MOTOR-DRIVEN EMERGENCY CELL SWITCHES

CONTENTS

1. GENERAL

1.1 Scope

1.11 This section covers installation of the following motor-driven emergency cell switches used on 301C, 302A, 303C and 702C Power Plants. Associated BSP numbers are also listed for reference purposes.

KS NO.	BSP NO.
15610	030-785-701
15624	030-785-701
15836	030-787-701
15847	030-786-701

1.12 If information is required on the KS-5502 switch, refer to BSP 030-787-701.

1.2 Associated Information

1.21 Coordinate information in this section with test of the power plant in Handbook 21.

1.3 Precautions

1.31 Before working on a switch that is in service refer to the section in Handbook O which covers cooperation with the telephone company, personnel hazards and prevention of service interruptions.

1.32 Before working on any of these switches remove motor fuses to avoid injury to personnel or equipment due to sudden starting of the motor. Verify switch blades or bridging sliders are fully closed in one of the main contacts. Replace fuses when work is done.

1.33 When operating KS-15610 or KS-15624 switches with the hand crank, with emergency cells connected, wind rapidly (about 120 revolutions per minute) and do not stop until the bridging slider engages the main contact clip at the next position.

NOTE: Before using the hand crank on these switches perform the operation shown on the warning plate on the cover as follows:

"Remove emergency cell 130-volt fuse "A" before working on switch".

1.34 When operating a 4-position KS-15847 switch manually with a wrench do not operate the switch beyond 12.4 dial marking as this cause an excessive increase in plant voltage. Also, do not stop the switch in the following ranges:

2.1-3.6 and 6.2-10.2 as this will damage the current limiting resistors.

1.35 Covers for these switches are quite heavy. Grasp the cover firmly to avoid dropping it.

1.36 After emergency cells are connected do not operate KS-15610, KS-15624 or KS-15847 switches from one position to another and return more often than once every five minutes. More frequent operation may burn out the current-limiting resistors.

1.37 Prior to connecting the emergency cells to the switch panel, make sure that the blade of a blade-type switch is fully engaged in a main clip, that the bridging slider is on a main contact, or that the rotary switch is in a main position.

1.38 When work is being done on the panel after emergency cells are connected, do not touch current-carrying parts and ground at the same time with either the hands or tools.

1.4 Inspection

1.41 Remove any materials used for shipping purposes and inspect the switch for damage or missing parts. Remove switch cover for this inspection. If defects or damage are found at this time originate a J.I.M. in accordance with the Job Clerical Handbook.

