

Power Circuit Breakers

Type MO-1 Operating Mechanism—Operation,
Installation, Maintenance, Adjustments, and
Parts Replacement Instructions

S290-54-3
Service Information

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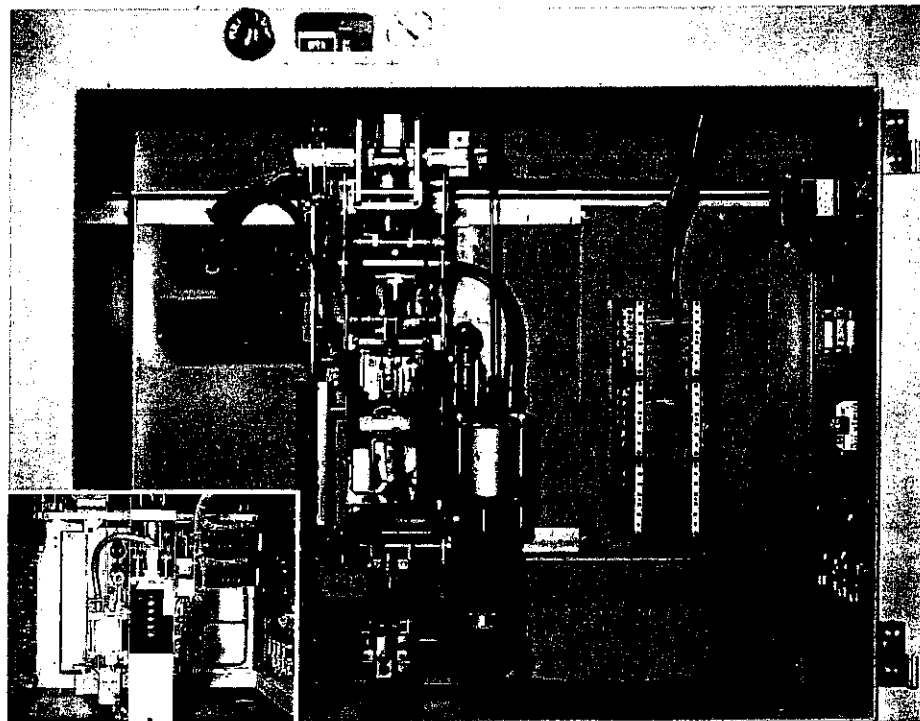


Figure 1.
MO-1 operating mechanism mounted in low-voltage compartment of Type VACG vacuum circuit breaker. (Inset, VAC)

GENERAL

Service Information S290-54-3 pertains specifically to the MO-1 operating mechanism, a hydraulically charged, spring-driven device that operates a McGraw-Edison vacuum circuit breaker electrically or manually at high speeds. The MO-1 operating mechanism is mounted in the low-voltage compartment of the vacuum circuit breaker (Figure 1).

Detailed connection diagrams are issued for and accompany each MO-1 operating mechanism.

When preparing an MO-1 operating mechanism for initial service, making in-service inspections, performing maintenance work, making adjustments, or replacing parts, the latest revision of the following instructions—copies of which accompany the breaker—must also be followed:

- Vacuum Circuit Breaker: applicable service information covering the vacuum circuit breaker in which the MO-1 operating mechanism is mounted.

- Bushing Current Transformers: Service Information S290-80-2, Type OE Bushing Current Transformers.

The MO-1 operating mechanism conforms to all applicable standards for electrical characteristics, mechanical features, and accessories.

SHIPPING

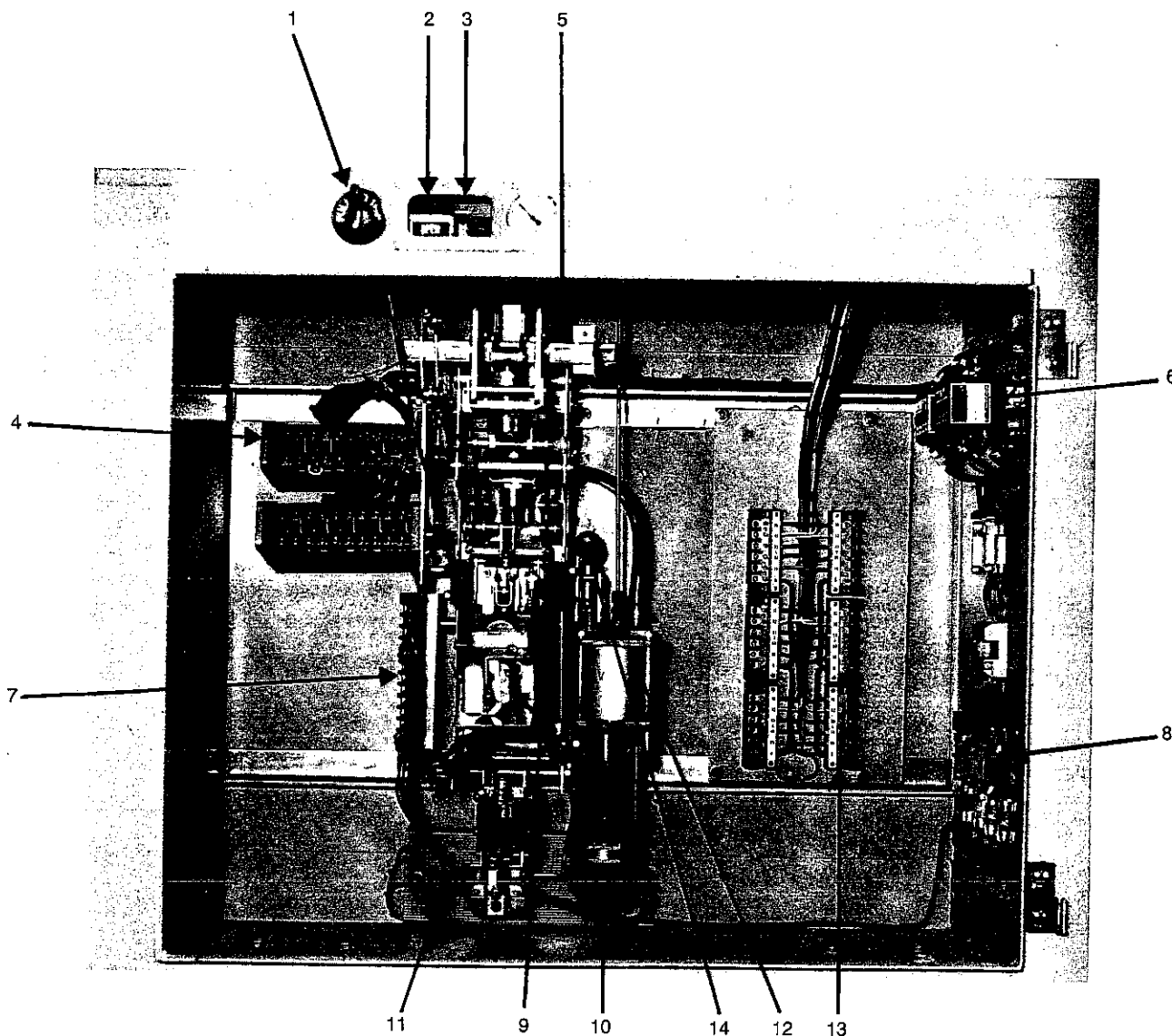
The MO-1 operating mechanism is shipped fully assembled and mounted in the low-voltage compartment of the vacuum circuit breaker.

