

Form 6 recloser control disassembly, reassembly, and testing instructions



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Contents

- DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY I**
- SAFETY FOR LIFE III**
- SAFETY INFORMATION III**
 - Safety instructions iii
- PRODUCT INFORMATION 1**
 - Introduction 1
 - ANSI Standards 1
 - Quality standards 1
 - Acceptance and initial inspection 1
 - Handling and storage 1
 - Description 1
- DISASSEMBLY 1**
 - Open the module 2
 - Removal/replacement of CPU board 3
 - Removal/replacement of communications
accessory board only 4
 - Removal/replacement of i/o board 5
 - Removal/replacement of power supply or recloser interface board (RIF) 5
 - Removal/replacement of analog board 5
- REASSEMBLY 6**
 - Place module in control 6
 - Before placing the recloser control into service 6
- INSTALLATION 7**
 - Initial programming prior to installation 7
- TESTING 7**
 - Form 6 recloser control testing instructions 7
 - Communication ports 7
 - Contact input/outputs 7
 - Testing with type MET tester 8
- ADDITIONAL INFORMATION 8**
 - Replacement Kits 8
 - Factory-authorized service **centers** 9
 - Factory testing and troubleshooting classes 9



Safety for life



Eaton meets or exceeds all applicable industry standards relating to product safety in its Cooper Power™ series products. We actively promote safe practices in the use and maintenance of our products through our service literature, instructional training programs, and the continuous efforts of all Eaton employees involved in product design, manufacture, marketing, and service.

We strongly urge that you always follow all locally approved safety procedures and safety instructions when working around high voltage lines and equipment, and support our “Safety For Life” mission.

Safety information

The instructions in this manual are not intended as a substitute for proper training or adequate experience in the safe operation of the equipment described. Only competent technicians who are familiar with this equipment should install, operate, and service it.

A competent technician has these qualifications:

- Is thoroughly familiar with these instructions.
- Is trained in industry-accepted high and low-voltage safe operating practices and procedures.
- Is trained and authorized to energize, de-energize, clear, and ground power distribution equipment.
- Is trained in the care and use of protective equipment such as arc flash clothing, safety glasses, face shield, hard hat, rubber gloves, clampstick, hotstick, etc.

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

Hazard Statement Definitions

This manual may contain four types of hazard statements:

DANGER

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

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in equipment damage only.

Safety instructions

Following are general caution and warning statements that apply to this equipment. Additional statements, related to specific tasks and procedures, are located throughout the manual.

DANGER

Hazardous voltage. Contact with hazardous voltage will cause death or severe personal injury. Follow all locally approved safety procedures when working around high- and low-voltage lines and equipment.

G103.3

WARNING

Before installing, operating, maintaining, or testing this equipment, carefully read and understand the contents of this manual. Improper operation, handling or maintenance can result in death, severe personal injury, and equipment damage.

G101.0

WARNING

This equipment is not intended to protect human life. Follow all locally approved procedures and safety practices when installing or operating this equipment. Failure to comply can result in death, severe personal injury and equipment damage.

G102.1

WARNING

Power distribution and transmission equipment must be properly selected for the intended application. It must be installed and serviced by competent personnel who have been trained and understand proper safety procedures. These instructions are written for such personnel and are not a substitute for adequate training and experience in safety procedures. Failure to properly select, install or maintain power distribution and transmission equipment can result in death, severe personal injury, and equipment damage.

G122.3

Form 6 recloser control disassembly, reassembly, and testing instructions

Product information

Introduction

Service Information MN280083EN provides disassembly, reassembly, and testing instructions for the Eaton Cooper Power series Form 6 recloser control.

Read this manual first

Read and understand the contents of this manual and follow all locally approved procedures and safety practices before installing or operating this equipment.

Additional information

These instructions cannot cover all details or variations in the equipment, procedures, or process described, nor provide directions for meeting every possible contingency during installation, operation, or maintenance. For additional information, contact your Eaton representative.

