Retrofit 12-Conductor Cable Installation Instructions

S225-50-6

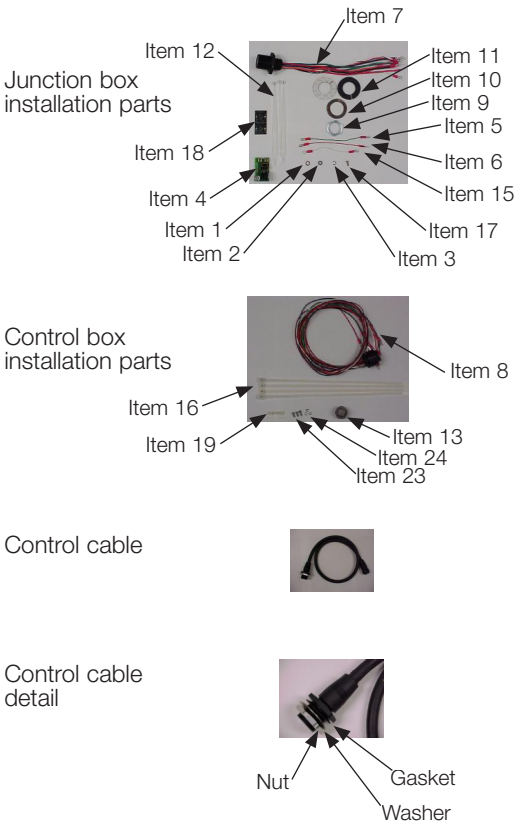

Figure 1.
Kit parts and control cable.

Note: The control cable is sold as a separate item. Refer to Table 2 for standard control cable lengths. The control cable length is determined by the control box option selected.

TABLE 1
Kit Parts Identification

Junction Box:		
Item	**Description**	**Qty**
1	Flat washer	1
2	Hex nut	1
3	Lockwasher	1
4	CT protector	1
5	Lead assembly (Green)	1
6	Lead assembly (Red)	1
7	Cable assembly	1
9	Nut	1
10	Washer	1
11	Gasket	2
12	Cable tie fastener	3
15	Lead assembly (White)	1
17	Machine screw #8-32	1
18	Adhesive-backed tie fastener	1
Control Box:		
Item	**Description**	**Qty**
8	Control box cable assembly	1
13	Pipe-coupling plug	1
16	Self-locking cable tie fastener	4
19	Mounting base	3

Contents

SAFETY FOR LIFE

Cooper Power Systems products meet or exceed 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 Cooper Power Systems 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 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 may 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

PRODUCT INFORMATION

Introduction

Service Information S225-50-6 provides the instructions for retrofitting a hard-wired Cooper Power Systems or McGraw-Edison VR-32 voltage regulator with quick-disconnect cables. The quick-disconnect cables can be retrofitted on any McGraw-Edison or Cooper Power Systems regulator with a junction assembly on the cover assembly.

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 *S225-10-30 VR-32 Voltage Regulator with Quik-Drive Tap-Changer Installation, Operation, and Maintenance Instructions* for information on the Cooper Power Systems voltage regulator with Quik-Drive tap-changer. Refer to *S225-11-1 CL-6 Series Control Installation, Operation, and Maintenance Instructions* for information on the CL-6 voltage regulator 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 Cooper Power Systems 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 Cooper Power Systems 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 9001:2000 Certified Quality Management System

INSTALLATION PROCEDURES

WARNING: Hazardous Voltage. This procedure must only be performed on a regulator that has been removed from service. Failure to comply can cause serious injury or death. VR-T224.0

Remove the regulator from service before installing this kit. Only a regulator in the neutral position can be safely removed from service without interrupting load continuity. It is recommended to use more than one method to determine the neutral position. Refer to the appropriate voltage regulator manual for complete instructions on removing from service. Refer to *S225-10-30 VR-32 Voltage Regulator with Quik-Drive Tap-Changer Installation, Operation, and Maintenance Instructions* for information on the Cooper Power Systems voltage regulator with Quik-Drive tap-changer.

