCs are available with many combinations of withdrawable and fixed units.

**Figure 29 - Unit Types**



One Module, Withdrawable Unit



Six Modules, Fixed Unit

## Withdrawable Units

Units are available as either standard withdrawable or withdrawable with the SecureConnect™ option.

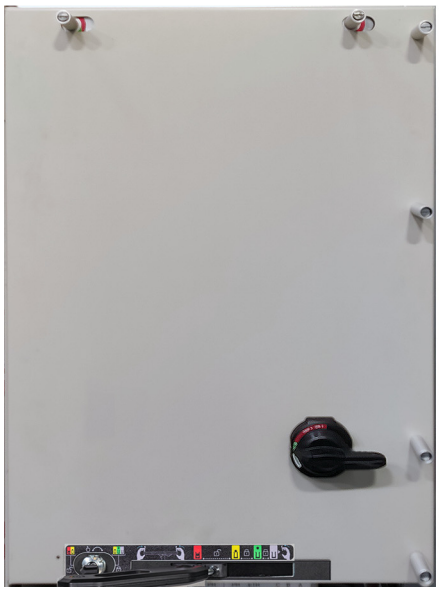
On standard withdrawable units, the withdraw lever is located behind the unit door, where you must first open the door to operate the lever. On withdrawable units with SecureConnect, the withdraw lever is on the outside of the door, so the unit lever can be operated and withdrawn while the door remains closed.

Additional features include a separate unit door and optional door-mounted pilot devices. The unit door can be closed and latched, providing isolation when the unit is removed. Pilot devices are housed in removable control stations. An optional closing plate is available to help provide isolation if the control station is removed.

## Components of Withdrawable Units with SecureConnect

There are five main components on a withdrawable unit with SecureConnect that distinguish it from the standard withdrawable unit; latches, withdraw lever, interlock operator, and release tabs.

**Figure 30 - Withdrawable Unit With SecureConnect Components**



**Ten Module Unit**
Six, eight, and ten module units have up to six latches on the door, with two near the top of the door


**Four Module Unit**
Two and four module units have two latches on the right-hand side of the door

### *SecureConnect Unit Door Latches*

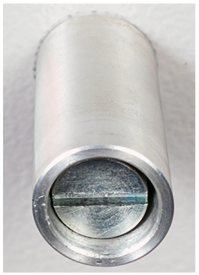
On SecureConnect unit sizes of two and four modules, door latches are on the right-hand side of the door; see Figure 30.

On unit sizes of six, eight, and ten modules, there are up to four door latches on the right-hand side of the door, and two additional latches near the top of the door. For details on the top door latches, see Figure 31 on page 69.

The right-hand side latches have dual engagements:

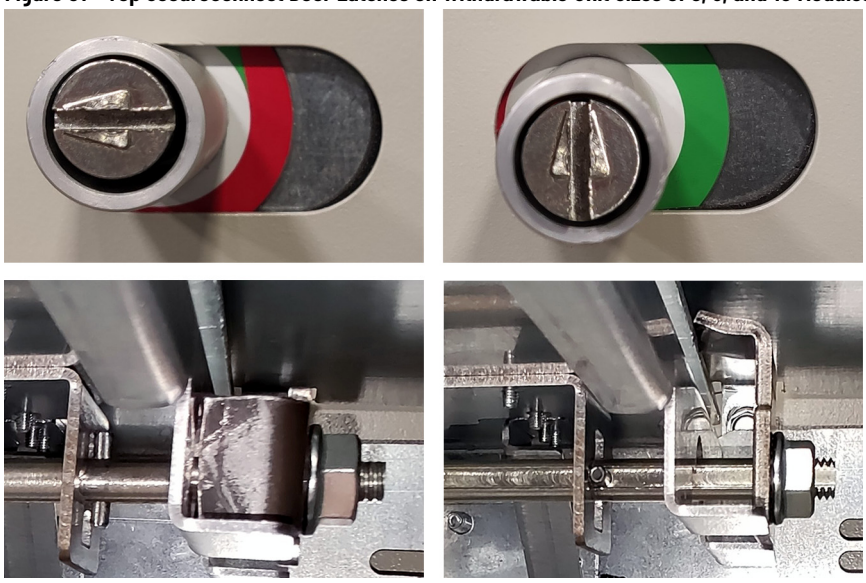
- Full engagement, which is when the unit latch is secured fully to the MCC structure and the SecureConnect unit cannot be removed.
- Partial engagement, which is when the latch is released from the MCC structure but remains secured to the SecureConnect unit. In partial engagement, the SecureConnect unit can be withdrawn from the MCC structure while the door remains securely closed.


Fully Engaged Latch


Partially Engaged Latch


Fully Disengaged Latch

**Figure 31 - Top SecureConnect Door Latches on Withdrawable Unit Sizes of 6, 8, and 10 Modules**



**Door Latch is Unlocked**
Red color is visible on outside of door

**Door Latch is Locked**
Green color is visible on outside of door

### *Withdraw Lever*

The withdrawal lever is the large black handle in the lower center of each SecureConnect unit. This handle can be retracted or extended, the latter position to gain more mechanical leverage while operating the handle.

The withdraw lever has the same four positions on the standard or SecureConnect withdrawable units. For more information on the positions, see Operating Positions for All Withdrawable Units on page 72.

A Retracted Withdraw Lever

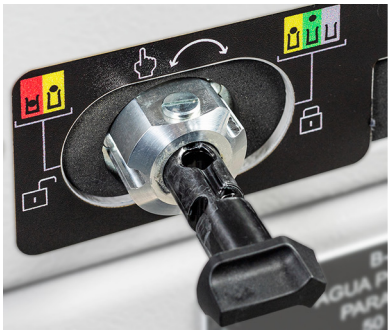
An Extended Withdraw Lever

### *Interlock Operator*

The interlock operator is the small, black handle closest to the hinged side of the unit door. To move a SecureConnect unit, the interlock operator must be depressed during any withdraw lever movement. Depressing the interlock operator releases the internal interlocks that help prevent any unwanted unit movement.

Besides being depressed or released, the interlock operator can also be rotated to the left (unlocked) or right (locked). The rotation direction controls the internal interlocks and limits the positions that the SecureConnect unit can move.

The interlock operator shaft includes a hole to insert a lockout/tagout lock for additional safety.



The Interlock Operator Released and in the Locked Position

The Interlock Operator Depressed to Rotate from the Locked to the Unlocked Position

### *Release Tabs*

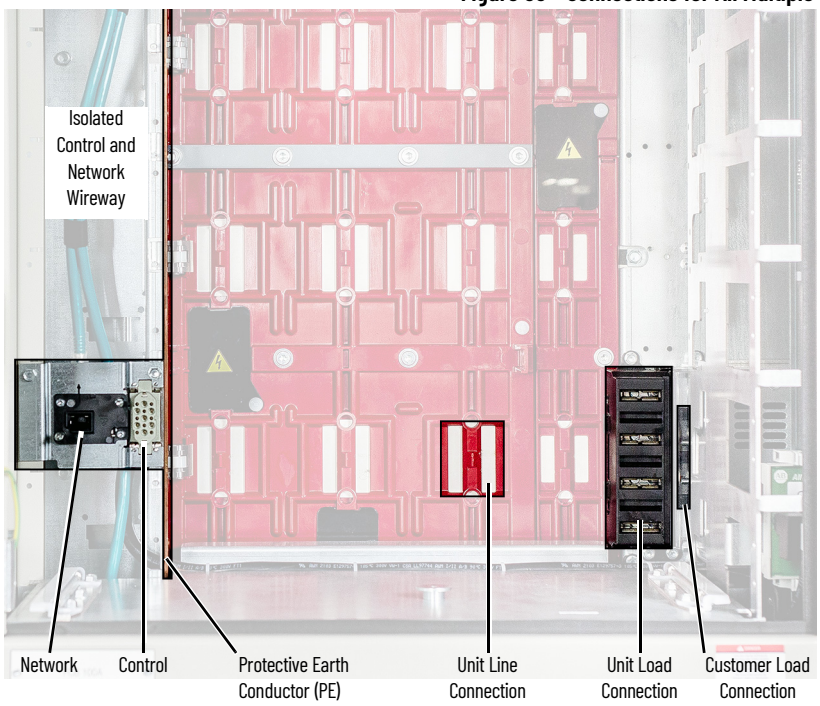
There are two release tabs inside the unit, one on each side of the unit and behind the door; see Figure 32. Both tabs must be depressed simultaneously when the SecureConnect unit is in the Released position to complete its removal from the MCC structure.

**Figure 32 - Release Tab Inside the SecureConnect Unit**

## Withdrawable Unit Connections

All withdrawable units have withdrawable line, load, control, network, and PE connections. Outgoing load and control connections from these units are made in the vertical wireway. All withdrawable units use a sliding track and a mechanical lever for ease of insertion and removal.

**Figure 33 - Connections for All Multiple-module Withdrawable Units**




**Two or More Module Withdrawable Unit**

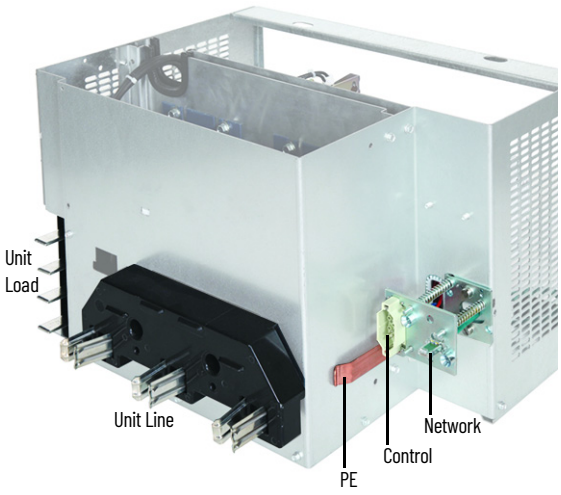
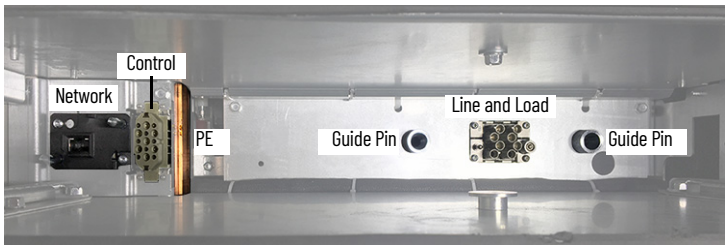
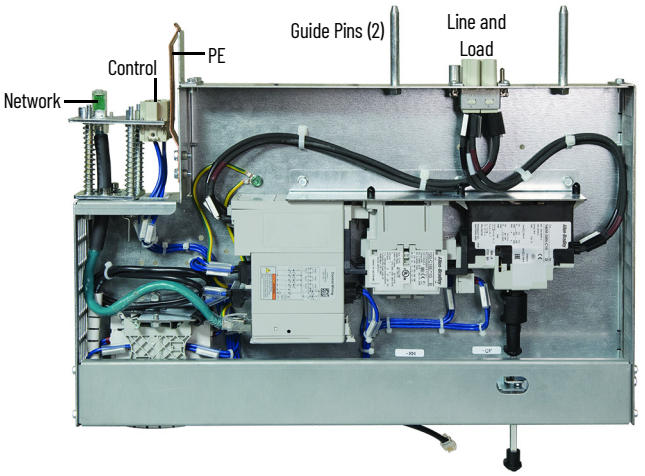



