

Voltage Regulators

QD3/T350 Reversing Movable Contact and Neutral Stationary Contact Assembly Kit, Kit 5741325B03

Service Information

S225-50-44

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GENERAL

The purpose of this replacement procedure is to provide the instructions for replacing the main stationary contacts on a QD3 Quik Drive Tap Changer.

This installation instruction is made up of four different procedure sections:

- Tap Changer Removal from Voltage Regulator
- QD3/T350 Tap Changer Assembly Separation
- Reversing Movable and Neutral Stationary Contact Removal and Re-assembly
- Tap Changer Re-assembly

PARTS SUPPLIED

Item	Part Number	Description	Qty
1	5741325B03	Reversing Movable Neutral Stationary Contact Assembly	1

TOOLS REQUIRED

Description	Qty
Needle Nose Pliers	1
9/15 inch Deep Well socket	1
3/8 inch Drive Ratchet Wrench	1
5/32 Allen Wrench	1
Phillips Head Screwdriver Size 1 Point	1
Diagonal Cutters	1
Phillips Head Screwdriver	1
Standard Screwdriver	1
Torque Wrench inch pounds	1

PRODUCT INFORMATION

Introduction

The QD3/T350 Reversing Movable Contact Assembly Kit and installation instructions give customers the ability and guidance to replace the Reversing Movable Contact and Neutral Stationary in case any wear or damage would prevent the tap changer from operating properly. This kit provides excellent service for keeping Cooper Power Systems Voltage Regulators in service for many years.

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 representative.

Acceptance and Initial Inspection

Each kit is in good condition when accepted by the carrier for shipment. Upon receipt, inspect the shipping container for signs of damage. Unpack the kit 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 kit to minimize the possibility of damage. If the kit is to be stored for any length of time prior to installation, provide a clean, dry storage area.

Standards

ISO 9001:2000 Certified Quality Management System



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

 **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.

 **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.

 **WARNING:** Power distribution equipment must be 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 this equipment can result in death, severe personal injury, and equipment damage.

INSTALLATION PROCEDURE

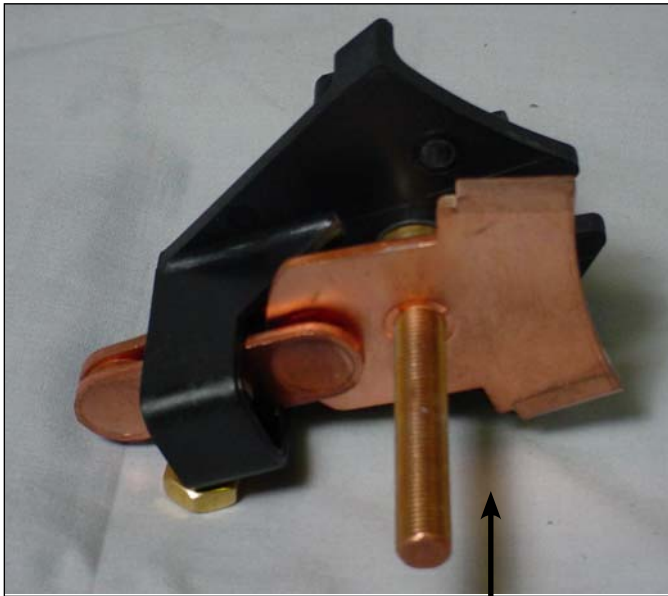


Figure 1.
Kit Part

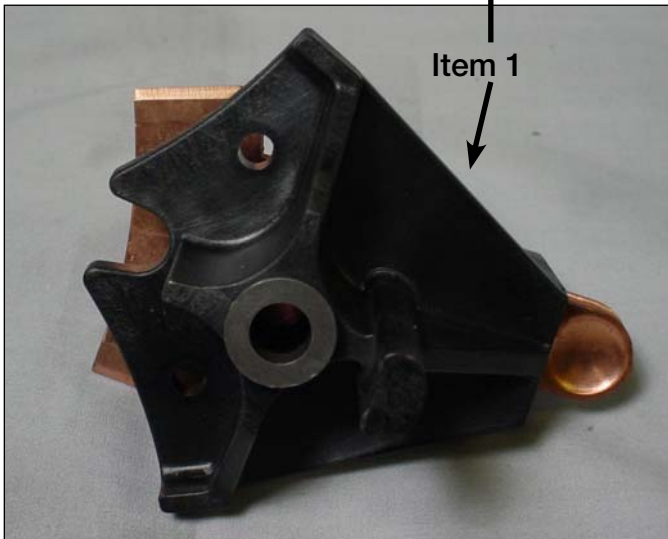


Figure 2.
Kit Part

Tap Changer Removal from Voltage Regulator

1. Remove the internal position indicator shaft from the tap changer indicator drive tube. See Figure 3.

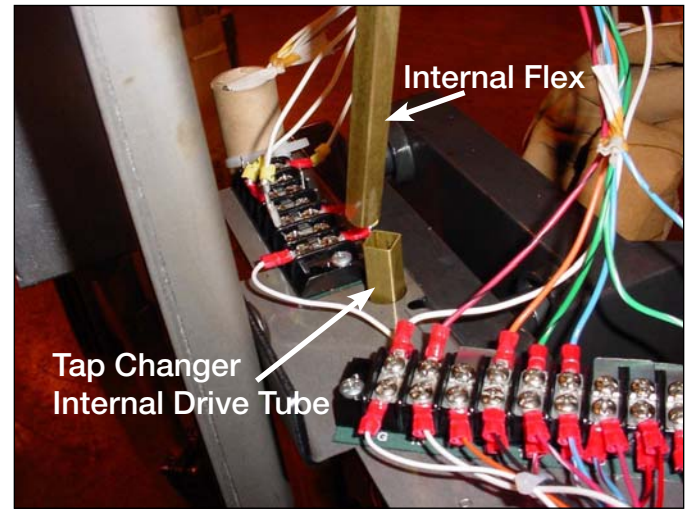


Figure 3.
Internal Flex Shaft

2. Use a pair of diagonal side cutters cut and remove the cable-ties from the control winding hard insulation tube and tap changer top bracket assembly. See Figure 4.

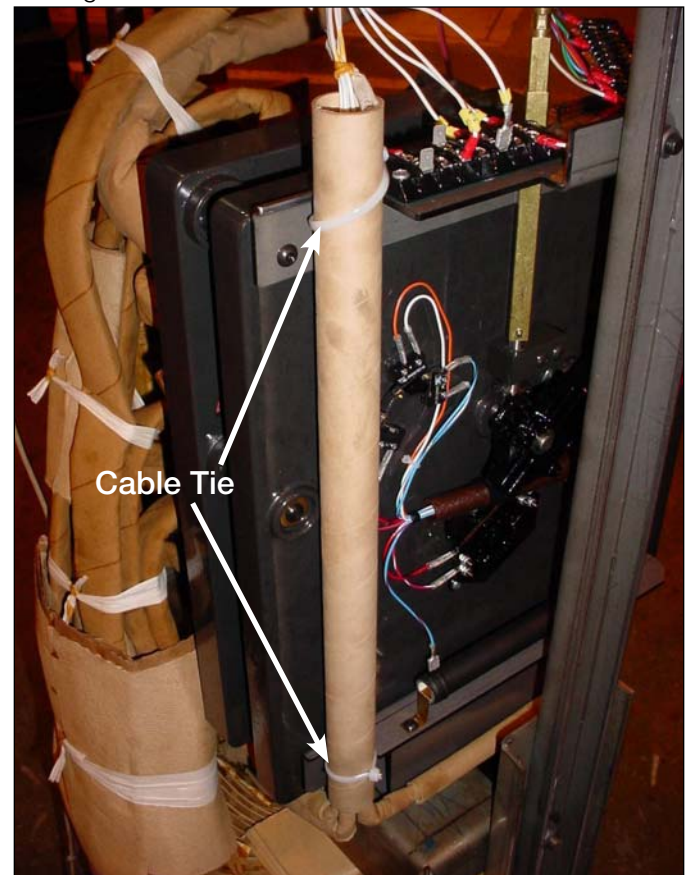


Figure 4.
Control Cable Fastening.

