

SWITCH PANELS
SINGLE MOTOR-DRIVEN TYPE
KS-15610 AND KS-15624
REPLACEMENT PARTS AND PROCEDURES

1. GENERAL

1.01 This section covers the information necessary for ordering parts to be used in the maintenance of the KS-15610 and KS-15624, single motor-driven type switch panels. It also covers approved procedures for replacing these parts.

1.02 This section is reissued to revise 3.01 and the replacement procedures specified in 3.11, 3.12, 3.13, 3.16, and 3.18.

1.03 Part 2 of this section covers ordering information for those parts which it is practicable to replace in the field in the maintenance of these switch panels. No attempt should be made to replace parts not designated except small items such as screws. Part 2 also contains explanatory figures showing the different parts. This information is called Replacement Parts.

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts

covered in Part 2. This information is called Replacement Procedures.

2. REPLACEMENT PARTS

2.01 The figures included in this part show the various replacement parts, with their corresponding names, in their proper relation to other parts of the apparatus.

2.02 When ordering a replacement part, give the name of the part and the complete nameplate data of the switch panel, including the KS number, list number, manufacturer's name and serial number. For example: relay for KS-15624 L1 Switch Panel, Anderson Power Products, Inc.

2.03 Information enclosed by parentheses () is not ordering information. This information may be references to notes, parts referred to in other portions of the section and not considered replaceable, or part names in general use in the field if these names differ from those assigned by the manufacturer.

SECTION 030-785-801

3. REPLACEMENT PROCEDURES

3.01 List of Tools and Materials

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
207	Tool (90 degrees offset screw-driver)
R-1542	3/4-Inch Adjustable Wrench
R-1626	Screwdriver
R-2671	1/8-Inch Allen Wrench
R-3094, Detail 2	Handle
R-3094, Detail 5	6-Inch Extension
R-3094, Detail 8	Universal Joint
R-3094, Detail 9	1/4- to 3/8-Inch Adapter
R-3094, Detail 16	3/8-Inch Socket Wrench
R-3094, Detail 17	7/16-Inch Socket Wrench
R-3094, Detail 18	1/2-Inch Socket Wrench
R-3094, Detail 30	9/16-Inch Socket Wrench
R-3193	9/32- and 11/32-Inch Hex Open Double-End Wrench
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
→ —	Waldes-Truarc Pliers No. 2 (External)
—	4-Ounce Riveting Hammer
—	1-3/4 Inch Adjustable Wrench, J. H. Williams & Co. No. 15B
—	Bearing Puller, Owatonna Tool Co. No. 1000-1/2-L
—	Bearing Pulling Attachment, Owatonna Tool Co. No. 949-1/2
—	1/16-Inch Drive Pin Punch, L. S. Starrett Co. No. 565

CODE OR SPEC NO.	DESCRIPTION
MATERIALS	
KS-6232	Light Mineral Oil
KS-14666	Cloth
—	1/4-Inch Diameter Brass Rod, Approximately 4 Inches Long
—	Small Hardwood Block [see 3.07 (4)]
—	Brass or Copper Tubing [see 3.09 (4), 3.10 (3), and 3.12 (4)]
→ —	1/16-Inch Rubber Sheet 12 x 18

3.02 The motor-driven portion of the switch panel is protected by a cover. To work on the mechanism, remove the four acorn nuts at the corners of the cover with the R-1542 adjustable wrench and pull the cover outward to remove it. Covers that are not secured by nuts may be removed by slightly lifting the cover and then pulling it outward. The cover is somewhat heavy and should be grasped firmly to avoid dropping it.

3.03 Before doing any work on the switch panel, one set of main contacts should be fully engaged unless the entire switch is disconnected; otherwise, the current-limiting resistors may have to carry current for a period sufficient to cause them to overheat and burn out. Unless otherwise stated in the procedures, the bridging slider should be in the normal position. Remove the motor fuse and control circuit fuse for the switch on the associated plant control panel to prevent unexpected starting while working on the switch panel, and replace them when the work is done.