**Figure 34 - Connections for a One-module Withdrawable Units**

**Subplate Connections for One Module Withdrawable Units**

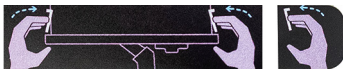



**One-module Withdrawable Unit**



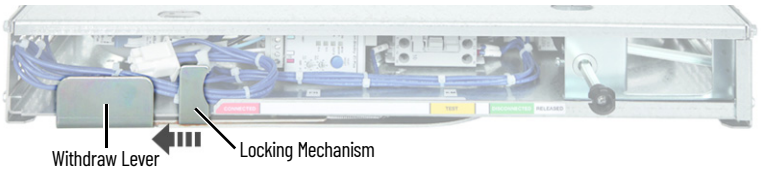
## Operating Positions for All Withdrawable Units

Standard and SecureConnect withdrawable units have four operating positions: **Connected**, **Test**, **Disconnected**, and **Released**. Detents are present to confirm that the unit is in one of the four positions. An interlock helps prevent the unit from being inserted or removed while the branch circuit device is in the ON/I position. Stabs are provided to make the line and load connections. A first make, last break PE contact is also provided. Control and network connections plug into an isolated vertical wireway on the left side of the column. See the following descriptions for additional information about the features of each position.

| Icon | Position | Description |
|---|---|---|
|  | Connected | Line, load, control, network, and PE connections are all engaged. Units can be locked in the Connected position. |
|  | Test | Control, network, and PE connections are engaged. Line and load connections are isolated. In this position, you can verify control and network wiring, and unit functionality. Units can be locked in the Test position. |
|  | Disconnected | An isolated position where the unit remains housed in the column and the PE connection is engaged, but no other connections are present. Units can be locked in the Disconnected position. |
|  | Released | Withdrawable units can be removed from the columns to isolate them from all connections. Released units can be locked to help protect against insertion. |
| **For Only Units with SecureConnect** | | |
|  | Release Tabs | Withdrawable units with SecureConnect have a release tab on each side of the unit that must be depressed simultaneously before the unit can be removed completely from the columns. See Release Tabs on page 70. |

*Select an Operating Position on a Standard Withdrawable Unit*

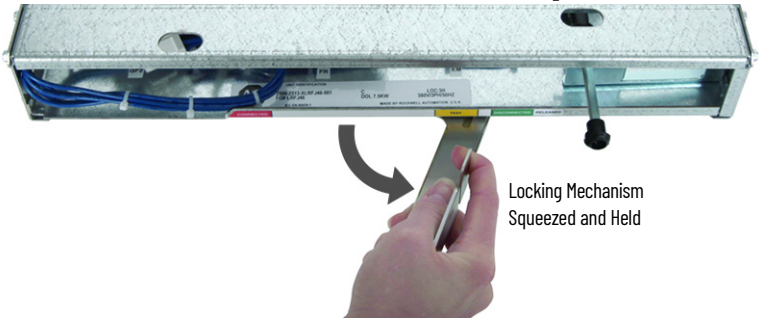
1. Turn the rotary operator handle on the unit door to the OFF/O position.
2. With a screwdriver, turn each latch slot one-quarter turn.
3. Open the unit door to access the withdraw lever.
4. Grasp the withdraw lever with your right hand.
5. With the same hand, squeeze the locking mechanism towards the withdraw lever.




When squeezed and held, the locking mechanism is unlocked and the withdraw lever can be moved.

6. With the locking mechanism held in the unlocked position, rotate the withdraw lever to the desired position.

Mechanical detents are used to confirm that a position is selected.



7. When you reach the desired position, release the locking mechanism to lock the withdraw lever in that position.

**Figure 35 - Various Positions for Standard Withdrawable Units**

Withdraw lever in Connected position.

Withdraw lever in Test position (and locked out).

Withdraw lever in Disconnected position (and locked out).

Withdraw lever in Released position (and locked out).

### *Select an Operating Position on a Withdrawable Unit With SecureConnect*

To remove withdrawable units with SecureConnect, perform the following steps.

1. Turn the rotary operator handle to the OFF/O position.
2. With a screwdriver, turn each SecureConnect latch slot one-quarter turn.

   Each slot is then in the partial engagement position, which means the latches are disconnected from the MCC structure while the door remains attached to the SecureConnect unit.

   In this latch position, the SecureConnect unit maintains its arc-resistant rating.

   **IMPORTANT** SecureConnect unit sizes between six and 10 modules have up to four latches on the right-hand side of the door, and two near the top of the door. For more information about these door latches, see page 68.

3. With your left hand, depress the interlock operator and rotate it to the left or right position for the following result.

| If | Then |
|---|---|
| To move the unit from Connected to Test | Depress and rotate the interlock operator to the left (unlocked) position. |
| To release or disconnect the unit | Depress and rotate the interlock operator to the right (locked) position. |

| IMPORTANT | Once you release the interlock operator, the withdraw lever is locked in position and cannot be moved again until you depress the interlock operator. |
|---|---|

4. To disconnect or release the unit, depress the interlock operator with your left hand while you move the withdraw lever through each of the **Test**, **Disconnect**, and **Release** positions.

   The interlock operator shaft includes a hole to insert a lockout/tagout lock for additional safety in any position.

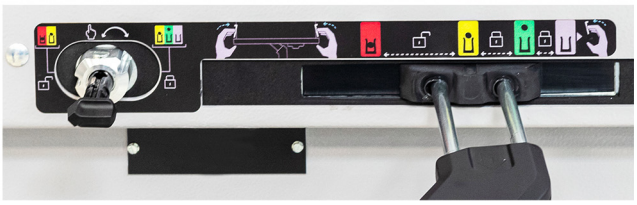
5. If the SecureConnect unit is in the **Release** position and you intend to remove the SecureConnect unit from the MCC, then you must press the release tabs on each side of the SecureConnect unit. See Release Tabs on page 70 for where these tabs are located.

For added safety, Rockwell Automation recommends that you purchase and install blanking doors for whenever a SecureConnect unit is removed from the MCC.

Four-module Blanking Door Shown

**Figure 36 - Various Positions of Withdrawal Units with SecureConnect**

Interlock Operator in the Unlocked Position; Withdraw Lever in the Connected Position.



Interlock Operator in the Unlocked Position; Withdraw Lever in the Test Position.

Interlock Operator in the Locked Position; Withdraw Lever in the Disconnected Position.

Interlock Operator in the Locked Position; Withdraw Lever in the Released Position.

## Safety Guidelines to Install and Remove All Withdrawable Units

**ATTENTION:** De-energize, lock out, and tag out all sources of power to the MCC when you install or remove MCC units. If MCC units are installed or removed with power that is applied to the main power bus, follow established electrical safety work practices. For further information, see the publication, NFPA 70E: Standard for Electrical Safety in the Workplace®.

**ATTENTION:** If power sources are connected to the motor control center, use extreme caution when you insert units. All busbars and the line sides of the inserted units are energized and contact with these parts can cause injury or death.

**ATTENTION:** To increase operator safety and help prevent equipment damage, we recommend that two people install or remove units that are in the upper six modules or over 1600 mm above floor level.

Units with door-mounted operator handles, switches, and disconnects must be in the OFF/O position before units are inserted or removed.

Do not attempt to install or remove a unit when the unit main switch is in the ON/I position.

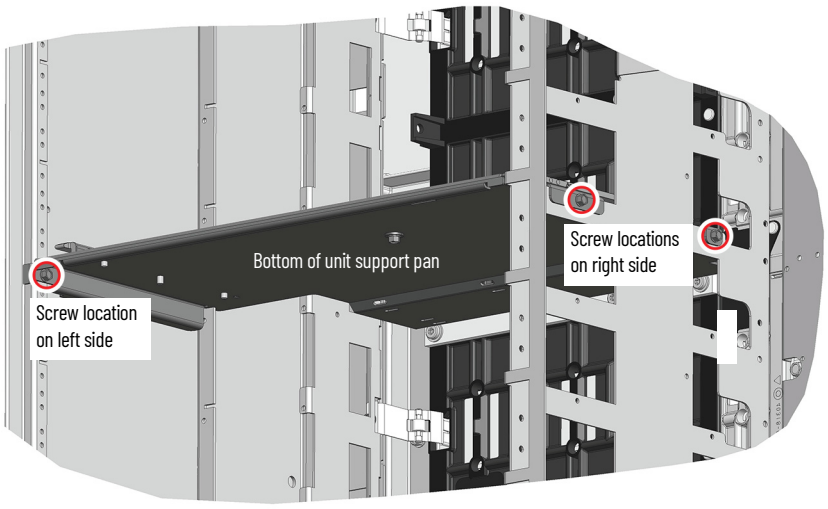
## Insert a Withdrawable Unit

**IMPORTANT** The unit support pan below the unit compartment must be in place before you install the unit.

Follow these procedures to insert a withdrawable unit.

1. Fully open the unit door and verify that the unit support pan has been installed.

   The unit support pan is secured with two screws on the right side and one screw on the left side.




   For one module units, verify that the subplate is installed. The subplate is attached to the column with two mounting screws.
2. Rotate the unit withdraw lever to the **Released** position.
3. Slowly slide the unit into the column along the tracks on the unit support pan until it locks in the **Disconnected** position.

4. Slide the locking mechanism toward the withdraw lever, rotate the withdraw lever to the **Test** position, and continue to insert the unit into the column.

   The unit locks in the **Test** position.
5. Slide the locking mechanism toward the withdraw lever again, and rotate the withdraw lever to the **Connected** position.

   Vertical bus shutters automatically opens as the unit is inserted.
6. Insert the unit until it locks in the **Connected** position.

   The unit is now installed in the column.
7. Connect any door-mounted devices.
8. Close the unit door and secure the door latches.