Required Tools:

- Screwdriver (Standard)
- Diagonal cutter
- Needle-nose pliers
- 3/8" Wrench or nut driver
- 1 1/4" Open-end wrench
- 1 3/8" Open-end wrench
- Allen wrench
- Crescent wrench

Junction Box Cable Removal

1. Using a standard screwdriver, remove the junction box cover.
2. Using an Allen wrench, remove the external flex shaft from the output shaft of the position indicator. Refer to Figure 2.

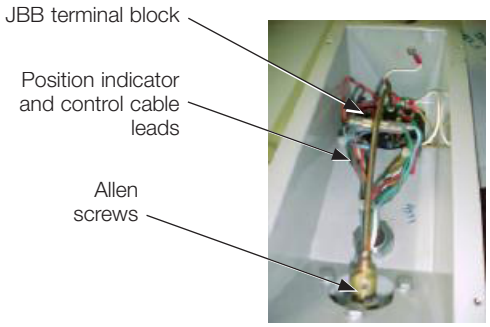

Figure 2.
Junction box and control cable leads.

3. Using a standard screwdriver, remove all control cable and position indicator lead connections from the round terminal block JBB located in the back of the junction box. Refer to Figure 2.
4. Using a pair of needle-nose pliers, disconnect the position indicator and control cable, green/black leads, from the male terminal with insulation sleeve. Refer to Figure 2.
5. Using a pair of needle-nose pliers, disconnect the blue lead from the position indicator and control cable.
6. Using a pair of diagonal cutters, cut the tie fasteners and separate the position indicator and control cable leads. Refer to Figure 2.

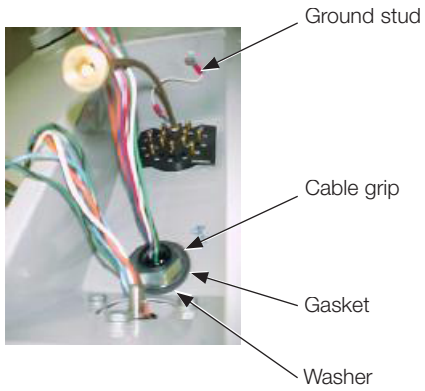

Figure 3.
Cable grip and ground stud.

7. Using a 1 1/4" wrench, remove the cable grip nut inside the junction box. Refer to Figure 3.
8. Remove the cable grip and control cable from the junction box.

Quick-Disconnect Cable, Junction Box Installation

There are two procedures for installing the junction box quick-disconnection cable assembly. Refer to Figure 3.

Procedure 1: for junction boxes that have a ground stud on the back surface inside of the junction box.

Procedure 2: for junction boxes without a ground stud on the inside surface of the junction box.

Procedure 1: Junction Box Cable Installation

1. Locate gasket (Item 11) and remove adhesive protective backing on one of the gaskets. Place the gasket around the cable entrance hole with the adhesive side down on the inside of the junction box. Refer to Figure 3.
2. Locate the second gasket (Item 11). The adhesive must be against the metal surface of the under side of the junction box around the cable entrance hole. Remove the protective backing and place the gasket with the slot offset 90° from the slot of the gasket in step 1.
3. Place the lead side of the cable assembly (Item 7) through the cable entrance hole from the under side of the junction box.
4. Place washer (Item 10) over the cable assembly leads and down against the gasket. Refer to Figure 3.
5. Place nut (Item 9) over the cable assembly leads and start the nut on to the threads. Using a 1 1/4" open-end wrench, tighten the nut down until snug. Refer to Figure 3.
6. Leads from the cable assembly and position indicator have ring tongue terminals. Connect leads from cable assembly and position indicator to C_1 and C_2 on the terminal block on the inside of the junction box; refer to Table 1.