ANSI Standards

Eaton Cooper Power series reclosers are designed and tested in accordance with the following ANSI standards: C37.60 and C37.85 and ANSI Guide C37.61.

Quality standards

ISO 9001-certified quality management system

Acceptance and initial inspection

Each unit is in good condition at the factory and when accepted by the carrier for shipment.

Upon receipt, inspect the carton for signs of damage. Unpack the unit(s) and inspect it thoroughly for damage incurred during shipment. If damage is discovered, file a claim with the carrier immediately.

Handling and storage

Be careful during handling and storage of the unit to minimize the possibility of damage. If the unit is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Description

Service Information MN280083EN provides disassembly, reassembly, and testing instructions for the Form 6 Rack Mount, Yard Mount, Pole Mount, and Triple-Single Pole Mount recloser controls.

For additional information on installing the control, removing the control from service, and control testing procedures, refer to the appropriate instructions:

- *Service Information MN280075EN Form 6 Rack Mount Recloser Control Installation and Operation Instructions*

- *Service Information MN280076EN Form 6 Yard Mount Recloser Control Installation and Operation Instructions*
- *Service Information MN280077EN Form 6 Pole Mount Recloser Control installation and Operation Instructions*
- *Service Information MN280080EN Form 6 Triple-Single Pole Mount Recloser Control Installation and Operation Instructions*

Disassembly

Form 6 recloser control disassembly instructions

These instructions describe the disassembly of the Form 6 recloser control.

CAUTION

Recloser misoperation. The control must be removed from service prior to performing any main-tenance, testing, or programming changes. Failure to comply can result in misoperation (unintentional operation) of the recloser.

T216.2

1. Remove the Form 6 Control from Service. Refer to appropriate Service Information Instructions:
 - *Service Information MN280075EN Form 6 Rack Mount Control Installation and Operation Instructions* **Remove the Control from Service** section
 - *Service Information MN280076EN Form 6 Yard Mount Control Installation and Operation Instructions* **Remove the Control from Service** section
 - *Service Information MN280077EN Form 6 Pole Mount Control Installation and Operation Instructions* **Remove the Control from Service** section
 - *Service Information MN280080EN Form 6 Triple Single Pole Mount Control Installation and Operation Instructions* **Remove the Control from Service** section

IMPORTANT:

Make sure the power is turned off and the battery is disconnected.

IMPORTANT

Isolate all power connections to the Form 6 recloser control, i.e., AC voltage sensing and SCADA, before removing control from service.

2. Carefully transport the recloser control to a suitable service facility.

Note: The entire disassembly, reassembly, and testing process should be conducted in a clean environment, such as a repair shop.

CAUTION

Equipment damage. Always wear a grounding wrist strap to control static electricity before handling circuit boards. Failure to use this strap may result in circuit board damage.

T253.1

WARNING

Equipment misoperation. Use of the ProView operating system may result in the creation of many combinations of settings and scheme files. Many of these combinations can be downloaded into any device using the ProView operating system. Before downloading settings and scheme files to the equipment, verify they are tested and correct for the location and application. Downloading settings or scheme files designed for a different location or application can result in death, severe personal injury, and equipment damage.

G169.0

This step applies to Form 6 Pole and Yard mount controls.

3. Remove module from cabinet as applicable.
 - A. For complete scheme structure and verification refer to appropriate instructions:
 - *Service Information S280-70-4 Form 6 Control Schemes* section
 - *Service Information S280-70-9 Form 6-TS Control Schemes* section
 - B. Disconnect SCADA communications to the Form 6 control.
 - C. Remove all applicable connecting wires from module.
 - D. Remove the 7/16 inch grounding nut and lock-washers located on the bottom of the control module (Figure 2).
 - E. Remove the four mounting nuts that secure the front of the module to the cabinet (Figure 3).