   Refer to Select an Operating Position on a Standard Withdrawable Unit on page 72 for additional information on the withdraw lever.

## Remove a Withdrawable Unit

1. Fully open the unit door.
2. Unplug or remove door-mounted pilot devices.
3. Slide the locking mechanism on the withdraw lever to the left and rotate the withdraw lever to the **Test** position.
4. Slide the locking mechanism toward the withdraw lever and rotate the withdraw lever to the **Disconnected** position.
5. Slide the locking mechanism toward the withdraw lever again and rotate the withdraw lever to the **Released** position.

   Continue to slide the unit out of the column. The unit can now be removed from the column.

   Shutters close automatically as the unit is removed.
6. Close the unit door and secure the door latches.

## Remove the Unit Door

It is not necessary to remove the unit door to install or remove a unit from a column. However, if a unit door must be removed, use one of the following procedures.

If present, door-mounted control stations can be removed from the door and kept with the unit.

Before you perform work on units or unit doors, verify that the unit main switch is in the OFF/O position.

### Multiple Module Unit Doors

Follow this procedure to remove multiple module unit doors.

1. Verify that the unit main switch is in the OFF/O position.
2. Release each door latch.
3. Fully open the unit door.
4. Remove or disconnect door-mounted devices and wiring.
5. Slide the hinge pins upward to remove.
6. Swing the door to near closed position and lift outward to remove.
7. To install the unit door, reverse this procedure.

## One Module Unit Doors

Follow this procedure to remove one module unit doors.

| IMPORTANT | Remove the unit from the column **before** removing its door. Follow unit removal procedures on page 76. |
|---|---|

1. Verify that the unit main switch is in the OFF/O position.
2. Release each door latch.
3. Fully open the unit door.
4. If a control station is provided with a plug for control wires, unplug this connection before removing the unit.
5. Remove or disconnect door-mounted devices and wiring.
6. Remove the two screws that fasten the hinge to the column.
7. Remove the unit door and hinge assembly from the column.
8. To install the unit door, reverse this procedure.

## Notes:

# Commissioning

## Introduction

This chapter provides guidance for the startup of a newly installed MCC.

We recommend that you make an itemized list that includes the following:

- Serial number
- Number of columns
- Number of units and their corresponding voltage
- Current ratings
- Kilowatt ratings
- Types of circuits
- Fuse sizes
- Circuit breaker ratings and trip settings
- Other important data

Save this itemized list in a file with other MCC data, such as component manuals, MCC manuals, overload relay instructions, and wiring diagrams.

## Pre-commissioning Checklist

**ATTENTION:** Follow applicable company safety procedures.

**ATTENTION:** To help protect the safety of personnel who perform the pre-energizing check, verify that the remote MCC power sources are disconnected and locked in the OFF/O position. Follow EN 50110 requirements, and local codes and guidelines.
Use a voltmeter to verify that the remote MCC power sources are disconnected.

**ATTENTION:** Power factor correction capacitors (PFCCs) must be applied correctly. Temporarily disconnect PFCCs when they are connected to the motor circuit, and the startup procedure requires the respective motors to be jogged, inched, or bumped (rotation direction check).
For additional assistance, contact your Rockwell Automation representative.

**ATTENTION:** Verify that motor acceleration times are within specific application specifications.
Excessive start currents and/or acceleration times can cause inverse time circuit breakers, power fuses, overload relays, and other components to overheat and/or shut down equipment.

The following procedures must be executed by only a 'skilled person' as defined by IEV 195-04-01 and 3.52 of IEC 60204-1, as follows:

'Skilled person: Person with relevant education and experience to enable him or her to perceive risks and to avoid hazards that operation or maintenance of a product can create.'

Follow these procedures to complete the pre-commissioning checklist.

1. Check and verify that the MCC is installed per instructions.
   See Chapter 3 on page 21.
2. Inspect and verify that the MCC is level and secured.
3. Inspect the enclosure and units for damage and verify that electrical clearances have been maintained based on the voltage and impulse rating of the equipment.
4. Remove all blocks or temporary holding means used for shipping component devices in the MCC.
5. Check the integrity of the bus splice connections.
   For the recommended torque values, see Torque Specifications on page 48.
   See Install Columns on page 21 for splicing information.
   
   The factory-made horizontal power bus to vertical distribution bus connections are tightened by a computer-controlled torquing system. Therefore, these components do not need torquing by the customer.
6. Check and verify that all PE connections are made according to applicable codes and standards.
   If the PE conductor is not provided or has been removed, verify that the MCC columns are connected with joining hardware to provide a continuous PE path. See Join Columns on page 34 for more information.
7. Perform the following for field wiring:
   a. Check the field wiring for proper conductor sizing.
   b. Verify that all incoming and outgoing power wiring is secure, well supported, and braced to withstand the effects of a fault current as detailed in Chapter 4 on page 49.
      **For incoming line compartments of eight modules or less:** firmly secure incoming cables halfway between the top of the column and the incoming line compartment terminals.
      **For full-line (24 modules) incoming line compartments:**
      Brace the cables every 300 mm if the available short circuit current is <42,000 amperes RMS symmetrical.
      Brace the cables every 150 mm if the available short circuit current is ≥42,000 amperes RMS symmetrical,
   c. Check the integrity of all field connections.
      Recommended torque values that are not found on individual devices can be found on wiring diagrams.
   d. Check field wired connections that are made to the MCC.
      See wiring diagrams and verify that proper clearances between adjacent phases and/or phases to PE are being maintained.
8. Verify that the voltage and kilowatt ratings on the motor correspond with the MCC unit ratings.

9. Verify that proper overload relays are installed and/or adjusted to relative full-load current shown on the motor rating nameplate.
10. For applications that require power fuses, install fuses in fusible switches in accordance with application requirements.

**IMPORTANT** Do not apply grease or NO-OX-ID to fuse ferrules.

11. Adjustable circuit protective devices in MCCs are set to the lowest trip setting when shipped from the factory. Verify that the trip settings of these devices are set in accordance with application requirements.

High efficiency motors can have higher locked rotor and inrush currents, which require higher magnetic trip settings.

**ATTENTION:** Rockwell Automation® AC drives and soft starter units are shipped with preset factory settings such as ramp speed, current limits, switch positions, and readouts. Preset factory settings are not suitable for some applications. For specific startup guidance, see the instruction manuals that are supplied with the MCC.

12. Set and verify adjustable current, voltage and other settings, according to device instructions or wiring diagrams.

    See the device instruction sheets or manuals that are supplied with the MCC for specific startup guidance.

    Component devices in MCC units (such as transfer switches, power factor correction capacitors, transducers, motor protectors, line monitors, over and undervoltage relays, and motor windings heaters) can require unique startup procedures.
13. Manually exercise all switches, control auxiliary switches, circuit breakers, their respective operators, unit interlocks, trip mechanisms (to test, push the Push to Trip button) and any other operating mechanisms to verify proper operation.
14. Check timing relay settings as required.
15. Verify that the vents are free from obstructions.
16. Check that fans that are used for forced air cooling have:
    a. Shafts that rotate freely
    b. Blades with no dust or debris build-up
17. Check that all filters are in place and clean.

We recommend that you establish an in-house program for scheduled cleaning or replacement.

18. Check all current transformers for proper polarity.
    a. Verify that the transformer secondaries are NOT open, and are either connected to their respective devices or shorted. Reference individual unit wiring diagrams and schematics for proper installation.

**ATTENTION:** Current transformer secondaries shall not be 'open.' To avoid possible injury and electrical shock to personnel, do not energize a current transformer with its secondary open.

    b. Verify that knife disconnect terminal blocks XCT are open before energizing.
    c. Open current transformers during commissioning.

19. Verify that **all barriers and parts that are removed during the installation process have been reinstalled**.

    We recommend that a barrier checklist is developed including such items as, unit location, and barrier location. Save this checklist for future reference.

20. Before you close the enclosure and/or individual units, remove all tools, metal chips, scrap wire, and other debris from the MCC interior.

    If there is an accumulation of dust or dirt, clean out the MCC by using a brush, vacuum cleaner, or a clean, lint-free rag. **DO NOT use compressed air—it redistributes contaminates on other surfaces**.

21. Verify that all withdrawable units are in the **Connected** position.

    Before you close and latch unit and wireway doors, verify that wires are not pinched. Column closing plates must be in place.

**ATTENTION:** When you conduct an electrical insulation resistance test, isolate equipment sensitive to high test voltages, such as meters, solid-state devices, motor winding heaters, capacitor units, and transformers.

22. Conduct an electrical insulation resistance test to verify MCC wiring integrity. Conduct this test with an insulation resistance tester with a potential of 500…1000 V.

**ATTENTION:** Verify that all switches or circuit breakers are in the OPEN/I or Off/O positions before an electrical resistance test is conducted.

    Conduct this insulation resistance tester test phase-to-phase, phase-to-PE and, when applicable, phase-to-neutral on the MCC bus work. Typical insulation resistance values are 50 MΩ or greater.

    Temperature, humidity, or dampness can affect insulation resistance values and considerably lower insulation resistance readings. If the insulation resistance values are less than 1 MΩ (due to dampness, temperature, or humidity) or the MCC has been stored in a damp or humid area, it is recommended the equipment be dried out. Dry out motor cables with a low voltage current or by using space heaters.

    Once the equipment is dry, repeat the insulation resistance test. The minimum value for insulation resistance on a new installation at startup or energizing is 1 MΩ. These readings can be recorded in Table 13 on page 103.

    Next, check the field wiring (for example, motor cables and/or incoming line cables).

# Commissioning Procedure

**ATTENTION:** Only skilled personnel with proper personal protective equipment can commission a motor control center. Energizing an MCC for the first time is potentially dangerous. Serious damage and/or personal injury can occur. Follow EN 50110 requirements, and local codes and guidelines.

**ATTENTION:** This procedure is provided as a general guideline to energize a newly installed CENTERLINE® 2500 an MCC and **be used only after the pre-commissioning checklist has been completed.**

Read this procedure in its entirety before beginning the commissioning procedure. If you have any questions or concerns, contact your Rockwell Automation representative.

1. Review other instructions that are supplied for the proper operation of special units such as AC drives and soft starters, with appropriate and skilled personnel.
2. Verify that main and unit main switches are in the OFF/O position so there is no load on the MCC.

   Also, verify that associated remote devices are de-energized.
3. Latch doors and secure covers.
4. Energize the MCC remote power source.

   If the MCC has a main circuit breaker or disconnect switch that can be operated from a remote location, energizing from the remote location is recommended.

   If the MCC main circuit breaker or disconnect switch cannot be energized from a remote location, follow the procedure below.

