SQUARE D
Instruction Bulletin

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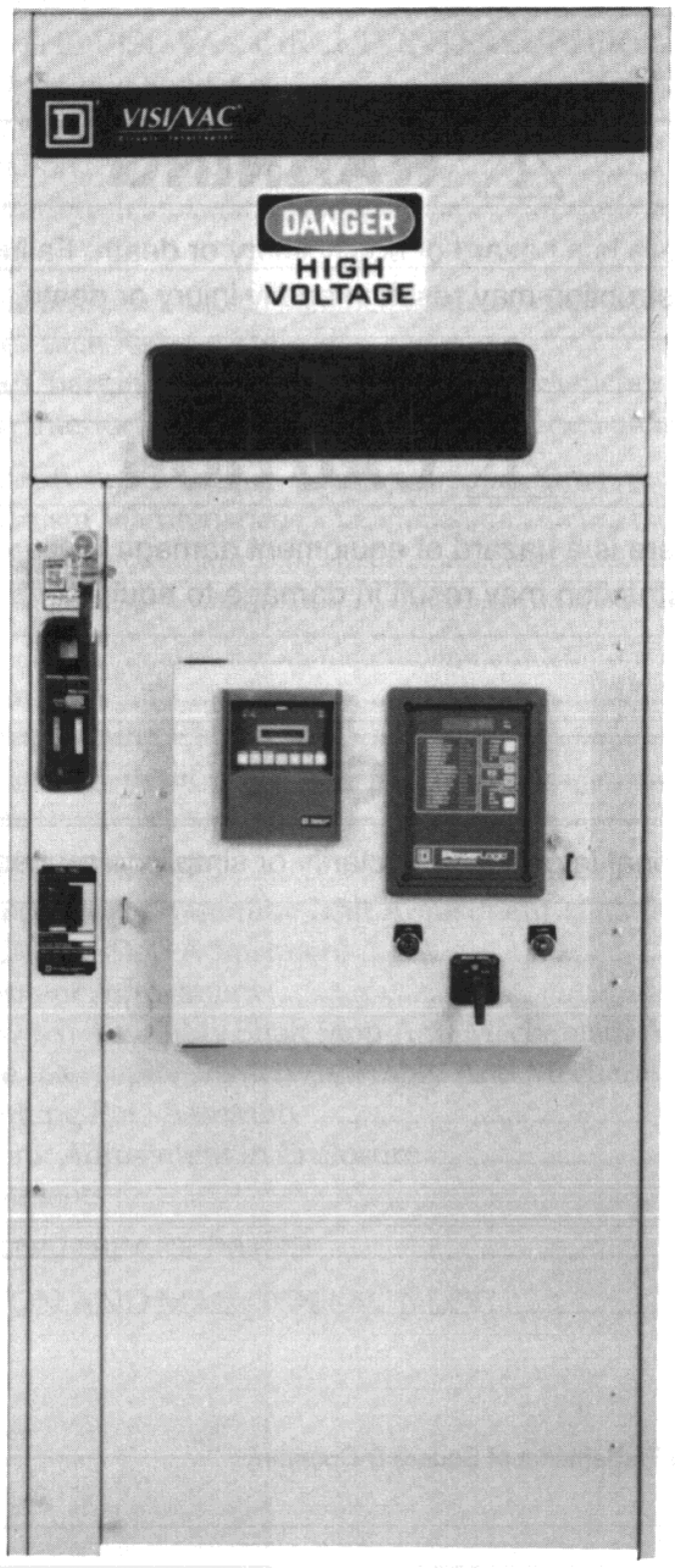
VISI/VAC® Circuit Interrupter Type C



NOTICE

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this bulletin to warn of potential hazards and to call attention to additional information which clarifies or simplifies a procedure.

⚠ DANGER

Used where there is a hazard of severe bodily injury or death. Failure to follow a "DANGER" instruction ***will*** result in ***severe*** bodily injury or death.

⚠ WARNING

Used where there is a hazard of bodily injury or death. Failure to follow a "WARNING" instruction may result in bodily injury or death.

⚠ CAUTION

Used where there is a hazard of equipment damage. Failure to follow a "CAUTION" instruction may result in damage to equipment.

NOTE

Provides additional information to clarify or simplify a procedure.

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ILLUSTRATIONS

TABLES

SECTION 1—INTRODUCTION

This manual provides installation, operation, and maintenance instructions for Type C VISI/VAC circuit interrupters. Type C has the stored energy mechanism mounted on the base interrupter assembly. See figure 1 for major component identification for Type C circuit interrupters.

The mechanism connects to the interrupter assembly with bracket and adjustable pullrod assemblies.

The VISI/VAC circuit interrupter is available in two different continuous current ratings, 600A and 800A, at 12.5 kA interrupting capacity. Service instructions are the same for both ratings.

Type C VISI/VAC circuit interrupters have a stored energy mechanism which can be operated manually or by a motor. The motor-operated assembly allows remote electrical opening and closing operations. If power is lost, it can also be manually operated.