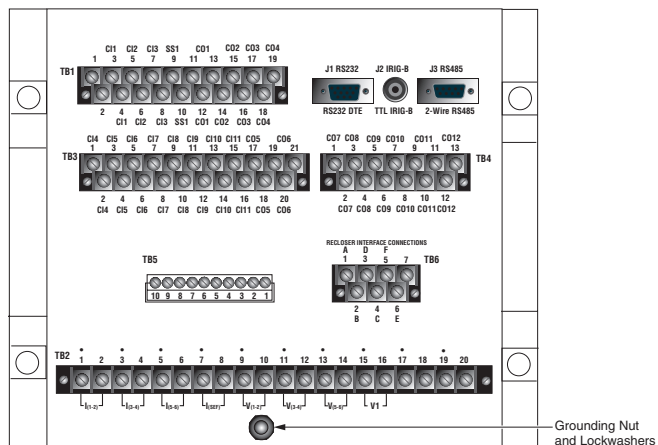


Figure 1. Location of grounding nut and lockwashers on the rear panel of the Form 6 pole mount control (below SN 10000).

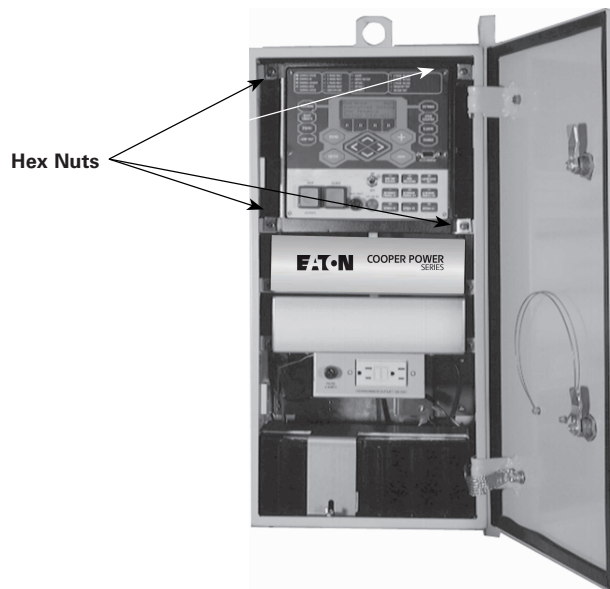


Figure 2. Location of the four mounting nuts on the front of the Form 6 pole mount control.

Open the module

1. Discharge internal capacitors using a 10 ohm (5 watt) load across TB6-1 and TB6-7 for five seconds.
2. Use a flat-head screwdriver to unscrew the six front panel screws.
3. Pull the right side of the panel outward toward the left.

Note: Various wire connections will keep the front panel attached to the control module. This will allow the display panel to be placed next to the control module while work on internal circuit boards takes place (Figure 4).

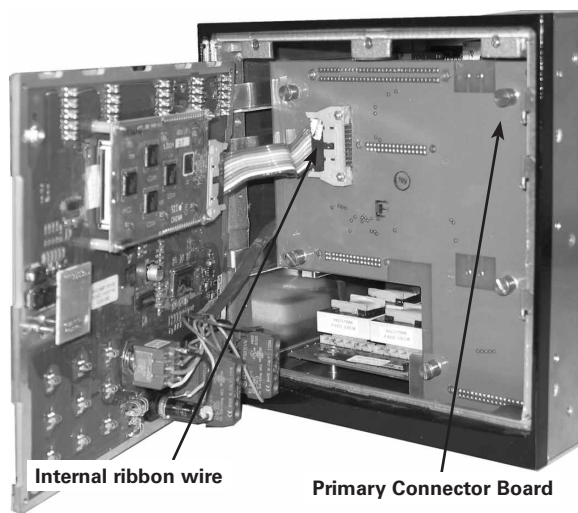


Figure 3. Form 6 control internal ribbon wire.

Form 6 recloser control disassembly, reassembly, and testing instructions

4. Disconnect the ribbon wire assembly from the primary connector board by lifting the locking tabs on either side and pulling out the connector.
5. Use a flat-head screwdriver to loosen the five captive screws on the primary connector board.
6. Holding the middle two screws on the primary connector board, firmly pull the primary connector board outward working left to right so as not to bend pins.