   - De-energize the remote power source
   - Close MCC main disconnect or circuit breaker switch.
   - Re-energize the MCC remote power source.

   **ATTENTION:** Main switch handles must be operated with a firm, direct motion into the closed (ON/I) position.
5. Energize from the source of the system, working toward the loads.

   Energize one unit at a time, beginning with control units then feeder units.
6. Withdrawable units can be commissioned in the Test position. This position helps allow control and network connections to be tested without engaging 3-phase power.

   See Chapter 6 on page 67 for more information on operating positions.
7. After the disconnect devices have been closed, loads such as lighting circuits, motor starters, and contactors can be energized.

   a. When power factor correction capacitors are energized with the motor windings and the startup procedure requires that the respective motors be jogged or inched, temporarily disconnect the power factor correction capacitors. For more information on power factor capacitors and MCC units, contact your local Rockwell Automation representative.

   b. Verify that acceleration times are within application specifications.

   Excessive starting currents and/or acceleration times can cause inverse time circuit breakers, power fuses, overload relays, and other components to overheat and/or shut down equipment.

8. Verify that meters are working properly, including voltmeters and ammeters.
9. Reset device settings that were adjusted during installation and commissioning to appropriate operational settings.

   For commissioning MCCs with the DeviceNet network and/or IntelliCENTER® software, see the CENTERLINE 2500 DeviceNet Motor Control Centers Technical Data, publication 2500-TD002, or CENTERLINE 2500 Motor Control Centers with EtherNet/IP™ Network Technical Data, publication 2500-TD003.

# Maintenance

**ATTENTION:** Only skilled personnel shall oversee the maintenance and service of motor control centers.
De-energize all power sources before any maintenance or service work is performed on columns or units.

For work on energized equipment, follow EN 50110 requirements, and local codes and guidelines.

Replace and secure all barriers, covers, shields and doors, and perform the Pre-commissioning Checklist on page 79 before re-energizing the equipment.

## Establish a Maintenance Program

Establish a periodic maintenance program for MCCs to avoid unnecessary downtime. The frequency of service to the MCC depends on the equipment usage and the operating environment. Inspect MCCs once per year or per an established maintenance program. Use the following suggested maintenance guidelines to establish a maintenance program.

Keep a log of service and maintenance work performed on your MCC. Record the following information.

- Date test and maintenance work are performed
- List of checks and tests performed
- Condition of the equipment
- Any repairs or adjustments that are made to equipment

For maintenance regarding specific components, such as circuit breakers, contactors, AC drives, relays, and meters, reference the specific component instruction manual for each device.

# Suggested Maintenance Guidelines

This table provides some suggested guidelines for maintaining your MCC.

| Suggested Maintenance Guidelines | | Date | Remarks | Initials |
|---|---|---|---|---|
| 1. Environment | • Verify operating (ambient) conditions.<br>– Room temperature range: -5...+40 °C[1]<br>– Noncondensing humidity, max: 95% at 40 °C[1] | | | |
| 2. Enclosure Exterior | • Clean surfaces. Retouch painted surfaces if necessary.<br>• Check that door latches are functioning and secure.<br>• Inspect for signs of excessive heat in the following locations:<br>– Doors<br>– Enclosure sides<br>If severe corrosion or discoloration is evident, replace the damaged components. **Identify the cause of damage and make necessary repairs.** | | | |
| 3. Contaminants | **ATTENTION:** For work on energized equipment, follow EN 50110 requirements, and local codes and guidelines.<br>• Check for contaminants (moisture, dirt, dust) inside the enclosure. Remove any contaminants and their source.<br>• Check for contaminants in the following locations:<br>– Cable entry and exit points, seams, and openings<br>– Devices (push buttons, relays, and disconnect switches)<br>**Make sure the source or cause of wetness or moisture is identified and removed.** | | | |
| 4. Bus System | **ATTENTION:** De-energize all power sources before any maintenance or service work on columns or units is performed.<br>• The factory-made power bus connections are tightened by a computer-controlled torquing system. The following connections do not require retorquing:<br>– Vertical to horizontal bus connections<br>– Power conductor to horizontal bus connections<br>These factory-made connections do not require servicing for the life of the MCC.<br>• Check the bus support and insulation for cracks or damage.<br>• Inspect bus splice connections for discoloration.<br>• Verify the integrity of bus splice connections. Retorque connections. See label inside vertical wireway door for recommended torque values.<br>• Use a vacuum or a lint free cloth to clean the bus and supports.<br>• Conduct an electrical insulation resistance test. Record and save the results.<br>See Pre-commissioning Checklist on page 79. | | | |
| 5. Operating Handles | • Verify that operator handles move freely (no sticking or binding).<br>• Check function of the operator handles.<br>• Check the defeater mechanisms on operator handles.<br>• Replace broken, deformed, malfunctioning or badly worn parts/assemblies. | | | |
| 6. Locking Devices | Check locking and interlocking devices for proper working condition. Replace as necessary. | | | |
| 7. Current Carrying Components | • Inspect for discoloration, corrosion, wear, excessive heat, and other signs of possible failure.<br>• Current carrying devices can include fuse clips, line, and load terminals. | | | |

| Suggested Maintenance Guidelines | | Date | Remarks | Initials |
|---|---|---|---|---|
| 8. Contacts | • Check for excessive wear and dirt accumulation.<br>– Vacuum or wipe contacts with a soft cloth to remove dirt.<br>**Note:** Applicable only for Allen-Bradley® 100-D size contactors (95-860A).<br>• Replace contacts in complete sets to avoid misalignment and uneven contact pressure.<br>• Discoloration or slight pitting of the contacts is normal.<br>• Do not file contacts or use spray cleaners. | | | |
| 9. Coils | • Check contactor and relay coils for signs of overheating (cracking, melting, or burnt insulation).<br>– If signs of overheating are present, replace the coil.<br>• Correct the overvoltage or undervoltage conditions that caused coil failure.<br>• Clean any residue of melted coil insulation from other parts of the device or replace such parts. | | | |
| 10. Terminals | • Check for loose wire connections and tighten as necessary.<br>• Check schematics/component documentation for torque values.<br>– Power terminals<br>– Control circuit terminals<br>• Replace damaged parts or wiring. | | | |
| 11. Pilot Lights | Replace damaged lamps and lenses. | | | |
| 12. Fuses | • Check fuses and fuse clips.<br>– When replacing fuses, install the same type and rated fuse that was originally furnished with the MCC. | | | |
| 13. Fans and Cooling Devices | • Inspect blowers and fans for operation and damage.<br>– Replace blowers and fans that have bent, chipped, or missing blades, or if the shaft does not turn freely.<br>• Clean or change air filters for fans.<br>• Clean heat exchanger fins.<br>• Clean ventilation mesh. | | | |
| 14. Solid-state Devices | • Perform a visual inspection. Components or circuit boards must be replaced if the following are found:<br>– Discoloration<br>– Charred or burned components<br>• Check printed circuit boards for:<br>– Proper seating in the edge board connectors<br>– Locking tabs in place | | | |
| 15. Unit Stabs | • Inspect stabs for wear and corrosion. Replace if necessary.<br>– If the line stab assembly is severely pitted, inspect the vertical bus for wear and pitting. Replace as necessary.<br>• Lightly lubricate line and load stabs with NO-OX-ID grease before installing the unit into the column. | | | |
| 16. Control and Network Plugs | • Inspect for bent or damaged pins.<br>– If necessary, clean the contacts.<br>• Verify that the connector mechanism is functioning properly. | | | |
| 17. Withdrawable Units | • Remove dust and grease from the guide rail.<br>• Check that the withdraw lever and locking mechanism operate freely.<br>• Check for easy movement of withdrawable units within the column.<br>• Test the unit interlock function. | | | |
| 18. Final Check | • Verify that all withdrawable units are in the correct operating position (Connected, Test, Disconnected, Withdrawn).<br>• Verify that enclosure doors and wireway covers have been closed and are secure.<br>• After maintenance or repair is performed, test the control system for proper functioning under controlled conditions. | | | |

(1) The average temperature over a 24-hour period must not exceed 35 °C (95 °F).

# Notes:

# IntelliCENTER Options

## EtherNet/IP Motor Control Centers

Basic information is provided in the following sections. For additional information, see CENTERLINE® 2500 Motor Control Centers with EtherNet/IP™ Network, publication 2500-TD003.

### Connection Count

The EtherNet/IP network can accommodate a vast number of nodes. The EtherNet/IP network does not have a specific maximum number of nodes like other fieldbus networks. The limit is based on the number of connections the EtherNet/IP scanner can make.

To estimate the number of connections a network uses, visit the Rockwell Automation Control Systems Configuration Tools website at https://www.rockwellautomation.com/en-us/support/product/product-selection-configuration/integrated-architecture-builder.html for our EtherNet/IP Toolkit.

### Cable Length Limitations

The EtherNet/IP network uses fiber or copper twisted-pair wiring. The maximum length of copper twisted-pair wiring is 100 m between devices. There is no cumulative length for the entire network. Fiber cable length varies by cable design. Inside the MCC, all cables are copper twisted-pair.

| | |
|---|---|
| **IMPORTANT** | The 100 m maximum length must account for Ethernet cable inside the column. To help determine cable lengths for your application, each MCC is shipped with documentation that identifies the cable length that is used within the MCC. This cable length must be added to the length between the GracePort® and the externally connected device. |

### Cable Routing

Each EtherNet/IP network has one or two Stratix® 5700 switches typically mounted in the top horizontal wireway in the standard configuration. The number of switches depends on the number of units in the column. Cables connected to the switch are then routed to EtherNet/IP devices in the column. Up to 24 EtherNet/IP ports can be provided in each CENTERLINE 2500 column.