Each breaker is shipped with the contacts blocked closed by a red rod inserted in the mechanism. The MO-1 mechanism is unlatched so that opening-spring pressure is on the rod. For removal of this rod, refer to the Installation section of these instructions, Page 5.

Detailed outline drawings, control drawings, connection diagrams, all pertinent instructions, and packing lists are shipped protected in each MO-1 operating mechanism cabinet.

NOTE: Breakers shipped overseas require special packaging.

These instructions do not claim to cover all details or variations in the equipment, procedure, or process described, nor to provide directions for meeting every possible contingency during installation, operation, or maintenance. When additional information is desired to satisfy a problem not covered sufficiently for the user's purpose, please contact your McGraw-Edison Power Systems sales engineer.



1. Manual trip handle.
2. Contact position indicator.
3. Operations counter.
4. Auxiliary switch.
5. Jackshift.

6. Auxiliary operating relays.
7. Control wiring terminal blocks.
8. Control supply switches.
9. Closing spring.
10. Pump motor.

11. Heaters.
12. Sump.
13. Current transformer terminal blocks.
14. Socket for manual charge handle.

Figure 2.
Auxiliary equipment and operator components. (VACG Breaker)

INITIAL INSPECTION

Refer to the applicable vacuum circuit breaker instructions for initial inspection of the breaker.

NOTE: Do not remove bracing or blocking from the operating mechanism at this time.

Immediately upon receipt of the breaker:

1. Inspect the exterior and interior of the operating mechanism compartment for evidence of rough handling or damage in transit and shortage.

2. Remove all masking tape (later removal may be very difficult).

3. After checking the operating mechanism compartment interior, close the doors promptly to prevent entrance of dirt and moisture. Should this initial inspection reveal evidence of rough handling or damage in transit or shortage, notify and file a claim with the carrier at once. Also notify the Service Department, McGraw-Edison Power Systems, Canonsburg, PA 15317.

IDENTIFICATION RECORDS

Retain, permanently, complete identification for each operating mechanism including connection wiring diagrams and all pertinent instructions.

Accurate and complete identification records—including the vacuum circuit breaker serial number and rating—must accompany any reference to, or inquiry about, the operating mechanism to McGraw-Edison Power Systems Group.

UNLOADING AND/OR MOVING FROM TRANSPORTING VEHICLE TO INSTALLATION LOCATION

When unloading or moving a breaker on which an MO-1 operating mechanism is mounted, the operating mechanism must be braced and blocked in the original shipping position. Refer to and follow the vacuum circuit breaker instructions for unloading or moving the breaker from the transporting vehicle to the installation location.

PREPARING MECHANISM FOR STORAGE

If a vacuum circuit breaker in which an MO-1 operating mechanism is mounted is not to be placed in the service-ready condition immediately upon receipt, it is considered to be in storage.

To prepare an MO-1 operating mechanism for storage:

1. Open compartment doors.
2. Check to be sure all bracing and blocking are secure, but do not remove any bracing or blocking at this time.

3. To prevent moisture from entering and damaging the operating mechanism, energize the cabinet heaters with a temporary electrical supply until permanent connections are made. *Refer to—and follow—the connection diagrams for heater circuit connections and voltage.*

4. Close the cabinet doors promptly.

PRINCIPLES OF OPERATION

Schematic representations, Figures 3, 4, and 5, illustrate the operating principles of the MO-1 operating mechanism.

In Figure 3 the breaker is open, the closing spring charging, and the hydraulic system operating. The trip link is in the collapsed position and the hold-on-latch is held down by the trip link. The closing spring must have an initial charge for the breaker to be operated.

Initial Charging of the Closing Spring

1. As soon as control voltage is supplied, the motor-driven hydraulic pump forces hydraulic fluid into the charging cylinder.

2. The charging cylinder compresses the closing spring towards the charged position; drive block follows.

3. Charging cycle continues until the close latch engages the closing roller. At this time through the mechanical linkage a motor cutoff switch interrupts the supply voltage to the motor, completing the charging sequence (Figure 4).

4. Meanwhile, the movement of the drive block has set the trip link; trip roller on trip latch and closes a trip latch switch in series with the close coil.

5. Simultaneous with the completion of the charging sequence, the pressure-release valve opens to the sump relieving hydraulic pressure to the charging cylinder and permitting the close roller to load the close latch.

6. As the pressure-release valve opens, the poppet-type dump valve opens to the sump and brings the charging fluid to sump pressure.

7. As the close lever moves to the set position, the close coil switch, in series with the close coil, is made.

The breaker is now ready for a closing operation, Figure 4.

