RS-485 Digital communications accessory board installation and operation instructions
DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY

The information, recommendations, descriptions and safety notations in this document are based on Eaton Corporation’s (“Eaton”) experience and judgment and may not cover all contingencies. If further information is required, an Eaton sales office should be consulted. Sale of the product shown in this literature is subject to the terms and conditions outlined in appropriate Eaton selling policies or other contractual agreement between Eaton and the purchaser.

THERE ARE NO UNDERSTANDINGS, AGREEMENTS, WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, OTHER THAN THOSE SPECIFICALLY SET OUT IN ANY EXISTING CONTRACT BETWEEN THE PARTIES. ANY SUCH CONTRACT STATES THE ENTIRE OBLIGATION OF EATON. THE CONTENTS OF THIS DOCUMENT SHALL NOT BECOME PART OF OR MODIFY ANY CONTRACT BETWEEN THE PARTIES.

In no event will Eaton be responsible to the purchaser or user in contract, in tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss whatsoever, including but not limited to damage or loss of use of equipment, plant or power system, cost of capital, loss of power, additional expenses in the use of existing power facilities, or claims against the purchaser or user by its customers resulting from the use of the information, recommendations and descriptions contained herein. The information contained in this manual is subject to change without notice.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY</td>
<td>I</td>
</tr>
<tr>
<td>SAFETY FOR LIFE</td>
<td>III</td>
</tr>
<tr>
<td>SAFETY INFORMATION</td>
<td>III</td>
</tr>
<tr>
<td>Safety instructions</td>
<td>iii</td>
</tr>
<tr>
<td>PRODUCT INFORMATION</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Acceptance and initial inspection</td>
<td>1</td>
</tr>
<tr>
<td>Handling and storage</td>
<td>1</td>
</tr>
<tr>
<td>Quality standards</td>
<td>2</td>
</tr>
<tr>
<td>Description</td>
<td>2</td>
</tr>
<tr>
<td>MOUNTING INSTRUCTIONS</td>
<td>2</td>
</tr>
<tr>
<td>CL-6B Control</td>
<td>2</td>
</tr>
<tr>
<td>CL-6A and CL-5 series controls</td>
<td>5</td>
</tr>
<tr>
<td>OPERATION</td>
<td>8</td>
</tr>
</tbody>
</table>
Eaton’s Cooper Power series Products meets or exceeds all applicable industry standards relating to product safety. 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 flash clothing, safety glasses, face shield, hard hat, rubber gloves, 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 a hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

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

**CAUTION**

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

**CAUTION**

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

**Introduction**

*Service Information MN225072EN* provides the installation and operation instructions for a CL-6 series and CL-5 series regulator control RS-485 communications module.

**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. Read and understand the manuals detailing the installation and operation of the regulator and the regulator control used with the regulator. Refer to *MN225016EN CL-6 Series Control Installation, Operation, and Maintenance Instructions* for information on the CL-6 series voltage regulator control. Refer to *MN225008EN VR-32 Voltage Regulator with Quik-Drive Tap-Changer Installation, Operation, and Maintenance Instructions* for information on the Cooper Power series voltage regulator with Quik-Drive™ tap-changer. Refer to *S225-10-10 McGraw-Edison VR-32 Voltage Regulator and CL5 Series Control Installation, Operation and Maintenance Instructions and Parts Replacement Information* for information on the Cooper Power Systems voltage regulator and CL5 series control.

**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, please contact your Eaton representative.

**Acceptance and initial inspection**

This kit is thoroughly inspected at the factory. It is in good condition when accepted by the carrier for shipment.

Upon receipt of the regulator kit, a thorough inspection should be made for damage, evidence of rough handling, or shortages. Should this initial inspection reveal evidence of rough handling, damage, or shortages, it should be noted on the bill of lading and a claim should immediately be made with the carrier. Also, notify your Eaton representative.

**Handling and storage**

Be careful during handing and storage of equipment to minimize the possibility of damage. If the regulator kit is not to be placed into immediate use, store the kit where the possibility of damage is minimized.
Quality standards
ISO 9001 Certified Quality Management System

Description
The RS-485 communications board allows digital SCADA communications from the CL-5/CL-6 series Cooper Power Systems voltage regulator control to external remote communication devices.