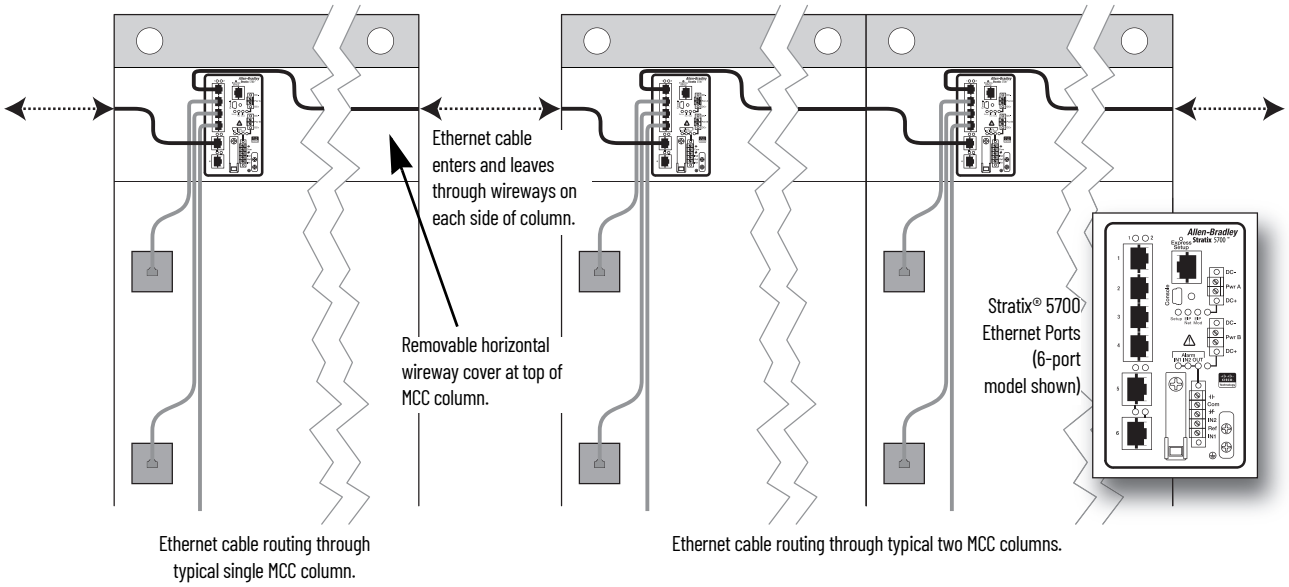
In a standard MCC column, the vertical network wireway has EtherNet/IP connections equal to the number of units (up to 24) for that column. Devices that require 24V DC to power up must have it supplied through pins B4 and B5 in the control plug.

| | |
|---|---|
| **IMPORTANT** | Pins B4 and B5 in the control plug are reserved for 24V DC power; avoid using for other reasons. |

Connection to the EtherNet/IP network and the control plug is made when a unit is in the Connected or Test position.

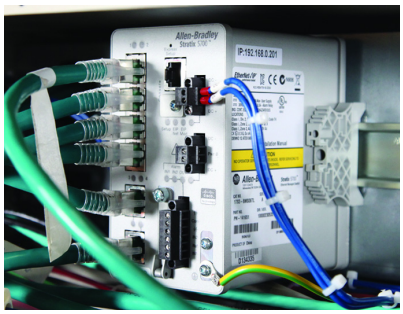
If you add or remove a unit from the EtherNet/IP system, it does not interrupt the operation of other units in the system.

**Figure 37 - EtherNet/IP Network Connections in 2500 MCC Units**




**NOTE:** The examples that are shown above depict typical 2500 MCC configurations with EtherNet/IP communication. See publication 2500-TD003 for more information on EtherNet/IP communication for 2500 MCC units.

See publication 1783-UM007 for more information on Stratix 5700 Ethernet-managed switches.



Stratix 5700 switch behind top horizontal wireway cover.

## *Determine Cable Lengths*

To help determine cable lengths for your application, each MCC is shipped with documentation that identifies the cable lengths that are used within the MCC.

*MCC Cable Types*

**ATTENTION:** Do not apply high voltage to any installed EtherNet/IP cable system or its connectors.

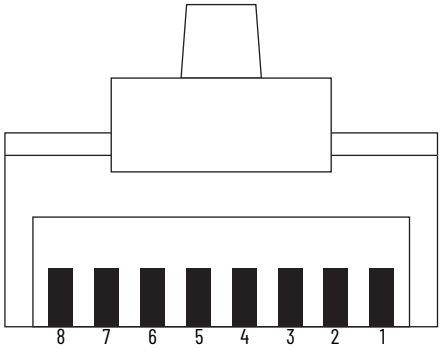
The CENTERLINE 2500 MCCs use a high-voltage 600V Ethernet cable designed to perform above TIA 568-B.2 and ODVA Ethernet standards. These cables have the following features:

- Foil and braided shield, PVC, eight conductor (four pair)
- 600V PVC cable designed to support high-voltage applications
- On-Machine™ rated cable for use in a cable tray shared with high-voltage power cables
- RJ45 insulation displacement connector available for field terminations
- Wide thermal operating range

**Table 11 - EtherNet/IP Cable Specifications for MCCs**

| | |
|---|---|
| Certifications | UL and c-UL Listed |
| Outside diameter | 8.13 ± 0.38 mm |
| Operating temperature | -20...+80 °C |
| Cable rating | UL, c-UL TYPE CMG; UL PLTC or UL AWM 2570 80C 600V, TIA 568B |

**EtherNet/IP Cable Pinout**




| Pin No. | Cable Color | Description |
|---|---|---|
| 1 | White/Orange | TxData + |
| 2 | Orange | TxData - |
| 3 | White/Green | Recv Data + |
| 4 | Blue | Unused |
| 5 | White/Blue | Unused |
| 6 | Green | Recv Data - |
| 7 | White/Brown | Unused |
| 8 | Brown | Unused |

## Add an MCC Unit to an EtherNet/IP System

Use this section to add 2500 MCC units to an EtherNet/IP MCC. Each EtherNet/IP component is factory wired within the unit and has a communication cable that plugs into the device on one end and generally into a vertical wireway EtherNet/IP port on the other end.

| No. of Conductors | Jacket Material | Cable Type | Cable Rating | Cat. No.(1) |
|---|---|---|---|---|
| 8 | Teal 600V PVC | Foil and braided shield | (UL) CMX, CMR; c(UL) CMG; (UL) PLTC or AWM 2570 80 °C 600V; TIA-568-B | 1585J-M8HBJM-2 |
| | Red 600V PVC | | | 1585J-M8EBJM-2 |

(1) Replace -2 (2 m) with -5 (5 m), or -10 (10 m) for additional standard cable lengths.

## Ethernet Power Supply

| | |
|---|---|
| **IMPORTANT** | Many EtherNet/IP components require 24V DC power source to operate. The power supply must be EtherNet/IP compatible as specified in the ODVA requirements.<br>Power supplies that do not satisfy both preceding points can result in damage to the EtherNet/IP signal and components, and failure to comply with local codes and inspection. |

A power supply unit that meets EtherNet/IP requirements can be supplied with the MCC. A cable connects the output of the power supply to pins C3 and C4 of the control plug in the network wireway. This cable is already connected when the power supply unit ships installed in the MCC. Redundant configurations are also available.

## Connect Power Supplies–Remote or in the MCC Lineup

Connect power supplies according to guidelines to minimize voltage drops in the EtherNet/IP system while providing proper supply voltage to system devices. For detailed connection instruction, see the Converged Plant-wide Ethernet Design and Implementation Guide, publication ENET-TD001.

## Network Power Supply and the Protective Earth Circuit

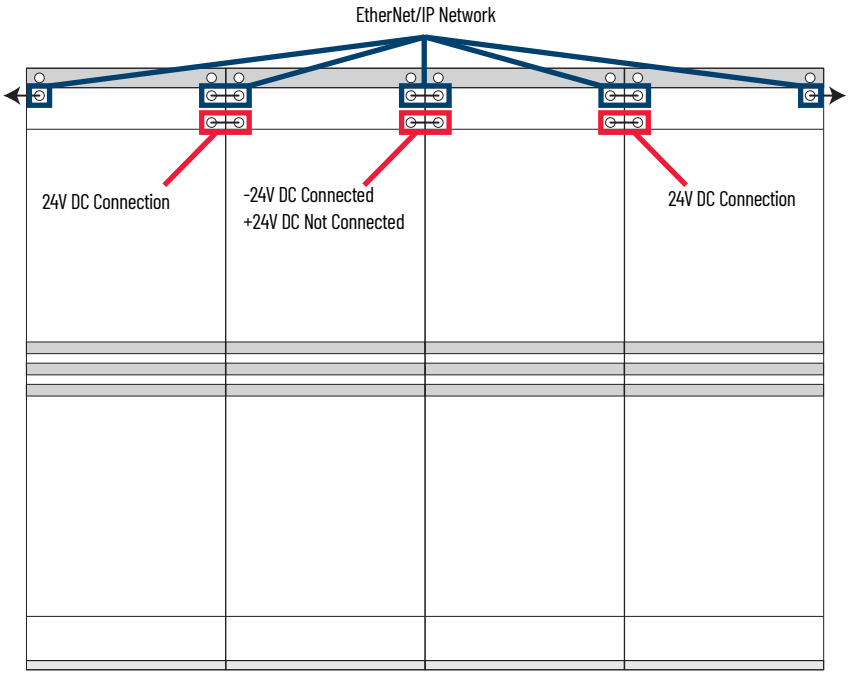
The EtherNet/IP network is grounded at the various components via the component ground. Therefore, no further grounding is needed for the Ethernet cables.

| | |
|---|---|
| **IMPORTANT** | Do not connect the 24V DC common in the power supply bucket to the PE. Doing so violates the grounding guidelines for the various EtherNet/IP components. |

## Connecting Two Power Supplies

Install an additional 24V DC Class 1 power supply for MCC lineups with 14 or more columns. When using two supplies, provide a break between the two 24V DC networks. Locate the appropriate break for the two networks and verify that the terminal blocks are not connected between these two columns.

**Figure 38 - Connecting Two Power Supplies**




Position each power supply so it feeds a maximum of seven columns to the left or right (see the sample lineup on page 97).

## System Design Installation Checklist

When you install an EtherNet/IP MCC, verify the following before you apply power to the network:

- Only one power supply is connected for every 14 sections of MCC.
- The power supply for the system is 24V DC.
- The PE is connected.
- Connections are inspected to detect and correct any loose wires, opens, or shorts.

## EtherNet/IP Software Installation Checklist

The following steps, along with references for more information, are provided to assist with the EtherNet/IP software installation process.

1. Install the communication card in your personal computer.
2. Load the Windows hardware drivers for the communication card.
3. Load RSLinx® software.
4. Configure the RSLinx driver.

   Within the RSWho function, make sure no unrecognized devices (the '?' symbols) appear for any devices. If an unrecognized device appears, load the Electronic Data Sheet (EDS) file.

For additional details, see Electronic Data Sheets (EDS) on page 98.

| IMPORTANT | Do not leave the RSWho software so it constantly browses. Close the RSWho screen or disable Autobrowse. |
|---|---|

5. Use the device web pages or RSLogix 5000® software to program and configure devices (for example, full load current, acceleration rate).
6. Write the PLC program.
7. If IntelliCENTER® software is provided, load per the IntelliCENTER Software User Guide, publication MCC-UM002.