Removal/replacement of CPU board

CAUTION

Equipment damage. Always wear a grounding wrist strap to control static electricity before handling circuit boards. Failure to use this strap may result in circuit board damage.

T253.1

1. Remove CPU board. Refer to **Form 6 Recloser Control Disassembly Instructions** section.
2. Remove the TB1 terminal block strip from the back of the module (Figure 2).
3. Carefully pull CPU board outward so as not to damage the capacitor or any of the electrical components on the Bezel tabs (Figure 6).
4. Proceed as appropriate for kit contents:
 - If mounting plate is included with the kit proceed to step 5.
 - If mounting plate is not included with the kit continue with this step.
 - A. Unscrew the five captive screws on top of the CPU board to release it from the mounting plate.
 - B. Flip the mounting plate over and remove the two mounting screws from the bottom of the mounting plate.
 - C. Lift the CPU from the mounting plate.
 - D. Install new CPU onto mounting plate and replace the five captive screws.
 - E. Flip mounting plate over and replace the mounting screws on the bottom of the mounting plate.

5. If a new back plate is included with the kit, unscrew the six back plate screws using a Phillips-head screwdriver and replace the back plate (Figure 5).
6. Slide mounting plate into card guide and carefully line up terminal strip to opening on the back plate.
7. Replace all of the terminal block strips.
8. Attach the new back plate over the communications port on the back panel using two screws and washers provided with kit.
9. Configure communications board with applicable switches and program as necessary.



CAUTION

Equipment misoperation. Do not connect this control to an energized recloser until all control settings have been properly programmed and verified. Refer to the programming information for this control. Failure to comply can result in control and recloser misoperation, equipment damage, and personal injury.

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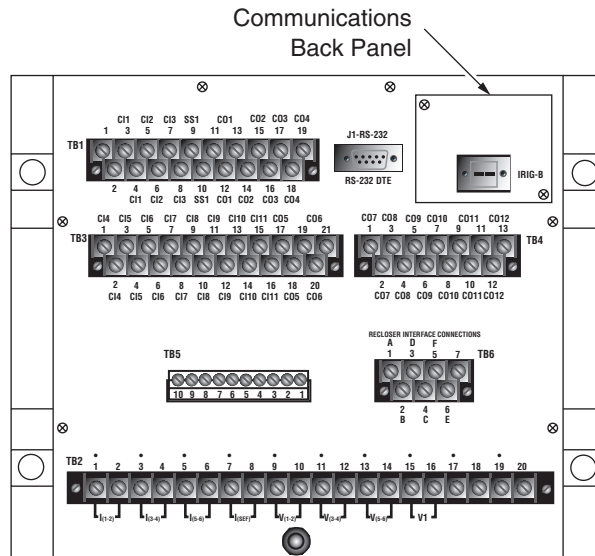


Figure 4. Form 6 control back plate.