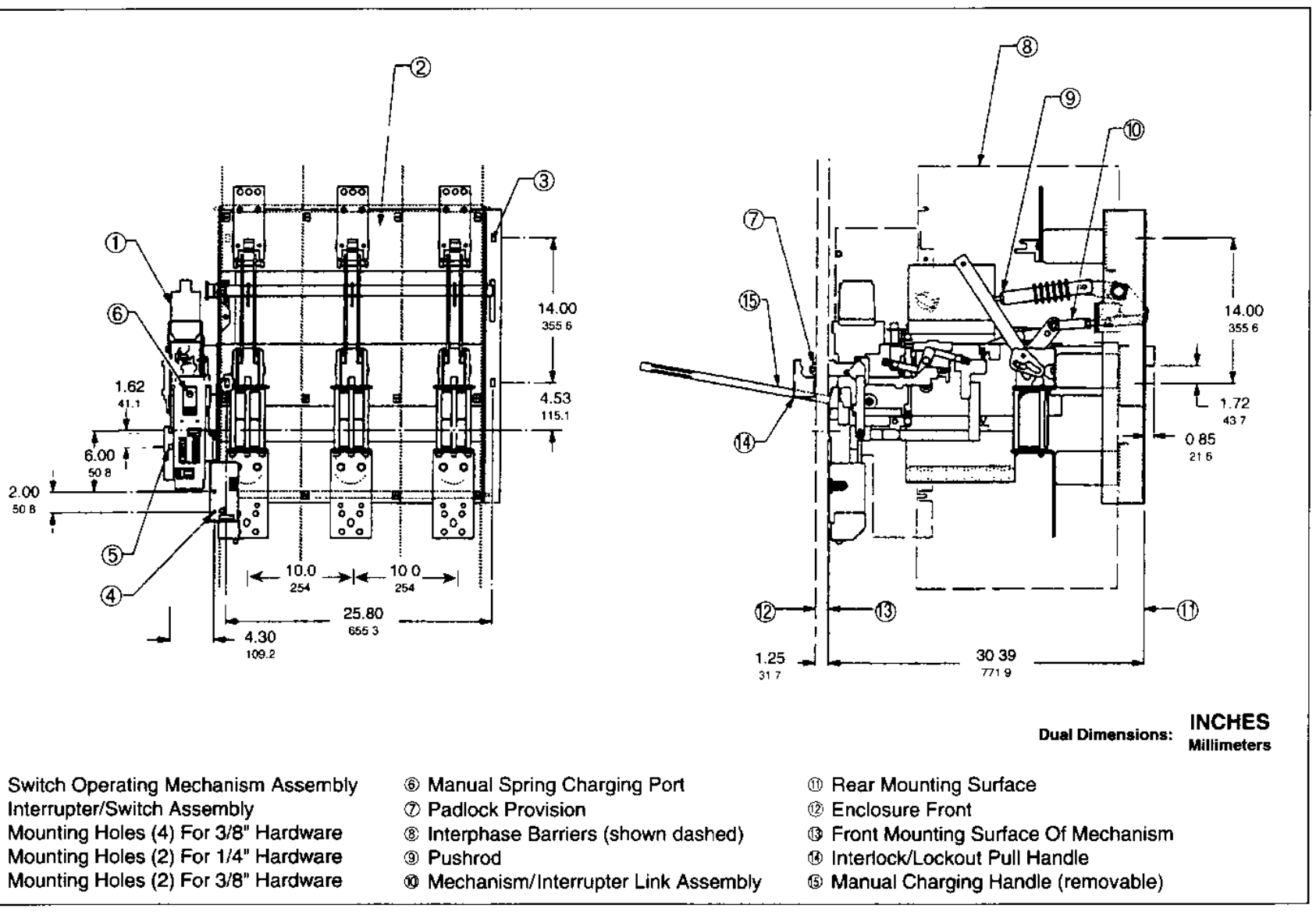


Figure 1: VISI/VAC vacuum circuit interrupter, major components

SECTION 2—SAFETY PRECAUTIONS

! DANGER

HAZARD OF ELECTRICAL SHOCK OR BURN.

- Only qualified electrical workers with training and experience on high voltage circuits should perform work described in this set of instructions. These workers must understand the hazards involved in working with or near high voltage equipment. Perform such work only after reading this complete set of instructions.
- The successful operation of circuit interrupters depends upon proper handling, installation, operation, and maintenance. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to electrical equipment or other property.
- VISI/VAC circuit interrupters have features designed to prevent unsafe operation, but it is not possible to eliminate every hazard with these features. Therefore, the person using this device is responsible for recognizing the potential hazards, wearing protective safety equipment, and taking adequate safety precautions.
- Do not make any adjustment to the equipment or operate the system with safety features removed. Contact your local Square D representative for additional instructions if the VISI/VAC circuit interrupter does not function as described in this manual.
- Before performing visual inspections, tests, or maintenance on this device, disconnect all sources of electric power. Assume all circuits are live until they are completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Before replacing covers, carefully inspect the circuit interrupter work area for tools and objects left inside the equipment.
- All maintenance must be performed by qualified personnel in accordance with local codes and ordinances, and under the following conditions:
  - The circuit interrupter must be isolated from the high voltage.
  - Control voltage must be removed from the controls.

All instructions in this manual assume the customer has taken the above steps to obtain safe conditions before performing maintenance or testing.

Failure to observe these precautions will result in severe personal injury or death!

SECTION 3—RECEIVING, HANDLING, AND STORAGE

Receiving

Upon receipt, inspect the entire circuit interrupter for damage that may have occurred in transit. Check all items against the packing list provided. The equipment ratings and catalog numbers are printed on the nameplate and shipping documents. Compare them with the shipping specifications. Notify the transportation company and Square D immediately if there are damages or shortages, or if the ratings or catalog numbers are not correct.

Handling

Use care when uncrating and handling the switchgear to avoid twisting or distortion of enclosure(s). When the mechanism and interrupter assemblies are shipped separately, lift and handle the separate assemblies as shown in figures 2 and 3. When moving the interrupter assembly, place the lifting strap around the two outside insulators, as shown in figure 3. Use appropriately rated lifting equipment to handle the weight of each assembly part:

- 12.5 kA interrupter assembly—116 lb (53 kg)
- mechanism assembly (motor operator)—60 lb (27 kg)

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

Never lift the circuit interrupter or switchgear by placing forklift bars beneath the frame. Never use racking arms or primary disconnects as handles.

Failure to observe this precaution can result in equipment damage.

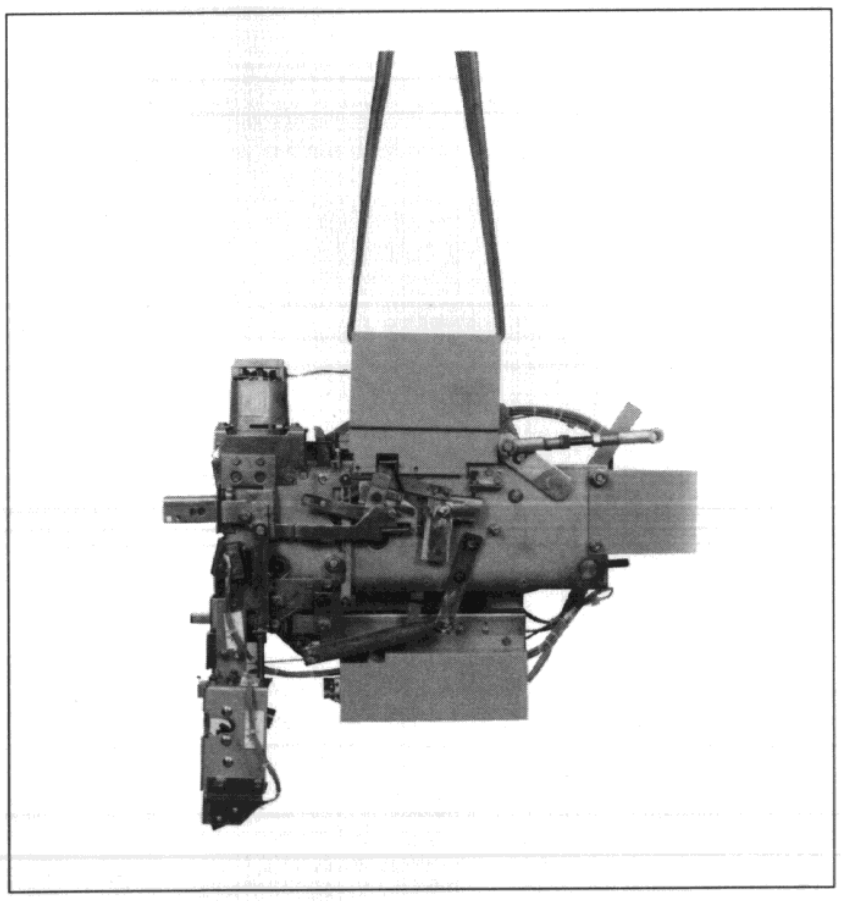


Figure 2: Lifting the mechanism assembly

Figure 3: Lifting the interrupter switch assembly

Storage

If the circuit interrupter, or indoor switchgear in which it is installed, will be stored before being put into operation, keep it in a clean, dry, corrosion-free area where it is protected from damage. Place the equipment in its permanent location as soon as possible. When used in outdoor switchgear or stored in an unheated location, energize the heaters in the switchgear.

When circuit interrupters are stored for prolonged periods, inspect them regularly for rusting or any other damage.

SECTION 4—INITIAL CIRCUIT INTERRUPTER PREPARATION

A VISI/VAC circuit interrupter, installed in switchgear manufactured by Square D, may require adjustment of doors and interlocks prior to being placed in service. This is because shipment and movement to its final location can cause distortion of bolted equipment.

If the VISI/VAC circuit interrupter is purchased by an OEM manufacturer, it must be installed in OEM equipment.