# DeviceNet Motor Control Centers

This section explains how to connect the terminating resistors and join the DeviceNet cables.

## Preparing a DeviceNet System for Commission

If your CENTERLINE 2500 MCC is equipped with DeviceNet, terminating resistors must be installed before commissioning. If your MCC consists of multiple shipping blocks, then DeviceNet splicing cables must be installed as columns are joined.

Basic information is provided in the following sections. For additional information, see DeviceNet Motor Control Centers (MCCs), publication 2500-TD002.

## Terminating Resistors

| IMPORTANT | The DeviceNet network only operates correctly when there are exactly two terminating resistors, one at each end of the network trunk line. |
|---|---|

Terminating resistors are necessary at the ends of trunk lines to reduce reflections of the communication signals on the network.

For more information, see Figure 39 on page 95.

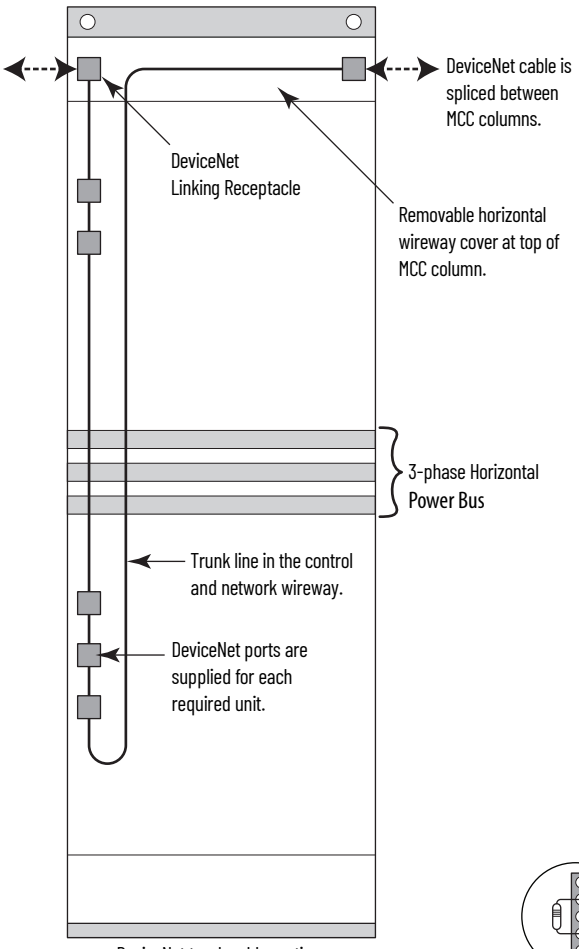
Follow these procedures to install terminating resistors.

1. Locate the terminating resistor kit.

   Terminating resistor kits are shipped in the top horizontal wireway. A removable white label indicates the location of the kit.
2. Remove the top horizontal wireway cover from each column in the network.
3. Plug the first terminating resistor into the left port in the top horizontal wireway of the left end column in the network and torque the connector screws to 0.55 N•m.
4. Plug the second terminating resistor into the right port in the top horizontal wireway of the right end column of the network and torque the connector screws to 0.55 N•m.
5. Do not replace the horizontal wireway covers until all shipping blocks in the network have been spliced together.

   Refer to Joining DeviceNet Cables on page 96.

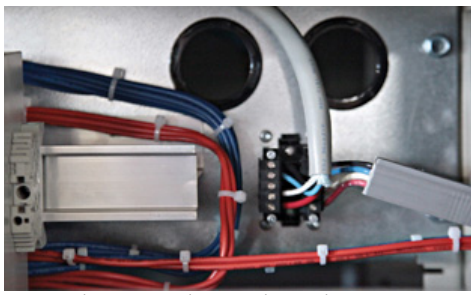
**Figure 39 - Install Terminating Resistors and DeviceNet Splicing Cables**



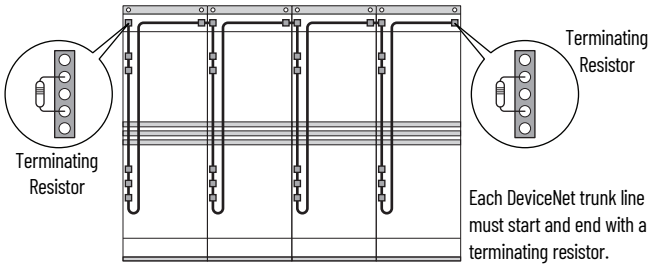

DeviceNet trunk cable routing through typical MCC column.

**NOTE:** Examples at right depict typical 2500 MCC configurations with one DeviceNet network.

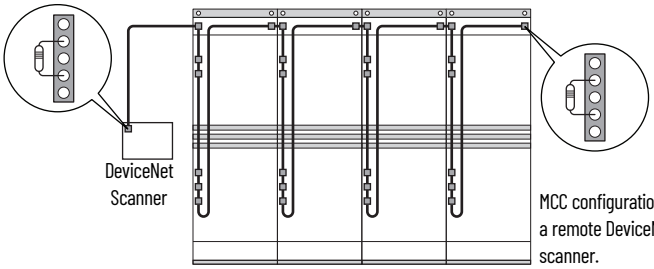
See publication 2500-TD002 for examples of typical 2500 MCC configurations with two DeviceNet networks.



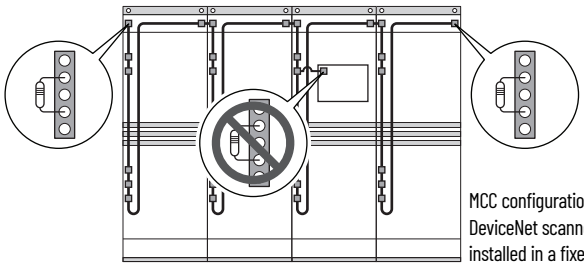
DeviceNet port behind top horizontal wireway cover.



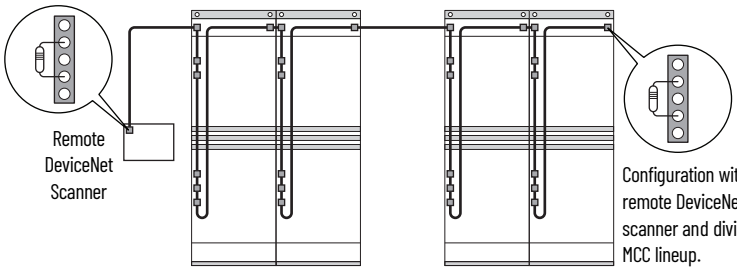

Each DeviceNet trunk line must start and end with a terminating resistor.



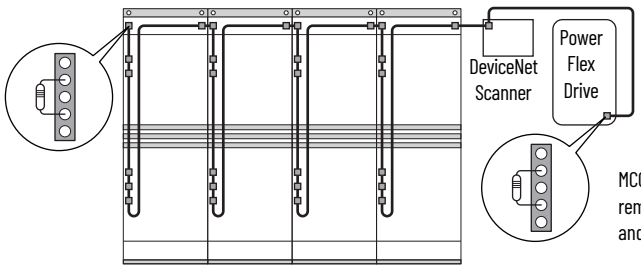

MCC configuration with a remote DeviceNet scanner.



MCC configuration with DeviceNet scanner installed in a fixed unit.




Configuration with remote DeviceNet scanner and divided MCC lineup.




MCC configuration with remote DeviceNet scanner and remote device.

## Joining DeviceNet Cables

After the terminating resistors have been installed, DeviceNet cables in each column of the network must be spliced together.

Follow these procedures to join the DeviceNet cables.

1. Locate the DeviceNet splicing cable in the top horizontal wireway.
   One end of the splicing cable is plugged into the right DeviceNet port in the column to the left of the splice.
2. Route the cable through the top horizontal wireway into the column to the right of the splice.
3. Plug the free end of the DeviceNet splicing cable into the left port in the top horizontal wireway of the column to the right of the splice.
4. Torque connector screws on the splicing cable plugs to 0.55 N•m.
5. Verify that the horizontal wireway is free of tools and debris.
6. Replace horizontal wireway covers.

## DeviceNet Power Supply

| | |
|---|---|
| **IMPORTANT** | The DeviceNet cable system requires a 24V DC power source to operate. The power supply must be DeviceNet compatible as specified in the ODVA requirements.<br>Power supplies that do not satisfy both points above can result in damage to the DeviceNet signal and components, and failure to comply with local codes and inspection. |

A power supply unit that meets DeviceNet requirements can be supplied with the MCC. A cable connects the output of the power supply to a DeviceNet port in the control and network wireway. This cable is already connected when the power supply unit ships installed in the MCC. Redundant configurations are also available.

Remote power supplies shall meet the following requirements, per ODVA:

- Rated 24V DC (±1%)
- Rise time of less than 250 milliseconds to within 5% of 24V DC at full load of 8 A
- Current limit protection of 8 Amps continuous and 10 Amps for the first 250 ms
- Sized correctly to provide each device with its required power—each device typically requires 90...165 mA
- Derated for temperature as specified by the manufacturer

## Connect Power Supplies–Remote or in the MCC Lineup

Connect power supplies according to these guidelines to minimize voltage drops in the DeviceNet system and help achieve proper supply voltage to system devices. For detailed connection instructions, see the DeviceNet Media Design and Installation Guide, publication DNET-UM072.

## Network Power Supply and the Protective Earth Circuit

The DeviceNet cable must be connected to the PE circuit at only one location. The ideal choice is at the power supply. Connect the power supply and 24V DC common (black wire) to the PE circuit by using #8 AWG wire.

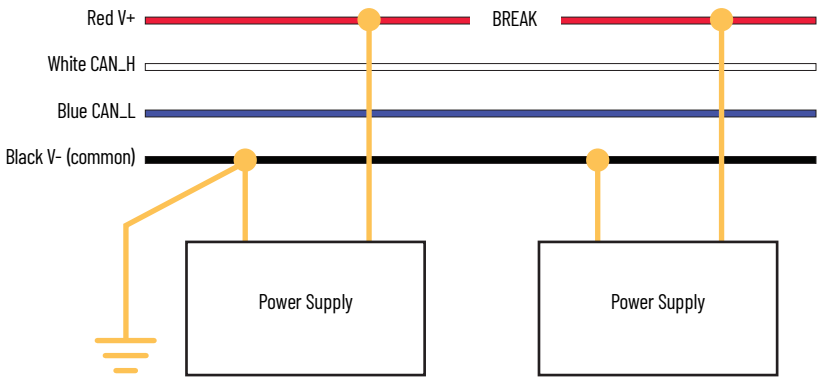
*Best PE Practice*

- If the power supply comes installed in the MCC, the black 24V DC common terminal is connected to the PE within the unit.
- To improve the connection, use #8 AWG green wire and ground the black 24V DC common terminal to a stable PE external to the MCC or to an optional true earth (TE) connection inside the MCC.
- If the power supply is external, the same recommendations apply.