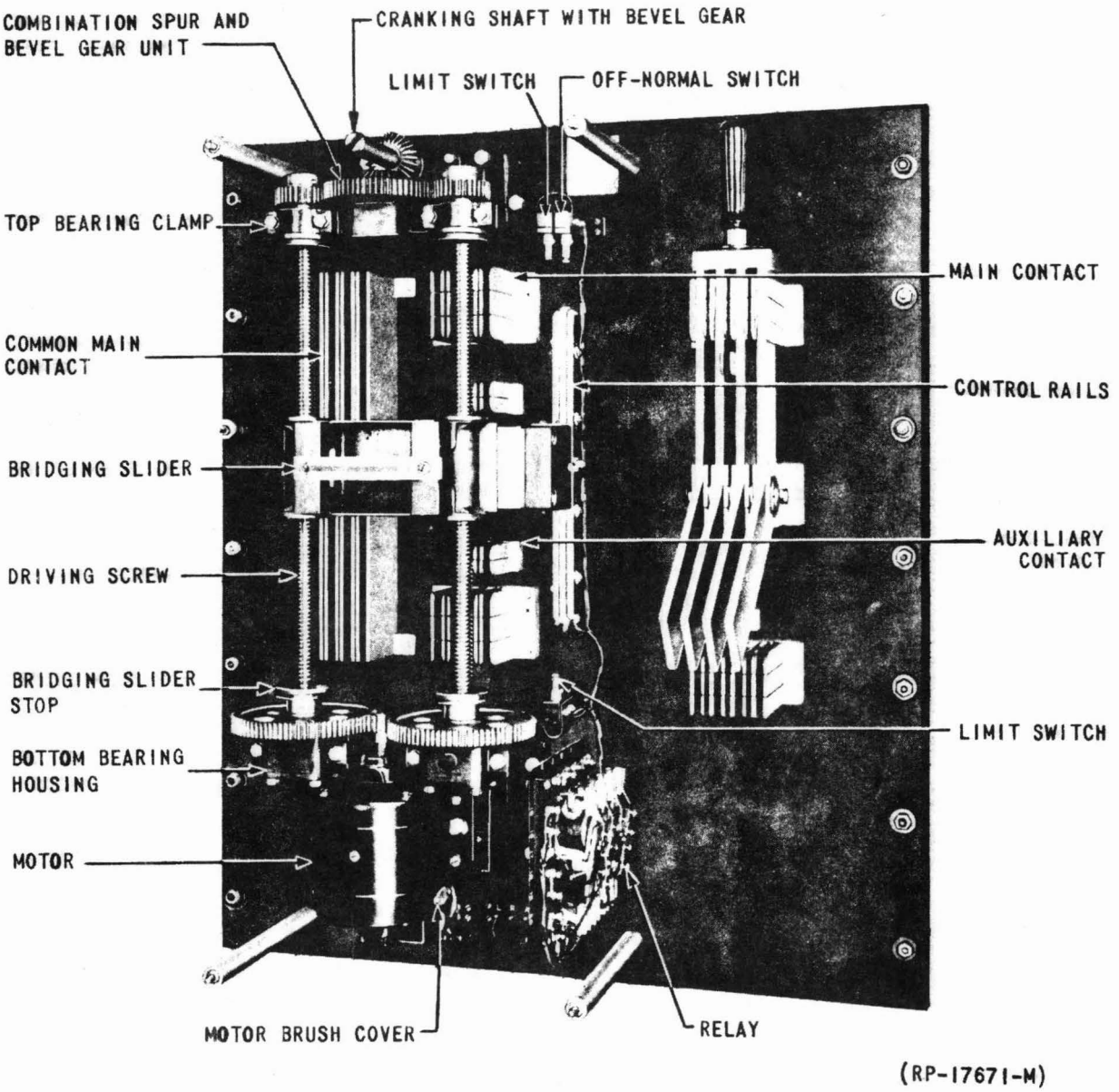


FIG. 1 KS-15610 4000 AMPERE SWITCH PANEL WITH COVER REMOVED (PARS. 1.51, 1.53)

1.5 Description

1.51 KS-15610 switch panels have a three-position slider type switch moved by driving screws turned by a shunt motor through a gear train. Relays and limit switches are provided for motor control and a single-pole double-throw knife switch is furnished on the panel. A cover encloses the motor-driven switch and the slider is provided with a target which indicates the position through a slot in the cover.

1.52 KS-15624 switch panels are similar to KS-15610 except that the panel may have either two or three main positions and no knife switch is furnished.

1.53 Control rails (See Figure 1) on KS-15610 and KS-15624 switches furnish voltage to the drive motor when the slider moves off a main contact until the slider is fully engaged in the next main contact. The position of these rails is factory-adjusted and should not be changed.

1.54 KS-15836 switch panels have three knife-blade type switches each driven by a dc motor through a linkage. Cam and limit switches transfer control to the next motor. The cover encloses the switch blades and the motors. Each switch blade has a target to indicate its position through a window in the cover. A handle is provided on the panel and is attached to a switch blade when necessary to operate it manually.

1.55 KS-15847 switches are motor-driven rotary-type. They were first furnished as 3-position switches but are now furnished as 4-position. The switch is mounted on an insulating panel with control relays and auxiliary switches.

2. INSTALLING EQUIPMENT

2.1 Tools

2.11 Tool kits already on the job will contain sufficient tools for installing and adjusting operations.

2.2 Test Apparatus

Code	Description
ITE-4034 or ITE-4442	Volt-Ohmmeter

2.3 Supplies

Code	Description
KS-2423	Cloth, Twill Jean
KS-7471	Grease, 260-300P
KS-6232	Oil, 90-110 S100
KS-16326	Oil, 220-260 S100
KS-7860	Spirits, Petroleum
RM-647651	Petrolatum

3. MANUAL SWITCH BLADES AND CLIPS

3.1 Refer to Section 3 in this handbook for certain requirements on knife blades and clips. This includes mounting, cleaning, contact area, lubrication and temperature. Perform as many of these operations as necessary before placing the manual switch in the circuit.