TABLE 1
10-Conductor Connections

Lead Color	Connector
White (Gounds)	G
Orange/Black	DHR
Black	S_2
Red	C_1
Green	C_2
Blue	R
Green/Black	L
Red/Black	NL
Orange	HS
Blue/Black	M_2
White/Black*	S_4

*White/Black lead is connected to S4 when an internal differential PT is being used. Otherwise tie back and insulate the terminal.

7. Connect green lead (Item 5) to C_2 and red lead (Item 6) to C_1 on the terminal block on the inside of the junction box.
8. Using a pair of needle-nose pliers, connect the control cable and position indicator leads with push-on connectors on to the clear insulated male connector. Refer to Figure 4 and Table 2.

TABLE 2
Push-On Connections

A		B
Position Indicator	to	Control Cable
Green/Black	to	Green/Black
Blue	to	Blue

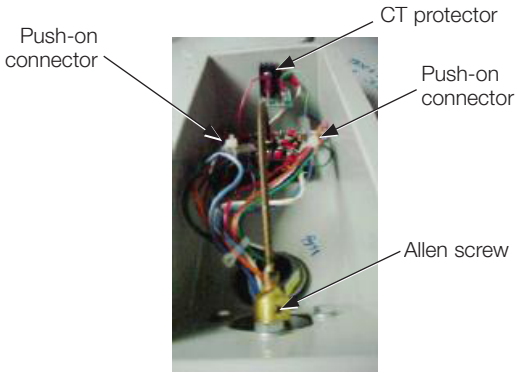

Figure 4.
Push-on connectors.

9. On the back side of the junction box, remove the ground stud nut and white ground lead.

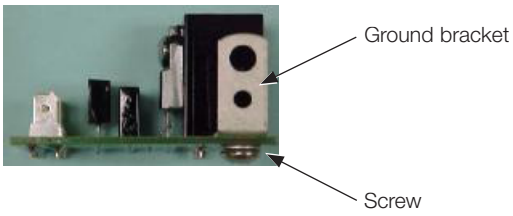

Figure 5.
CT Protector, side view.

10. Using the L-shaped bracket, place CT Protector (Item 4) on to the ground stud. Refer to Figure 5.
11. Place the ring tongue terminal of the ground lead over the stud followed by the nut and tighten. Refer to Figure 4.

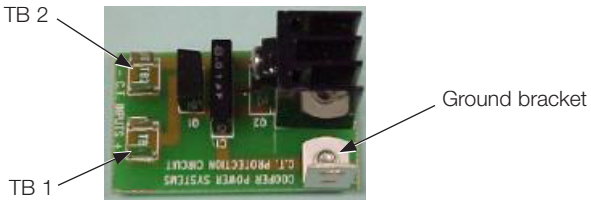

Figure 6.
CT Protector, top view.

12. Connect green lead push-on connector (Item 5) to CT protector (Item 4) at TB1. Connect red lead push-on connector (Item 6) on to CT Protector (Item 4) at TB2. Refer to Figure 6.
13. Using three cable tie fasteners (Item 12), tie the control cable leads and position indicator lead so that they are clear of interference with the external flex shaft.
14. Verify that the position indicator pointer is on zero. Place the external flex shaft on the output shaft of the position indicator and tighten the Allen screws with an Allen wrench.
15. Replace the junction box cover after inspecting that all connections are correct.

Procedure 2: Junction Box Cable Installation

In this option installing the junction box cable assembly is the same except for step 8 in option 1. In this case of an older regulator that does not have a ground stud on the back surface inside of the junction box, use the following process to assemble the CT Protector.

1. Replace the grounding screw on the bottom of the CT Protector grounding bracket (Item 4) with the #8-32 SS machine screw (Item 17). Refer to Figure 5.