Caution: *When working on the switch panel, exercise extreme care to maintain office voltage.*

3.04 Automatic Operation of Switch

(1) Turn off all the charging units in the plant associated with the switch as covered in the BSP section for the plant. After a short interval the bridging slider will move from the normal position to the next position. Press the ACO button on the plant control panel to shut off the audible alarm. Operate the MAN-AUTO key on the plant control panel to MAN to prevent further movement of the bridging slider.

Caution: *During maintenance operations, it is not advisable to move the bridging slider of a 3 position switch from the normal position beyond the midposition since this would cause an excessive increase in plant voltage.*

- (2) To return the bridging slider to the normal position, operate the MAN-AUTO key to AUTO and restore the charging units in the plant to service as covered in the BSP section for the plant. When the batteries associated with the plant are charged to their proper voltage, the bridging slider will return to the normal position.

Caution: *The switch should not be operated and returned to normal more often than once every 5 minutes.*

3.05 Caution: *It is not practicable to remove potential from the switch. Live parts should be wrapped with canvas or tape. Extreme care should be exercised to avoid a short circuit between the live contacts and other metal parts of the switch. (The main switch rails are battery and the control rails are ground.) However, certain cases, such as replacing the driving screw top bearings, may require that the switch be disconnected from the power supply. Such cases should be referred to the supervisor, since the switch must be temporarily shunted with a cable or bus bar of adequate capacity to maintain the office voltage before disconnecting the switch.*

3.06 After making any replacement of parts, the part or parts replaced shall meet the requirements involved as specified in Section 030-785-701. Other parts whose adjustments may have been disturbed by the replacing operations shall also meet the requirements and an overall operation check shall be made before restoring the switch to service.

3.07 Motor—Fig. 1

- (1) Tag the motor leads and then, using the 4-inch E screwdriver and the R-1542 adjustable wrench, disconnect the motor leads from the relay and terminal block.
- (2) Using the R-3094, Detail 18 socket wrench with the R-3094, Detail 8 universal joint,

R-3094, Detail 5 extension, and R-3094, Detail 2 handle, remove the motor mounting screws and washers. Lower the motor to disengage the pinion and remove the motor.

- (3) Using the R-2671 Allen wrench, remove the setscrew in the shoulder of the motor pinion. Then, remove the pinion with the Owatonna bearing puller.
- (4) Position the pinion on the shaft of the new motor, making sure that the setscrew hole in the shoulder of the pinion lines up with the hole or flat on the shaft. If necessary, use the small hardwood block and 4-ounce riveting hammer to tap the pinion into position.
- (5) Raise the motor into position on the switch panel so that the motor pinion meshes properly with the associated gears on the switch panel. Then, mount the motor and securely tighten the screws.
- (6) Connect the motor leads to the proper terminals on the relay and terminal block, securely tightening the screws.

3.08 Brush Assembly

- (1) Using the 3-inch C screwdriver, remove the brush plate mounting screws and remove the brush plate. Remove the brush assembly from the brush holder.
- (2) Position the new brush assembly in the brush holder with the brush spring outermost. Carefully compress the spring and remount the brush plate, securely tightening the screws.

3.09 Motor Bearings: If the motor has been in service for several years, it is recommended that both bearings be replaced whenever it is necessary to replace one. To replace a bearing, proceed as follows.

- (1) Remove the motor and remove the motor pinion as covered in 3.07(1) through (3).
- (2) Remove both brush assemblies from the motor as covered in 3.08(1) and mark them for remounting in their original positions.
- (3) Using the 4-inch E screwdriver and R-3094, Detail 16 socket wrench with the R-3094,