4. MOTORS

4.1 Refer to Section 120 in this handbook for certain requirements on the dc motors used on the switch. This includes commutator condition, brushes, noise, vibration and commutation.

4.2 Each motor shall develop sufficient torque to start and move its associated switch blade or the slider or cam from one position to another.

5. RELAYS

5.1 Relays on KS-15610 and KS-15624 switch panels are Struthers-Dunn type 166BXB100, similar to those covered in Section 101 in this handbook. Refer to Section 101 for information on contact pressure and contact separation.

5.2 Relays on KS-15847 switch panels are Ward Leonard commercial types and not covered in this handbook.

6. MAIN, AUXILIARY AND ARCING CONTACTS

6.1 Contact areas of clips, blades and arcing contacts shall be clean and smooth.

6.2 Contact areas of clips and blades of main and auxiliary contacts shall have a thin coat of grease, except for the arcing contacts.

6.21 The lubricant is applied at the factory. If it appears to be inadequate, refer to lubrication information in the following paragraphs under the specific switch for the type of lubricant to be used.

6.3 Any contact areas coated with molybdenum disulphide (moly power) must be cleaned and coated with RM-647651 Petrolatum. This applies only to existing switches that may have to be worked on. For cleaning operations refer to the BSP listed in Paragraph 1.11 for the specific switch.

7. KS-15610 AND KS-15624 PANELS

7.1 Lubrication

7.11 Slider driving screws and drive gears shall have a film of grease. If these require greasing, apply KS-7471 Grease with the fingers. Operate crank handle a turn or two to make all surfaces accessible. Wipe off excess.