- Use a 9/16 inch socket and ratchet to loosen and remove the nut and carriage bolt fastening the tap changer bracket to the regulator side channel. See Figure 5

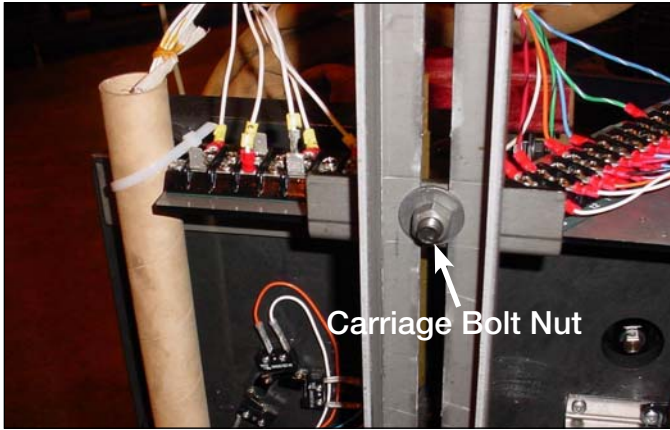


Figure 5.
Tap Changer and Side Channel Fastener.

- Using a Phillips head screwdriver, loosen and remove the TCB terminal board leads from the 14 position terminal board located on the top right of the QD3 tap changer. See Figure 6. The lead color and termination points are as follows:

Lead Color	TCB Connection
Blue/White	1
Green/White	5
Blue	9
Green	10
Orange	11
Red/Black	13
White	G

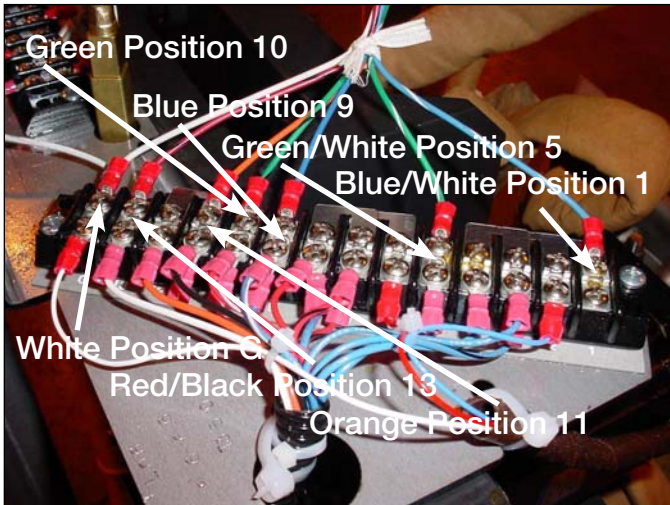


Figure 6.
TCB Lead Color and Termination Points.

- Use a Phillips head screwdriver and needle nose pliers to disconnect the white E control winding leads and P leads if available from the seven position terminal board located on the left top of the tap changer. See Figure 7.

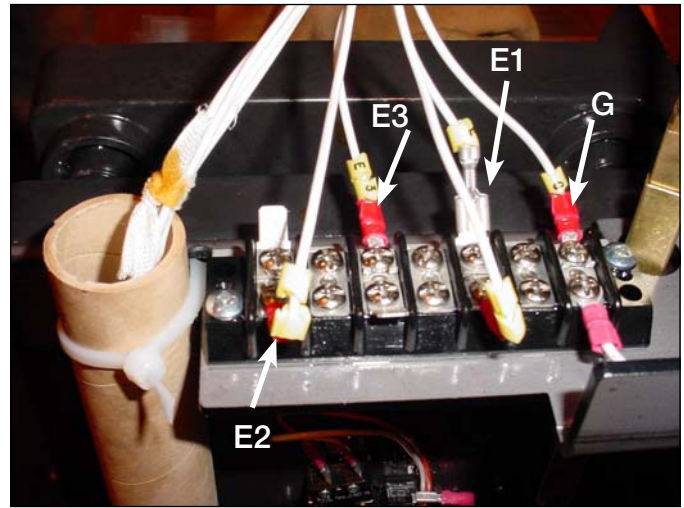


Figure 7.
E & P Lead Connections.

Control Winding E Lead and (P Lead if Available) Connections.

The E lead will have E lead ID markers and the P leads, if available, will have P lead markers.

Lead Marker	Terminal Board ID
E	Could be on either E1, E2, or E3
E1	E1
E2	E2
E3	E3
P	If available, could be on either P1, P2, or P3
P1	P1
P2	P2
P3	P3

- Use a deep well 9/16 inch socket with ratchet or a 9/16 inch wrench to loosen and remove all lead connections from the back of the tap changer contact board. See Figure 8.

CAUTION: Do not remove lead ties from lead bundles holding the tap leads in a certain position. Try to keep from moving the lead bundles from normal position. Doing so can result possibly in de-electric failures.

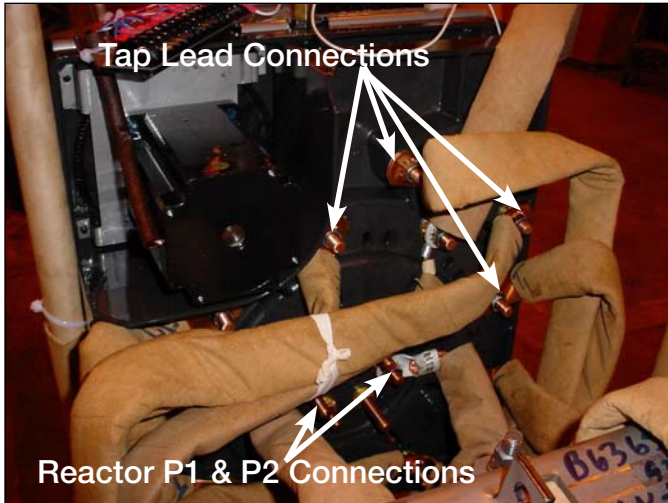


Figure 8.
Tap Leads and Reactor Connections.

- Remove the mounting bolts fastening the tap changer-mounting bracket to the top core clamp. See Figure 9. Remove the tap changer from the regulator and place on a work surface.

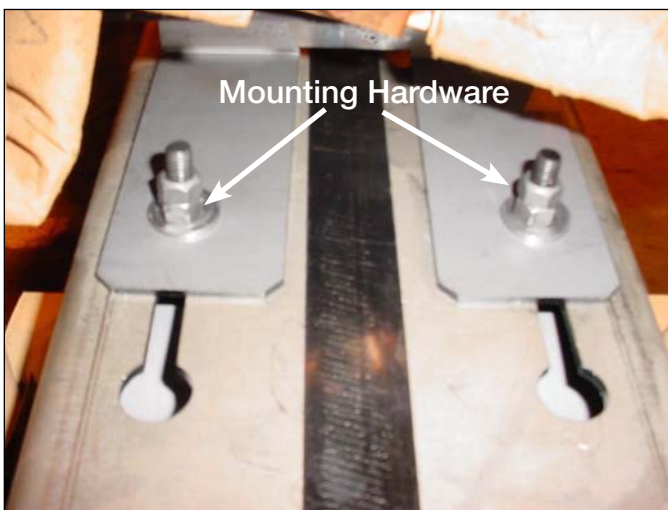


Figure 9.
Tap Changer to Core Clamp Fastening Hardware.

QD3/T350 Tap Changer Assembly Separation

- After removing the tap changer from the regulator assembly, use a Phillips head one point screwdriver too loosen and remove the six screws mounting the Reversing Lower, Raise and Neutral switch located in the upper left corner of the tap changer assembly. See Figure 10.