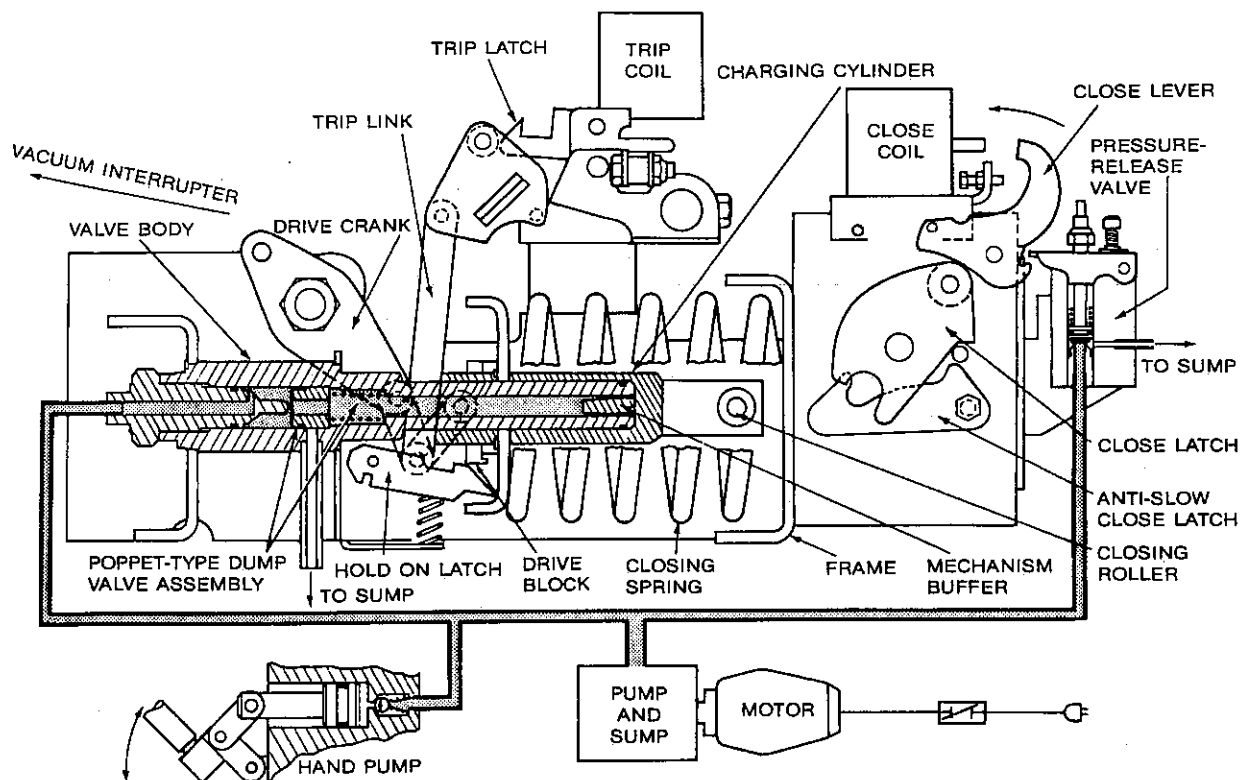


Figure 3. Breaker open, closing spring charging, hydraulic system operating.

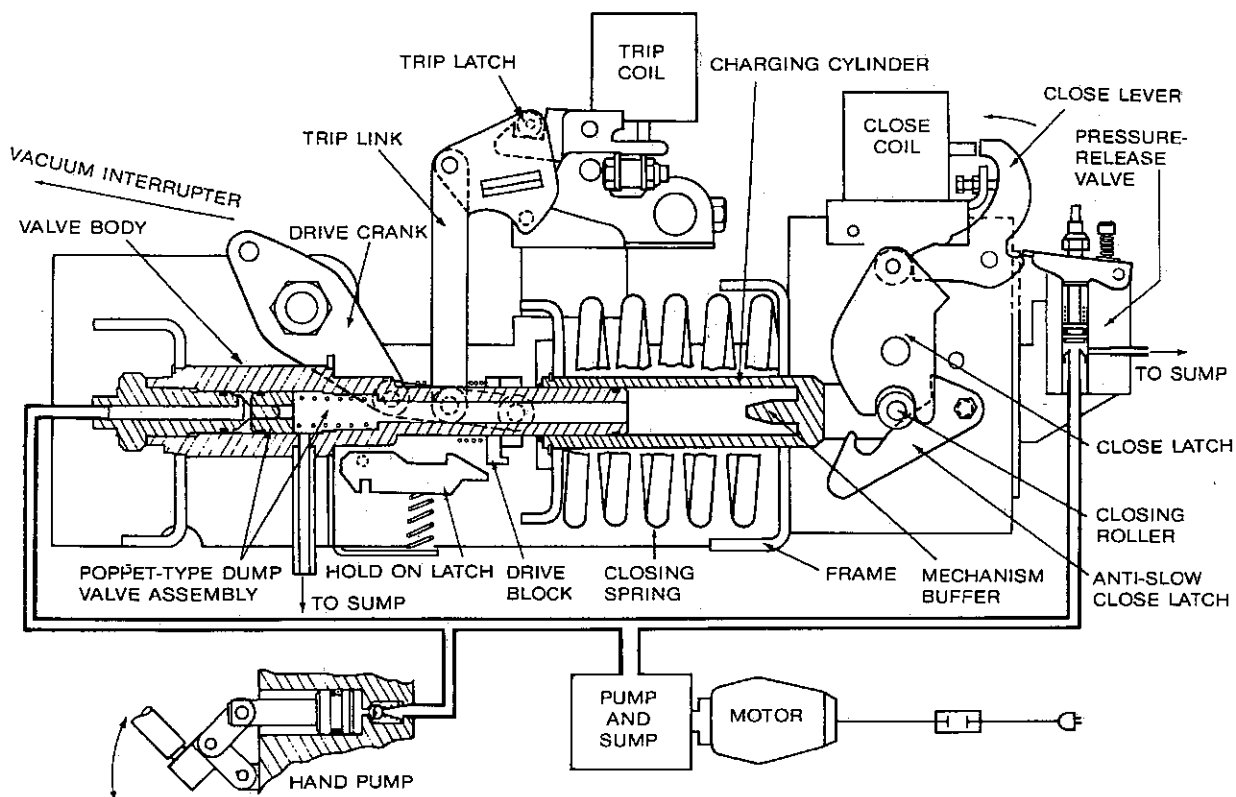


Figure 4.
Breaker open, closing spring charged, no hydraulic pressure.

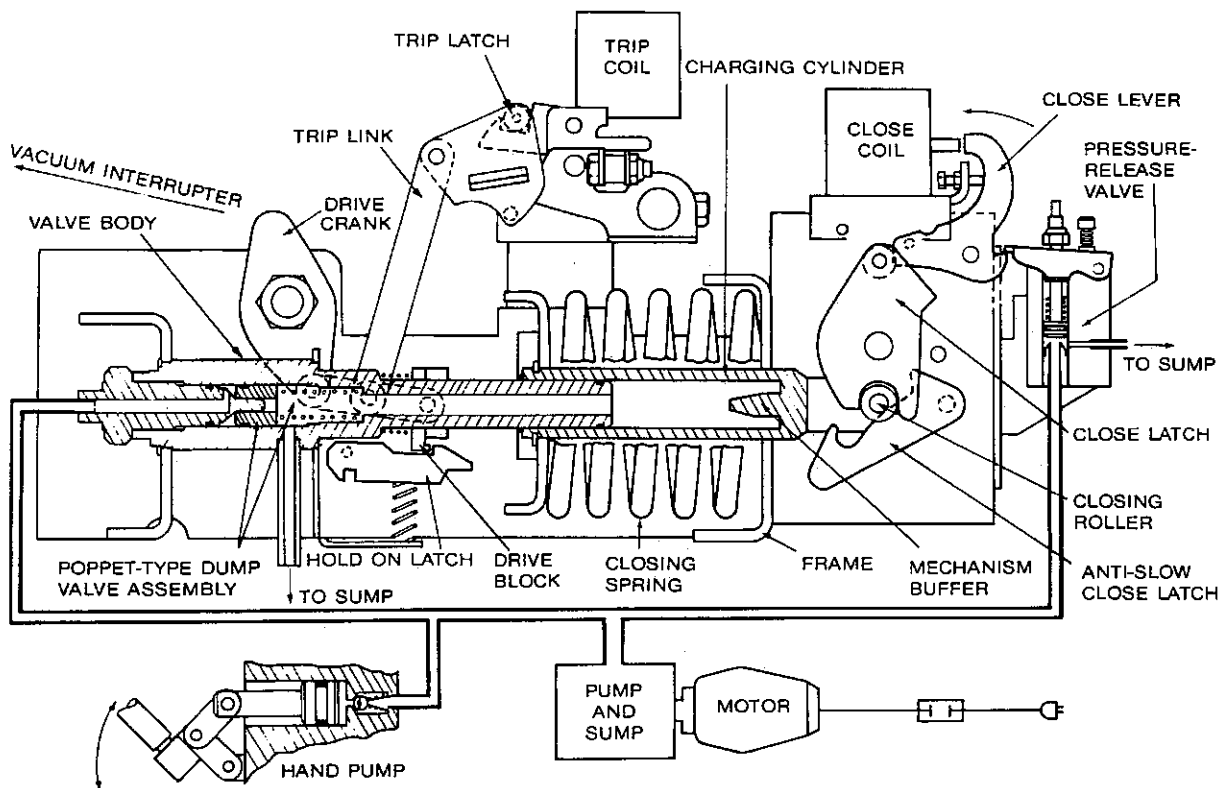


Figure 5.
Breaker closed, closing spring charged, no hydraulic pressure.

