



DESCRIPTION • INSTALLATION • MAINTENANCE

INSTRUCTIONS

MOTOR OPERATING MECHANISM

Type T-2

WESTINGHOUSE ELECTRIC CORPORATION

SWITCHGEAR APPARATUS DEPARTMENTS

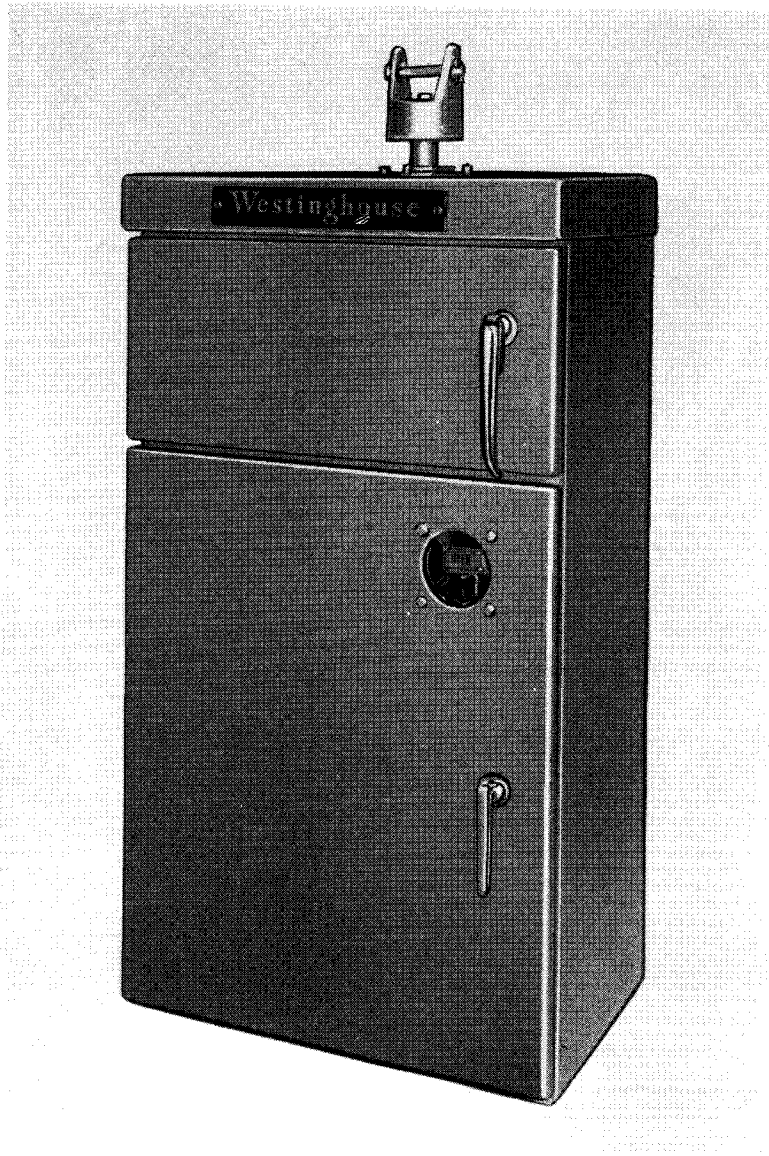
EAST PITTSBURGH PLANT

EAST PITTSBURGH, PA.

NEW INFORMATION

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THE WESTINGHOUSE TYPE T-2 MOTOR MECHANISM is of the torsional output type designed for electrical motor operation of outdoor disconnect switches. The torque output of the mechanism is transmitted from the output coupling of the mechanism through the vertical pipes, 8 to 1 gear box and connecting pipes to the pole units. The maximum rotation of the output coupling is 4 revolutions. A typical outdoor switch arrangement using the motor mechanism is shown in Fig. 1. However, field erection drawings are made by Westinghouse for each disconnect switch order and reference should be made to these drawings when installing a motor mechanism.