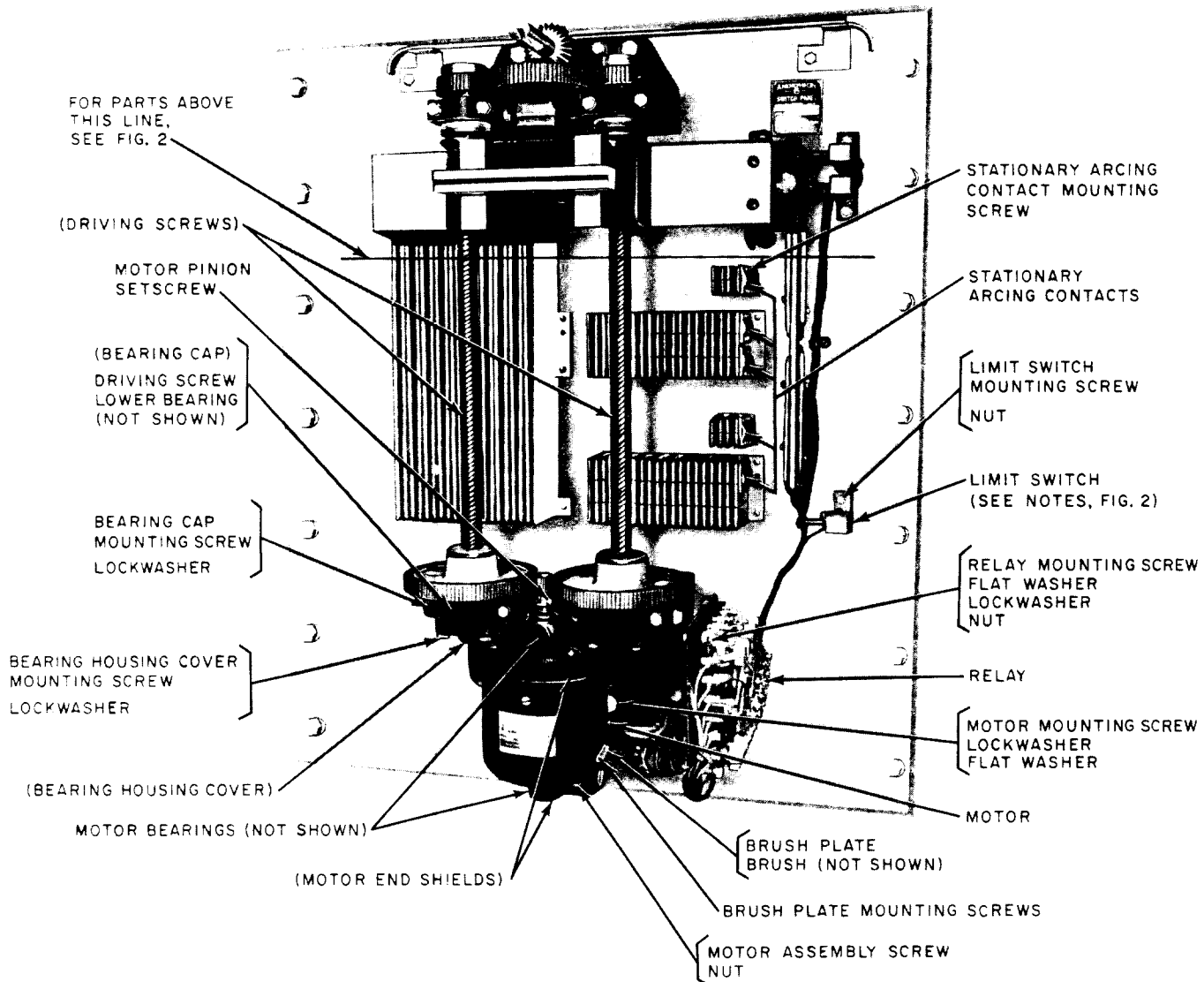


Fig. 1—KS-15610 and KS-15624 Type Switch Panel—Front View (KS-15624 L4 switch panel shown, cover removed)

Detail 2 handle, remove the motor assembly screws and nuts. Pull or pry off the end shields and remove the rotor. Remove end play washers and mark them for remounting in their proper order. Using the Owatonna bearing puller and bearing pulling attachment, remove the defective bearing.

(4) Wipe the shaft with a clean KS-14666 cloth. Start the new bearing on the shaft. Position the tube which just fits over the shaft so that it engages the inner race of the bearing. Using

the 4-ounce riveting hammer, gently tap the tube to position the bearing on the shaft.