To adjust the circuit interrupter in OEM equipment, follow the instructions in section 10; see **Connection Link Adjustment In Enclosure**, page 28.

SECTION 5—VISI/VAC CIRCUIT INTERRUPTER DESCRIPTION

The VISI/VAC circuit interrupter consists of a mechanism and an interrupter assembly; it contains three identical pole units. Each pole unit consists of a set of visible disconnect blades in series with a vacuum interrupter module. The connection between the blades and vacuum interrupter modules is made using a flexible connector.

A sequence cam, attached to the visible disconnect blades, controls the opening and closing of the two contacts, blade, and vacuum module, in series. The sequence cam ensures that the vacuum interrupter module always makes and breaks the circuit. The disconnect blades visibly indicate that the circuit is open.

When closing, the vacuum interrupter module contacts close *after* the visible blades close. When opening, the vacuum interrupter module contacts open *before* the visible blades open.

When closed, the vacuum interrupter module contact inside the vacuum module enclosure is held closed by the bias spring. The bias spring is compressed by a toggle linkage (mounted between the disconnect blade and the vacuum interrupter module contact). The toggle linkage *must* go "over toggle" when the circuit interrupter is closed. Otherwise, the vacuum interrupter module could be damaged when subjected to high short circuit currents, and could weld because of insufficient contact force. If the pole linkages do not toggle, see section 10 for adjustments.

Motor-operated VISI/VAC circuit interrupters have electrical interlock switches which prevent electrical operation if its lower compartment door is open or the padlock bar is in the outward position.

Figure 4 illustrates a typical wiring schematic for the VISI/VAC circuit interrupter. Refer to specific order drawings for actual wiring of the device in your application.

Interphase barriers are required for all ratings and applications of the circuit interrupter. Barriers are 1/8"-thick polyester-glass sheets located as shown in figure 1, page 1.

Table 1 lists ratings for unfused VISI/VAC circuit interrupters.

Table 1: Ratings For Unfused VISI/VAC Circuit Interrupters

Voltage Class	4.76 kV	15.0 kV
Rating Class	4.76 kV	15.0 kV
Maximum Design Voltage (rms)	4.76 kV	15.0 kV
Continuous Current (60 Hz rms)	600A or 800A	600A or 800A
Impulse Withstand	60 kV± ①	95 kV± ①
Dielectric Withstand (60 Hz, one minute)	19 kV	36 kV
Interrupting Current Capacity (sym. rms)	12.5 kA	12.5 kA
Momentary and Fault Closing Current (asym. rms)	20 kA (34 kA peak)	20 kA (34 kA peak)
Short Time Current Capacity (sym. rms)	12.5 kA (2 seconds)	12.5 kA (2 seconds)

① Interphase barriers must be in place to meet this withstand level.

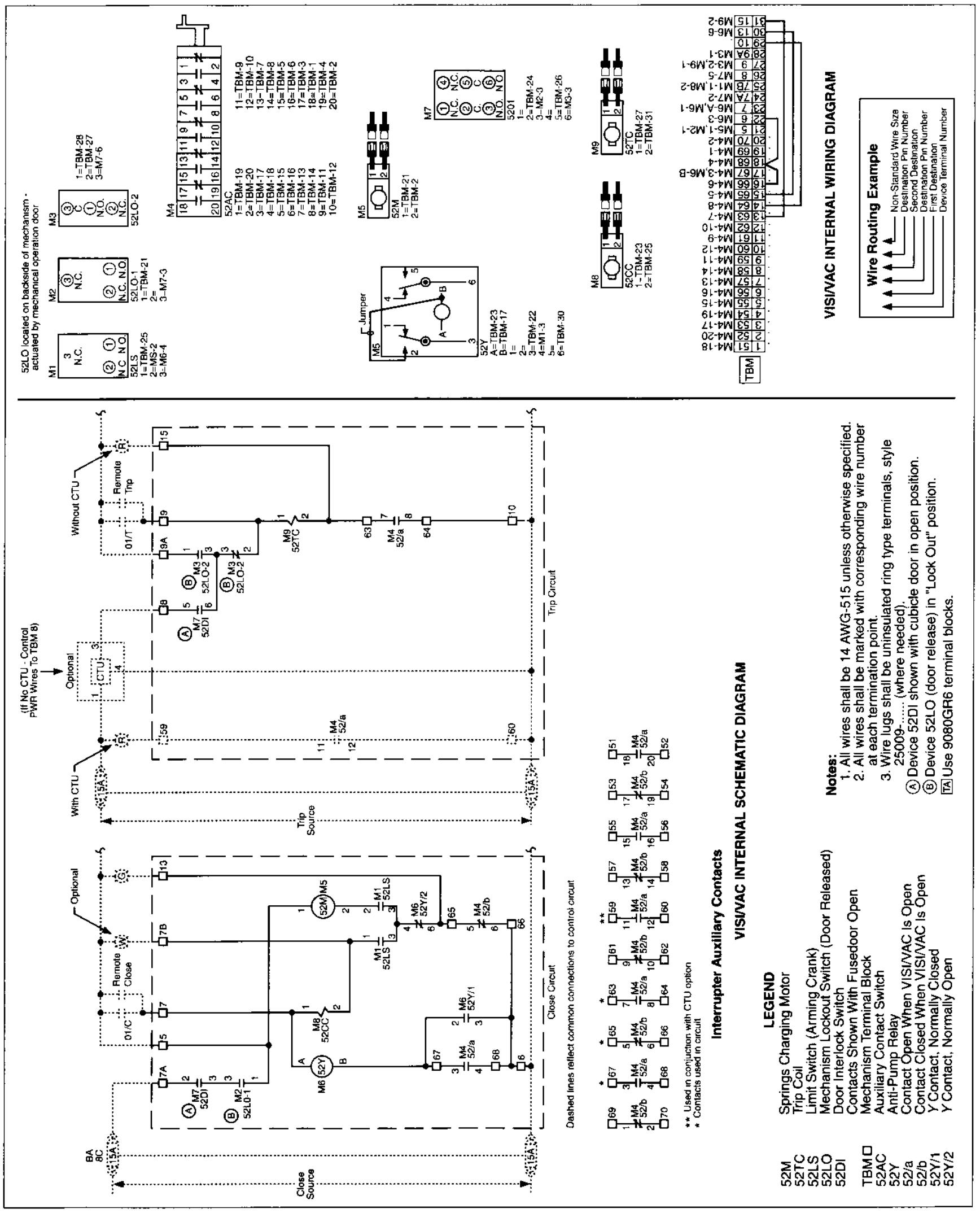


Figure 4: VISI/VAC internal schematic and wiring diagram

SECTION 6—OPERATING THE VISI/VAC CIRCUIT INTERRUPTER

⚠ CAUTION

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE.

- These instructions are written for Square D manufactured switchgear. These instructions also apply when the VISI/VAC circuit interrupter is installed in OEM equipment or when the interrupter module assembly is replaced by the OEM. However, if the OEM controls and interlocks vary from the Square D standard, these instructions do not apply unless sanctioned by the Square D Company engineering department.
- The removable manual charging handle should not be in place during electrical operation.

Failure to observe these precautions can result in personal injury or product damage.

Mechanism Operating Sequence

Before operating the circuit interrupter, the following conditions must exist:

- The closing and opening springs are discharged.
- The circuit interrupter is in the *open* position.
- The control power source is de-energized.
- The enclosure door is closed and the interlock bar is reset (inward position, nearest to the front panel).