DESCRIPTION

The type T-2 motor mechanism is essentially a 2-stage spur gear train powered by an electric motor. The motor is controlled by a reversing contactor and limit switches. Figure 2 shows the mechanism with the doors open and the principle parts indicated.

The WEATHER PROOF HOUSING is divided into two compartments. The UPPER COMPARTMENT houses the gear train and the mechanism for disengaging the motor when the disconnect switch is to be manually operated. This compartment also provides storage for the handle which is used for manual operation. See installation instructions. The SAFETY SWITCH, which de-energizes the control circuit of the motor mechanism when the motor mechanism is in the MANUAL operating position, is also located in this compartment.

The LOWER COMPARTMENT contains the working parts of the motor mechanism such as; the motor, the brake assembly, the auxiliary switch and limit switches, the swinging panel and terminal blocks. Knife switches and fuses, pushbuttons, space heater and reversing contactor are located on the swinging panel.

Both compartments contain gaskets at the doors to provide a dust proof seal. Another gasket is located around the output shaft. The lower door contains a plexi-glass window for viewing the position indicators (and operation counter when used). The lower door is interlocked with the upper door and cannot be opened unless the upper door is open. The mechanism housing can be padlocked closed at the handle on the upper door.

The MOUNTING DIMENSIONS for this mechanism are shown in Fig. 3 and also on the outline

drawing 31-D-6680. This mechanism does not mount interchangeably with the old design type T-2. However, a special housing is available which will mount interchangeably with the old design. Contact the local Westinghouse Sales Office for this information.

The MOTOR used in this mechanism is a Westinghouse time proven "F" line fractional horsepower motor. The motor is protected by fuses located on the swinging panel. The current and voltage rating of the motors are listed in Table 1.

The BRAKE ASSEMBLY is designed to prevent over-travel of the output shaft. It consists of a spring loaded moving core, brake coil, a movable asbestos lined brakeshoe, and a brake disk rigidly attached to the motor coupling. The brake assembly is adjusted and set at the factory to operate at the minimum operating voltage. The asbestos lining has shown negligible wear on life test and no adjustments should be required in the normal operating life of the mechanism.

The AUXILIARY SWITCH is driven from the output shaft by means of a ladder chain and sprocket assembly. The auxiliary switch is permanently coupled to the output shaft and gives reliable indication of the position of the disconnect switch whether it be manually operated or motor operated. There are eleven stages in all available for alarm bells, indicating lights, relaying, etc. If additional stages are required, a special six-stage switch can be mounted below the standard switch.

Each stage consists of a MOLDARTA cam with a clamping ring and set screw, a moving contact, and a stationary contact. Each stage is separate and universally adjustable in itself. A make or break

TABLE 1

NOMINAL VOLTAGE	OPERATING VOLTAGE		CURRENT REQUIRED IN AMPERES AT NOMINAL VOLTAGE		CONTACTOR COIL CURRENT IN AMPERES AT NOMINAL VOLTAGE
	Minimum	Maximum	Full Load	Locked Rotor	
48 d-c	36	52	12	150	.26
125 d-c	90	130	6	60	.13
250 d-c	180	260	3	30	.07
115 a-c	95	125	10	52	.5
230 a-c	190	250	5	26	.5