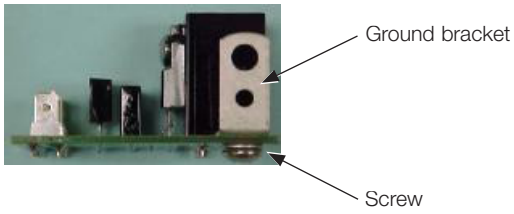

Figure 5.
CT Protector, side view.

2. Place the ring tongue terminal of the lead assembly (Item 15) between the head of the screw and the ground pad on the CT Protector and tighten the screw.

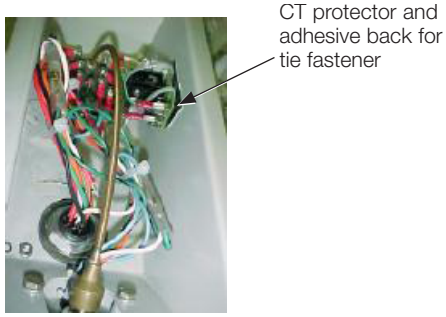

Figure 7.
Tie-fastener placement.

3. Remove the adhesive protector on the adhesive-backed tie fastener (Item 18). Locate and place in the center on the inside surface of the back of the junction box with the fastener running parallel to the bottom of the box. Refer to Figure 7.
4. Finish the junction box assembly step 9 through step 12 as stated for Procedure 1.

Control Box Cable Removal

1. Open the control cabinet and swing open the front panel.
2. Using a pair of diagonal cutters, cut the tie fasteners holding the control cable leads to the mounting bases on the back panel. Refer to Figure 8.

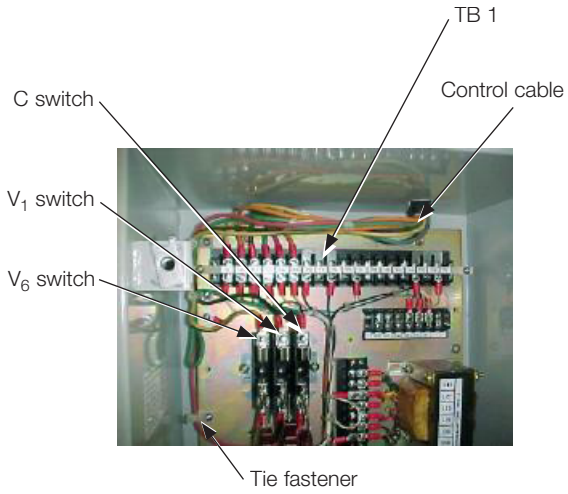

Figure 8.
Control cable leads.

3. Using a standard screwdriver, remove the control cable leads on TB1. Refer to Table 3 for the control cable lead color and connector identification.

TABLE 3
Control Cable Connections

Lead Color	Connector ID
White	G
Orange	HS
Blue	R_1
Green/Black	L_1
Red/Black	NL
Orange/Black	DHR

4. Using a 3/8" nut driver, remove the black lead from the top of V_1 knife blade switch . Remove the green lead from the top of the C knife blade switch and the red lead from the bottom of the C switch. Remove the white/black lead from the top of V_6. Remove blue/black lead from the top of V_2 .

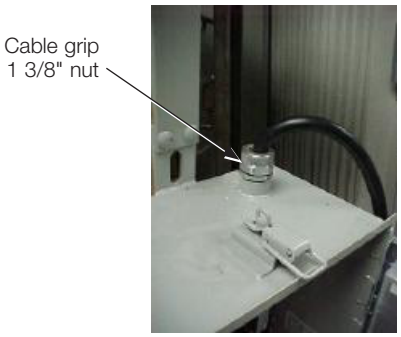

Figure 9.
Cable grip.

5. Use a 1 3/8" open-end wrench to remove the cable grip on the top of the control box. Refer to Figure 9.
6. Remove the control cable from the control box.

Quick-Disconnect Cable, Control Box Installation

There are three options in installing the control retrofit cable in the control box. Determine which option is appropriate for the application; this will determine the cable length.