## Connecting Two Power Supplies

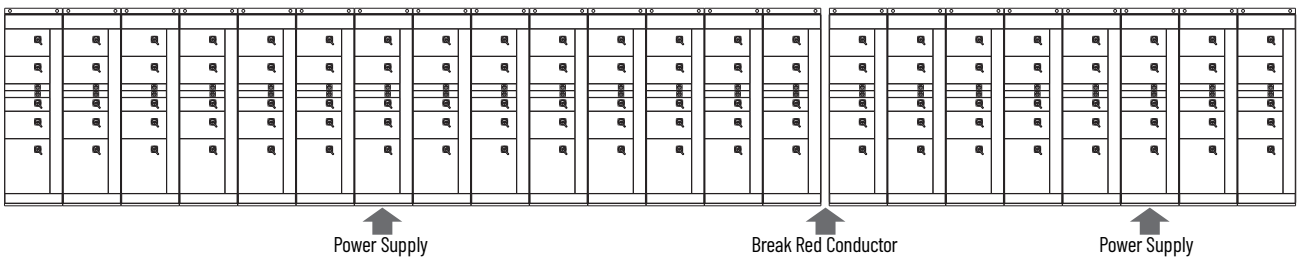
An additional 24V DC Class 1 power supply must be installed for MCC lineups with more than 14 columns. When using two supplies, the red conductor between the power supplies must be broken. Locate a linking connector between columns and disconnect the red conductor.

Connect only ONE of the two power supplies to the PE.




Position each power supply so it feeds a maximum of seven columns to the left or right (see the following sample lineup).

MCC Lineup With More Than 14 Columns




MCC lineups with more than 14 columns could exceed the 75 m trunk length limit to support 500 Kbps communications. When the trunk length exceeds this limit, specify 250 Kbps communications.

# Electronic Data Sheets (EDS)

This section applies to any MCC with IntelliCENTER software that is installed on a DeviceNet or EtherNet/IP network.

After IntelliCENTER software is installed, an Electronic Data Sheet (EDS) must be registered for each unique device in the MCC. This section details how to perform that task.

## Overview

EDS files are simple text files that are used by network configuration tools—such as RSNetWorx™, RSLogix 5000, or IntelliCENTER software—to help identify products and easily commission them on a network. EDS files describe device type, version, and configurable parameters on a DeviceNet or EtherNet/IP network.

## Where to Find EDS Files

The IntelliCENTER data CD has a directory (<cdrom>:\<order>\<item>\EDS) that contains the EDS files necessary for the devices in your IntelliCENTER MCC. The installation program automatically registers the EDS files.

An 'EDS file' CD is provided with EDS files for all DeviceNet and EtherNet/IP products that are found in MCCs.

## Installing EDS Files

EDS files are installed with a program from Rockwell Software® called 'RSHWare.exe'. This program is included on the IntelliCENTER data CD and in the same directory as the EDS files.

Follow these steps to install EDS files for a DeviceNet or EtherNet/IP network.

1. Run the program 'RSHWare.exe'.
2. Click Add/Remove.
3. Select Register an EDS file and click Next.
4. Select Register a directory of EDS files.
5. Browse to the EDS directory on the data CD.
6. Click Next.
   The Installer displays the test results.
7. Click Next to continue.
   You can change the graphic image for each device.
8. Click Next to continue.
   The Installer displays the final task summary.
9. Click Next to continue.
10. Click Finish when completed.

## Finding EDS Files for Other Devices

EDS files can be obtained at https://www.rockwellautomation.com/en-us/products/hardware/allen-bradley/network-security-and-infrastructure.html.

## Uploading EDS Files from the Device

RSNetWorx for EtherNet/IP or RSNetWorx™ for DeviceNet software can be used to upload an EDS file directly from a device. If an EDS file cannot be found by other methods, see the RSNetWorx help file for steps to upload an EDS file.

# Notes:

# Worksheets

## Sample MCC Layout Worksheet

**Figure 40 - Sample MCC Layout Worksheet**

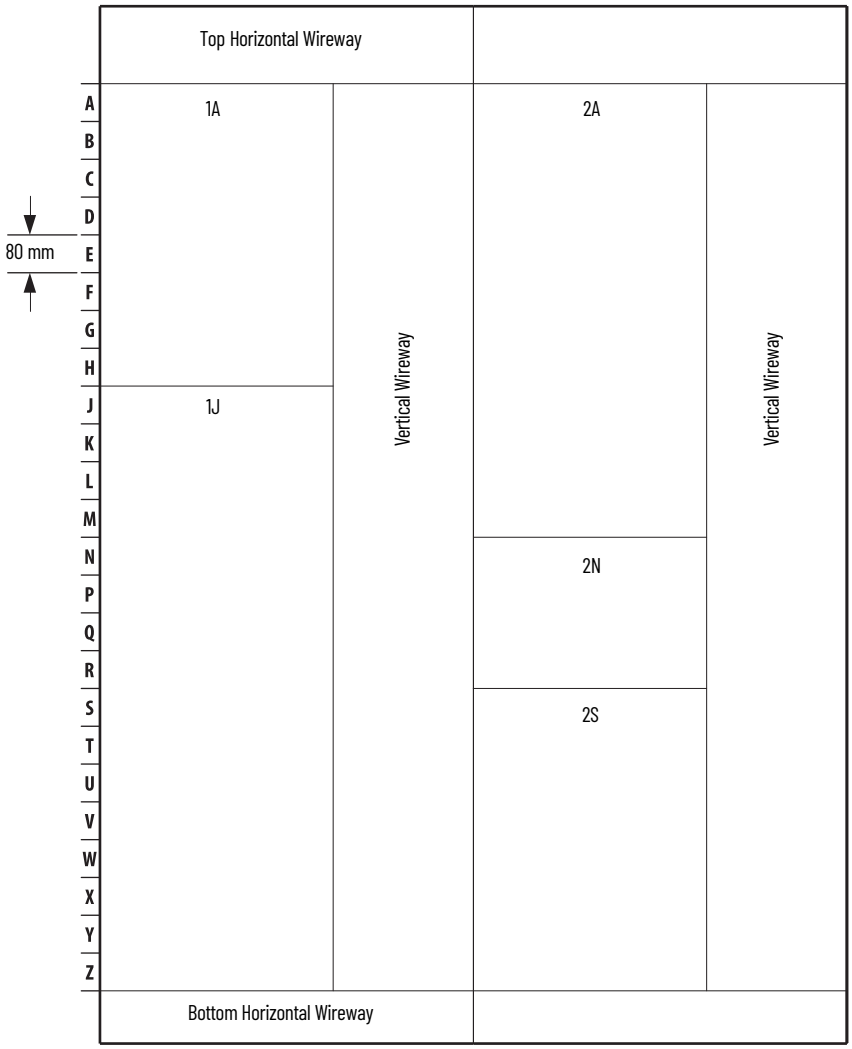


**Table 12 - Location of Sample Units within MCC Layout in Figure 40 on page 101**

| Unit Location | Unit Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Serial Number | Wiring Diagram | Size or Amp Rating | Description | Full-load Current | Overload | Kilowatts | Circuit Breaker Trip Setting | Power Fuse Rating |
| 1A | | Y-359039 | 1200A | MLUG | | | | | |
| 1J | | Y-359043 | | DOL | | | 185 | | |
| 2A | | Y-359042 | | DOL | | | 110 | | |
| 2N | | Y-359041 | | DOL | | | 22 | | |
| 2S | | Y-359045 | | XFMR | | | | | |

## Table 13 - Motor Control Center Layout Worksheet

**MCC Name/Number**_____

| Unit Location | Unit Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Serial Number | Wiring Diagram | Size or Amp Rating | Description | Full-load Current | Overload | Kilowatts | Circuit Breaker Trip Setting | Power Fuse Rating |
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## Table 14 - Electrical Insulation Resistance Test Reading/Recording Table

**MCC Name/Number**_____

| Unit Location | Unit Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Serial Number | Wiring Diagram | Size or Amp Rating | Description | Full-load Current | Overload | Kilowatts | Circuit Breaker Trip Setting | Power Fuse Rating |
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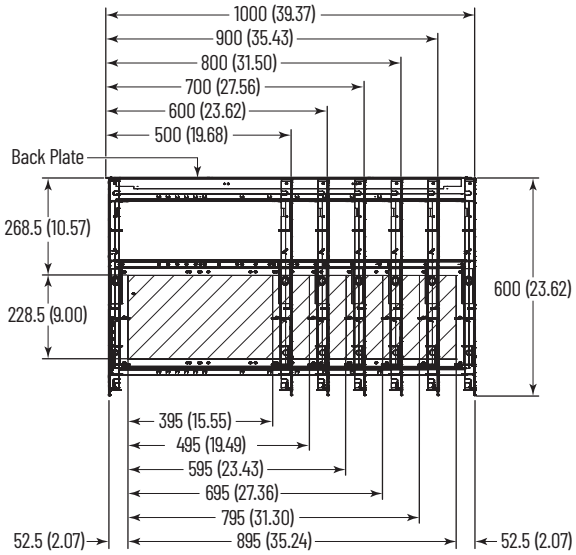
# Cable Entry and Exit Points

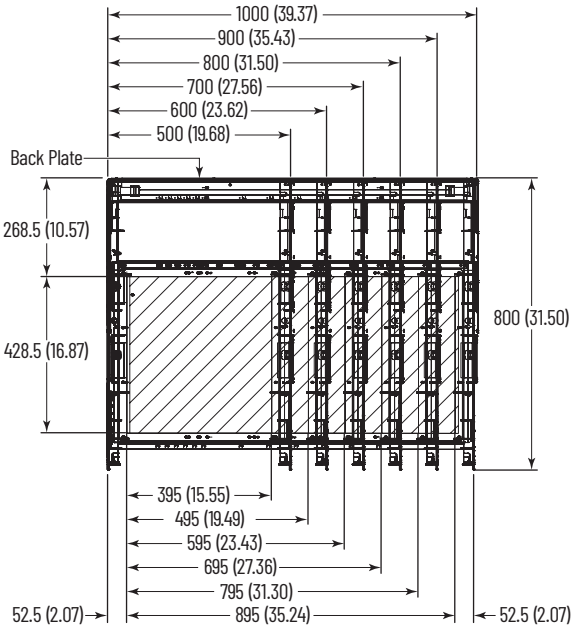
This section details the available area for cables in various configurations.