DESCRIPTION

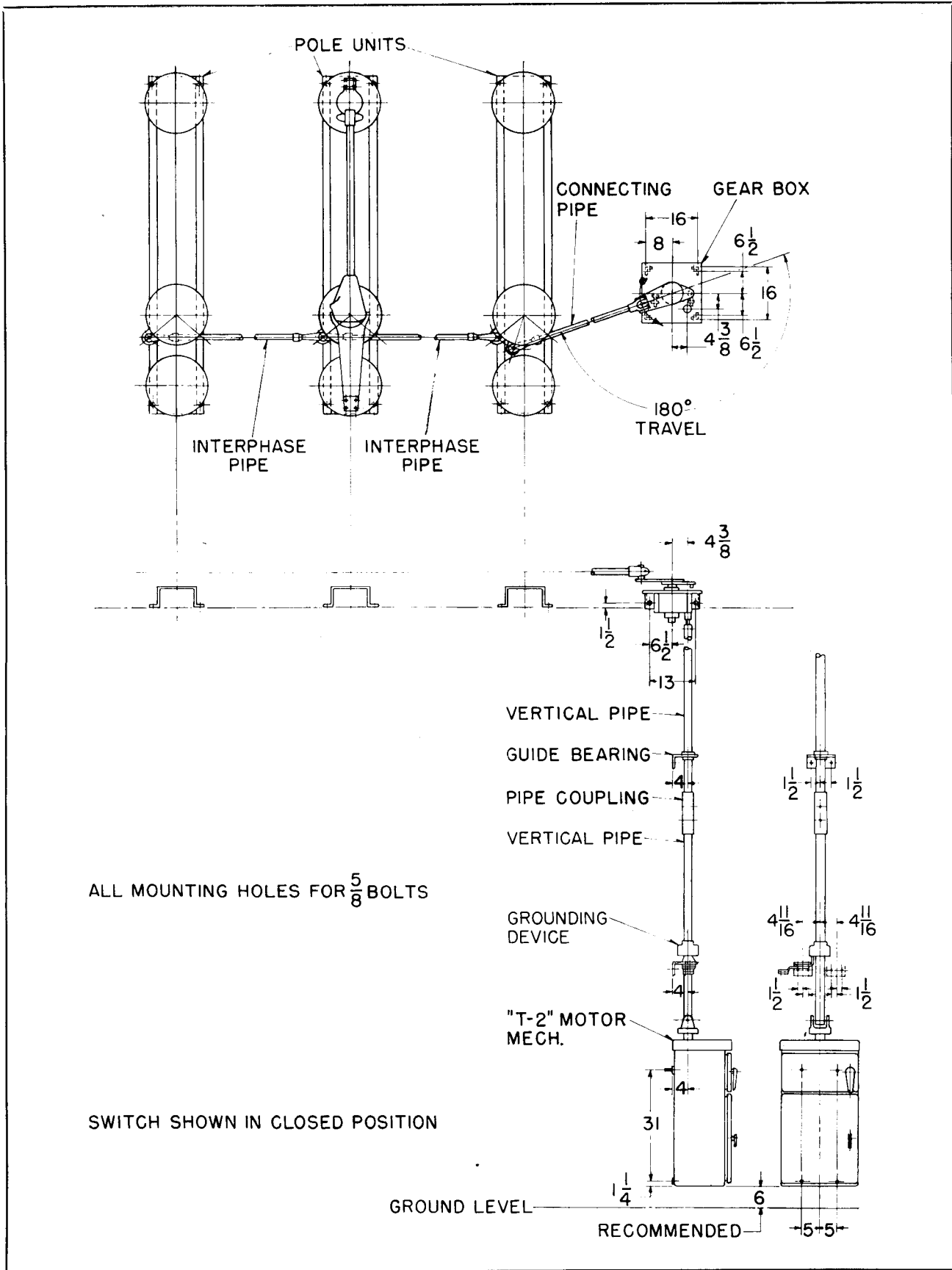


FIG. 1. Typical Outdoor Switch Arrangement

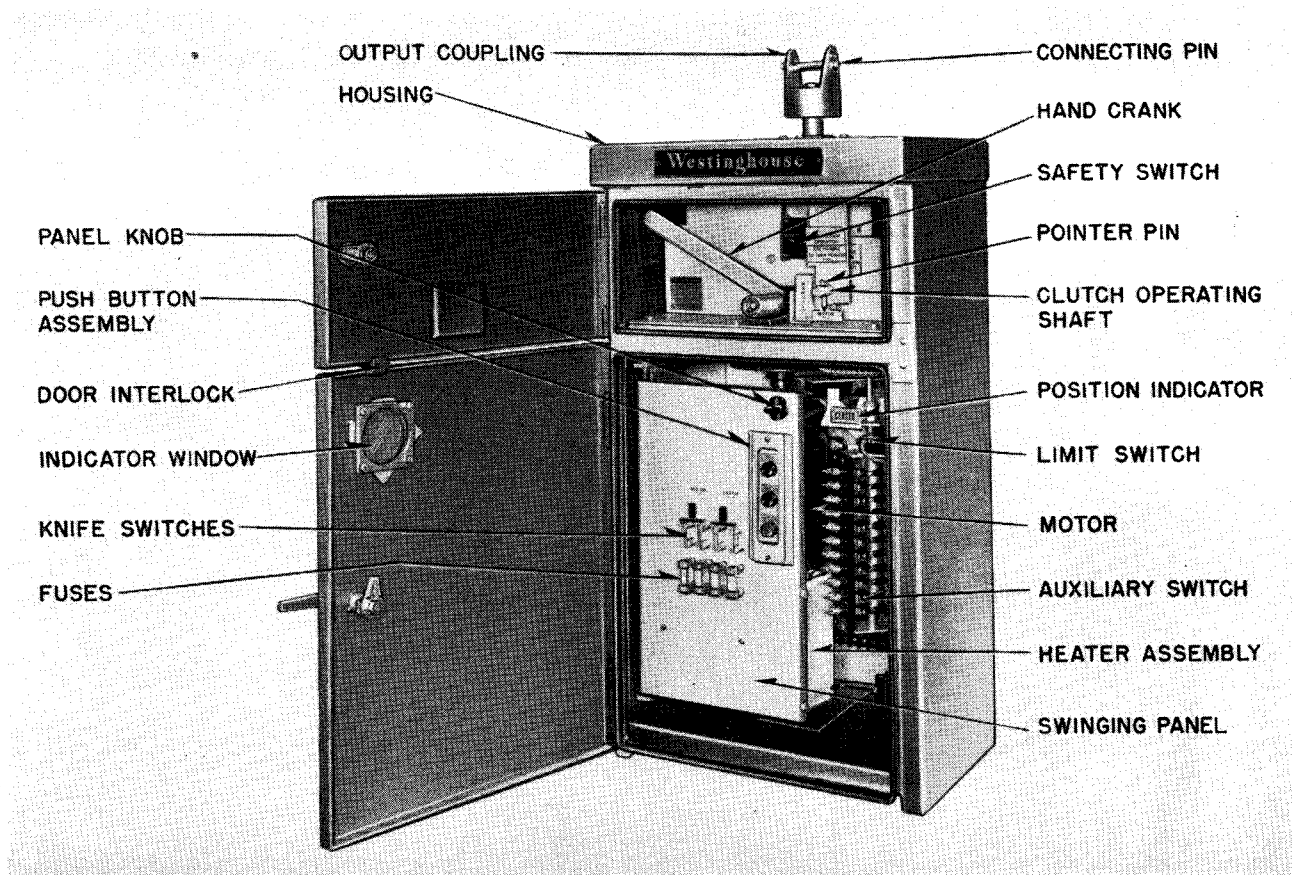


FIG. 2. Type T-2 Motor Mechanism with Door open

contact can be established at any point in the operating cycle. See Fig. 4.

The auxiliary switch contacts are designed to carry 15 amperes continuously or 250 amperes for 5 seconds. The interrupting capacities of the auxiliary switch contacts are given in Table 2.

TABLE 2

VOLTS	NON-INDUCTIVE CIRCUIT—AMPERES	INDUCTIVE CIRCUIT—AMPERES
48 d-c	20.0	10.0
125 d-c	4.0	2.0
250 d-c	1.0	.5
115 a-c	80.0	40.0
230 a-c	60.0	30.0

The LIMIT SWITCHES are set at the factory when the motor mechanism is tested. The limit switches are set to allow the motor mechanism output cou-

pling to rotate 4 revolutions. It may be necessary to increase the rotation of the output coupling to take up the pin clearances in the vertical operating pipe.