(5) Wipe the inside of the bearing housing in both end shields with a clean KS-14666 cloth moistened with a small amount of KS-6232 oil.

(6) Place the end play washers in their proper order on the rotor shaft. Remount the rotor and end shields and securely tighten the screws.

(7) Remount the brush assemblies as covered in 3.08(2).

- (8) Remount the pinion on the motor shaft and remount the motor as covered in 3.07(4) through (6).

3.10 *Upper Bearing of Driving Screw—Fig. 2*

- (1) Using the 4-ounce riveting hammer and Starrett pin punch, tap out the taper pin in the hub of the gear above the bearing to be replaced and remove the gear using the Owatonna bearing puller, if necessary.
- (2) Using the R-3094, Detail 30 socket wrench with the R-3094, Detail 9 adapter and R-3094, Detail 2 handle, remove the bearing cap mounting screws and lockwashers associated with the bearing to be replaced and remove the bearing cap. Then, remove the bearing using the Owatonna bearing puller, if necessary.
- (3) Wipe the shaft with a clean KS-14666 cloth. Mount the new bearing on the shaft. If necessary, position the tube which just fits over the shaft so that it engages the inner race of the bearing and, using the 4-ounce riveting hammer, gently tap the tube to position the bearing on the shaft.
- (4) Remount the bearing cap and securely tighten the screws.
- (5) Position the gear on the shaft, making sure that the tapered holes in the gear are in line before meshing the gears. If necessary, use the tube and hammer in (3) to tap the gear into position. Insert the taper pin through the gear hub and shaft and tap the pin into place with the Starrett pin punch and 4-ounce riveting hammer.

3.11 *Lower Bearing of Driving Screw—Fig. 1*

- (1) ♦Mark motor pinion and associated mating gear teeth to obtain original condition of mesh. Remove the motor as covered in 3.07 (1) and (2).♦
- (2) ♦Using the R-3094, Detail 18 socket wrench with R-3094, Detail 2 handle, remove the bearing housing cover mounting screws and lockwashers associated with the bearing to be replaced and remove the cover. Drive out the 3/16 Type A Drivlok pin which secures the jam nut. Remove the 1-1/8 inch hex jam nut with

the Williams Adjustable Wrench No. 15B. Then remove the bearing using the Owatonna bearing puller if necessary.♦