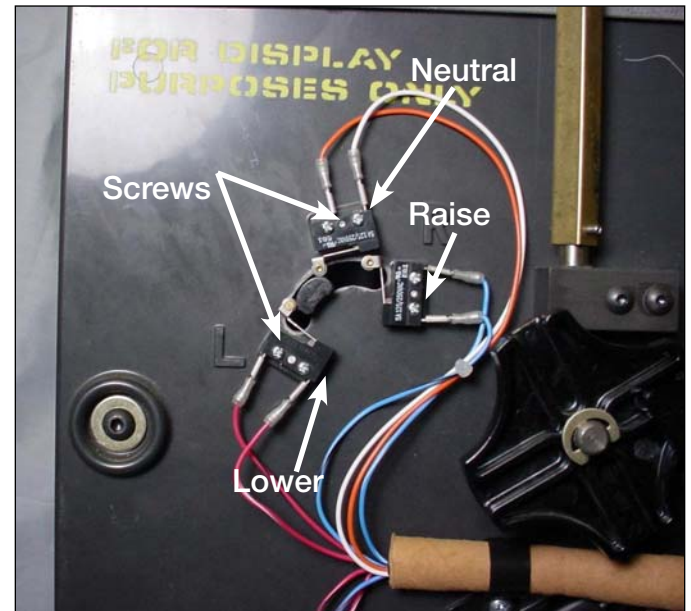


Figure 10.
Lower, Raise and Neutral Logic Switches.

- Using a Phillips head screwdriver, loosen and remove the three mounting screws fastening the position indicator micro switch hub to the front of the tap changer assembly. See Figure 11.

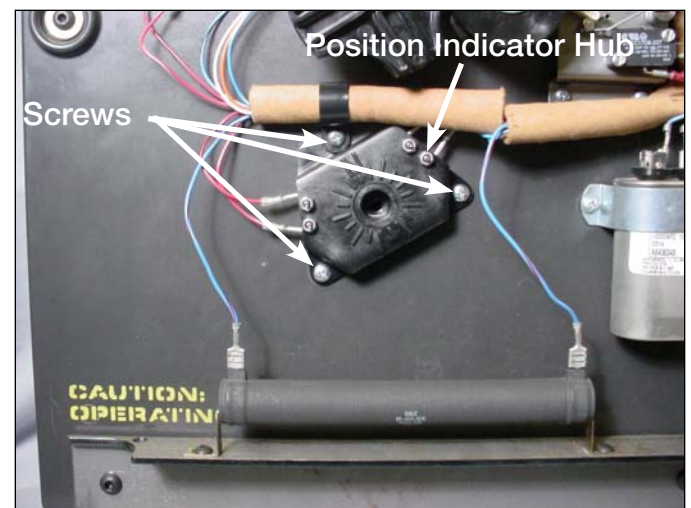


Figure 11.
Position Indicator Hub.

3. Remove the tapping indicator position lobe pointer from the tap changer. The lobe may have to be pried a little to be removed. See Figure 12.



Figure 12.
Indicator Position Lob.

4. Disconnect and remove the blue and red strip leads from the 40-ohm resistor. These connections are push-on connections. See Figure 13.

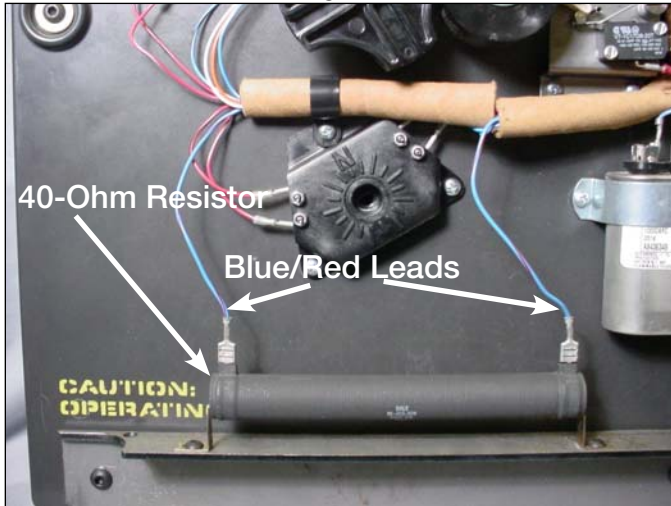


Figure 13.
40-Ohm Resistor Connections.

5. Lay the tap changer assembly flat on a work surface with the tap contact studs down on the surface.

6. Using a 5/32 Allen wrench loosen and remove the two pan head Allen screws from the tap changer-mounting bracket. See Figure 14.

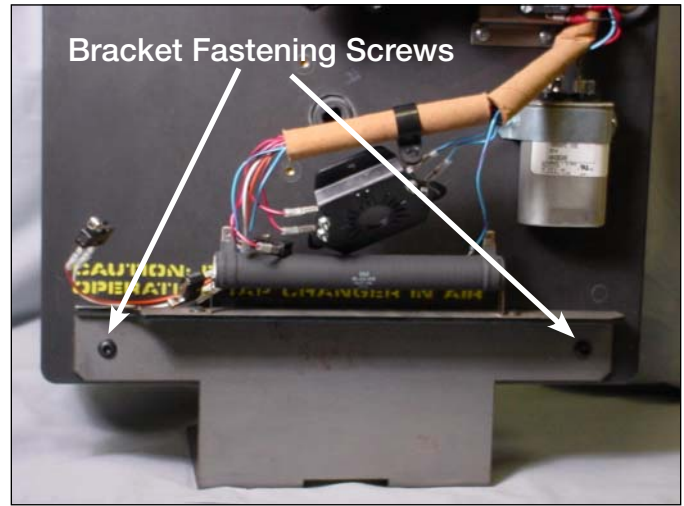


Figure 14.
Tap Changer Bracket Mounting.

7. Using a 5/32 Allen wrench, loosen and remove the pan head Allen screws fastening the front drive assembly section and the contact panel assembly section together. See Figure 15.

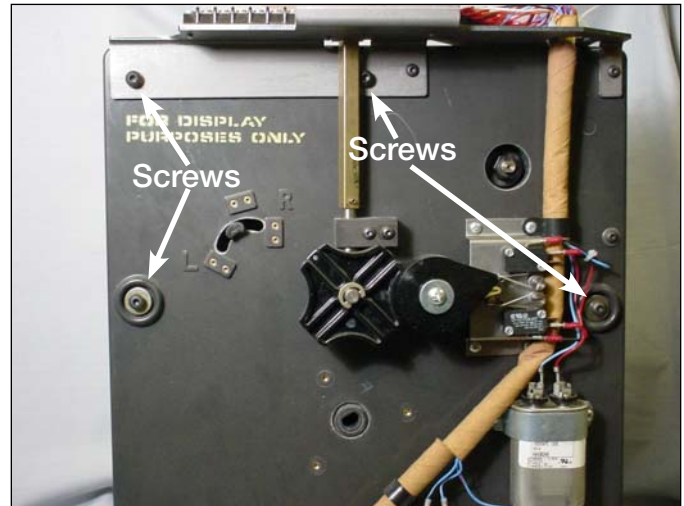


Figure 15.
Drive Panel and Contact Panel Fastening.

- Lift the front drive assembly off of the contact assembly and set aside. See Figure 16.