Closing Operation

1. After applying proper control voltage to the close coil, the closing roller is moved from under the close latch and the close latch is driven free by the force of closing spring.
2. Charging cylinder moves forward forcing drive block along with it.
3. Interconnecting links will rotate the drive crank and jackshaft and will close the breaker contacts.
4. Hydraulic fluid is returned to the sump through the dump valve.
5. Rotation of the drive crank and jackshaft compresses the opening springs.
6. Mechanical linkage closes charging motor cutoff switch, energizing motor and closes pressure-release valve so that there is pressure in charging cylinder.
7. Poppet-type dump valve closes.
8. Charging cylinder moves closing spring to the charged position, Figure 5.
9. Drive block is held in set position and trip link is loaded.

The breaker is now ready for an opening operation, Figure 5.

Opening Operation

1. When proper voltage is applied to the trip coil, the trip latch moves mechanically, allowing trip link to collapse by the component of force from the opening spring.
2. Interconnecting links rotate the drive crank and jackshaft, moving the breaker contacts into the open position.
3. As trip link collapses, hold-on latch disengages and drive block moves back toward charging cylinder and trip link resets, Figure 5.

When the trip latch resets, the trip roller and the trip latch switch is made up, the breaker is ready to be reclosed.

INSTALLATION

Safety Precautions

It is extremely important that all safety precautions described in these instructions and the breaker instructions be clearly understood and carefully followed.

Although the MO-1 operating mechanism and the breaker on which it is mounted have been designed with the safety of operating personnel foremost in mind, the inherent mechanical characteristics of the breaker—along with the necessary activities of operating personnel—make cautious work habits essential.

Preparation for Service

The MO-1 operating mechanism is mounted and tested in the breaker before shipment. Since it is shipped mounted and mechanically complete, there is no actual installation work required. However, certain checks must be thoroughly performed.

It is necessary to fully understand the principles of operation of the MO-1 operator before any attempt is made to energize the control circuits. Before the mechanism is actuated, operation of the breaker should be understood and specific checks made.

Before preparing the MO-1 operating mechanism for service, prepare the foundation, level and bolt the breaker in place, and install grounding connections in accordance with the breaker instructions.

The MO-1 operating mechanism is adjusted at the factory. Ordinarily factory-set adjustments need not be altered.

To prepare an MO-1 operating mechanism for service:

1. Make electrical connections in accordance with the connection diagram furnished with the equipment.

NOTE: If a permanent supply is not available, make temporary electrical connections until permanent connections can be made.

CAUTION

Mechanism operating circuits should not be closed until called for in both the breaker and these mechanism instructions.

2. Check hydraulic fluid level in the sump.

NOTE: Closing spring must be discharged when checking fluid level.

- A. Dip stick connected to fill hole plug indicates fluid level.
 - B. If addition of fluid is required, refer to the Maintenance section. *Correct this condition before proceeding to the next installation step.*
3. Remove any bracing or blocking placed in the relays for shipping purposes.
 4. If not already accomplished, remove operator blocking as follows:
 - A. Open door of compartment.

NOTE: Be careful not to damage gasket.

- B. Use maintenance-positioning wrench as illustrated (Figure 6).
 - C. Apply upward force toward closed position to relieve pressure on blocking pin.
 - D. Remove blocking pin.
 - E. Using the maintenance-positioning wrench, very slowly relieve the opening spring force on the jackshaft until the breaker reaches the fully open position.
 - F. Reseal low-voltage compartment.
5. Energize the motor and control circuits with a permanent supply (or a temporary supply until a permanent power source is available).
 6. Refer to—and follow—the vacuum breaker instructions for final installation instructions.

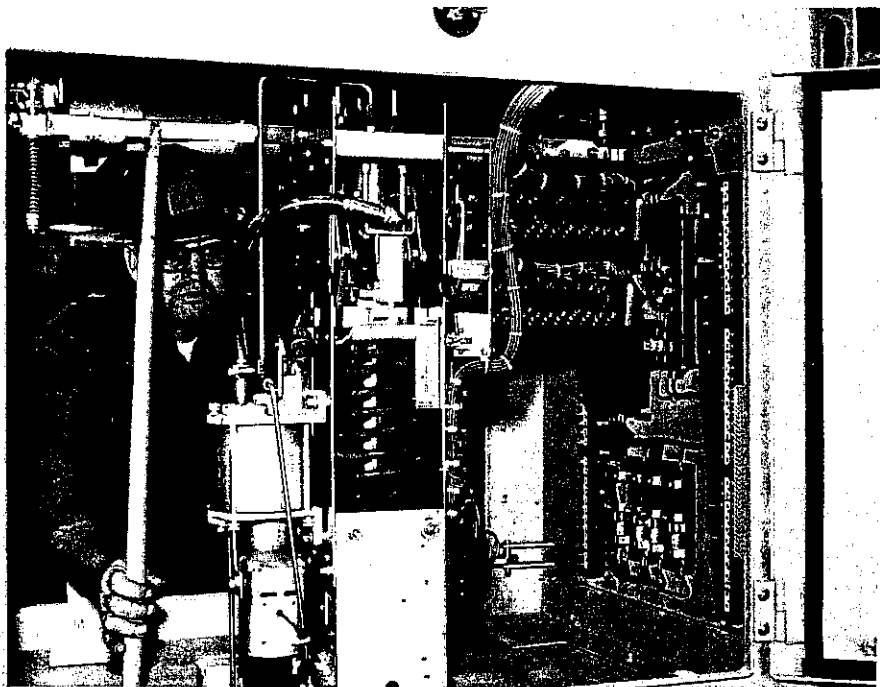


Figure 6. Maintenance-positioning wrench permits manual rotation of jackshaft for blocking pin removal or for maintenance checks.

MAINTENANCE AND INSPECTION

Schedule and coordinate maintenance work on the MO-1 operating mechanism with maintenance work on the vacuum circuit breaker. Refer to—and follow—the instructions covering the breaker on which the MO-1 operating mechanism is mounted. Keep complete records of all maintenance work performed.