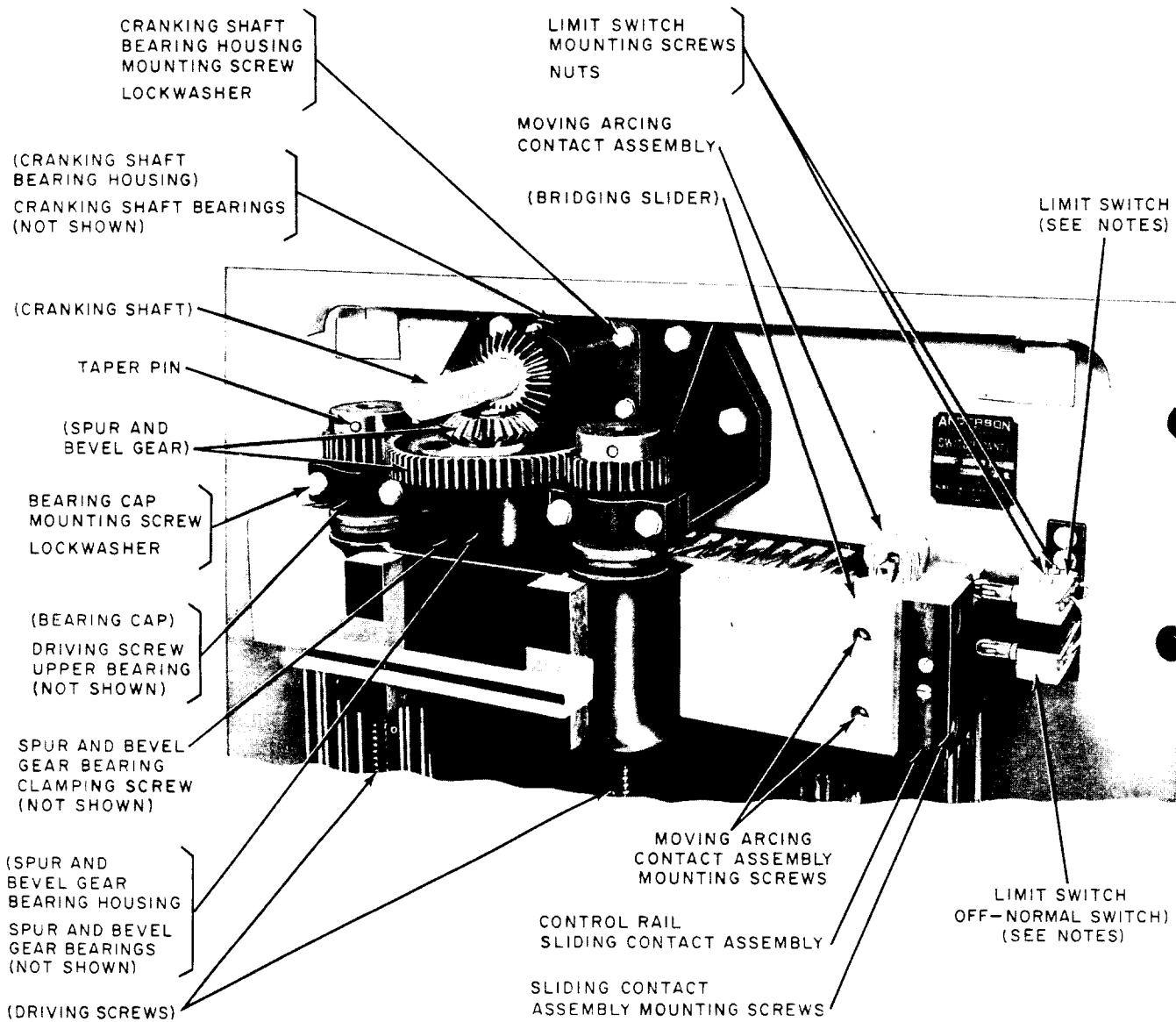
- (3) ♦Mount the new bearing on the shaft as covered in 3.10(3).♦

(4) ♦Secure the bearing jam nut and pin. Remount the bearing housing cover. Avoid pinching "O" ring seal when tightening the cover mounting screws.♦

- (5) ♦Remount the motor as covered in 3.07(5) and (6).♦

3.12 *Cranking Shaft Bearings—Fig. 2:* If the bearing adjacent to the gear on the cranking shaft requires replacement, replace both bearings, since both must be removed from the shaft. Also if the switch has been in service for several years, it is recommended that both bearings be replaced whenever it is necessary to replace one. To replace the bearings, proceed as follows:

- (1) Using the R-3094, Detail 18 socket wrench with the R-3094, Detail 5 extension and R-3094, Detail 2 handle, remove the cranking shaft bearing housing mounting screws and washers and remove the housing and cranking shaft from the panel. Place the parts on a work bench.
- (2) ♦Using the Waldes-Truarc No. 2 pliers, remove the locking ring at the rear end of the shaft and withdraw the shaft from the housing.♦
- (3) ♦The bearings may be withdrawn from their respective ends of the housing. Use bearing puller if necessary.♦
- (4) ♦Wipe the shaft and bore at either end of housing with a clean KS-14666 cloth moistened with KS-6232 oil. Slide new bearing against spacer collar on shaft. Insert shaft assembly into top end of housing and tap end of crank shaft, if necessary, to seat bearing. Similarly mount the other bearing from the rear and secure with locking ring. Rotate shaft slowly to check for roughness or binding.♦
- (5) ♦Remount housing on the switch panel, securely tighten screws.♦



NOTES:

1. INITIALLY VERTICALLY MOUNTED LIMIT SWITCHES WERE PROVIDED. SUBSEQUENTLY, THE HORIZONTALLY MOUNTED LIMIT SWITCHES SHOWN WERE INTRODUCED. THE TYPE OF SWITCH REQUIRED FOR REPLACEMENT IS DETERMINED BY THE SERIAL NUMBER OF THE SWITCH PANEL.
2. VERTICALLY MOUNTED LIMIT SWITCHES MAY HAVE TERMINAL SHIELDS, WHEN ORDERING A TERMINAL SHIELD, SPECIFY WHETHER IT IS FOR THE UPPER OR LOWER LIMIT SWITCHES.