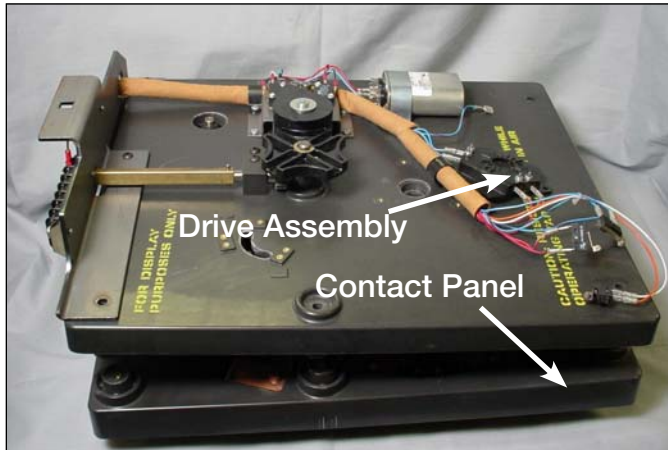


Figure 16.
Tap Changer Sections.

Reversing Movable and Neutral Stationary Contact Removal and Re-assembly

- Use a 9/16 wrench or a deep well 9/16 socket and ratchet, loosen and remove the brass nut on stationary contact one, remove the external tooth lock washer and flat washer. See Figure 17.

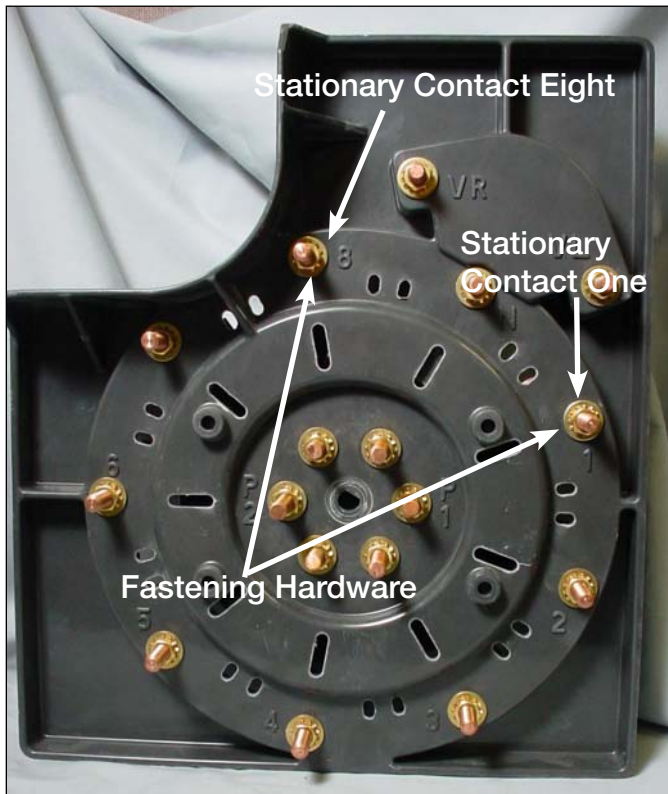


Figure 17.
Stationary Contacts.

- Push the contact stud through the mounting hole in the contact panel. See Figure 18.

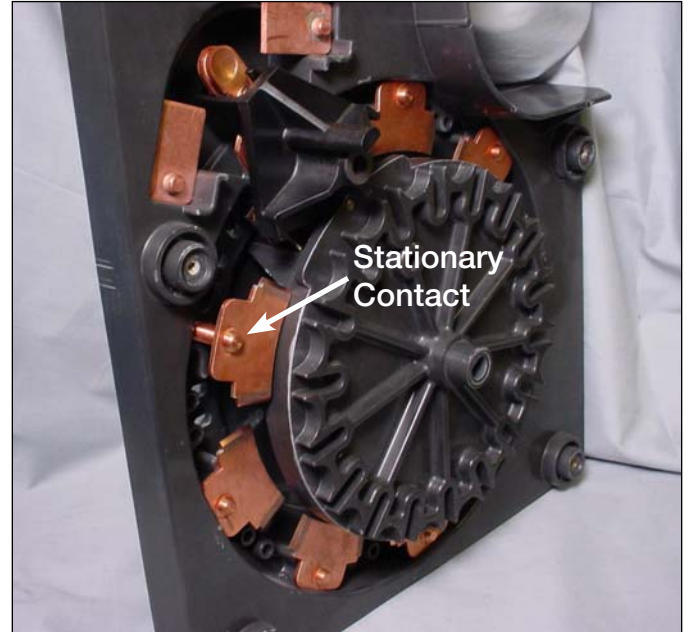


Figure 18.
Stationary Contact Removal.

- By hand, rotate the main movable contact and geneva gear assembly so that the movable contact is in the stationary one contact position. See Figure 19.



Figure 19.
Positioning of Movable Contacts.

- Use a 9/16 wrench or deep well 9/16 socket and ratchet to remove the six nuts, lock washer, and flat washer fastening the P1 and P2 slip ring studs to the contact panel located in the center back of the stationary contact panel. See Figure 20.

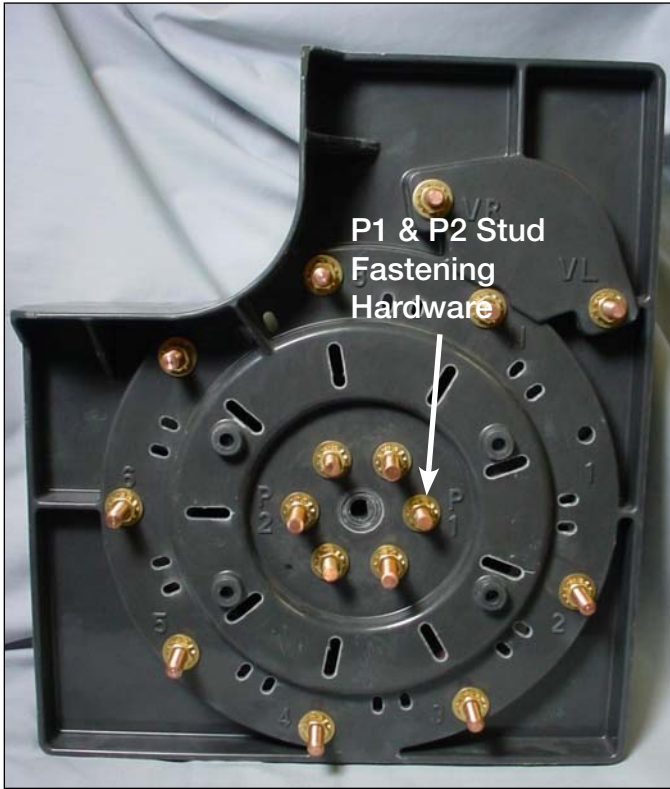


Figure 20.
P1 and P2 Stud Hardware Removal.

- Facing the main movable contacts and geneva gear assembly, pull forward removing the main contact assembly and P1 and P2 slip ring assemblies from the contact board assembly. See Figure 21.

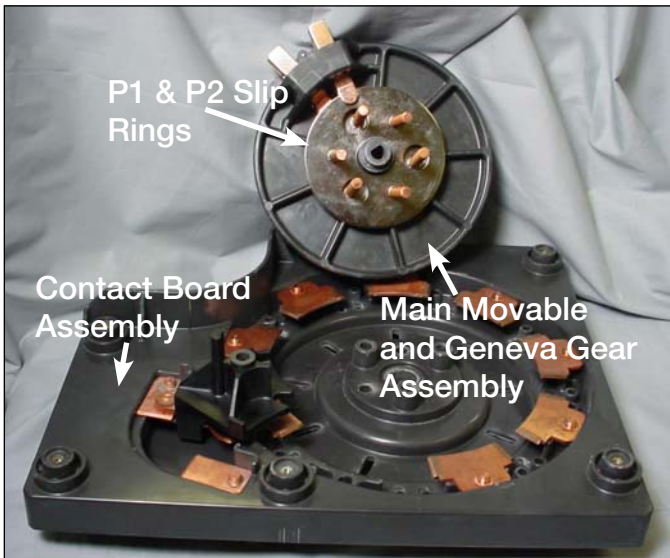


Figure 21.
Separating Movable Contacts.