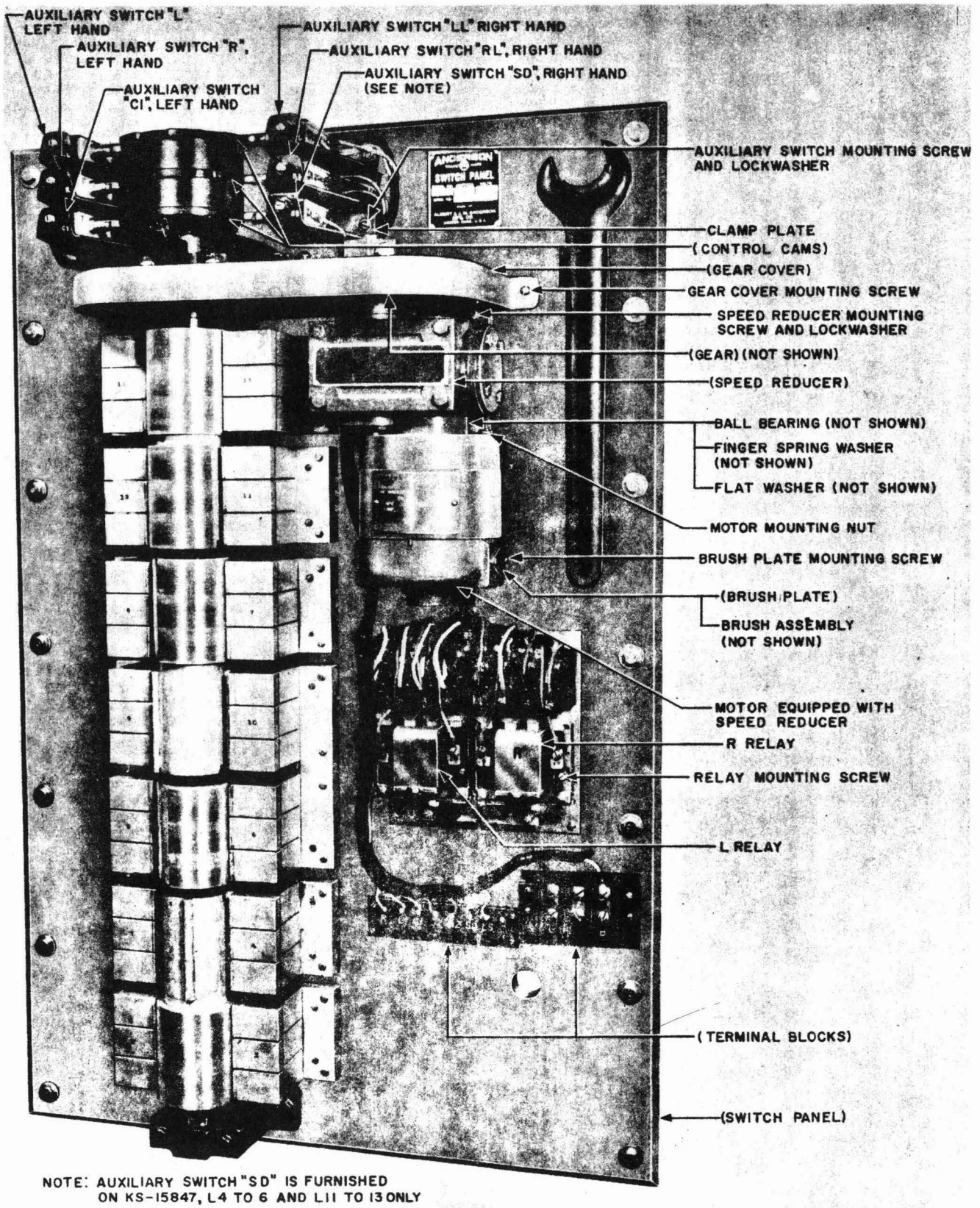


FIG. 2 KS-15847 EMERGENCY CELL SWITCH
(PAR. 1.55)

7.12 Auxiliary and main switch contacts and clips shall have a thin film of RM-647651 Petrolatum.

7.13 The ball bearings on the motor and on the upper end of the driving screws do not require any lubrication. Roller bearings on the lower end of the driving screws should not require lubrication at installation.

7.14 If any lubrication is done on these switches, record on ID-1275 chart.

7.2 Off-Normal Switch

7.21 The Off-Normal switch is the left switch in the group of two at the top of a KS-15610 panel, or the upper switch in the group of two in the upper right hand corner of a KS-15624 panel.

7.22 The Off-Normal switch should close its contacts just before or when the sliding contacts on the bridging slider touch the control rails. Operate switch manually to top position. Then operate slider downward to check Off-Normal switch operation using an ITE-4034 or ITE-4442 to check for switch closure.

7.23 The operating point of the switch is adjusted by changing the length of the plunger. Hold plunger barrel with pliers, loosen the locknut and turn the hexagonal nut end with an adjustable wrench. Tighten locknut when adjustment is satisfactory.

7.3 Limit Switches

7.31 Two limit switches are furnished, one at the bottom of the panel and the other at the top. The top limit switch is the other switch grouped with the Off-Normal switch.

7.32 The limit switches shall open immediately after the sliding contacts leave the control rails. This prevents the slider from jamming against the stop. Operate switch manually from one end position to the other, and check limit switch operation with ITE-4034 or ITE-4442.

7.33 The operating point of the limit switch is adjusted the same as the Off-Normal switch in Paragraph 7.23.

7.4 Arcing Contacts (Where Provided)

7.41 Contact surfaces shall be clean and free from buildups that might prevent reliable contact. Refer to Figure 3. No lubrication should be applied to arcing contacts.

7.5 Manual Operation

7.51 The switch can be operated manually with the crank provided. Before using the crank perform the operation shown on the plate on the cover: "REMOVE EM CELL CONT FUSE 'A' BEFORE ATTACHING CRANK". It will not be necessary to remove the cover to attach the crank. Crank rapidly (about 120 rpm of the crank) to operate slider from one position to another without damaging current-limiting resistors.