Form 6 recloser control disassembly, reassembly, and testing instructions

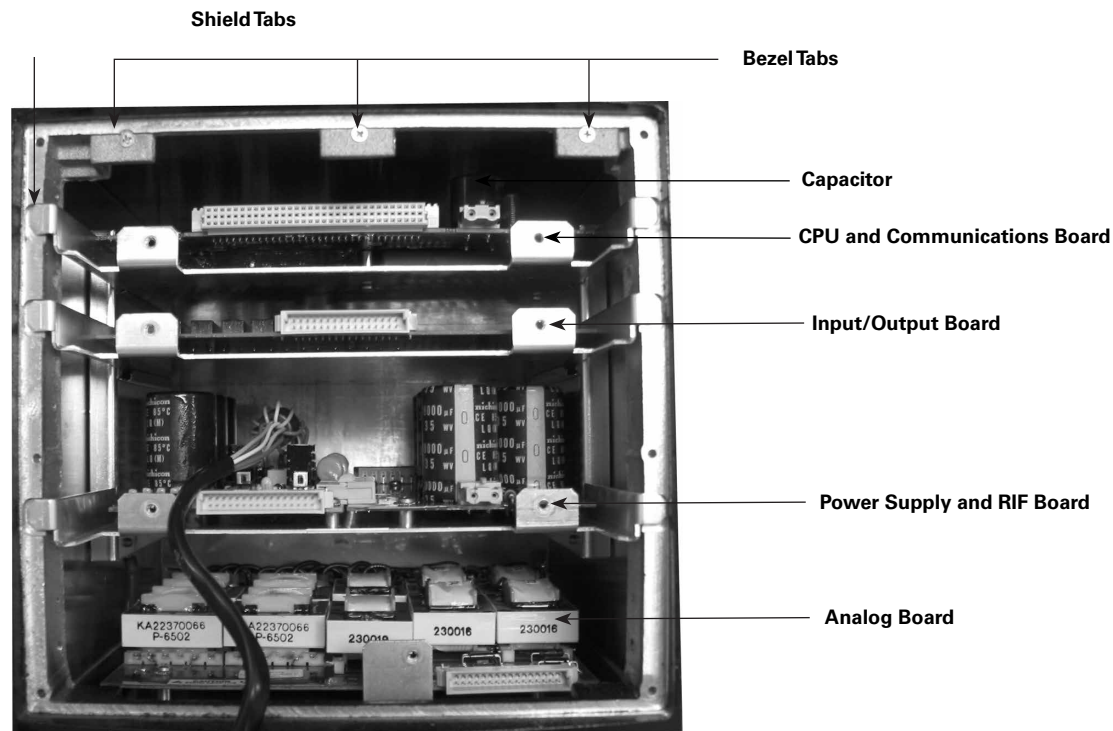


Figure 5. Internal view of the Form 6 pole mount recloser control module.

Removal/replacement of communications accessory board only

The Form 6 control is equipped with a Communication Board Accessory (expansion bay) offering versatile support for modern communication media. Seven distinct communication options are available, providing two-way, real time digital communications with a remote terminal unit (RTU), wireless, telephone modem, Ethernet network, or other communication devices. The following options are available:

- No auxiliary communication card installed (standard)
- RS485 (isolated) Serial Communication Card (KME6-3839-1S)
- Fiber-optic-based Serial Communication Card (ST) (KME6-3839-2S)
- 10/100 Base-T dual Ethernet Communication Card (2*RJ-45) (KME6-3839-5S)
- 100 Base-FX dual Ethernet Communication Card (2*MT-RJ) (KME6-3839-3S)
- 10/100 Base-T, 100 Base-FX Ethernet Communication Card (RJ-45 + MT-RJ) Multi-mode (KME6-3839-4S)
- 100 Base FX dual Ethernet Communication Card (2 SC) Single-Mode (KME6-3839-6S)

Additional accessories are being continuously developed. Contact your Eaton representative for the latest information regarding particular media and communication protocol support.

Note: Form 6 Rack Mount Controls with serial numbers below 20,000 and Form 6 Pole and Yard Mount Controls with serial numbers below 10,000 will need an additional CPU replacement kit to upgrade a communications board. Refer to KME6-3837-3S (pole mount) or KME6-3837-4S (rack/yard mount).

This procedure will be used when changing communications accessory board:

1. Remove the CPU circuit board. Refer to **Form 6 Removal/Replacement of CPU Board** section.
2. Remove the TB1 terminal block strip from the back of the module (Figure 2).
3. Carefully pull the CPU board outward so as not to damage the capacitor or any of the electrical components on the Bezel tabs (Figure 6).
4. Install two standoffs with copper washers into the holes on the left side of the CPU board (Figure 7).
5. Carefully install the communication board onto the CPU board so as to not bend any connections.
6. Install two screws with lock washers onto the communications board.

Note: Use 10 in-lbs. of torque. Do not overtighten standoffs.

7. Slide mounting plate into card guide and carefully push the assembly into the module.

Form 6 recloser control disassembly, reassembly, and testing instructions

IMPORTANT

Do not damage the capacitor or any other electrical components on the Bezel tabs (Figure 6).