Mounting instructions

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Communication module circuit board</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Interface cable: CL-5/CL-5 to communication module</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Nylon cable clip</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Machine screw, 6-32 x 1/2, round head</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Flat washer, #8, stainless steel</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Cable ties, 1/16-5/8</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>Lock washer, #6, stainless steel</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Stand-off stud, 1 1/4”</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Stand-off stud 1/2”</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Machine screw, 10-32 x 3/8”, stainless steel</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>Lead assembly, #20, white/black</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Lock washer, #10, stainless steel</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>Flat washer, #10, brass</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Lead assembly, #20, white</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Stainless steel mounting plates</td>
<td>2</td>
</tr>
<tr>
<td>16</td>
<td>Assembly Drawings</td>
<td>3</td>
</tr>
</tbody>
</table>

CL-6B Control
Follow these instructions to install the RS-485 communications module onto a CL-6B control.

1. De-energize the control panel according to the regulator manufacturers instructions.

⚠️ CAUTION
Electrical Shock Hazard. Failure to de-energize the control panel will expose the equipment installer to 120 VAC resulting in an electrical shock.

On Cooper control boxes, open the V¹ and V⁶ (if present) knife switches and close the C switch on the back panel. This will de-energize the control panel and also the back panel below the switches.

2. The communications board may be mounted at two possible locations on the rear of the CL6B control panel. Each location is defined by four threaded mounting holes. Locate one set of four mounting holes on the rear of the CL6B control panel. See Figure 2.

Note: These mounting holes are threaded to accept the stand-off studs.

Figure 2. Communications module mounting locations, rear of CL-6B control panel

3. Screw four of the 1/2” threaded stand-off studs (Item 9) into the rear of the CL6B control panel. See Figure 3.

Figure 3. Stand-off studs on control panel
4. Using the screws (Item 10), brass washers (Item 13), and lock washers (Item 12), mount the communications module (Item 1) to the stand-off studs. The brass washer is placed directly on the communications module; the lock washer is placed between the brass washer and the screw. See Figure 4.

Note: The orange RS-485 connectors should point down.

5. Connect the interface cable (Item 2) to the jack on the right side of the communications module marked “CL6”. See Figure 5.
6. Loosen the module mounting screw to the right of the RS-485 connectors (lower right corner). Place the fork terminal of the grounding lead from the interface cable between the brass washer and the communication board and retighten the screw. See Figure 5.

7. Push the interface cable terminal connector into an open accessory jack on the hinge side of the control panel. Use the lower jack (Com2); if Com2 is in use, use the upper jack (Com3). See Figure 6.

8. Use the supplied cable clip (Item 3) to route the control cable through the clip and mount the clip to the control using the threaded hole adjacent to the accessory jacks. See Figure 6. Use Items 4, 5, and 7 to accomplish this.

9. Mount the control cable fork terminal lead (grounding lead) to the second threaded hole adjacent to the accessory jacks. See Figure 6. Use Items 4, 5, and 7 to mount the fork terminal.

10. Confirm that both cable terminals and both fork leads are connected.

11. Route the cable along the back of the control panel and add cable ties (Item 6) where appropriate.

A. When installing the communications board in a Cooper control box the RCT terminal board should be used to supply power. See Figure 8.

1. Connect the white/black lead (Item 11) to the 115 terminal.

2. Connect the white wire (Item 14) to the COM terminal.

B. For communications boards installed in other than Cooper control boxes, any stable 120 VAC source can be used to supply power to the board.

CAUTION

The communications module must not be subjected to a voltage above 137 VAC or damage may result. A voltage supply below 80 VAC will result in loss of function.

Figure 7. Connecting power to communications module

12. Connect the white/black lead (Item 11) to the “L” terminal; connect the white lead (Item 14) to the “N” terminal. See Figure 7.

13. Connect the communications board to a stable approximately 120 VAC power source.

Figure 8. Connecting power leads to RCT terminal board

14. Set the termination resistor DIP switch located to the left of the orange RS-485 connectors at the bottom of the communication board. See Figure 9. Typically, the switch will be set to terminate for the communications cards located at the beginning and end of an RS-485 communications wire. The communications cards between the first and last of a system should have the switch set to non-terminating. Refer to the Operation section of this manual for more information.
Follow these instructions to install the RS-485 communications module onto a CL-6A control or a CL-5 series control from Cooper Power Systems. The preferred mounting location for these models is the control box back panel.

1. De-energize the control panel according to the regulator manufacturers instructions.

**CAUTION**

Electrical Shock Hazard. Failure to de-energize the control panel will expose the equipment installer to 120 VAC resulting in an electrical shock.

On Cooper control boxes, open the \( V^1 \) and \( V^6 \) (if present) knife switches and close the \( C \) switch on the back panel. This will de-energize the control panel and also the back panel below the switches.