Safety Precautions

The vacuum circuit breaker on which the MO-1 operating mechanism is mounted must be removed from service before performing any maintenance work on the operating mechanism or the breaker.

Use the operating mechanism maintenance-positioning wrench during the performance of some of the maintenance steps. Observe all Safety Precautions in the vacuum circuit breaker instructions as well as those throughout these instructions when performing maintenance.

Although the Type MO-1 operator was designed with the safety of operating personnel foremost in mind, the mechanical characteristics of the operating mechanism and breaker, along with the necessary activities of operating personnel, make cautious work habits essential.

WARNING

Deenergize the circuit breaker before performing any maintenance or inspection work. Unless stated otherwise in the procedure, all maintenance and inspection should be performed with the breaker open and the closing spring discharged.

Contact position indicator must read OPEN. Closing spring position indicator must read DISCHARGED.

Materials

- Clean, lint-free rags.
- Cleaning solutions.

The preferred cleaning solutions are heptane, Stoddard's solvent, or cleaner's naphtha.

WARNING

Preferred cleaning solutions are flammable. Avoid sparks and flames. Use in an area where there is adequate ventilation.

Lubricants

Wipe all parts to be lubricated with clean, lint-free rags. Lubricate parts such as operating linkages, pins, and roller bearings with a light film of Humble Oil and Refining Lidok 000 grease. Wipe off excess grease with clean, lint-free rags.

NOTE: Roller bearings require packing only after they have been removed for a complete overhaul.

Hydraulic Fluid

Recommended fluids are: Chevron Oil Company Aviation Hydraulic Fluid A, Texaco Inc Aircraft BB Hydraulic Oil, Shell Oil Company Aeroshell Fluid #4, Exxon Company Univis J-43.

Cleanliness is the best assurance of trouble-free operation. When performing these routine maintenance steps, if the equipment is out of adjustment, refer to the corresponding Adjustments section; if a part must be replaced, refer to the corresponding Parts Replacement section.

Following is the procedure for checking the hydraulic fluid level in sump.

1. Check level with closing spring discharged.
2. Dip stick connected to fill hole plug indicates fluid level.
3. An empty hydraulic system requires approximately 1½ pints of fluid to fill sump.
4. Add one of the recommended hydraulic fluids through the fill hole to reach the proper level.

Auxiliary Switch

1. Refer to the auxiliary switch manufacturer's instruction book that accompanies the breaker.

Close Coil

WARNING

To inspect the close coil, the breaker must be OPEN and the closing spring DISCHARGED. Keep fingers and loose objects away from the closing spring and linkage.

1. Insure that the breaker is open and closing spring discharged.
2. Manually move the close latch to the set position by inserting a screwdriver through the opening in the operating mechanism frame and pulling the close latch to the set position (Figure 9).
3. With the close latch in the set position (Figure 9), the close coil armature air gap should measure 0.060 in. (15.2 mm).
4. If the close coil armature air gap requires adjustment, see close coil in the Adjustments section.

Close Coil Switch, Motor Cutoff Switch

1. Check for cracked switches or loose wires.
2. Refer to the wiring diagram and test the circuit to make sure the switches function properly when the switch buttons are depressed by the actuating arm on the valve block. The wiring diagram number is stamped on the nameplate.

NOTE: If an adjustment is made to obtain the correct close coil armature air gap, check the pressure-release valve, close coil switch and motor cutoff switch for proper operation in accordance with the Adjustments section.

Trip Coil

WARNING

To inspect the trip coil, the breaker must be CLOSED and the closing spring DISCHARGED. Keep fingers and loose objects away from springs and associated linkage.

1. Close the breaker.
2. With the closing spring discharged and the trip latch set, measure the trip latch armature air gap (Figure 7).
3. Air gap should be 0.130 in. \pm 0.005 (3.30 mm \pm 0.13).
4. If necessary adjust to this dimension in accordance with the Adjustments section.

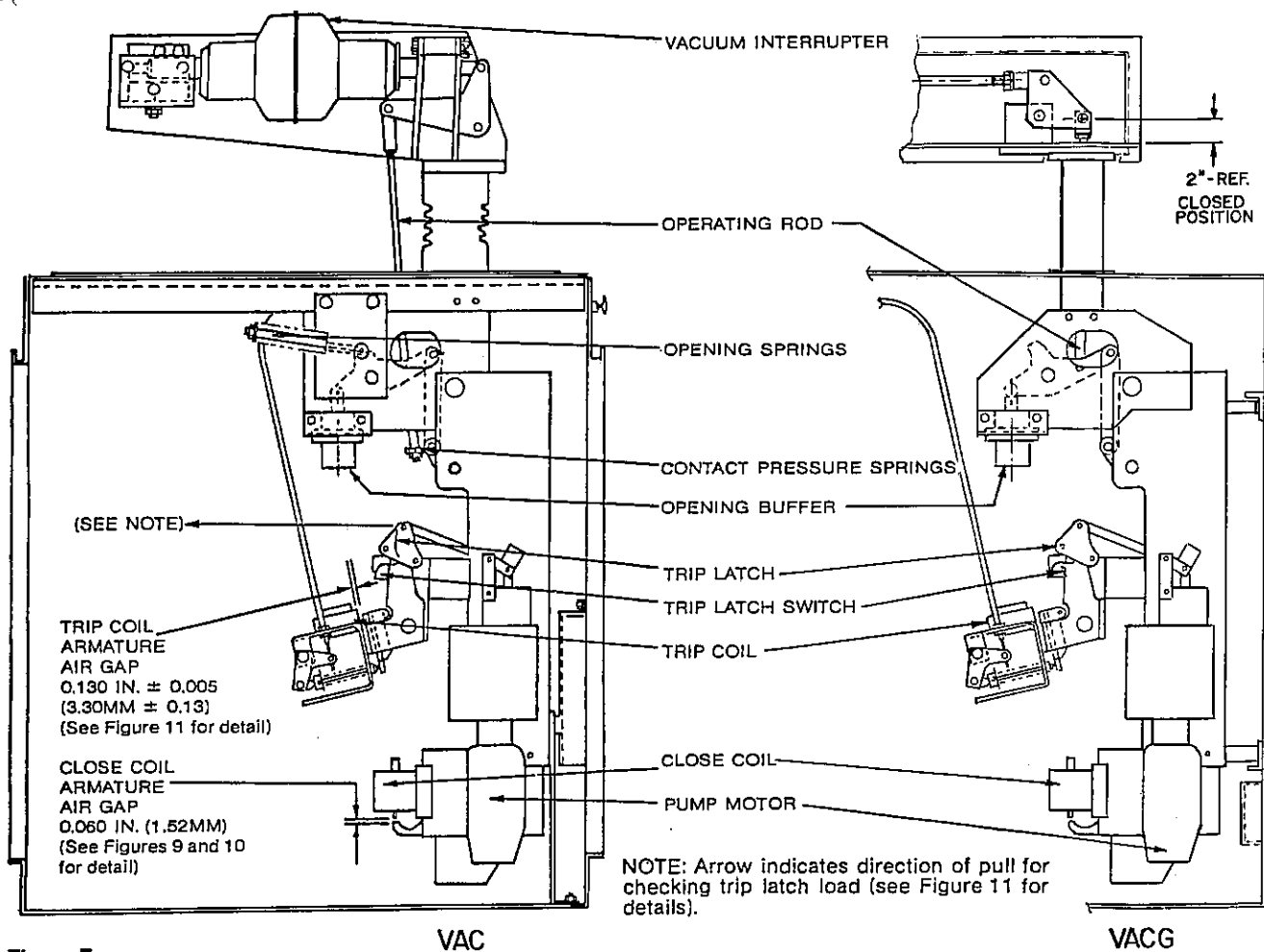


Figure 7.
Maintenance check points.