Option 1: Control Box, Bottom Entrance
Bottom entrance using the left hand knockout in the bottom of the control box.

Option 2: Control Box, Side Entrance
Side entrance using one of the two knockouts on the right side of the control box.

Option 3: Control Box, Top Entrance
Top entrance that requires cutting a 1 5/16 inch diameter hole in the top of the control box.

The internal control box cable is designed extra long to allow for fitting a long box. The same internal control cable is used in all three options and requires that the excess lead length be shaped and tied in place with cable tie fasteners (Item 16).

The electrical connections are all the same in all three control box entrance options. The customer determines which option is best for their own application when deciding on which quick-disconnect control cable length to be used when retrofitting.

Standard quick-disconnect cable lengths are 19", 27", 31", 34", 40", 40", 46", 54", 6', 15', 20', 25', 30', 35', 40', 45', and 60'.

Determine the appropriate quick-disconnect cable to use to connect the junction box and the control box for Option 1, Option 2, or Option 3.

Option 1: Control Box, Bottom Entrance

Measure the distance from the bottom side of the junction box to the bottom edge of the control box and add eight inches; select the nearest cable length. As a rule, the cable should never have a radius less than two times the diameter of the cable.

Note: The distance between the bottom of the junction box and the bottom of the control box is dependant on where the customer is planning to fasten the control box.

Option 2: Control Box, Side Entrance

Measure the distance from the bottom side of the junction box to either the top or bottom knockout on the right side of the control box and add eight inches; select the nearest cable length . The radius of the cable should never be less than two times the cable diameter.

Note: The distance between the bottom of the junction box and the knockout is dependant on the location where the customer is planning to fasten the control box.

Option 3: Control Box, Top Entrance

Measure the distance from the bottom side of the junction box to the top of the control and select the nearest length.

Note: The distance between the bottom of the junction box and the top of the control box is dependent on the location where the customer is planning to fasten the control box.

Quick-Disconnect Cable, Control Box Assembly

1. Connect the cable assembly-control box (Item 8) to the back panel. Refer to Figure 9.
2. The control cable has two different connector types. One end is a male connector that connects into the junction box. The other connector is a female connector that connects to the control box. Remove the nut and washer from the female connector end of the cable.
3. Place the external threaded connector through the entrance hole in the control box. The rubber gasket on the connector should be on the outside surface of the control box.
4. From the inside of the control box, place the washer over the connector threads, then start and tighten the cable connector nut.