Fig. 2—Upper Part of KS-15610 and KS-15624 Type Switch Panel (Cover removed)

3.13: Spur and Bevel Gear Bearings—Fig. 2:
 If the bearing adjacent to the spur and level gear requires replacement, replace both bearings, since both must be removed from the shaft. Also, if the switch has been in service for several years, it is recommended that both bearings

be replaced whenever it is necessary to replace one. To replace the bearings proceed as follows:

- (1) Remove the cranking shaft bearing housing as covered in 3.12(1).

(2) ♦Mark the spur gear and the associated mating gears with a pencil to obtain the original condition of mesh when remounting the spur gear and bevel gear assembly. Grasp the spur gear through holes in web and withdraw assembly out of frame casting from above.♦

(3) ♦Using Waldes-Truarc No. 2 Pliers, remove retaining ring on the bearing end of the spur and bevel gear shaft. Remove the outermost bearing from the shaft, using the bearing puller if necessary. If the other bearing is being replaced remove the spacer and then the other bearing.♦

(4) ♦Wipe the shaft and bearing housing bore with a clean KS-14666 cloth moistened with KS-6232 oil. Start the new bearing on the shaft. Position the tube which just fits over the shaft so that it engages the inner race of the bearing, and using the 4-ounce riveting hammer, gently tap the tube to position the bearing on the shaft. Similarly mount the other bearing if both bearings were removed, making sure that the spacer is properly positioned between bearings. Then remount the retaining ring.♦

(5) ♦Position and lower the spur and bevel gear unit into the bearing housing so the original condition of gear mesh is obtained. Tap bevel gear end of shaft with 4-ounce riveting hammer, if necessary to seat bearings in the housing.♦

(6) ♦Remount the cranking shaft and housing on the switch panel and securely tighten the mounting screws.♦

3.14 Limit Switches—Fig. 1: Initially the limit switches were mounted vertically on the switch panel. Subsequently a different type switch was introduced which is mounted horizontally. In replacing limit switches, the same type of switch must be used as that originally furnished on the switch panel, the type of switch required being determined by the serial number of the switch panel. A pair of limit switches, one of which functions as the off-normal switch, is provided at the top of the switch panel. Where vertically mounted switches are used, the two switches are mounted with the same screws and both switches must be removed, if one is to be replaced.

(1) Using the R-3193 wrench and the 4-inch E screwdriver or 207 tool, remove the limit

switch mounting nuts, washers, screws, and terminal shield, if provided, and allow the switch or switches to hang by the leads. Using the screwdriver, disconnect the leads from the terminals of the switch to be replaced and remove the switch.

(2) Mount the new switch and associated parts in reverse order of removal. Adjust the switch or switches to meet the applicable requirements covered in Section 030-785-701.

3.15 Relay—Fig. 1

(1) Tag and disconnect the leads using the R-3094, Detail 16 socket wrench with the R-3094, Detail 5 extension and R-3094, Detail 2 handle. Then, using the 4-inch E screwdriver or R-1542 adjustable wrench with the socket wrench remove the relay mounting nuts, washers, and screws and remove the relay.

(2) Mount the new relay so that terminals 11 through 14 are at the top and securely tighten the mounting nuts. Connect the leads to the proper terminals of the relay and securely tighten the mounting nuts.