To make adjustments in the limit switch, first loosen mounting bolts which hold brackets to the nameplate assembly. Then slide brackets in their slots to provide the travel desired. Tighten mounting bolts to prevent the brackets from moving out of adjustment. See Fig. 7 and Fig. 8.

RECEIVING

Upon receiving the motor mechanism, examine it for any damage. If it has been damaged in shipment, notify the nearest Westinghouse Sales Office. Also file a damage claim with the transportation company.

Inspect the motor mechanism to see that the doors and panel open freely. Check the mechanism to see that no parts are missing.



motor mechanism to the structure using these mounting provisions.

From the 3-pole field erection drawing determine the direction of rotation of the vertical operating pipe in order to open the disconnect switch. For COUNTER-CLOCKWISE rotation of the vertical pipe to OPEN the switch connect the motor mechanism per PROCEDURE I. For CLOCKWISE rotation of the vertical pipe to OPEN the switch connect the motor mechanism per PROCEDURE II.

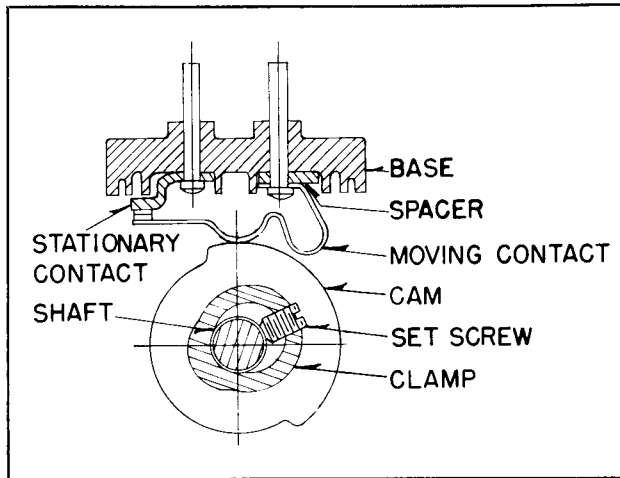


FIG. 4. Typical Stage of the Type WA Auxiliary Switch

PROCEDURE I

COUNTERCLOCKWISE ROTATION TO OPEN DISCONNECT SWITCH

(as viewed from above)

1. Cut and drill the vertical pipe, which connects to the output coupling of the motor mechanism. Use the output coupling as a guide to drill the hole in the pipe.
2. Connect output coupling of the motor mechanism to the vertical pipe with the disconnect switch