Trip Latch

1. With the breaker open, charge the closing spring and check that the trip latch resets.
2. Close the breaker.
3. Trip the breaker and observe the trip latch action.
 - A. The trip latch will disengage, allowing the linkage to collapse and the breaker to open.
 - B. The linkage will immediately reset on the trip latch, *provided the closing spring is recharged*.
4. The trip latch should function with a quick positive action.
5. If the trip latch does not function properly, measure the latch load and reset values and adjust as necessary in accordance with the Adjustments section (Figure 11).

Opening Buffer

Check that there is no fluid leakage.

NOTE: Normally, the opening buffer will not require adjustment. However, to insure that the drive linkage can function properly, the drive block must clear the bellville washer as shown in Figure 11. Refer to opening buffer in the Adjustments section if drive linkage does not function properly.

Motor

Since the motor is sealed, no maintenance should be required other than checking that the mounting bolts are tight and listening for excessive noise or bearing rumble. Check motor mounting bolts for tightness. See Motor, in the Parts Replacement section, Page 11, if motor must be replaced.

Handpump

1. Insert the handpump handle (furnished with the breaker) into the socket.
2. Pump approximately ten to twelve strokes to charge the closing spring.
 - A. When the closing spring is charged, loss of pressure will be felt in the pumping operation.
 - B. If no pressure loss is felt, refer to Pressure-Release Valve in the Adjustments section.

NOTE: The handpump can be used to charge the closing spring in the event of a loss of control power.

3. Check that the close latch is holding the close latch roller.

Dump Valve

Dump valve is factory set and will not require adjustment.

Auxiliary Devices

Make sure all auxiliary devices are clean. If it is necessary to replace an auxiliary device, refer to auxiliary devices in the Parts Replacement section.

Interior and Exterior Cabinet Surfaces

Clean all internal and external cabinet surfaces.

NOTE: An industrial vacuum cleaner is recommended.

1. Using clean, lint-free rags wipe down all surfaces.
2. Check the interior and the exterior of the cabinet for evidence of corrosion caused by leakage, moist air, or heater malfunction.
 - A. Eliminate the cause of such corrosion if it exists. Correct this condition before proceeding to the next maintenance step.
 - B. Make sure all electrical connections are tight.
 - C. Make sure all fasteners are tight.
 - D. Retouch painted surfaces where necessary for appearance and complete protection.

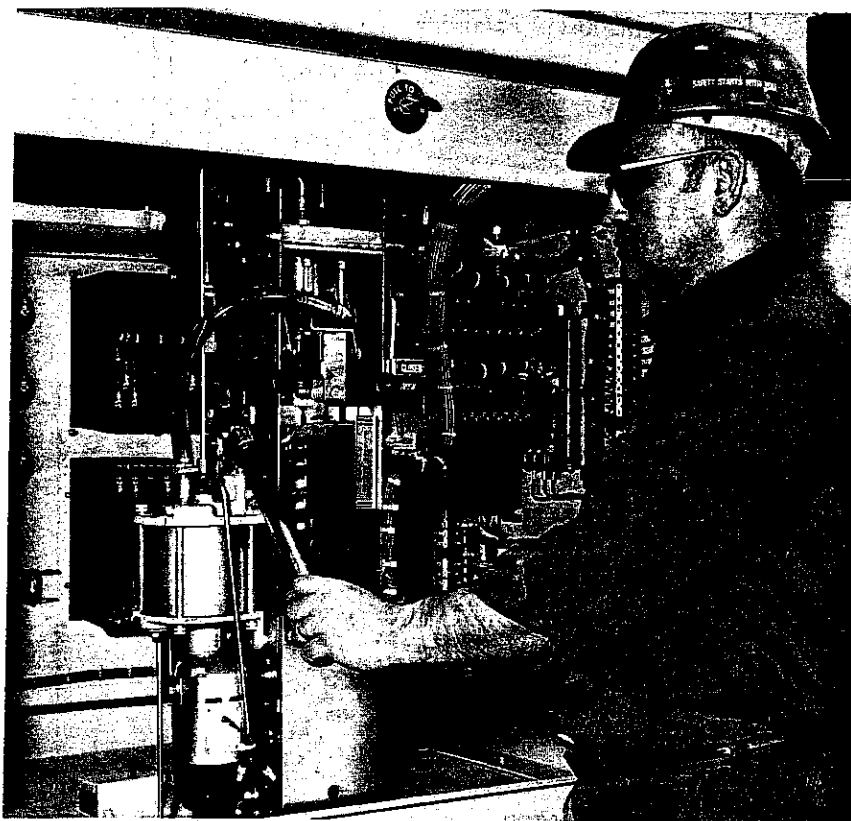


Figure 8.
Handpump used to manually charge closing spring.

ADJUSTMENTS

WARNING

Deenergize the circuit breaker before making any adjustments on the MO-1 operating mechanism or the breaker. Unless stated otherwise in the procedure, all adjustments should be performed with the breaker open and the closing spring discharged. Contact position indicator must read OPEN. Closing spring position indicator must read DISCHARGED.

Observe all safety precautions in the vacuum circuit breaker instructions as well as those throughout these instructions when making adjustments. Although the Type MO-1 operator was designed with the safety of operating personnel foremost in mind, the mechanical characteristics of the operating mechanism and breaker, along with the necessary activities of operating personnel, make cautious work habits essential.

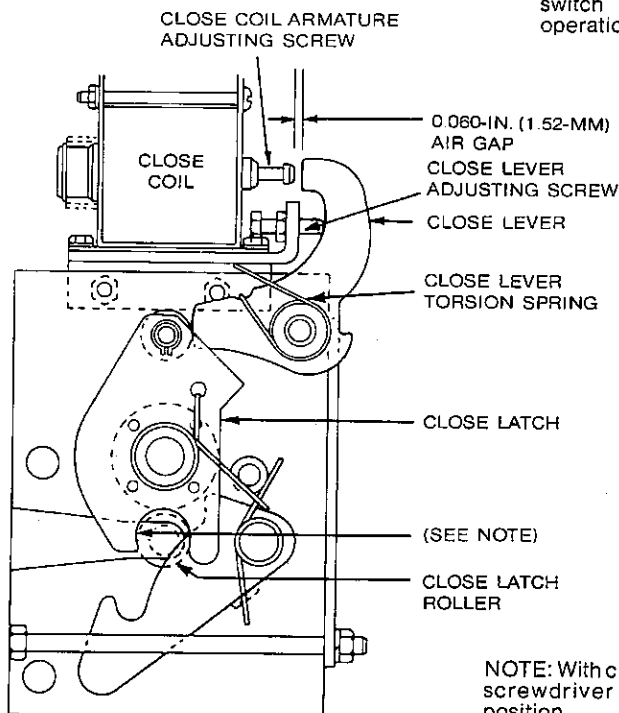


Figure 9.
Close coil armature air gap.