3.16 Control Rail Sliding Contact Assembly—Fig. 2♦

(1) ♦Remove the motor fuse and control circuit fuse for the switch from the associated plant control panel. Remove the ground connection on terminal strip. Operate ACO key on the control panel to shut off the audible alarm. Referring to Fig. 2, remove the lower sliding contact assembly mounting screw using the R-1626 screw-driver. Loosen the top screw slightly and rotate the contact assembly forward, away from the panel at the bottom until the brushes are free of the control rails. Remove top screw and withdraw sliding contact assembly.♦

(2) ♦Mount new contact assembly in reverse order of removal (1) above.♦

3.17 Stationary Arcing Contacts (all switch panels except KS-15610 L1, L2, L11, and L12)—Fig. 1: Using the 4-inch E screwdriver, remove the contact mounting screws for the contact to be replaced and remove the contact. Mount the new contact and securely tighten the screws.

3.18 Moving Arcing Contact Assembly (all switch panels except KS-15610 L1, L2, L11, and L12)—Fig. 2

- (1) ♦ Remove control rail sliding contact assembly as covered in 3.16(1).♦
- (2) ♦ Cover control rail assembly and adjacent auxiliary contact clip assembly with rubber sheet or canvas. Remove the moving arcing contact assembly mounting screws at the front of the bridging slider (Fig. 2) using the 4-inch E screwdriver. Push the moving arcing contact assembly toward the panel to free the positioning dowels and withdraw the assembly around the end of the bridging slider.♦
- (3) ♦ Position the new contact assembly on the bridging slider so the contacts face the main contact clips and positioning dowels in the bridging slider, line up with mating holes in the mounting face of the contact assembly. Insert and securely tighten the mounting screws.♦
- (4) ♦ Remount the control rail sliding contact assembly as covered in 3.16(2).♦

3.19 Current Limiting Resistors—Fig. 3: Before replacing a current limiting resistor, make sure that the bridging slider is in the normal position of the switch.

(1) All Switch Panels Except KS-15610 L1 and L11 Switch Panels:

Caution: Exercise extreme care to avoid shorting live parts with the tools or hands. Before doing any work on the rear of the panel, wrap live parts with canvas or tape, as required, to avoid possible short circuits or shock.

- (a) Using the R-3094, Detail 17 or 18 socket wrench with the R-3094, Detail 5 extension, if necessary, and the R-3094, Detail 2 handle, remove the resistor mounting screws and lockwashers. Remove the resistor mounting nut using the Williams 15B adjustable wrench and remove the resistor.
- (b) Place the end of the new resistor having a single mounting hole on the auxiliary contact terminal stud and line up the holes in

the other end with the mounting holes in the main contact terminal stud. Securely tighten the mounting screws and nut.

- (2) **KS-15610 L1 and L11 Switch Panels:** The current limiting resistors on these switch panels are connected between the main and auxiliary contact terminal studs. A cable which is also connected to the main contact terminal stud may be either in front of or behind the resistor. If the cable is in front of the resistor and the resistor has a mounting hole instead of an open slot, it is necessary to disconnect the cable before removing the resistor. Before disconnecting the cable, open the circuit between the group 1 emergency cells in the associated plant and the switch at one of the terminals of the emergency cells.

Caution: Exercise extreme care to avoid shorting between live parts with the tools or hands. Before doing any work, wrap live parts with canvas or tape, as required, to prevent possible short circuits or shocks.

- (a) Using the Williams 15B adjustable wrench, remove the nut which secures the resistor to the auxiliary contact terminal stud. Then loosen the nut which secures the resistor to the main contact terminal stud sufficiently to observe whether this end of the resistor has a hole or open slot. If it has a slot, withdraw the end of the resistor from the stud and remove the resistor. If it has a hole and the cable is mounted in front of the resistor, remove the nuts which secure the cable using the wrench and remove the cable. Take care to prevent the cable from touching live parts. Remove the resistor mounting nut and remove the resistor.
- (b) Position the new resistor on the studs and securely tighten the mounting nuts. If the cable was removed, thread one of the nuts with its wide face outward on the stud, allowing sufficient clearance between the face of the nut and the end of the stud for the cable lug, the other nut, and the locknut. Place the cable lug on the stud and then start the other nut with its wide face toward the cable lug. Securely tighten the nut and mount and securely tighten the locknut.