With the enclosure door closed, and the interlock reset, the mechanism charges the springs electrically; if control power is not available, the charging can be done manually. When charged, the closing and opening latches are both engaged.

Charging The Mechanism

Electrical Charging Operation—To begin electrical charging, energize the control power source. The following process occurs:

- The motor advances the ratchet mechanism (figure 5) and charges both the opening and closing springs simultaneously.
- At the end of the charging cycle, a cam (figure 5) in the ratchet mechanism lifts one pawl (figure 5) and the motion of the charging ratchet stops. At this point, the closing latch (figure 8, page 12) and tripping latch (figure 8) engage, and the motor circuit is opened by the motor limit switch (figure 7b, page 11).
- The trip linkage mechanism is in an "in line" position, illustrated in the "mechanism armed" diagram (figure 8).

Manual Charging Operation—Follow these steps to perform manual charging:

- Insert the removable manual charging handle into the ratchet mechanism hole (figure 7b).
- Move the manual charging handle up and down to advance the ratchet mechanism. Continue this procedure until the cam lifts one pawl, and the ratchet no longer advances.

The circuit interrupter is ready for manual or electrical closing.

Closing Operation

Electrical Closing—To begin electrical closing, energize the closing circuit from a remote location. The following process occurs:

- The closing solenoid disengages the closing latch from the closing roller (figure 8, page 12).
- The released closing spring moves the drive link through the "over toggle" trip linkage assembly, which travels with the drive link; this operates the drive link and the mechanism/switch connection. The motion of the mechanism/switch connection toward the rear of the mechanism rotates the main shaft of the switch counterclockwise. This closes the switch blades and the vacuum interrupter.
- The circuit interrupter closes without intentional delay.

Manual Closing—Begin manual closing with the circuit interrupter charged; pull the operating handle outward from the panel, as indicated on the *Pull-Close/ Push-Trip* lever (figure 7b, page 11). The following process occurs:

- The closing latch (figure 8) disengages, releasing the closing spring (figure 7a, page 10) from the closing roller (figure 8).
- The released closing spring moves the drive link through the "over toggle" trip linkage assembly, which travels with the drive link. This operates the drive link and the mechanism/interrupter connection. The motion of the mechanism/ interrupter connection toward the rear of the mechanism rotates the main shaft of the interrupter assembly clockwise. This closes first the switch blades, and then the vacuum interrupter assembly.
- The circuit interrupter closes without intentional delay.

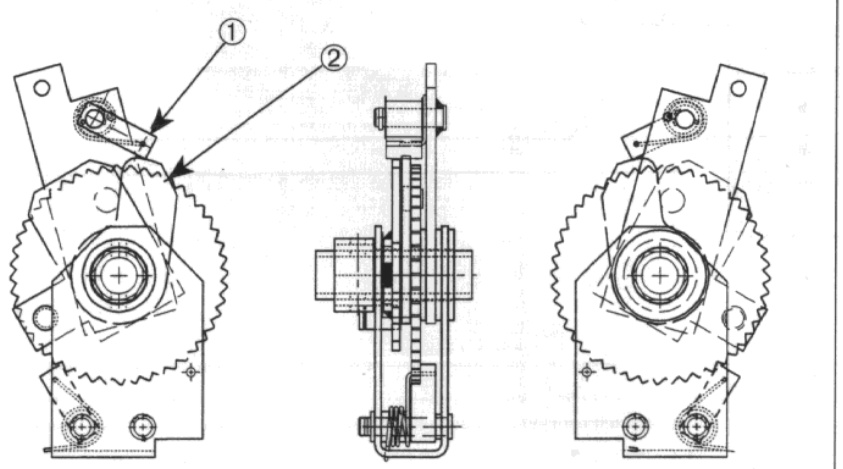


Figure 5: Ratchet charging mechanism

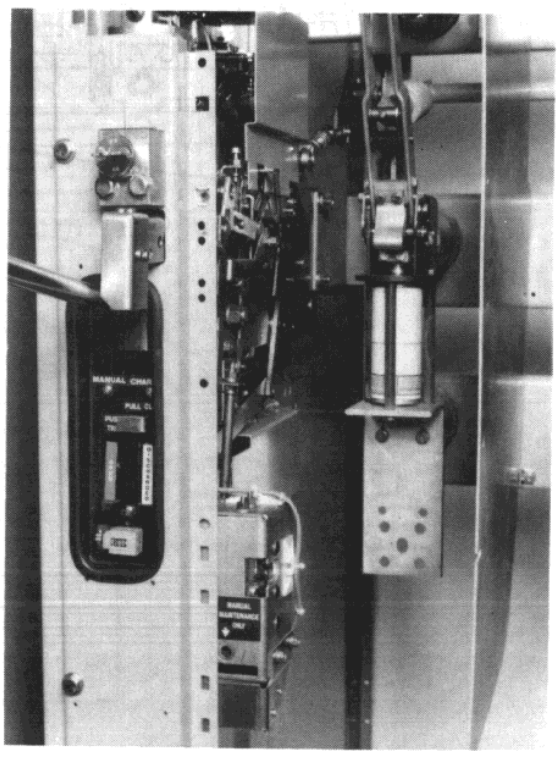
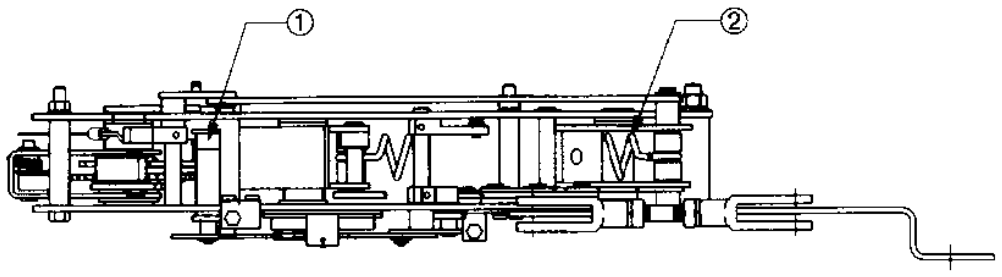
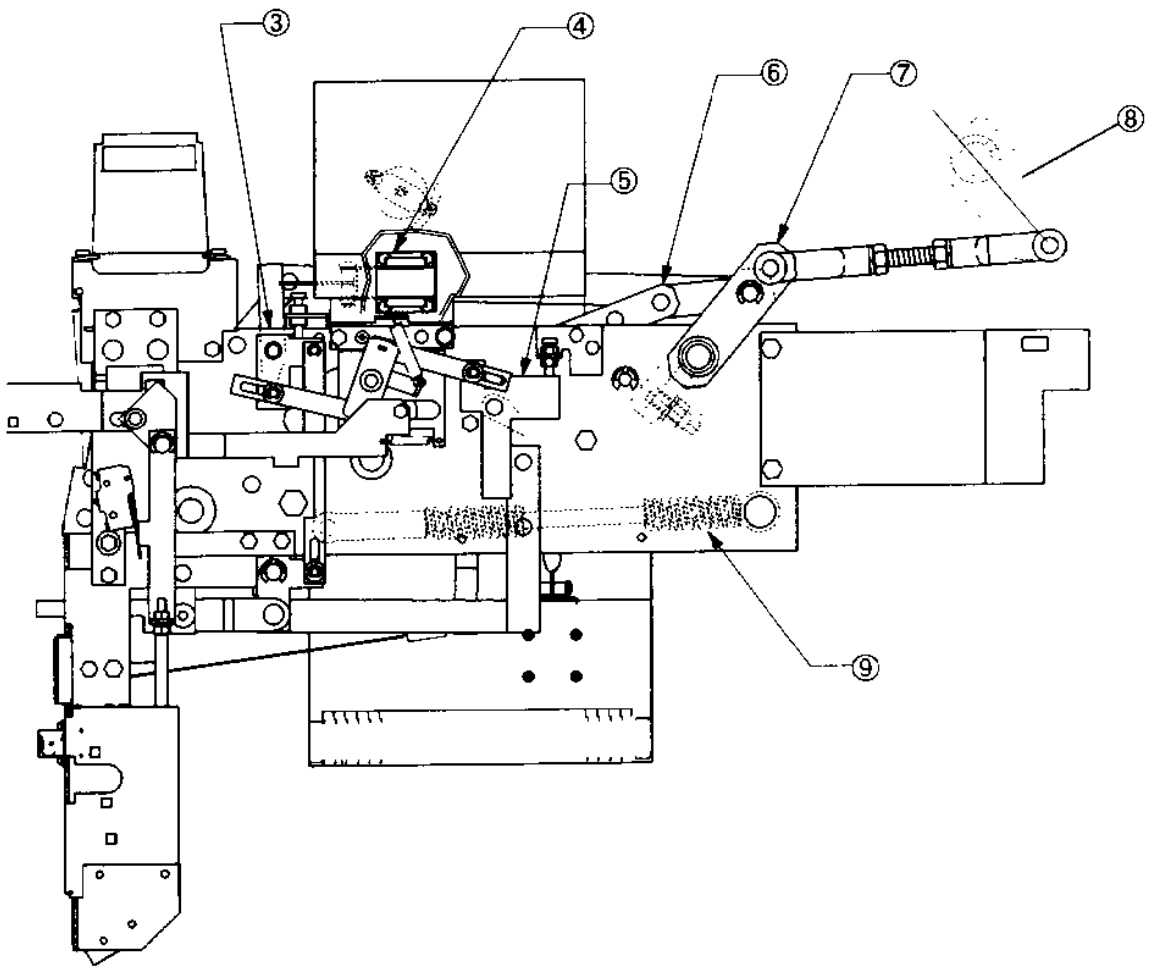