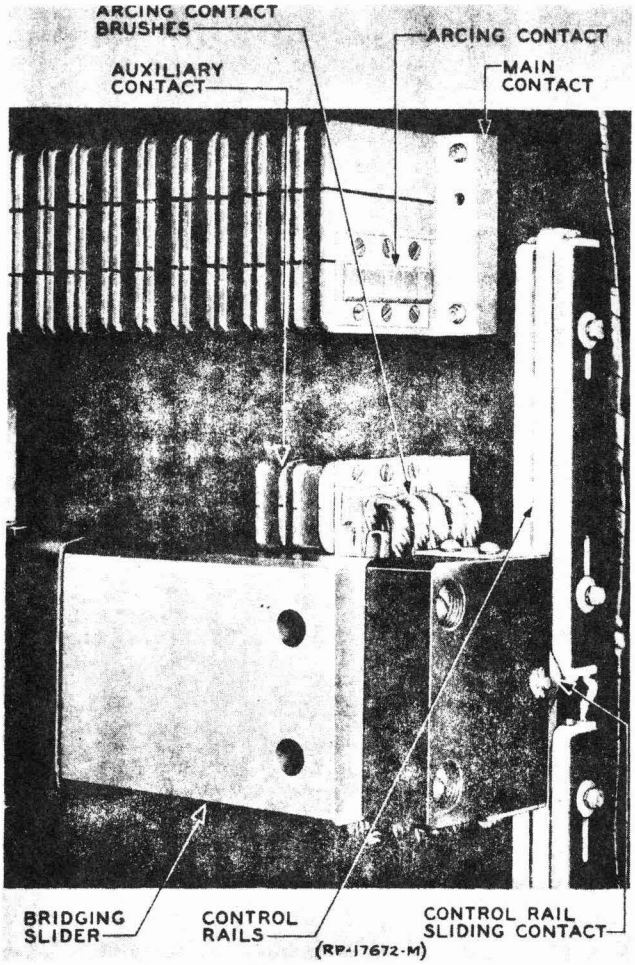


FIG. 3 KS-15624 ARCING CONTACTS (PAR. 7.4)

8. KS-15836 PANELS

8.1 Lubrication

8.11 All gears shall have a film of grease. Use KS-7471 Grease.

8.12 Switch blades and clips shall have a thin coat of RM-647651 Petrolatum.

8.13 Oil joints in the linkage sparingly with KS-6232 Oil.

8.14 If any lubrication is done on these switches record on ID-1275 chart.

8.2 Cam Switches

8.21 Each motor has a cam switch drum which operates stationary contact springs. Stationary contact springs rest in an insulated depression on the drum when the knife switch blade is fully in a main contact.

8.22 Stationary contact pressure on the drum shall be positive and shall be maintained by a spring-like action. This pressure need not be measured but shall be gauged by eye and feel.

8.221 Stationary contact springs may be shaped with pliers, or with the fingers, to provide sufficient tension against the depression on the cam switch drum. There should be a distinct flexing of the spring when it reaches the low point in the drum.

8.3 Limit Switches

8.31 The limit switch associated with each switch blade clip should be closed when the knife blade is fully in the associated clip and open after the switch blade is started out of the clip far enough for the stationary contacts on the cam switch to make and maintain the motor circuit.

8.32 Limit switches are finger-type auxiliary contacts. They are adjusted to maintain contact with the associated switch blade until after the contacts of the associated cam switch close.

8.321 If the switches do not operate at the proper time, the fingers can be shaped with pliers for the correct operating point.

8.4 Manual Operation

8.41 If necessary to operate the switch manually, disconnect the insulating link from the switch arm by removing the pin. Attach the operating handle to the blade and operate the blade to the position desired.

9. KS-15847 PANELS (4-POSITION)

9.1 Lubrication

9.11 All gears shall have a film of grease. KS-7471 Grease should be used.

9.12 The main rotary contacts shall have a film of oil.

NOTE: This is special oil (Chicago Manufacturing and Distributing Center Point Oil) and must be obtained from the switch supplier.

9.13 If any lubrication is done on the switch record on ID-1275 chart.

9.2 Auxiliary Switches

9.21 Table A shows the sequence of auxiliary switch operation with the switch rotation. The dial marking in the table refers to the indexing dial attached to the auxiliary switch cam. Major divisions on the dial are numbered and minor divisions scribed on the dial equal 0.2. A stationary indicator (window with center line) allows the dial marking to show through.

9.22 To check auxiliary switch operation, remove VR and ECM fuses on plant control panel. Connect ITE-4034 or ITE-4442 across the switch to be checked. Manually operate the switch as in Paragraph 9.3. Check make or break points for the switch as in Table A.

CAUTION 1: If batteries are connected to the switch, do not operate the switch beyond 12.4 dial marking as this causes an excessive increase in plant voltage. Operation of auxiliary switches beyond 12.4 can be assumed to be correct.

CAUTION 2: If batteries are connected do not stop the switch in the following ranges: 2.1-3.6 and 6.2-10.2. Stopping the switch within these ranges would damage the current-limiting resistors.