Close Coil

1. Check that the breaker is in the open position and the closing spring discharged.
2. Manually set the close latch roller to the set position as shown in Figure 9.
 - A. Start with the close lever adjusting screw well out into the unlatched position.
 - B. Manually load the close latch roller against the close lever.
 - C. Then, slowly back off the adjusting screw while keeping the roller loaded against the lever, but not stopping its motion.
 - D. Further reset motion of the close lever not causing further motion of the close latch indicates reaching the radial ground portion of the close lever.
 - E. Back off four additional turns from this point and tighten the locking nut.
3. Measure the close coil armature air gap.
4. Set the gap to 0.060 in. (1.52 mm) by using close coil armature adjusting screw.

NOTE: Insert a screwdriver through the opening in the operating mechanism frame and pull the close latch to the set position.

NOTE: Once an adjustment is made, to obtain the correct close coil armature air gap, the pressure-release valve, close coil switch, and motor cutoff switch must be checked for proper operation.

NOTE: With closing spring discharged, insert screwdriver and pull close latch to set position.

Pressure-Release Valve, Close Coil Switch, and Motor Cutoff Switch

1. With a 0.135-in. (3.43 mm) shim in the close coil armature air gap, the pressure-release valve adjusting nut should rest on the raised surface of the pressure-release valve operating arm—but not raise the pressure-release valve stem. Adjust as required.

2. Also, with a 0.135-in. (3.43 mm) shim in the close coil armature air gap, both the close coil switch and the motor cutoff switch should operate.

3. If the switches do not operate, adjust with the setscrews on the actuating arm (contact operation can either be determined audibly or by a continuity check).

NOTE: If adjustment is made to the close coil and motor cutoff switches, recheck the positive stop of the pressure-release valve operating arm against the raised surface of the valve block. Final adjustment should produce following results:

- 0.060-in. (1.52 mm) close coil armature air gap, pressure-release valve opens.
- 0.135-in. (3.43 mm) close coil armature air gap, close coil switch and motor cutoff switches operate.

See Figure 7 for close coil location reference and Figure 10 for detail.

Trip Latch

WARNING

While adjusting the trip latch, the opening and closing springs will discharge at high speed. Keep fingers and foreign objects away from the springs and associated linkage.

NOTE: The *latch load* is the pulling force required to move the trip roller in the trip latch. The force at which the trip roller returns to its original position is the *reset force*. Since this movement is very slight, be sure to observe carefully.

To measure trip latch load and reset values:

1. Close the breaker and wait for the closing spring to recharge.
2. As demonstrated in Figures 7 and 11, hook a metal strap or wire around the trip pin, bring it out the rear of the mechanism compartment, and attach a spring scale which will measure from 10 to 100 lb (45 to 450 newtons).
3. Slowly pull on the scale until a release of the roller is observed—*latch load*—and record this value.
4. Slowly relax while pulling on the scale until roller returns—*reset*—record this value.
5. Values for latch load and minimum reset are prescribed in the table accompanying Figure 11.
6. Measure and record three sets of latch load and reset values; between each set of measurements remove the strap and trip open then reclose the breaker.

7. Adjust the trip latch with the breaker closed, and the closing spring charged by turning the $\frac{1}{8}$ -in. adjustment bolt clockwise to increase the reset load and counterclockwise to decrease it.

NOTE: Latch load will increase approximately 2½ lb (11 newtons) per flat, when turned clockwise, and decrease 2½ lb (11 newtons) per flat when turned counterclockwise.

8. Check for proper adjustment by again taking latch-load and reset measurements.

Trip Coil Armature Air Gap

1. The trip coil armature air gap should be 0.130 in. \pm 0.005 (Figure 7).

2. If adjustment is required:

- A. Loosen nuts securing trip coil mounting bolts.
- B. Move trip coil toward or away from armature as needed.
- C. Do not allow armature to move toward trip latch when measuring gap.
- D. Retighten nuts.

Opening Buffer

To insure the drive linkage can function properly, the factory setting of $\frac{1}{32}$ to $\frac{1}{16}$ in. (0.79 to 1.58 mm) gap must be maintained between the drive block and the belleville washer with the breaker in the open position, and the closing spring charged.

1. If the trip linkage does not set, adjust for $\frac{1}{32}$ to $\frac{1}{16}$ in. (0.79 to 1.58 mm) clearance between the drive block and belleville washer by adjusting the opening buffer (Figure 7).
2. To increase the clearance, the opening buffer is adjusted by turning clockwise.
3. The measurement must be made from the rear of the mechanism compartment. Measure from the top of the belleville washer to the drive block (Figure 11).

Trip Latch Switch

1. Check to see that plunger on trip latch switch clicks when trip linkage is set on trip latch (Figure 7).
2. If switch does not operate when trip linkage is set, bend the trip latch switch actuating arm to permit proper operation.

Dump Valve

The dump valve is factory set and requires no adjustment.