8. Replace the TB1 terminal block strip.
9. Attach fiber/wire cover plate over the communications port on the back panel using two screws and washers.
10. Configure communications board with applicable switches, and program as necessary.

CAUTION

Equipment misoperation. Do not connect this control to an energized recloser until all control settings have been properly programmed and verified. Refer to the programming information for this control. Failure to comply can result in control and recloser misoperation, equipment damage, and personal injury.

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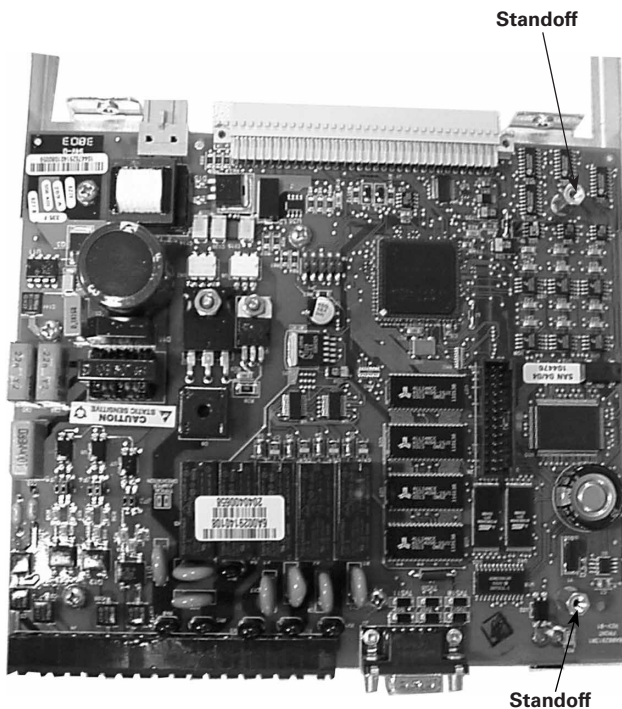


Figure 6. Location of standoffs on CPU board.

Removal/replacement of i/o board

1. Remove the I/O circuit board. Refer to **Form 6 Recloser Control Disassembly Instructions** section.
2. Remove the TB3 and TB4 terminal block strips or cover plate from the back of the control module (Figure 2).
3. Carefully pull I/O board outward so as not to damage any of the electrical components.
4. Unscrew the five screws on top of the I/O board using a Phillips-head screwdriver to release it from the mounting plate.

5. Lift I/O board from shield.
6. Install new I/O board onto mounting plate and replace the five screws.
7. Slide mounting plate into card guide and carefully line up terminal strip to opening on the back plate.
8. Replace the TB3 and TB4 terminal block strips.

Removal/replacement of power supply or recloser interface board (RIF)

Note: The Form 6 pole mount control will not contain an internal power supply board.

1. Remove the power supply or RIF circuit board. Refer to **Form 6 Recloser Control Disassembly Instructions** section.
2. Remove the TB5 and TB6 terminal block strips from back of the control module (Figure 2).
3. Carefully pull power supply and RIF board mounting plate outward (Figure 4). Disconnect wire assembly from the display assembly.
4. Unscrew the four screws on top of the power supply or RIF board using a Phillips-head screwdriver.
5. Lift power supply board off of mounting plate and carefully separate the board to board connector between the RIF and the power supply board.
6. Install new power supply board onto mounting plate and replace the four screws.
7. Slide mounting plate into card guide and carefully line up terminal block strip to opening on the back plate.
8. Replace the TB5 and TB6 terminal block strips.

Removal/replacement of analog board

1. Remove the analog circuit board. Refer to **Form 6 Recloser Control Disassembly Instructions** section.
2. Remove the bottom two screws on the outside of the right panel, left panel, and back plate of the module.
3. Remove the two screws on the bottom panel located under the TB2 terminal block strip (Figure 6).
4. If applicable disconnect each wire connector from the TB2 terminal block strip.
5. Remove bottom panel carefully so as not to remove grounding strip.
6. Unscrew the five screws on top of the analog board using a Phillips-head screwdriver.
7. Install new analog board onto mounting plate and replace the five screws.
8. Reconnect each of the wire connectors to the TB2 terminal block strip (Table 1).
9. Slide mounting plate into card guide and replace each of the two screws on the right panel, left panel, back panel, and bottom of the control housing.