- Rotate the reversing switch assembly, if not already rotated, so that the contact buttons are in the center space between the VR and VL stationary contacts as though in the neutral position. See Figure 22.

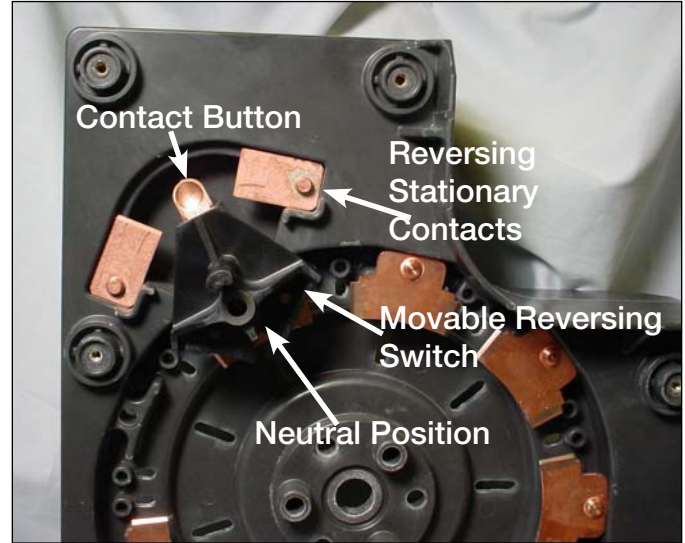


Figure 22.
Positioning of Movable Reversing Switch.

- Using a 9/16 wrench, or 9/16 socket and ratchet loosen and remove the mounting nut on the stud of the reversing switch assembly. The reversing switch assembly stud is located between the reversing stationary contacts VR and VL on the stationary contact assembly on the contact panel. See Figure 23.

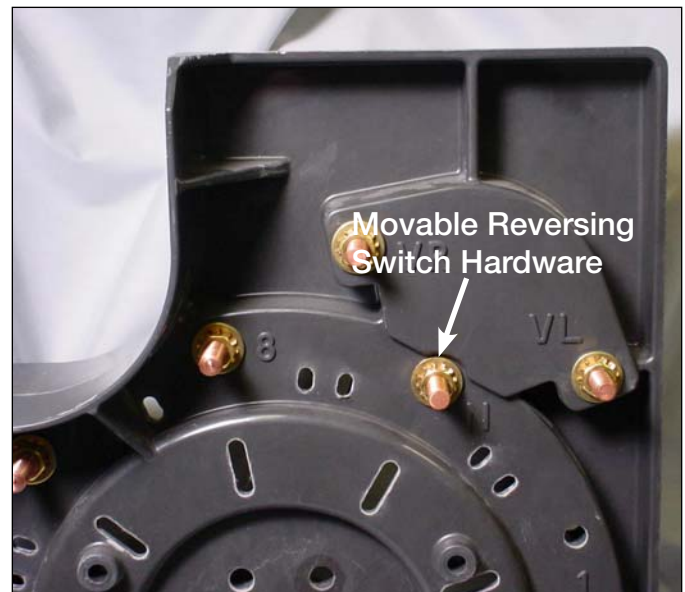


Figure 23.
Movable Reversing Switch Hardware.

- Pull out on the reversing movable contact assembly removing from the contact panel. See Figure 24.

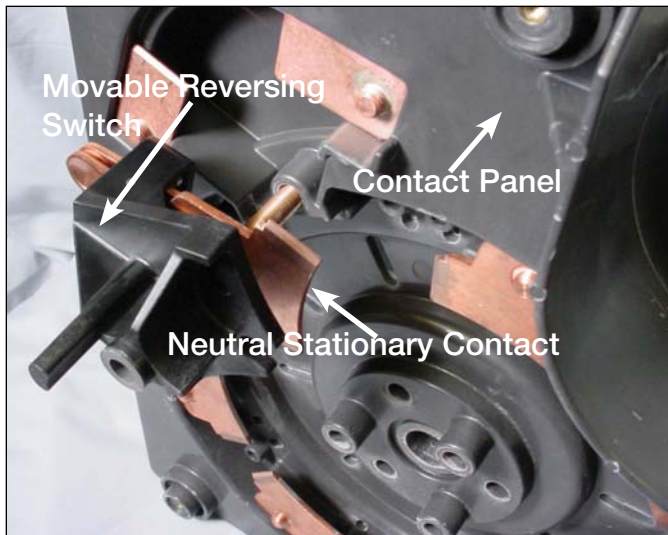


Figure 24.
Removal of Movable Reversing Switch.

- Install the reversing switch assembly with the contact buttons located between the VR and VL stationary contacts. See Figure 22.
- Place the brass flat washer, external tooth lock washer and nut onto the reversing switch assembly stud. Tighten and torque the hardware to 90 to 110 inch pound torque (10.168-12.428 Nm).
- Rotate the reversing switch assembly so that the button contacts are on the VR reversing stationary contact. See Figure 25. To identify the VR stationary contact look for the ID marking on the contact panel.

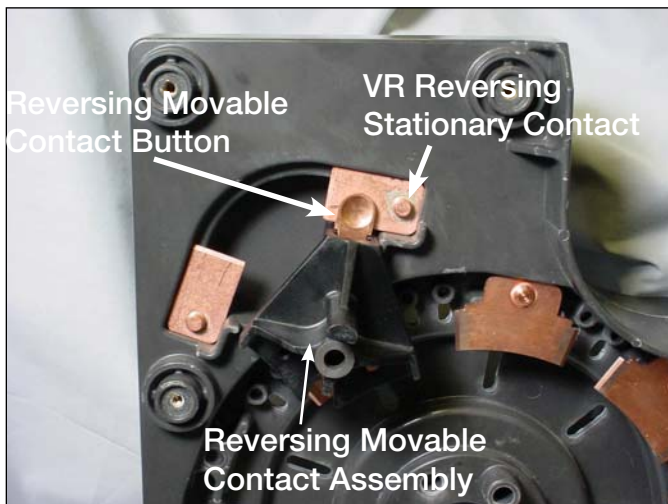


Figure 25.
Reversing Movable Contact Positioning.

- Align the Movable Contact and Geneva Gear Assembly so that the movable contacts align to where the number one stationary contact has been removed. See Figure 26.

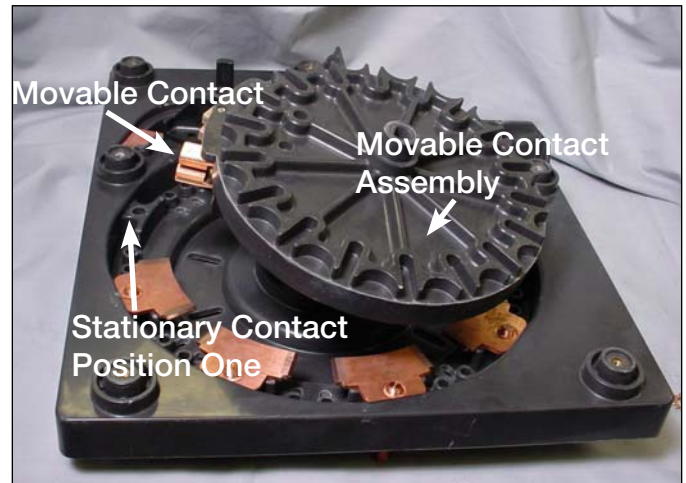


Figure 26.
Movable Contact Re-assembly.

- Align the studs of the slip rings with the mounting holes in the contact panel. The studs on the slip ring that is between the left hand lower button contact will go into the holes that have the high shoulder spacer as part of the contact panel. See Figures 27 and 28.