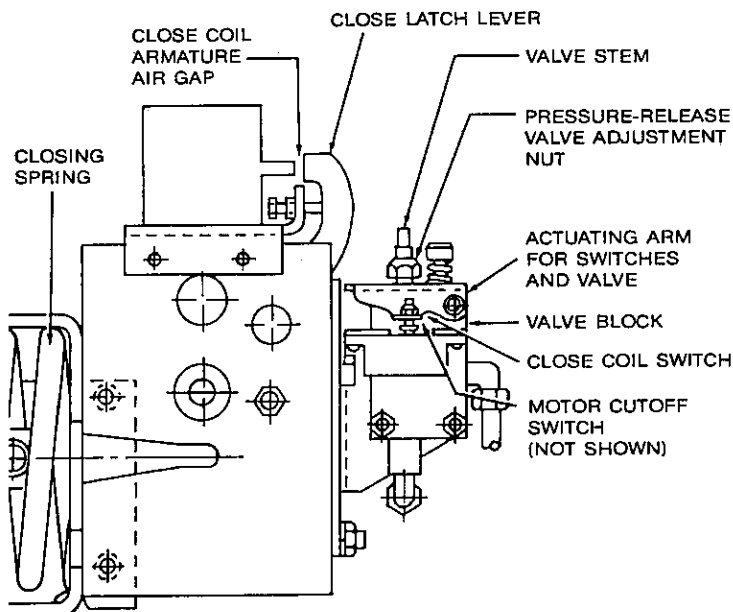
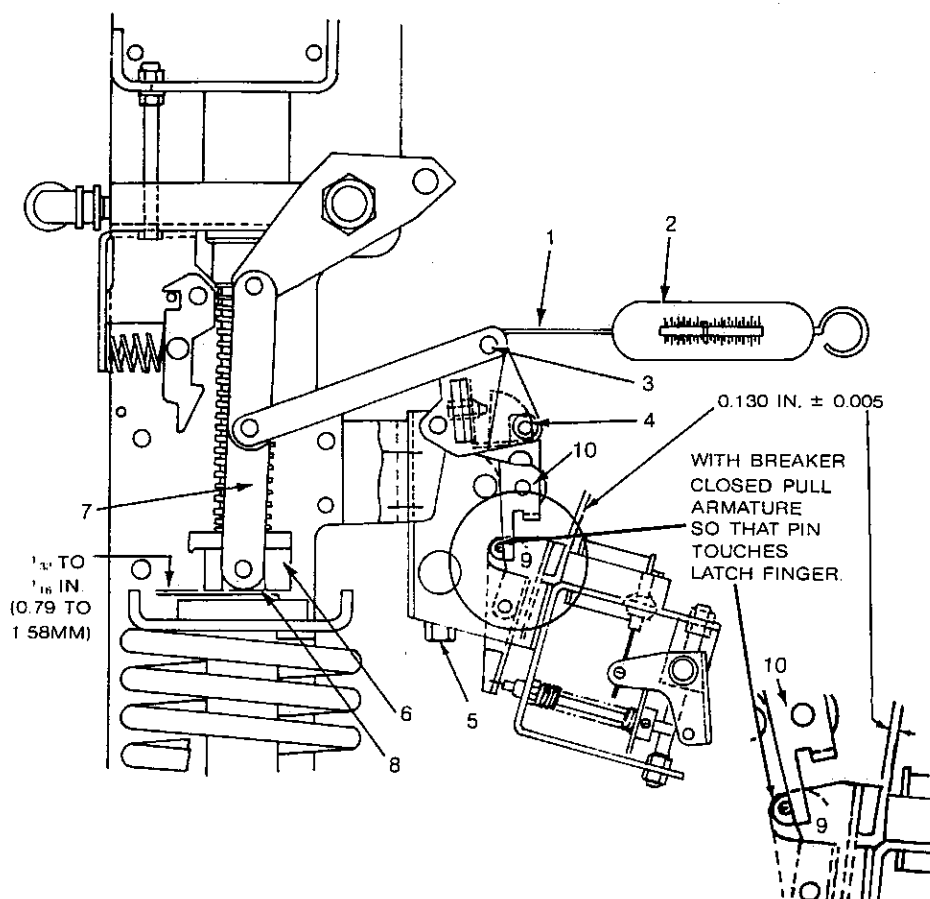


Figure 10. Adjustment; high pressure-release valve, close coil switch, and motor cutoff switch.



kV	Load		Reset Minimum	
	(lb)	(Newtons)	(lb)	(Newtons)
15	70—90	311—400	20	89
25.8	70—90	311—400	20	89
38	70—90	311—400	20	89

1. Metal strap or wire hooked around trip pin.
2. Spring scale—(10 to 100 lb.) (45 to 450 newtons).
3. Trip pin.
4. Trip latch roller.
5. 5/8-in. trip latch adjustment bolt.
6. Drive block.
7. Trip link.
8. Belleville washer.
9. Armature.
10. Latch finger.

Figure 11.
Trip latch adjustment.

PARTS REPLACEMENT

Safety Precaution

The vacuum breaker on which the MO-1 operating mechanism is mounted must be removed from service prior to replacing operating mechanism parts. Proper parts replacement procedures require that the breaker be open, closing spring discharged and the auxiliary electrical system be deenergized.

Close Coil

1. Disconnect the close coil wiring from the terminal block.
2. Remove the bolts and washers which mount the close coil to the mechanism.
3. Remove the coil.
4. Mount replacement coil on the mechanism frame with the bolts and washers.
5. Connect close coil wiring to terminal blocks.
6. Check following items per Adjustment section.
 - A. Close coil.
 - B. Pressure-release valve.
 - C. Close coil and motor cutoff switches.

Trip Coil

1. Disconnect the trip coil wiring from the terminal block, then use same procedure used to replace the close coil.
2. Check following items per Adjustment section:
 - A. Trip coil.
 - B. Trip latch switch.
 - C. Linkage.

Auxiliary Switch

NOTE: Follow the switch manufacturer's instructions for internal adjustments to switch.

1. Remove auxiliary switch wiring at the switch.
2. Remove cotter pin, washer, and operating link from switch.
3. Remove nuts securing switch mounting plate to the mechanism frame.

4. Note the position of the contacts, cranks, and the rod links on the switch:

A. Looking from the linkage end, the drive crank should be at an approximate 2:00 o'clock position and typically a contacts should be open, b contacts should be closed, etc.

B. Contact for contact the replacement switch must operate the same as the old switch (discounting a broken stage in the old switch).

C. Operate the old switch counter-clockwise 90 degrees to approximately a 10:00 o'clock position, and observe the action of the contacts.

5. Remove the rod links and cranks from the old switch shaft.

6. Install operating crank on the shaft of the new switch.

7. Bolt new switch to mounting plate.

8. Secure mounting plate to mechanism frame.

9. Replace switch wiring.

10. Replace operating link, washer, and cotter pin in switch linkage.

Motor

1. Disconnect wires.

2. Remove two mounting bolts.

3. Put replacement motor in position.

4. Connect wires.

5. Replace and tighten mounting bolts.

TROUBLESHOOTING

TABLE 1

Failure to Charge the Closing Spring

Possible Cause	Solution
1. Motor does not run. A. No supply voltage to motor. B. Charging motor cutoff switch.	A. Check fuses, wiring, secondary contact. B. Check adjustment.
2. Motor continues to run. A. Insufficient oil to sump. B. Pressure-release valve open. C. Charging motor cutoff switch.	A. Fill sump as prescribed. B. Check adjustment. C. Check adjustment.

TABLE 2

Failure of Breaker to Close

Possible Cause	Solution
1. Closing spring not charged. 2. No supply voltage to closing coil. 3. Closing coil switch. 4. Open-circuited closing coil. 5. Auxiliary switch. 6. Linkage doesn't reset. 7. Trip latch switch.	1. Charge spring. 2. Check fuses, wiring, secondary contacts. 3. Check adjustment. 4. Replace coil. 5. Inspect auxiliary switch. 6. Adjust closing buffer. 7. Check adjustment.

TABLE 3

Failure of Breaker to Open

Possible Cause	Solution
1. Breaker not closed. 2. No supply voltage to trip coil. 3. Auxiliary switch. 4. Open-circuited trip coil.	1. Close breaker. 2. Check wiring secondary contacts. 3. Inspect auxiliary switch. 4. Replace coil.



**McGRAW-EDISON
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