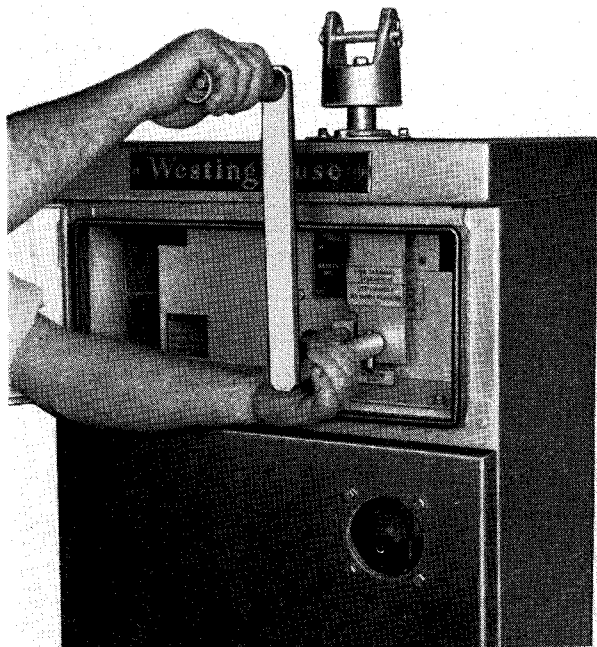


FIG. 5. Manual Operating Handle on Clutch Operating Shaft

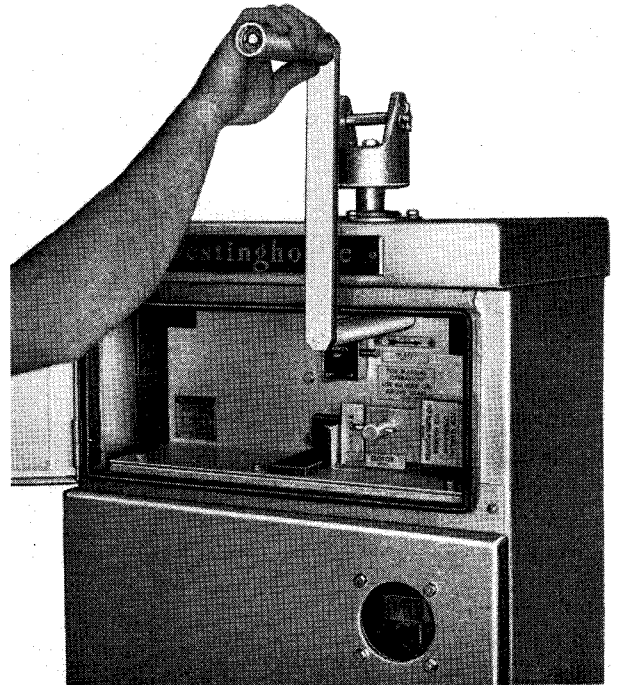


FIG. 6. Manual Operating Handle Shown in position for Manual Operation of Motor Mechanism

in the closed position, and the motor mechanism in the CLOSED position. Use pin and cotterpins provided.

3. Obtain manual operating handle (located in the upper compartment) to open the disconnect switch.

4. Insert the slotted end of the handle over the clutch operating shaft, engage pointer pin in the

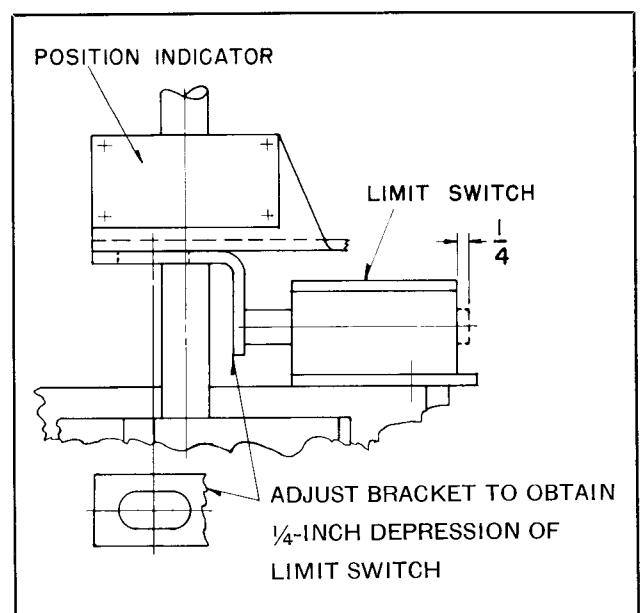


FIG. 7. Lower Limit Switch Adjustments

INSTALLATION

slot and turn $\frac{1}{4}$ turn clockwise so that the yellow pointer indicates the **MANUAL** position. Fig. 5.

5. With the pointer indicating the Manual position, remove the handle from this shaft and place it on the upper shaft, engage pin in the slot and turn handle counterclockwise (direction of arrow under shaft), Fig. 6, until the disconnect switch is completely open and the gear box lever is against its stop. With pencil make position reference lines on the output shaft and mechanism housing while the switch is in this position.

6. Check the limit switch (lower plunger type switch of the limit switch assembly). The plunger should be depressed about $\frac{1}{4}$ of an inch at the end of the stroke. If necessary, adjust bracket. See Fig. 7.