Figure 6: Manually charging the mechanism



Top View



Right Side View

Legend, figures 7a and 7b

① Closing Roller
② Opening Spring
③ Closing Latch Crank
④ Closing Solenoid
⑤ Tripping Latch Crank
⑥ Tripping Assembly
⑦ Driven Link
⑧ Switch Operating Shaft
⑨ Closing Spring
⑩ Ratchet Mechanism, Manual Charging Hole
⑪ Opening Solenoid
⑫ Drive Link
⑬ Motor Limit Switch
⑭ Operating Lever (*Pull-Close/Push-Trip*)

Figure 7a: Mechanism, top and right side views

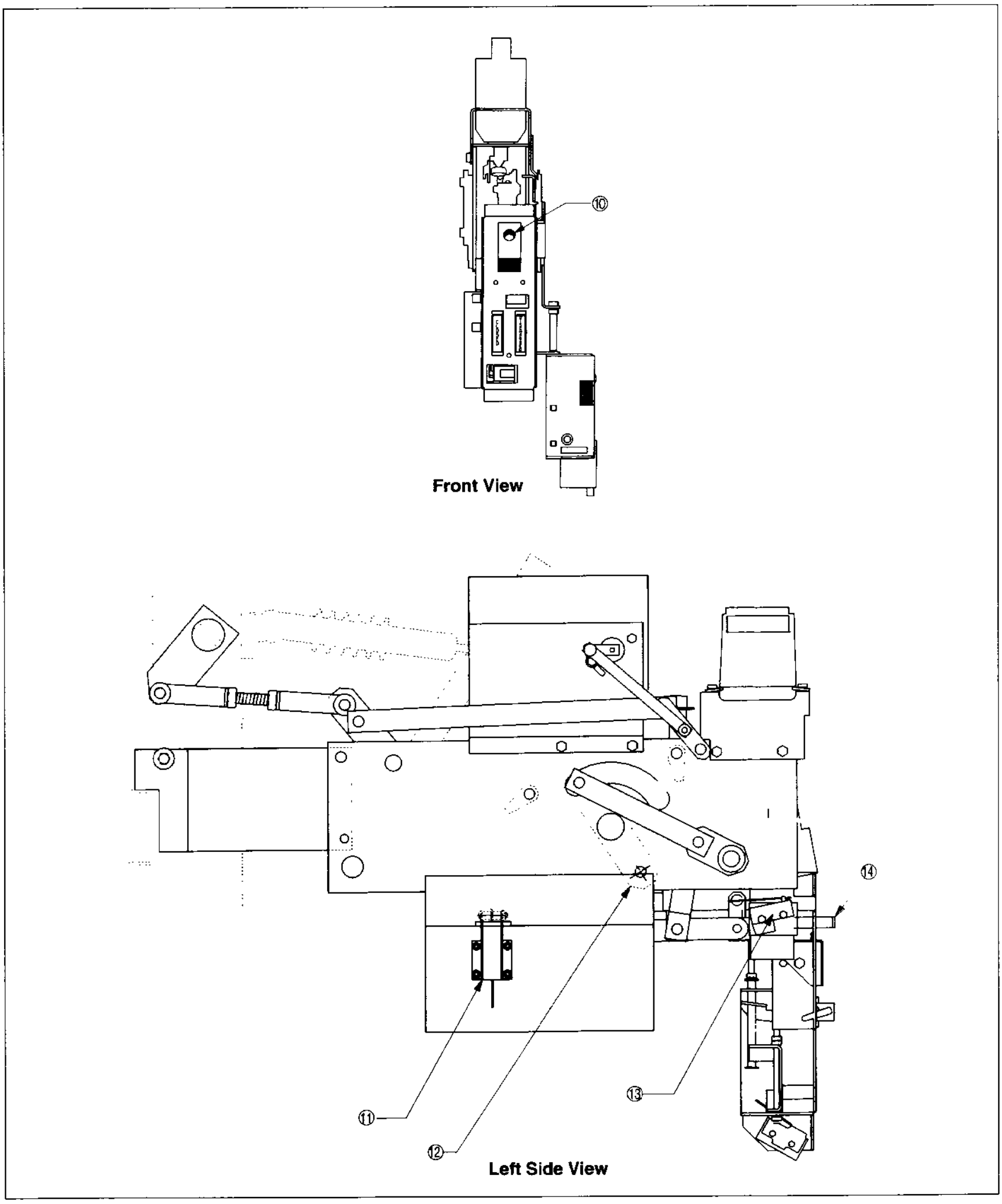


Figure 7b: Mechanism, front and left side views

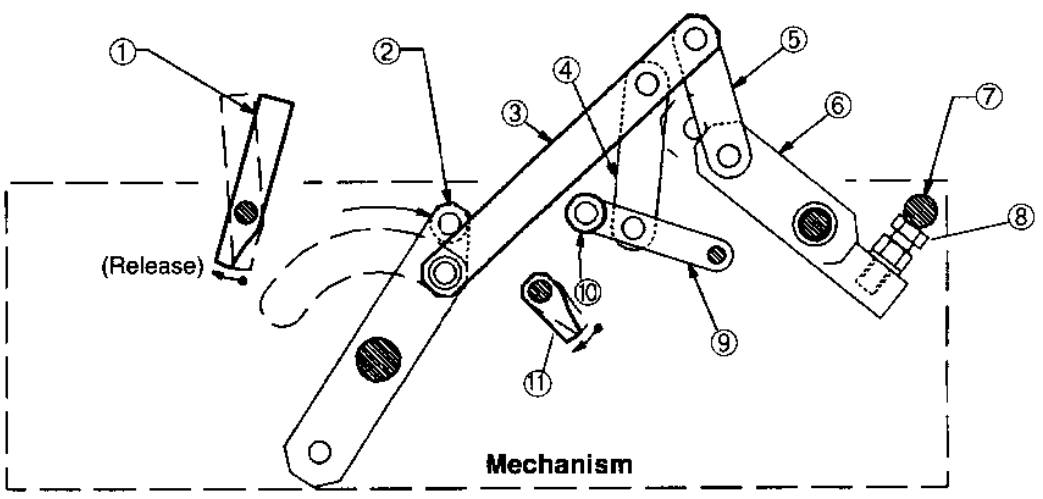
Opening Operation

Electrical Opening—To begin electrical opening, energize the opening circuit. The following process occurs:

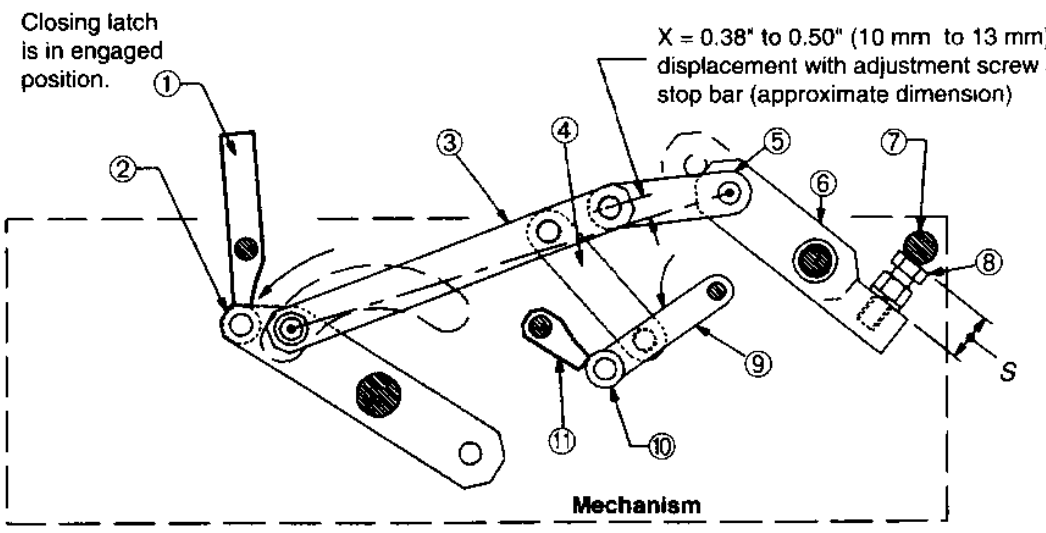
- The circuit interrupter opens without intentional delay.
- The opening solenoid (figure 7b, page 11) disengages the trip latch (figure 8) from the tripping roller (figure 8) and releases the tripping linkage.
- The tripping linkage assembly collapses, out of toggle, to allow the driven link to move forward and counterclockwise. This allows the main shaft to open first the vacuum interrupter, then the visible blades.

Manual Opening—To begin manual opening, push the operating handle (figure 7b) inward toward the panel as indicated on the *Pull-Close/Push-Trip* lever.

The tripping latch (figure 8) disengages and releases the tripping mechanism. This allows the tripping mechanism (figure 8) to collapse "out of toggle" and the switch operating shaft (figure 7a, page 10) to rotate clockwise.



Mechanism Disarmed



Mechanism Armed

① Closing Latch
② Closing Roller
③ Link *B*
④ Link *D*
⑤ Link *C*
⑥ Driven Link *A*
⑦ Stop Bar
⑧ Adjustment Screw
⑨ Trip Link *E*
⑩ Tripping Roller
⑪ Tripping Latch

Note: Adjust screw height *S* until the tripping roller is just blocked and held by the tripping latch in engaged position.

Figure 8: Mechanism in armed and disarmed positions

SECTION 7— INTERLOCKS

The enclosure door interlocks mechanically and electrically with the VISI/VAC mechanism. The VISI/VAC circuit interrupter must be in the *open* position and the opening springs discharged before the enclosure door can open. The mechanism cannot close or operate electrically unless the door is in the *closed* position. However, if the interlock is manually released, operate the switch manually *only* to perform maintenance operations.

Locking Provision

The circuit interrupter can be padlocked in the open position (see figure 9, page 14) to prevent its operation and to allow the enclosure door to be opened. To padlock the circuit interrupter in the open position and allow the door to be opened, follow these steps:

1. Pull the door release handle outward from the enclosure panel to its farthest position. This causes these events:
   - The control circuit opens; no electrical operation can occur.
   - The closing and opening springs automatically discharge.
   - The circuit interrupter opens and holds the tripping latch in the tripped position. The closing latch is held in the operating position. The circuit interrupter cannot be re-armed to close (if attempted, the latches do not engage and the springs discharge).
   - The enclosure door catch is unlocked. The door can be opened. The mechanism cannot be closed until the interlock is re-set (the interlock handle is returned to its original position).
2. Place the padlock in the holes in the interlock handle that align with the fixed hole on the mechanism.

   If an optional key interlock is provided, the bolt may be extended so the bolt blocks the interlock handle, preventing it from resetting.

The door interlock consists of the interlock assembly and interlock box, which are factory-assembled as part of the mechanism.

The interlock operating linkage and the latch box assemblies are mounted to fixed locations on the mechanism chassis (interlock assembly). The interlock latch box assembly also attaches to the enclosure (for stability) with a tolerance allowing for slight misalignment.

The connection between the interlock assembly and the latch box assembly is the latch release pullrod.

Adjusting The Latch Release Pullrod

The latch release pullrod is adjustable. Perform the following procedure when adjusting the pullrod.

1. Pull the door release handle outward. This causes the closing latch crank and tripping latch crank to activate the two respective mechanism latches (figures 7a and 7b, pages 10 and 11).
2. Pull outward until the hole in the pull handle assembly aligns with the holes in the fixed bracket on the mechanism chassis.
3. In this position, check to ensure that spacing *B* (figure 9) is between the top surface of the lockout retaining gate, and the pullrod end is as shown (figure 9). Adjust *B* to 0.050" (1.3 mm); if necessary, use washers at the connection between the rod from the lock box and the bracket above it.

Adjusting The Charging Motor And Trip Lockout Switches

The interlock charging motor isolation and trip lockout switches are adjustable. Perform the following adjustment procedure when required:
Use the mounting screws to adjust the switches.

- Pull up on the latch release pullrod assembly to de-energize the control circuit.
- Adjust the switches to open prior to the operation of the closing and opening latches.

Adjusting The Interlock Release Door Angle And The Latch Striker Plate

The door release angle and latch striker are pre-assembled and pre-adjusted on a common mounting plate which is, in turn, adjustable by use of elongated mounting holes. The plate assembly is factory-adjusted during testing and removed for shipment. It must be replaced when the equipment is placed in its final location.

The door and enclosure frame must be aligned and in their final position prior to mounting, adjusting, and tightening the release and striker plate to the door. Re-adjust the charging motor isolation switch and latch release, if necessary.