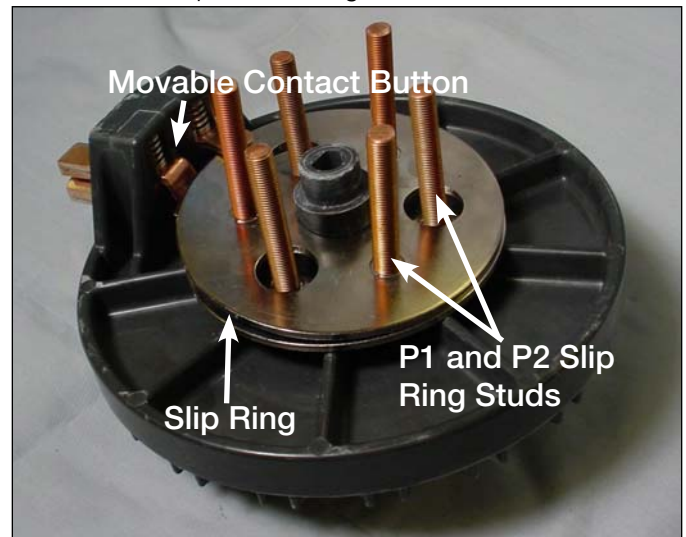


Figure 27.
Slip Rings P1 and P2 Studs

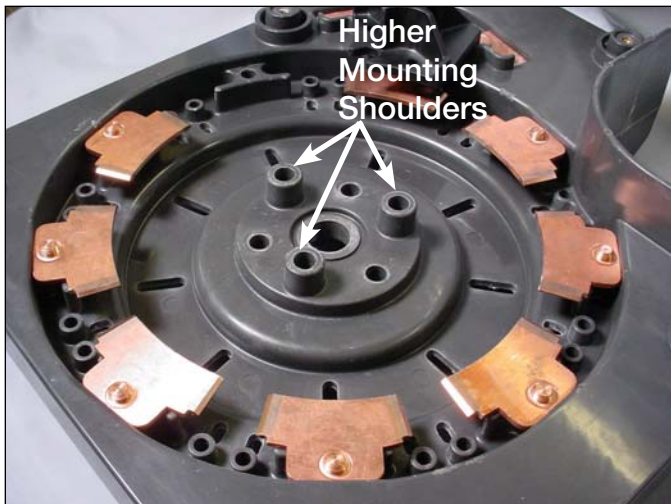


Figure 28.
P1 and P2 Mounting Holes.

14. You may need to rotate the slip ring assemblies in the button contact to make the proper alignment.
15. Press on the movable and geneva contact assembly to insert the studs.
16. You may find that after starting the studs, the movable and geneva contact assembly will need to be rotated to position the movable contact so that the contacts are not interfering with other stationary contacts during the installation.
17. Rotate the main movable contact Geneva gear assembly onto the neutral stationary contact, located under the reversing switch assembly, locating the reversing movable so that the button contact is between VR & VL stationaries. See Figure 29.

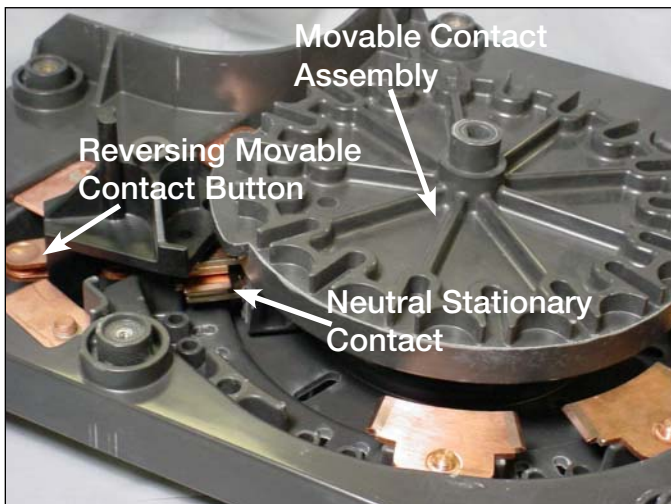


Figure 29.
Positioning of Reversing Movable Contacts.

18. Place a flat brass flat washer, external tooth lock washer, and 3/8 nut on each of the P1 and P2 slip ring studs and tighten with a 9/16 wrench or socket and ratchet. Torque the nut on the studs to 110 inch pounds (12.428 Nm).

19. Replace the number 1 stationary contact by inserting the contact stud into the contact-mounting hole in the contact panel. The contact position number is located on the contact panel. See Figure 30.

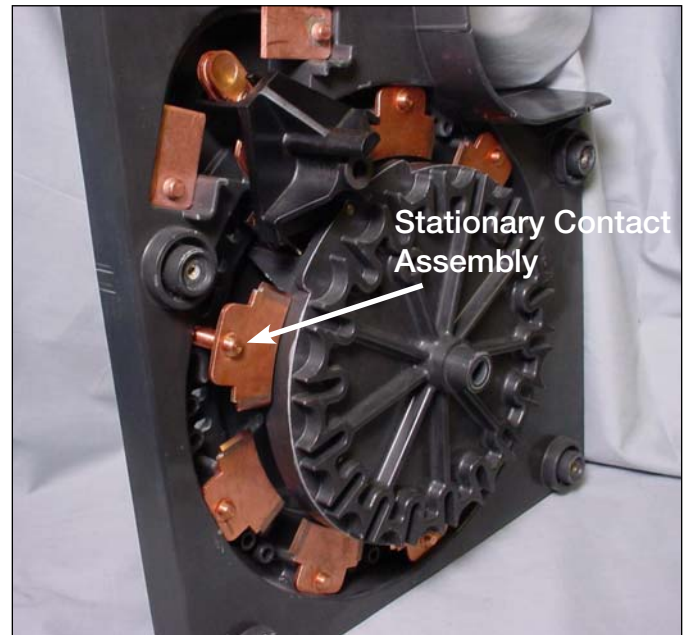


Figure 30.
Stationary Contact Replacement.

20. Place a brass flat washer, external tooth lock washer, and nut on the number 1 stationary contact stud. Tighten and torque the hardware 90 to 110 inch pounds (10.168-12.428 Nm).

Tap Changer Re-assembly

1. Lay the contact panel assembly section flat on a table surface. See Figure 31

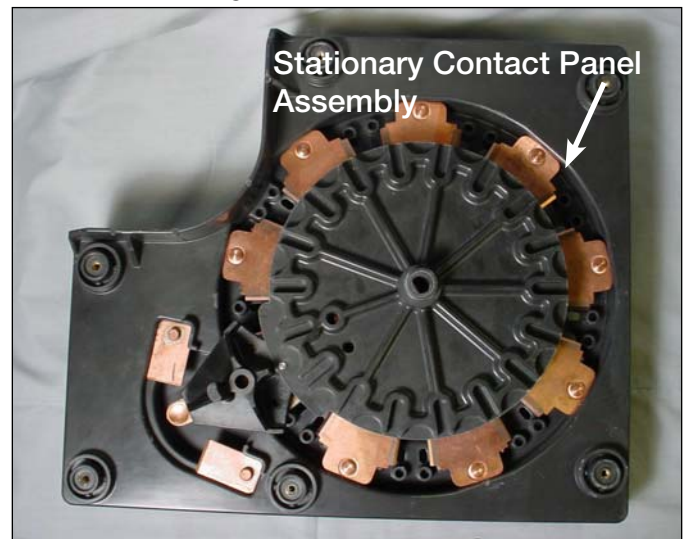


Figure 31.
Stationary Contact Panel Assembly.