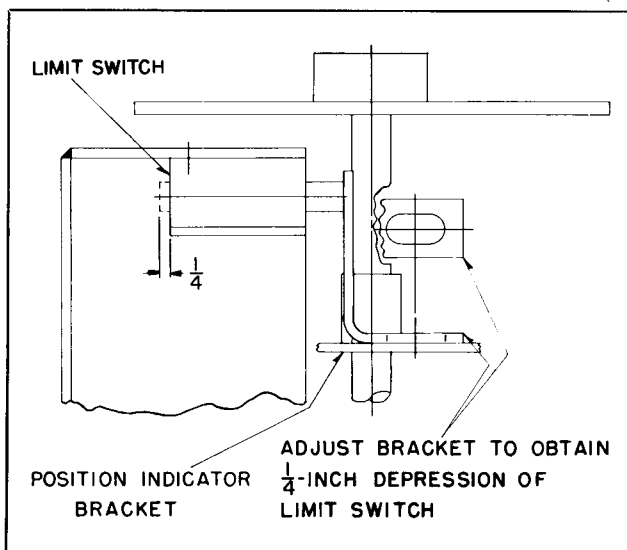


FIG. 8. Upper Limit Switch Adjustments

7. When the motor mechanism adjustments have been made in the open position, manually operate the mechanism and disconnect switch to the closed position by turning handle clockwise until the gear box lever is against its stop and the disconnect switch is completely closed. Again in pencil, mark reference lines for the closed position of the switch.

8. In this position, check the limit switch (upper plunger type switch of the limit switch assembly). The plunger should be depressed $\frac{1}{4}$ of an inch at the end of the stroke. If necessary, adjust bracket. See Fig. 8.

9. Remove manual operating handle from upper shaft and insert it over the clutch operating shaft. Restore mechanism to the **MOTOR** position.

10. **DISCONNECT** motor mechanism from the vertical operating pipe at the output coupling.

11. Connect the power leads to the terminal blocks located in the lower compartment according to the specified wiring diagram.

12. Close the knife switch for the motor circuit and operate the motor mechanism electrically using the pushbutton station located on the swinging panel. Check the open and closed reference lines made with pencil. If repeated successive operations are made, it is suggested that a slight time interval be allowed between operations.

13. If necessary, make further adjustments to the brackets which depress the limit switch plungers.

Important: Open the motor knife switch before attempting to adjust limit switch cams.

14. Connect the vertical operating pipe permanently to the output coupling of the motor mechanism, using the pin and cotter pins provided.

15. Operate disconnect switches electrically and make further adjustments to the brackets which depress the limit switch plungers, if necessary.

PROCEDURE II

CLOCKWISE ROTATION TO OPEN DISCONNECT SWITCH (as viewed from above)

Note: The motor mechanism, as received from the factory, is wired and adjusted to rotate the output coupling 4 revolutions counter-clockwise to open the disconnect switch.

Before drilling and connecting the vertical pipe to the output coupling and with the disconnect switch in the closed position, it will be necessary to operate the motor mechanism manually to its "OPEN" position according to the following instructions:

1. Obtain manual operating handle located in the upper compartment.

2. Insert the slotted end of the handle over the clutch operating shaft, engage pointer pin in the slot of the handle, and turn handle $\frac{1}{4}$ turn clockwise so that the yellow pointer indicates the **MANUAL** position. See Fig. 5.

3. With the pointer indicating the **MANUAL** position, remove the handle from this shaft and place it on the upper shaft, engage the pin in the slot (Fig. 6) and turn handle counterclockwise (direc-

tion of arrow under shaft) until the "OPEN" nameplate appears at the window of the lower door.

4. With the motor mechanism in its "OPEN" position and disconnect switch in the CLOSED position drill the vertical pipe which connects to the output coupling. Use the output coupling as a guide to drill the holes in the pipe. Connect the vertical pipe to the output coupling using the pin and cotter pin provided.

5. Open the door to the lower compartment. Interchange the OPEN and CLOSED nameplates so that CLOSED nameplate appears at the window of the lower door. Each nameplate is held in place by four small screws.