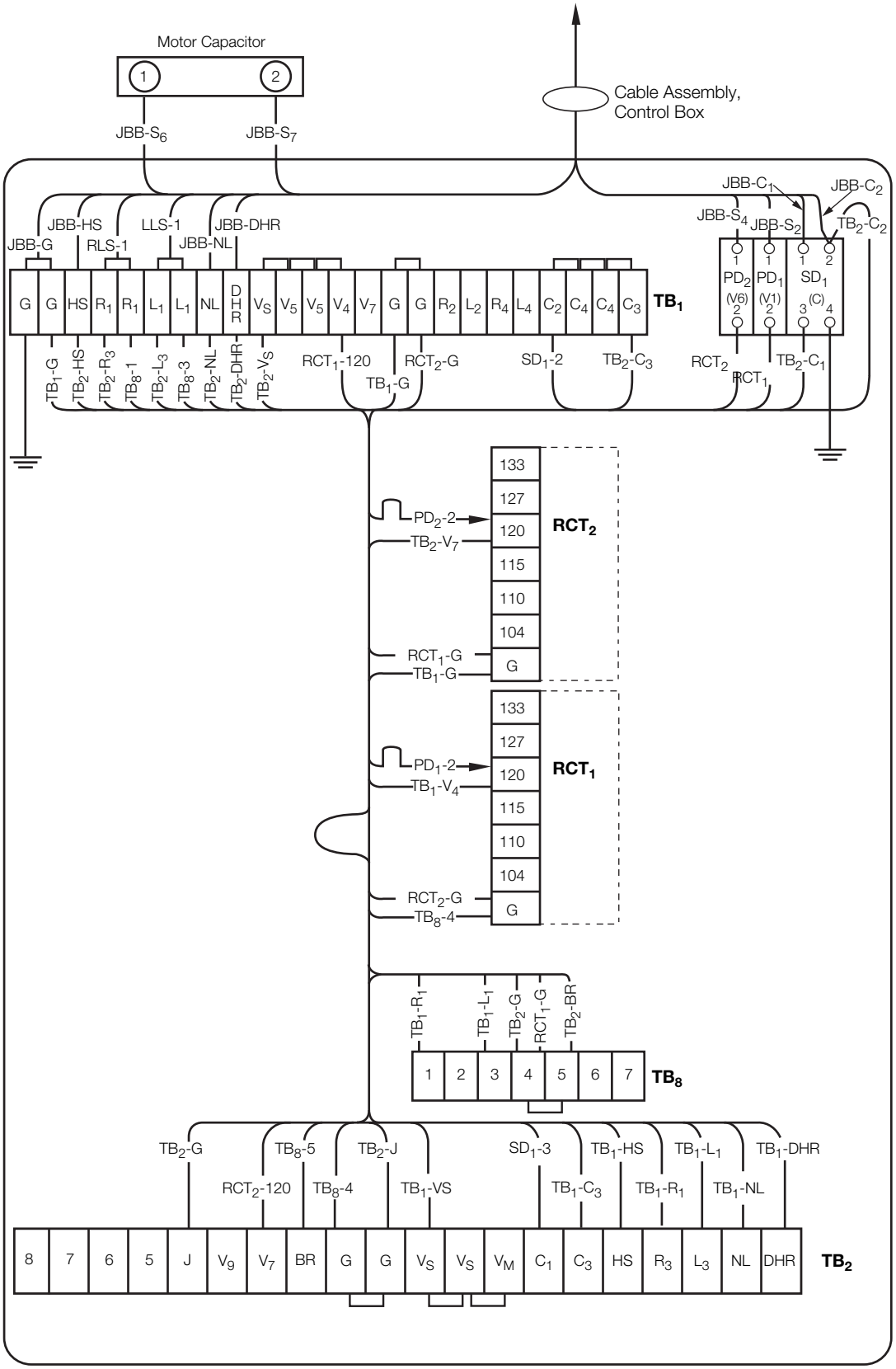

Figure 10.
Control back-panel wiring.

5. Align the key slot of control box cable assembly (Item 8) with the key guide in the control cable connector.
6. Insert the control box cable in to the control cable and tighten the cable fastener. Refer to Figures 10, 11, and 12 for the three entrance options.
7. After installing the control box retrofit cable assembly and the control cable, shape the excess leads in the control box and secure using the self-locking cable tie fasteners (Item 16), three mounting bases (Item 19), three 32 x .375 machine screws (Item 6), and three #6 spit lockwashers. Refer to Figures 11, 12 and 13.

Figure 11.
Bottom entry.

Figure 12.
Side entry.

Figure 13.
Top entry.

8. After the old cable assembly is removed from the control box, there is an open hole in the top of the control box. Refer to Figures 14 and 15. Application of sealing compound to the threads of pipe coupling (Item 13) is recommended. Using a Crescent wrench, tighten the pipe plug.

Figure 14.
Control box coupling without pipe plug.

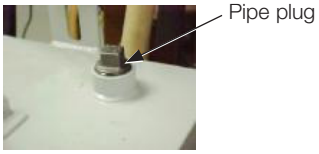

Figure 15.
Control box coupling with pipe plug.

COOPER Power Systems

2300 Badger Drive
Waukesha, WI 53188 USA
www.cooperpower.com