Form 6 recloser control disassembly, reassembly, and testing instructions

Table 1. Form 6 yard and pole mount (below S/N 10000) control TB2 wiring connections

TB2	Wire color	
1	White/Black	
2*	Black*	
3	Red/Black	
4*	Black*	
5	Green/Black	
6*	Black*	
7*	Black*	
8	Orange/Black	
9	White/Red	RW
10	White/Brown	RW
11	Black	RW
12	White	RW
13	Gray	RW
14	Violet	RW
15	Blue	RW
16	Green	RW
17	Yellow	RW
18	Orange	RW
19	Red	RW
20	Brown	RW

* = Wire connected together
RW = Ribbon wire

Reassembly

Form 6 recloser control reassembly instructions

These instructions describe the reassembly of the Form 6 recloser control.

1. Ensure that the board that was serviced or replaced is seated firmly and has been aligned properly.

Note: All connections must be made carefully to ensure proper alignment.

CAUTION

Equipment damage. Use care to properly align and seat connection pins to the terminal block strips. Failure to comply can result in equipment damage and protective device misoperation.

T317.0

2. Carefully seat the primary connector board at each of the five captive screws sites using gentle pressure so as not to bend any connection pins.
3. Using a flat-head screwdriver tighten the five captive screws.

4. Carefully attach ribbon cable to the ribbon wire connector and secure locking tabs.
5. Replace the front panel.
6. Carefully thread each of the six front panel screws into place.

Note: Use 5-7 in-lbs. of torque. Do not cross thread or overtighten.

7. Tighten each screw in an alternating manner.
8. Check all fasteners for tightness and assure that all connections are properly made before applying power.

Place module in control

For Yard and Pole mount modules, rewire TB2 terminal block strip per Table 1.

1. Place the module into the control,
2. Secure the module with the four mounting screws.
3. Replace the 7/16 inch nut (with appropriate lock-washers) located below the TB2 terminal block strip.
4. Connect all wires.
5. Place the control in service. Refer to the **Before Placing the Recloser Control into Service** section.
6. Apply local procedures to enable an electronic recloser control.
7. Reconnect SCADA communications to the Form 6.

Before placing the recloser control into service

CAUTION

Equipment misoperation. Do not connect this control to an energized recloser until all control settings have been properly programmed and verified. Refer to the programming information for this control. Failure to comply can result in control and recloser misoperation, equipment damage, and personal injury.

G110.3

Prior to placing the Form 6 recloser control into service, installation procedures must be properly completed and verified.

For information on placing the control into service refer to the appropriate instructions:

- Service Information MN280075EN *Form 6 Rack Mount Control Installation and Operation Instructions*
- Service Information MN280076EN *Form 6 Yard Mount Control Installation and Operation Instructions*
- Service Information MN280077EN *Form 6 Pole Mount Control installation and Operation Instructions*
- Service Information MN280080EN *Form 6 Triple-Single Pole Mount Control Installation and Operation Instructions*

Installation

CAUTION

Equipment misoperation. Do not connect this control to an energized recloser until all control settings have been properly programmed and verified. Refer to the programming information for this control. Failure to comply can result in control and recloser misoperation, equipment damage, and personal injury.

G110.3

CAUTION

Equipment misoperation. Check minimum trip values prior to changing an alternate profile. Failure to do so may cause misoperation of the recloser under load conditions.

T280.1

IMPORTANT

Program all protection profiles. Unused alternate profiles should be programmed with the same settings as one of the applicable profiles. Default settings on unused alternate profiles can cause unnecessary outages if they are below normal system requirements.

Initial programming prior to installation

The control must be programmed with all necessary operating settings, all alternate profiles, and parameters prior to operation with an energized recloser.