2. Place and align the tap changer drive assembly section on top of the contact panel assembly. See Figure 32.

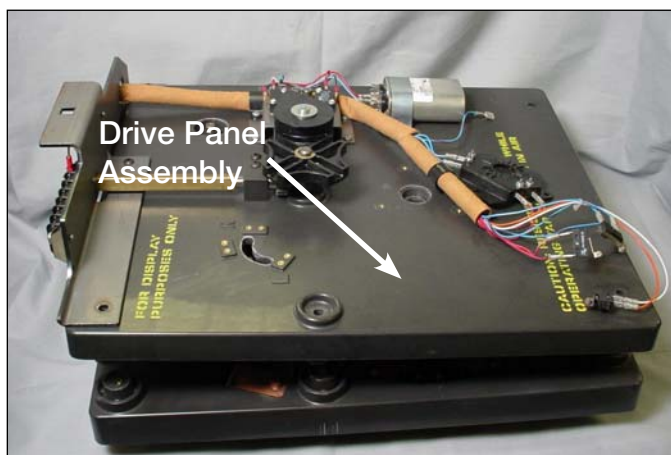


Figure 32.
Tap Changer Sections.

3. Align the center hub of the main movable contact assembly with the center hole in the tap changer drive assembly. See Figures 33 and 34.

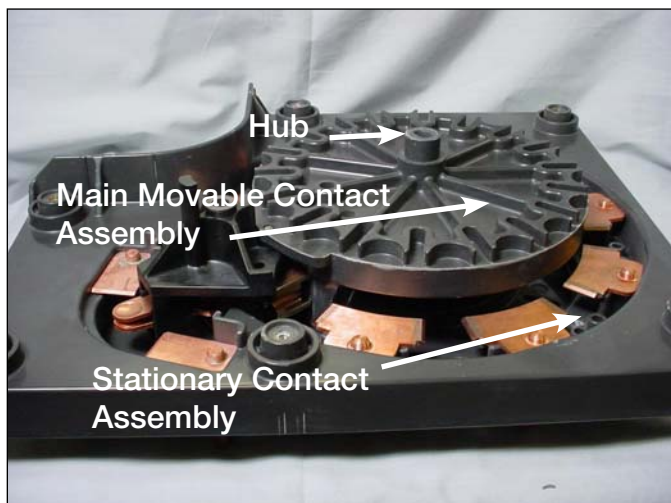


Figure 33.
Contact Assembly and Main Movable Contacts.



Figure 34.
Drive Assembly Panel.

4. Press both of the tap changer assembly sections together and stand-up-right. See Figure 35

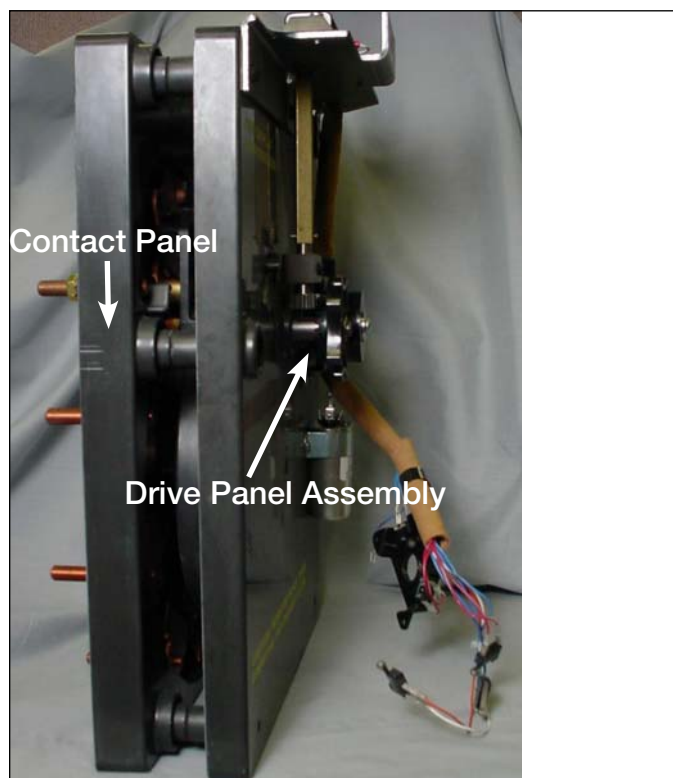


Figure 35.
View of Panel Assembly.

5. Insert four pan head Allen screws into the tap changer assemblies. Two screws will mount the two tap changer assemblies and the terminal block bracket at the top of the tap changer. The other two screws are inserted in the mounting holes along both side centers of the tap changer. See Figure 36.



Figure 36.
Panel Assembly Fastening.

6. Place the mounting bracket, see Figure 37, to the base of the tap changer assembly and fasten with two pan head hex screw and tighten with a 5/32 Allen Wrench. See Figure 38.

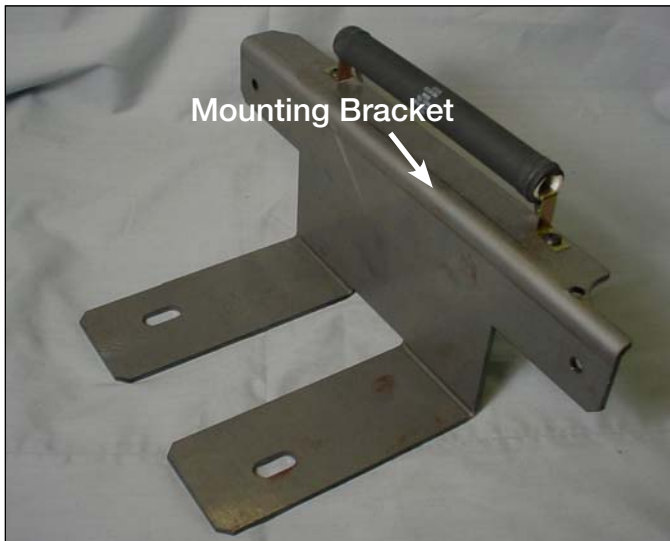


Figure 37.
Tap Changer Mounting Bracket.

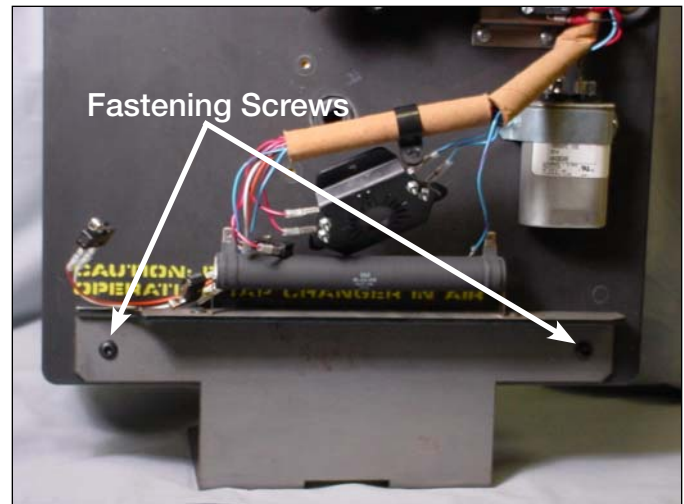


Figure 38.
Bracket Fastening.

7. Place the neutral position pointer lob, see Figure 39, into the main movable contact hub located in the lower front center of the drive assembly panel. See Figure 40.

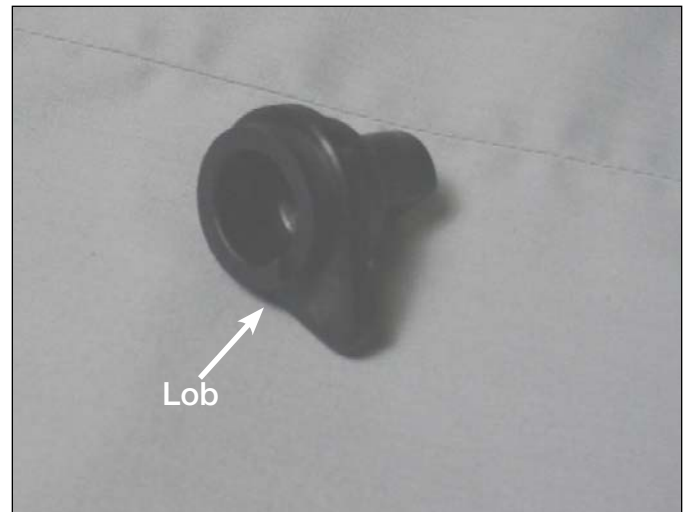


Figure 39.
Position Indicator Lob.