2. Locate the four mounting holes on the control back panel. See Figure 10.

**Note:** These mounting holes are threaded to accept the stand-off studs.
5. Using the screws (Item 10), brass washers (Item 13), and lock washers (Item 12), mount the communications module (Item 1) to the stand-off studs. The brass washer is placed directly on the communications module; the lock washer is placed between the brass washer and the screw. See Figure 11.

**Note:** The orange RS-485 connectors should point down.

6. An alternate method of mounting the communications board onto the back panel is to use two (2) stainless steel mounting plates (Item 15), six (6) screws and lock washers (Items 10 and 12), four (4) brass washers (Item 13) and six (6) 1/2” stand-off studs, (Item 9). See Figures 12 and 13.

7. Connect the provided interface cable (Item 2) to the jack on the right side of the communications module. See Figure 14. Use the jack marked “CL5” for CL5 Series control panels and the one marked “CL6” for CL6 Series control panels. The interface cable for the CL6 has 10-pin terminals and for the CL5 it has 8-pin terminals.
8. Loosen the module mounting screw to the right of the RS-485 connectors (lower right corner). Place the fork terminal of the grounding lead from the interface cable between the brass washer and the communication board and retighten the screw. See Figure 14.

9. Connect the interface cable to the control panel:
   A. For the CL6A control panel: Push the interface cable terminal connector into an open accessory jack located on the hinged side of the control panel. Use the lower jack, (Com2); if Com 2 is in use, use the upper jack (Com 3). See Figure 15.
   B. For the CL5 control panel: Remove the metal shield from the back of the control by removing 4 nuts and wiring harness cable stay. Push the interface cable terminal connector into the accessory jack located at the top right of the printed circuit board. See Figure 16.

   Figure 16. Connecting interface cable to CL5 control panel

10. For the CL6A, use the supplied cable clip (Item 3) to route the control cable through the clip and mount the clip to the control using the threaded hole adjacent to the accessory jacks. See Figure 15. Use items 4, 5, and 7 to accomplish this. Skip this step for the CL5 control.

11. Connect the interface cable grounding lead to the control panel:
   A. For the CL6A, connect the lead to the threaded hole adjacent to the accessory jacks. See Figure 15. Use items 4, 5, and 7.
   B. For the CL5, connect the lead under the nut adjacent to the accessory jack. See Figure 16. Install the metal shield onto the back of the control panel, routing the interface cable through the slot in the side of the shield as it is installed. See Figure 17.

   Figure 17. Routing interface cable on CL5 control panel

12. Confirm that both cable terminals and both fork leads are connected.

13. Route the cable along the back of the control panel and add cable ties (Item 6) where appropriate.

14. Connect the white/black lead (Item 11) to the “L” terminal; connect the white lead (Item 14) to the “N” terminal. See Figure 17.

15. Connect the communications board to a stable approximately 120 VAC power source.
   A. When installing the communications board in a Cooper control box the RCT terminal board should be used to supply power. See Figure 18.
      1. Connect the white/black lead (Item 11) to the 115 terminal.
      2. Connect the white wire (Item 14) to the COM terminal.
   B. For communications boards installed in other than Cooper control boxes, any stable 120 VAC source can be used to supply power to the board.

   CAUTION

The communications module must not be subjected to a voltage above 137 VAC or damage may result. A voltage supply below 80 VAC will result in loss of function.
Operation

The RS-485 communications board allows digital SCADA communication from the CL5/CL6 series regulator control to external remote communication devices. Several Function Codes (FC) must be set properly when attempting to use the second communications port: for CL5 series, FC 64—FC 68; for CL6 series, FC 60—FC 67 for Com 1/Com 3 and FC 160—FC 167 for Com 2..

To properly set the FCs, refer to MN225016EN CL6 Series Control Installation, Operation, and Maintenance Instructions for information on the CL6 series voltage regulator control and refer to Service Information S225-10-10 for information on the CL5 series. Refer also to any manuals provided by the RTU/master station vendor.

For additional assistance contact your Eaton representative.

16. Set the termination resistor DIP switch located to the left of the orange RS-485 connectors at the bottom of the communication board. See Figure 19. Typically, the switch will be set to terminate for the communications cards located at the beginning and end of an RS-485 communications wire. The communications cards between the first and last of a system should have the switch set to non-terminating. Refer to the Operation section of this manual for more information.
This page intentionally left blank.
RS-485 Digital communications accessory board installation and operation instructions

This page intentionally left blank.