9.221 The auxiliary switch should make or break within ±0.1 of the dial mark shown in Table A.

9.222 L and LL operation should overlap a minimum of 0.2 dial marking.

9.223 R and RL operation should overlap a minimum of 0.2 dial marking.

9.23 To adjust an auxiliary switch to open earlier, turn the switch adjusting screw out. To adjust for earlier closing turn the switch adjusting screw in.

9.3 Manual Operation

9.31 To operate the switch manually, first decouple the gear reducer by turning out the hex-head setscrew using an adjustable wrench. Attach the wrench furnished with the switch to the square hub of the drive gear. Turn the drive gear to position the switch as desired. Return to motor drive position by turning the drive gear so that the mark on the hub lines up with the mark on the drive shaft. Remove wrench and tighten hex-head setscrew securely.

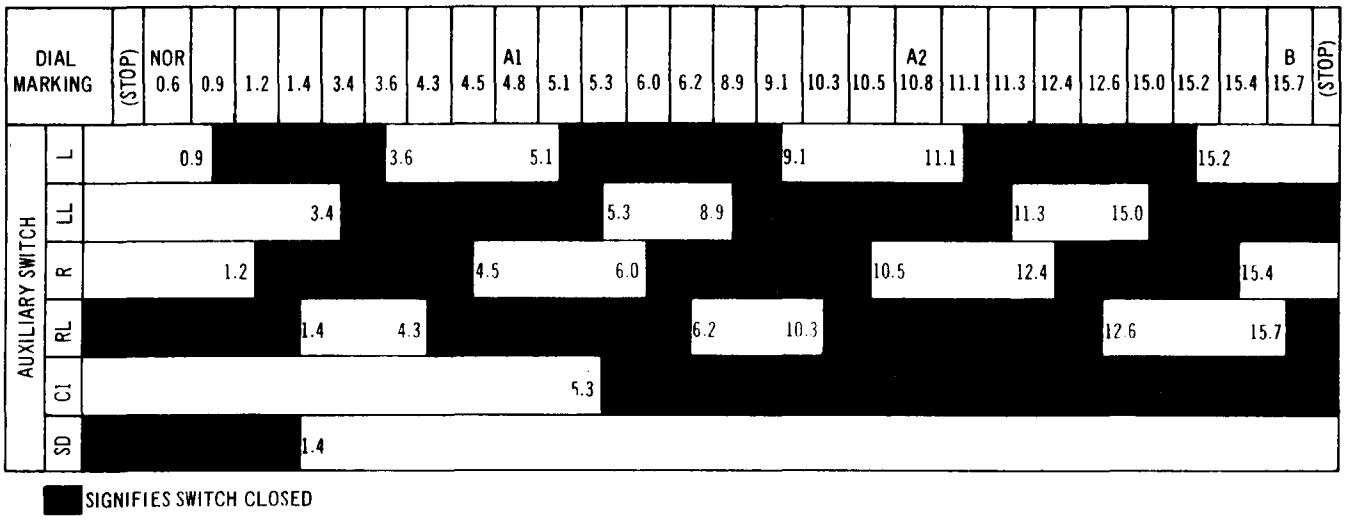
10. TEMPERATURE

10.1 Under normal operating conditions the temperatures of the motor and other parts shall not exceed the following values:

Bearings	80° C	(176 F)
Motor Frame (KS-15836)	90° C	(194 F)
Motor Frame (KS-15847 KS-15610, KS-15624)	95° C	(203 F)
Switch Blades and Contacts	70° C	(158 F)
Terminal Studs	70° C	(158 F)

10.2 If temperature of any part is thought to be excessive, measure by placing the bulb of the R-1032 thermometer on the part, covering the exposed portion of the bulb with a piece of felt or equivalent. Observe the highest temperature reading. If this exceeds the specified limit report it to the supervisor.

TABLE A: AUXILIARY SWITCH SEQUENCE (KS-15847)



SIGNIFIES SWITCH CLOSED

No arrows are shown due to extensive changes.

Vertical line at side of paragraphs indicates requirements.

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Reason for Reissue:
(1) To include KS-15847 Switch.
(2) To drop KS-5502 Switch which is rated A. & M.
(3) To make minor revisions.

Replaces Section 5 dated 2-19-59.