Figure 40.
Lob Placement.

8. Fasten the tap position switch assembly to the front of the drive panel assembly with three pan head Phillip screws. See Figure 41.

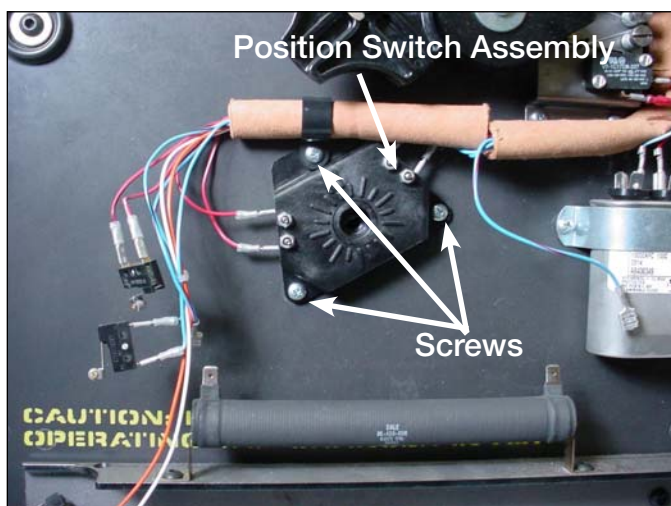


Figure 41.
Position Switch Assembly.

9. Position the position actuator arm between the center position and L by rotating the pinion counter clockwise. See Figure 42. This will allow for mounting the micro switches without interference with the micro switch arms.

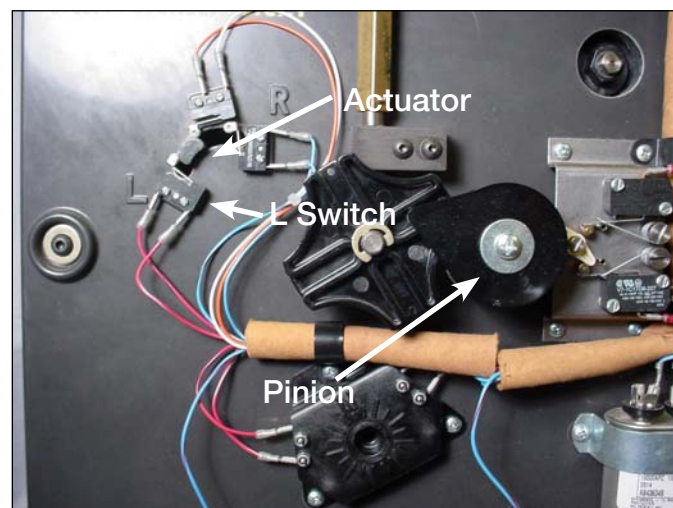


Figure 42.
Switch Actuator Position.

10. Place and fasten the reversing logic and neutral logic micro switches on the upper left of the drive assembly panel. The micro switch with a blue white striped wire and blue black striped wire is located on the R position. The micro switch with a red white striped wire and red black striped wire is located on the L position. The micro switch with an orange wire and a white wire is located on the center position between the R and L position. See Figure 43.

11. Rotate the pinion back clockwise until the arm in Figure 43 is in the center and the neutral switch is depressed.

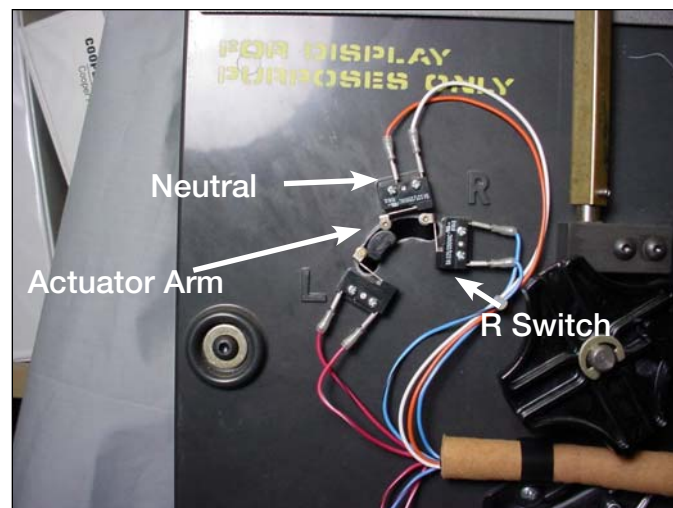


Figure 43.
Logic Switch Positioning.

12. Connect the blue wires with red strips to the 40-ohm resistor by pushing the female connector onto the resistor terminals. See Figure 44.

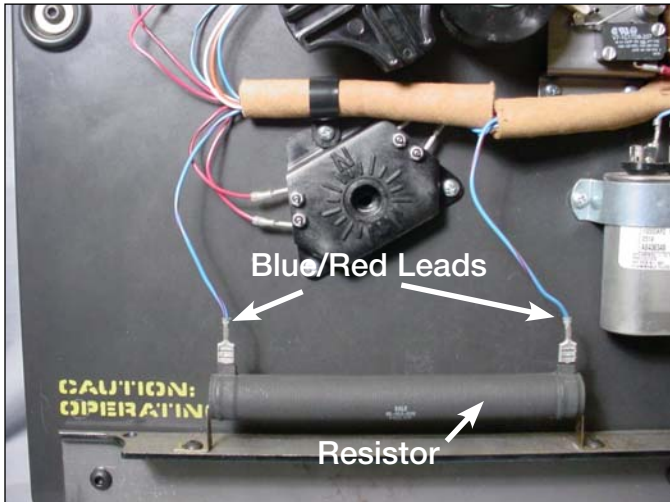


Figure 44.
Resistor Connections.

13. Check and set the tap changer for neutral position. The tap changer can be set for any tap position by rotating the pinion cam in either the clockwise or counter clockwise direction. For rotating to the neutral position, the reversing logic switch actuator must be in the center with the neutral switch arm depressed. The tap position lobe must have the pointer pointing at N. The pinion cam point is pointing at the three o'clock position over the holding switch lever arm. The holding switch is open. See Figure 45.

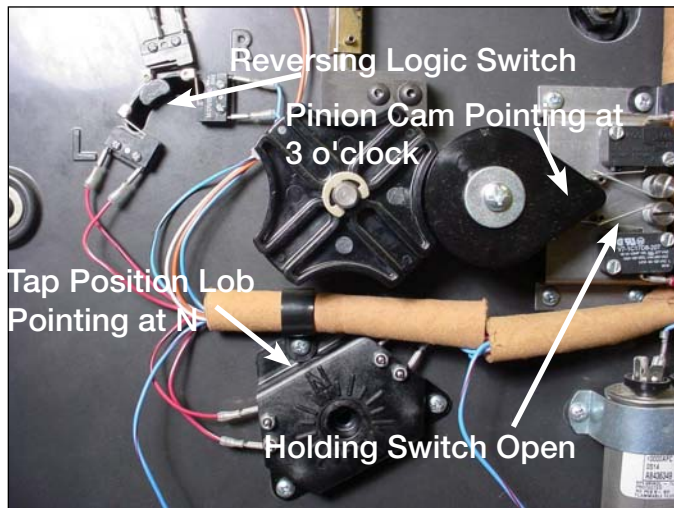


Figure 45.
Neutral Position.

Re-assembly of Tap Changer to Voltage Regulator Assembly

1. Once the tap changer has been re-assembled, reverse the process in the procedure titled "Tap Changer Removal from Voltage Regulator" at the beginning of this installation instructions.