To re-assemble the common mounting angle plate, perform the following adjustments:

Door Angle Adjustment

- Position and tighten the interlock release door angle so the angle is centered both vertically and horizontally in hole *D* (figure 9).
- The charging motor isolation switch and trip lockout switch (figure 9) must operate when:
  - The enclosure door is closed.
  - The latch striker has activated the latch to lock closed the enclosure door mechanism. When the door is closed and locked, the circuit interrupter may be operated electrically. Tighten the bolts to ensure that the door is fully closed.

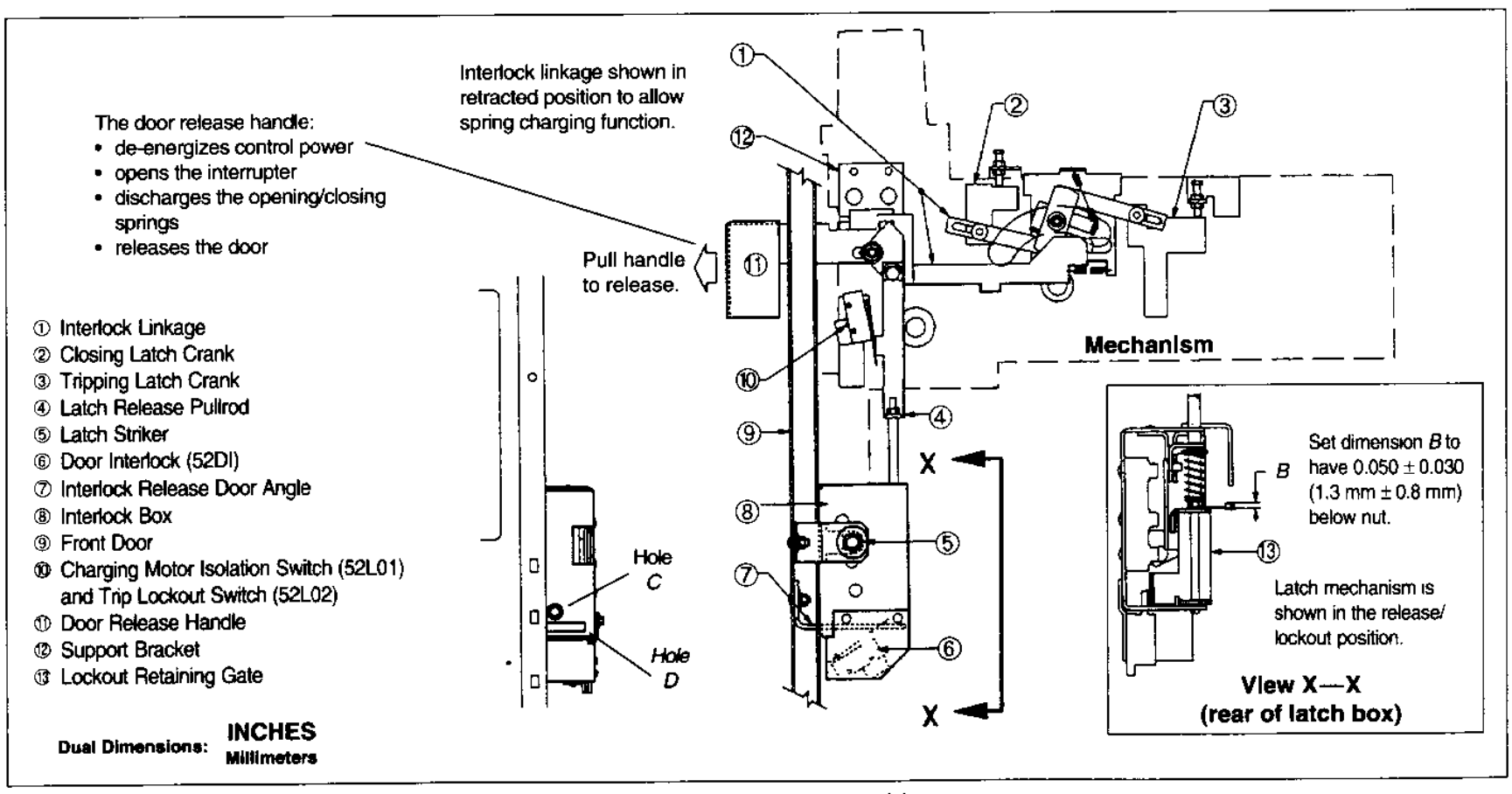


Figure 9: Interlock assembly

Adjusting the Interlock Release Door Angle And Latch Striker Plate (cont.)

Latch Striker Adjustment

- Ensure that the latch striker position activates the door latch (in the locked position) just after the charging motor isolation switch contacts are activated. If adjustment is required, loosen the striker nut, relocate it, and tighten.
- If necessary, readjust the position of the trip lockout switch. To do so, loosen, adjust, and re-tighten the switch mounting screws.

SECTION 8 — MAINTENANCE

⚠ WARNING

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE.

- Before performing any service or maintenance work, open the circuit interrupter, disconnect all high voltage sources from it, and ground the interrupter terminals.
- Momentarily ground the disconnect switch blades of the circuit interrupter to eliminate any residual charge on the vacuum module assembly and its molded insulation.
- Disconnect the control voltage source.
- *Before maintenance, **always** ensure that the switch is open and cannot be closed on a live circuit.*
- Because there are wide variations in operating conditions, each operating company must develop its own maintenance schedule based on individual needs. Until such a schedule is developed, Square D recommends inspection of the VISI/VAC circuit interrupter after one year of service, or after 1,000 operations, whichever occurs first.
- Inspect the circuit interrupter for damage following heavy exposure to through currents or interruptions near its maximum rating. Measure the contact erosion gaps at this time.

Failure to observe these precautions could result in severe personal injury or death, or equipment damage!

Type C Mechanism Maintenance

To operate the mechanism for maintenance, follow these steps:

1. Pull the door release interlock handle out. This causes these events:
   - opens the control circuits
   - activates both the closing and opening latches
   - releases the door latch mechanism and striker
   - allows the door to be opened

The control power circuit is open; all mechanism power springs are de-energized. Charging the mechanism with the manual charging handle permits charging the springs; however, all spring energy is discharged at the end of the charging cycle since no latches are engaged.

⚠ WARNING

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE.

Verify that the circuit interrupter is disconnected from high voltage sources and the interrupter terminals are grounded.

Failure to observe this precaution can result in severe personal injury, death, or equipment damage!

Type C Mechanism Maintenance (cont.)

2. To operate the circuit interrupter manually, insert a six-inch thin blade screwdriver into hole C (figure 9, page 14). This action resets the interlock mechanically, not electrically. It allows manual operation of the circuit interrupter using the manual charging handle and the *Pull-Close/Push-Trip* lever to close and open the circuit interrupter. The interlock release door angle on the open door does not engage the latch box switch, so the control circuits remain de-energized (i.e., the device cannot be opened or closed electrically).

   With the circuit interrupter set in this manner, the operator can check adjustment of latches, interlock handle forces, and interrupter function.

3. When maintenance is complete, take the mechanism out of the manual mode by following these steps:
   - Remove the screwdriver or equivalent from hole C.
   - Pull the interlock handle outward from the front panel.
   - Close the enclosure door *only* without operating the interlock handle.

   After these steps are performed, the interlock mechanism is reset, closing the control circuit.

Routine Maintenance

There are several procedures that should be performed during routine maintenance. These procedures are discussed in the following paragraphs.