6. With the switch and the motor mechanism both in the CLOSED position, manually operate the disconnect switch to the OPEN position by turning the handle (inserted over the upper shaft) clockwise until the gear box lever is against its stop and the disconnect switch is completely open. With pencil make position reference lines on the output shaft and mechanism housing while the switch is in this position.

7. Check the limit switch (upper plunger type switch, marked SF-CT, located in the lower compartment). The plunger should be depressed about $\frac{1}{4}$ of an inch at the end of the stroke bracket. If necessary, adjust per Fig. 8.

8. When the adjustments have been made, manually operate the disconnect switch to the CLOSED position by turning the handle counterclockwise until the gear box lever is against its stop and the disconnect switch is completely closed.

9. In this position, check the limit switch (the lower plunger type switch, marked SF-CS). The plunger should be depressed about $\frac{1}{4}$ of an inch at the end of the stroke. If necessary, adjust bracket per Fig. 7.

10. Reverse the position of the "arrow" nameplate (located under the upper shaft) to indicate that the manual operating handle must be rotated clockwise "TO OPEN" the disconnect switch. The "arrow" nameplate is held in place by two screws.

11. Remove manual operating handle from the upper shaft and insert it over the clutch operating shaft. Restore motor mechanism to the MOTOR position by turning the handle $\frac{1}{4}$ of a turn counterclockwise. See Fig. 5.

12. DISCONNECT motor mechanism from the vertical pipe at the output coupling.

13. Interchange C1 and C2 leads at the push-button station located on the swing panel in the lower compartment.

14. Connect power leads to the terminal block located in the lower compartment according to the specified wiring diagram.

15. Close the knife switch for the MOTOR circuit and operate the motor mechanism electrically using the pushbutton station located on the swinging panel or using a control switch located remotely. Check the open and closed reference lines made with pencil. If repeated successive operations are made, it is suggested that a slight time interval be allowed between operations.

16. Make any further adjustments to the brackets of the limit switch assembly that are necessary.

Important: Open the motor circuit knife switch before attempting to adjust limit switch brackets.

17. Reconnect the vertical operating pipe to the output coupling of the motor mechanism using the pin and cotter pins provided.

18. Operate the disconnect switches electrically and make further adjustments to the limit switch brackets if necessary.

ELECTRICAL OPERATION

The electrical operation of the motor mechanism is started by depressing the OPEN (or CLOSE) push-button, completing the control circuit to the DNOO Reversing Contactor. When C1 (or C2) contactor coil is energized, it picks up its contacts and seals in for the complete operation of the mechanism. (The contactor contains a mechanical interlock so that when one coil has picked up, it prevents operation of the other). When C1 (or C2) picks up, the brake coil and motor are energized. The brake coil releases the brake shoe and allows the motor and gears to operate. At the end of the stroke, the limit switch drops out the contactor, which de-energizes the brake coil and motor. The spring-biased brake shoe forces against the brake disk on the motor shaft and prevents over travel of the output coupling.

MAINTENANCE

Once a year the motor mechanism should be checked to see that it is in top operating condition. It should be disconnected from the operating pipe at the output coupling and operated electrically without disturbing the position of the disconnect switch.

Important: Allow a slight time interval between repeated successive operation to allow for cooling of the electrical components.

Apply a few drops of light machine oil at the pin points and pivot points on the brake levers and contactor mechanical interlock bar.

The gear train requires very little lubrication throughout the mechanism's normal operating life.

All shafts of the gear train run in self-lubricating porous bearings except the output gear shaft which is equipped with sealed ball bearings. However, it is advisable to apply a few drops of light machine oil at the porous bearings. The gear teeth have been lubricated with a silicone grease.

The motor will operate several years before re-lubrication is necessary and then lubricate sparingly with a good grade of light machine oil. More damage results from over lubrication than from under lubrication.

Check the limit and auxiliary switch contacts for excessive burning. If the contacts are dirty or pitted, use a fine file to dress them.

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