**Figure 41 - Available Area for Cable in CENTERLINE® 2500 MCCs With Air Circuit Breakers**

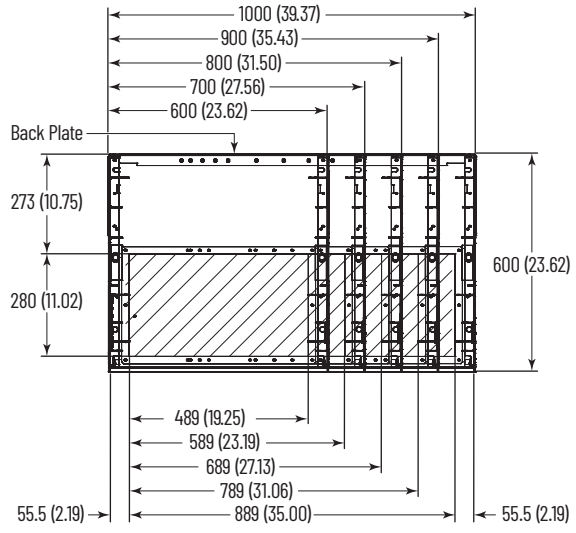
**Top View of Bottom Gland – 600 mm Deep Column**




**Top View of Bottom Gland – 800 mm Deep Column**




**Top View of Top Gland – 600 mm Deep Column**




**Top View of Top Gland – 800 mm Deep Column**

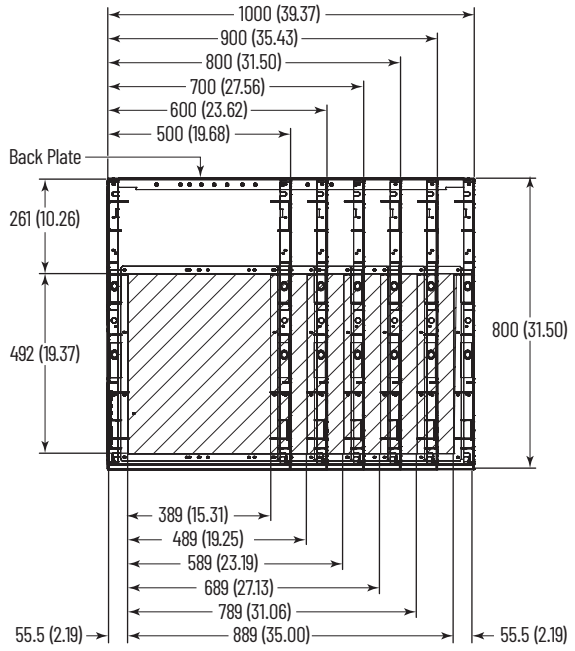
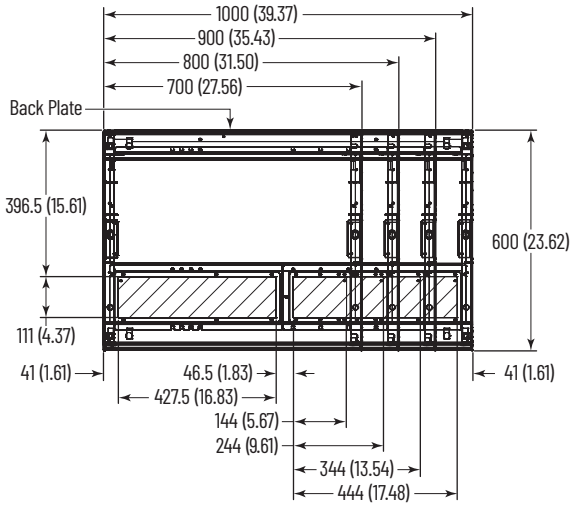
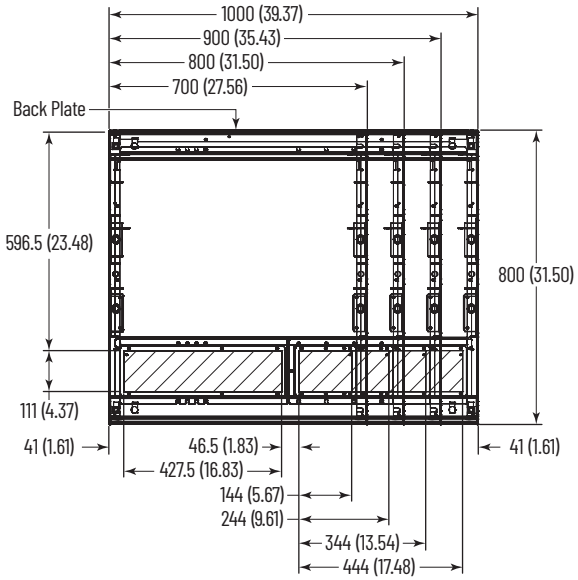


**Figure 42 - Available Area for Cable in CENTERLINE 2500 MCCs With Plug-in Columns**

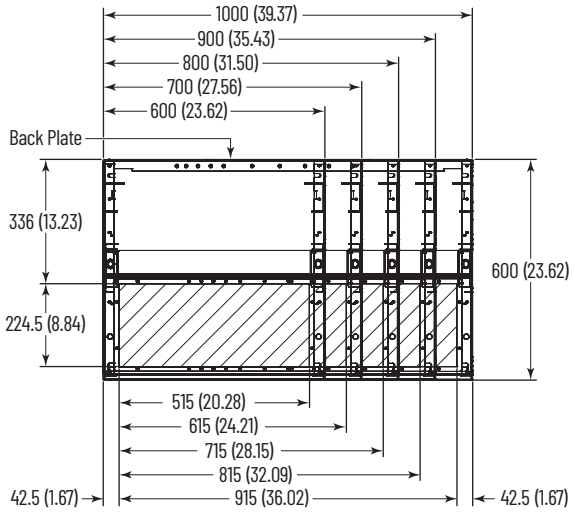
**Top View of Bottom Gland – 600 mm Deep Column**




**Top View of Bottom Gland – 800 mm Deep Column**




**Top View of Top Gland – 600 mm Deep Column**




**Top View of Top Gland – 800 mm Deep Column**

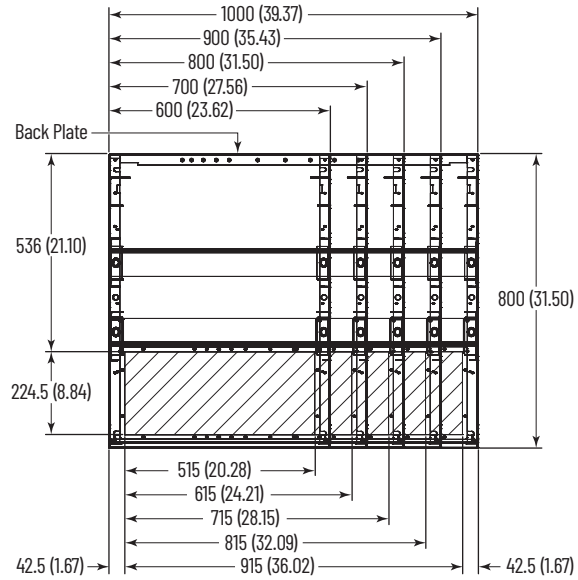
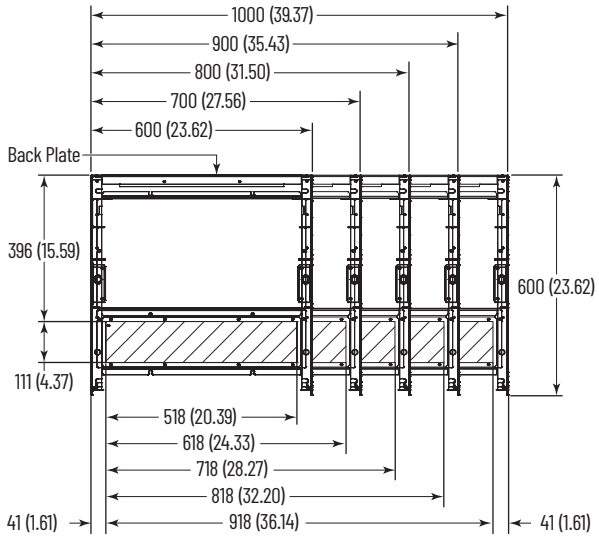
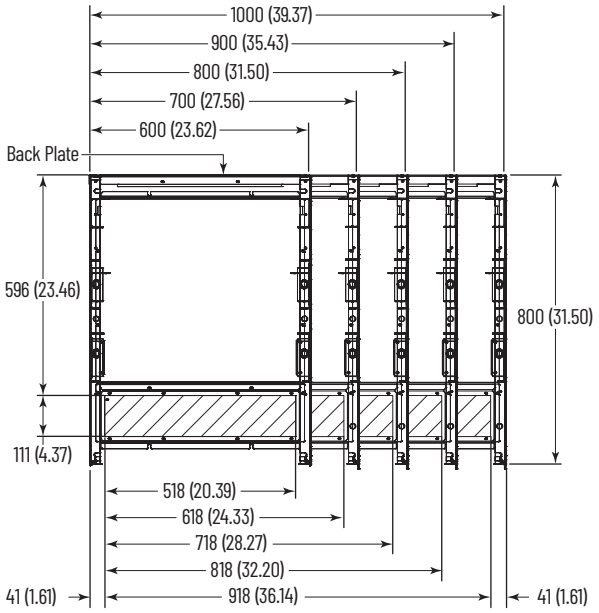


**Figure 43 - Available Area for Cable in CENTERLINE 2500 MCCs With Fixed Unit Columns (24 Modules)**

**Top View of Bottom Gland – 600 mm Deep Column**




**Top View of Bottom Gland – 800 mm Deep Column**



# Notes:

## Rockwell Automation Support

Use these resources to access support information.

| | | |
|---|---|---|
| **Technical Support Center** | Find help with how-to videos, FAQs, chat, user forums, and product notification updates. | rok.auto/support |
| **Knowledgebase** | Access Knowledgebase articles. | rok.auto/knowledgebase |
| **Local Technical Support Phone Numbers** | Locate the telephone number for your country. | rok.auto/phonesupport |
| **Literature Library** | Find installation instructions, manuals, brochures, and technical data publications. | rok.auto/literature |
| **Product Compatibility and Download Center (PCDC)** | Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes. | rok.auto/pcdc |

## Documentation Feedback

Your comments help us serve your documentation needs better. If you have any suggestions on how to improve our content, complete the form at rok.auto/docfeedback.

## Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at rok.auto/pec.



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EEE YÖnetmeliğine Uygundur

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