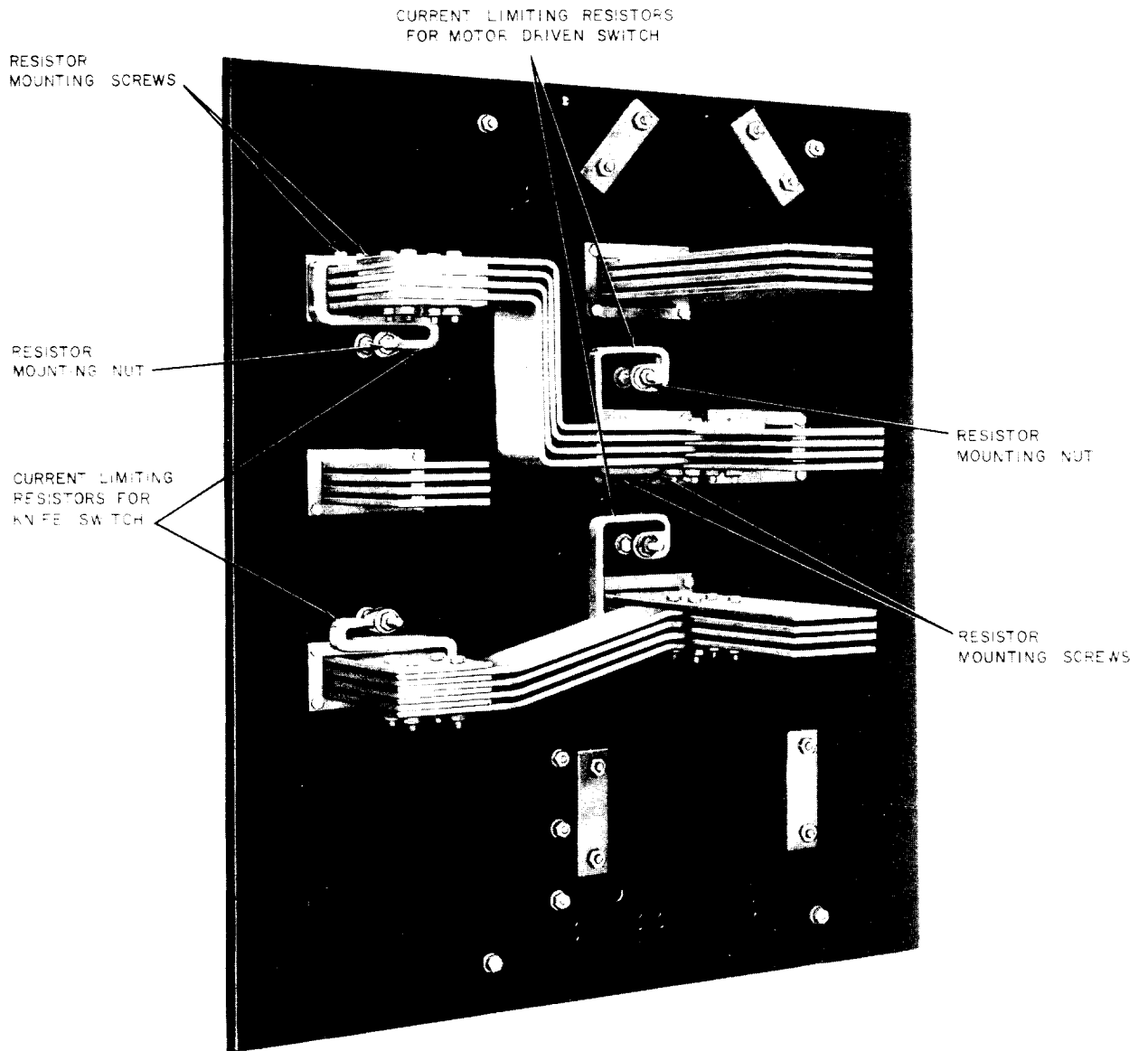


Fig. 3—KS-15610 and KS-15624 Type Switch Panel—Rear View (KS-15610 L4 switch panel shown)