Note: Initial programming of the control is the responsibility of a qualified technician or engineer familiar with control functions and programming parameters required for the specific recloser installation.

The control must be programmed with the Form 6 ProView interface software. Refer to the appropriate control programming guide for information:

- *S280-70-4 Form 6 Control Programming Guide*
- *S280-70-9 Form 6 Triple-Single Pole Mount Control Programming Guide*

Testing

Form 6 recloser control testing instructions

These instructions describe the testing of the Form 6 recloser control.

Communication ports

Verify that the communication settings have been appropriately configured for your selected communication protocol.

For information on configuring communications refer to the appropriate instructions:

- *S280-70-4 Form 6 Control Programming Guide*
- *S280-70-9 Form 6 Triple-Single Control Programming Guide*

Contact input/outputs

Standard default supervisory input control and output status contacts

Test inputs/outputs by asserting appropriate alarms per the ProView™ software to verify that all contact outputs operate (open and close). Figures 8 and 9 show the location of the controls module manufacturing numbers. Refer to Tables 2 and 3 for Operating Voltage Requirements for Standard and Optional Supervisory Inputs.

NOTICE

External leads must be shielded and the shield must be grounded at both ends. Terminate each lead with a 320VAC, 150 Joules metal oxide varistor (MOV), or equivalent, at the remote end. Attach MOV's between the leads and ground. Failure to properly shield and protect leads can result in equipment damage and/or unintentional operation.

For information on testing refer to the appropriate instructions:

- *Service Information MN280075EN Form 6 Rack Mount Control Installation and Operation Instructions*
- *Service Information MN280076EN Form 6 Yard Mount Control Installation and Operation Instructions*
- *Service Information MN280077EN Form 6 Pole Mount Control Installation and Operation Instructions*
- *Service Information MN280080EN Form 6 Triple-Single Pole Mount Control Installation and Operation Instructions*

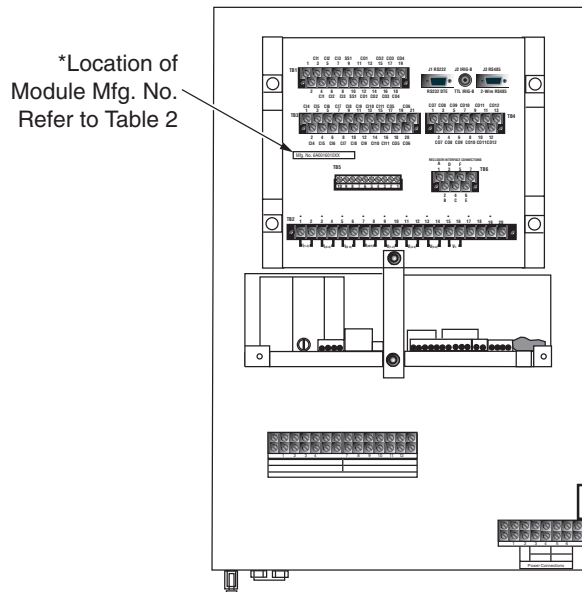


Figure 7. Module Mfg. No. location on back of Form 6 pole mount control.

Form 6 recloser control disassembly, reassembly, and testing instructions

these kits, refer to the *Replacement Parts price list S260-01 through S280-01* for catalog numbers and pricing. Contact your Eaton representative for additional information and order procedures.

Factory-authorized service centers

Factory-authorized service centers are located throughout the continental United States to provide maintenance, repair and testing services for Eaton Cooper Power series controls and reclosers. For further information, contact your Eaton representative.

Factory testing and troubleshooting classes

The factory service department offers a basic testing and troubleshooting course for the Form 6 microprocessor-based recloser control. This course, taught by experienced service technicians, is held at the factory's inhouse training facility. For additional information, contact your Eaton representative.

Type MET recloser control tester

A 30-minute video program *KSPV7 Type MET Electronic Recloser Control Tester Operation and Testing Procedures* is available as a supplemental training aid for service personnel.

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