Vacuum Interrupter Module Contact Erosion Measurement—The circuit interrupter must be closed and the pole mechanism in the "over toggle" position (figure 10). To determine the amount of vacuum interrupter module contact erosion, accurately measure dimension *Y* (figure 11, page 18) on the pole assembly, as follows:

1. Measure at the right side, inboard corner of the terminal mounting block through the opening in the right side of the mounting bracket (figure 11).
2. Subtract the dimension measured from the value of *Y* recorded on the vacuum interrupter module assembly. The result is the cumulative erosion that has occurred since the unit was manufactured.
3. If the calculated erosion value exceeds 0.080" (2.0 mm) for a 12.5 kA rated VISI/VAC, replace the pole unit.

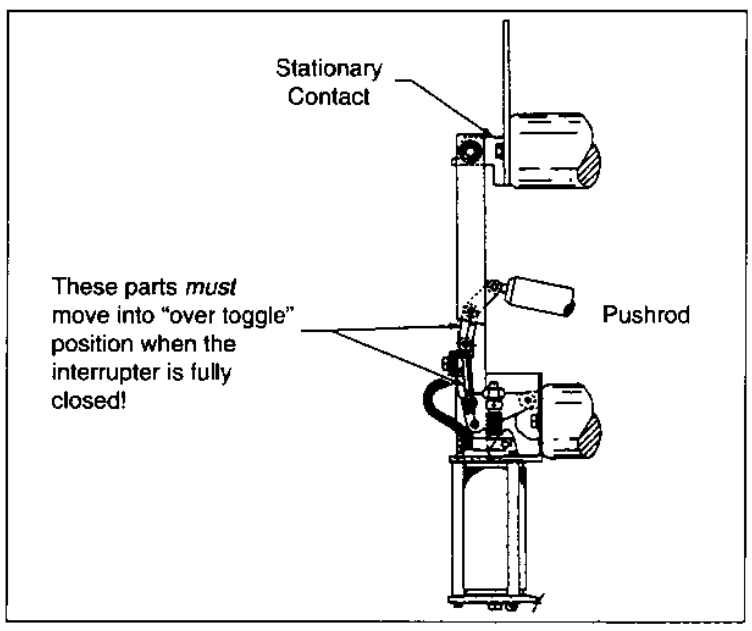


Figure 10: Pole mechanism, closed position

Routine Maintenance (cont.)

Dimension Z (figure 11) also indicates the contact erosion present, but does not indicate the cumulative value if the gap has been re-adjusted since the device was manufactured.

Vacuum Interrupter Contact Stroke Measurement—The stroke is determined as follows:

- Measure dimension Y (figure 11) with the circuit interrupter in both the *closed* and *open* positions.
- The difference between these dimensions is the vacuum interrupter module stroke.

Insulating Surfaces—Using a clean, dry cloth, remove all dirt and moisture from the outside of all insulating surfaces.

Loose Or Worn Parts—Check the mechanism and operator and switch assembly pole units for loose hardware, and worn or broken parts. Replace or repair as required. Use Locktite 262 red to lock screws where required. Do not use Locktite on flexible connector hardware, since Locktite has insulating qualities which may cause a bad electrical connection.

Lubrication

Use a clean, dry cloth to wipe off dirt or grime before lubricating. It is not normally necessary to disassemble any of the mechanism or the current- carrying parts for lubrication. Lubricate the circuit interrupter after intervals of approximately 1,000 close-open cycles. Do not wash the unit down with high pressure cleaning solution; this practice voids the warranty.

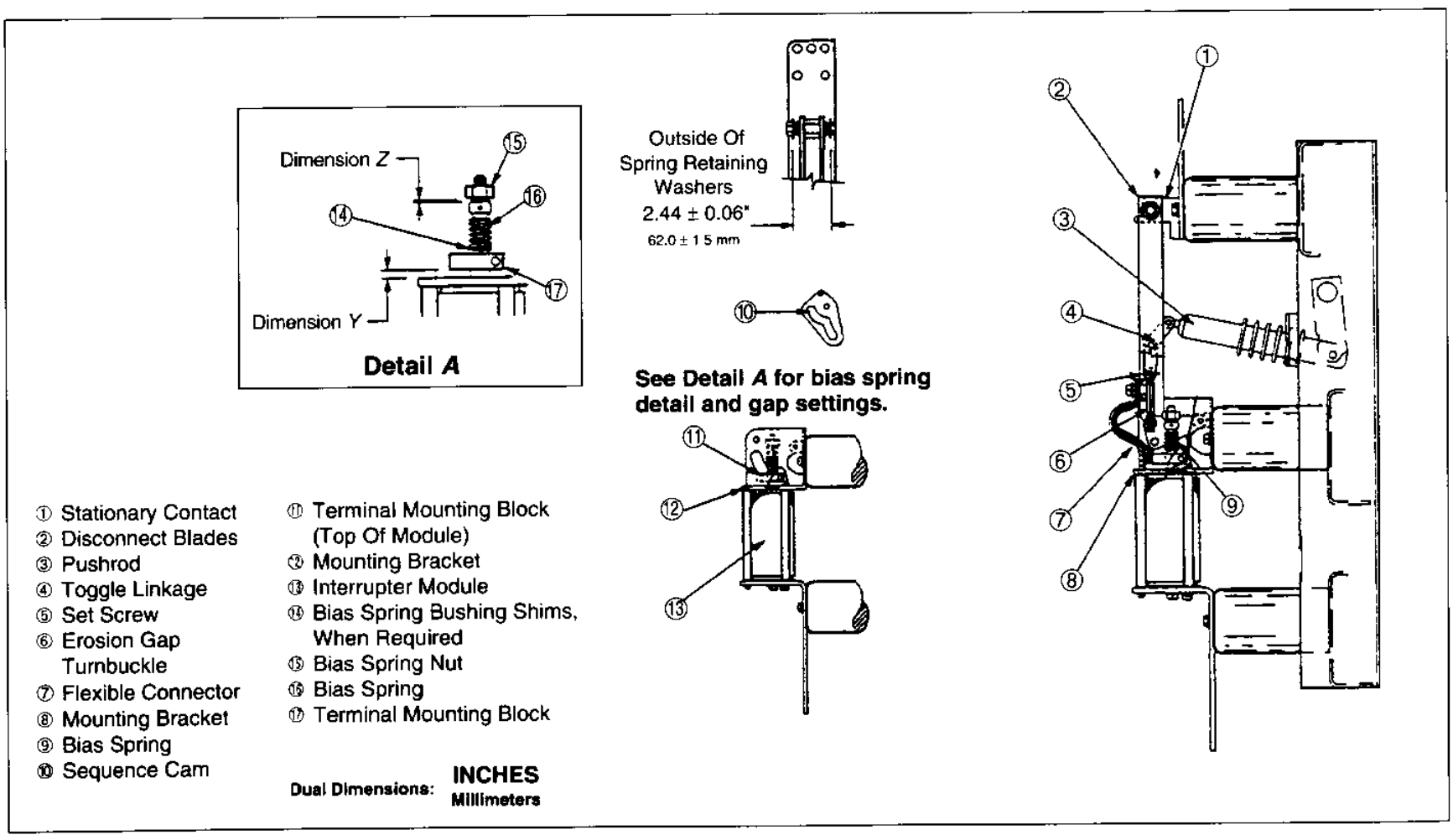


Figure 11: Interrupter module adjustments

Lubrication (cont.)

Use Mobil synthetic grease type SHC-32 to lubricate gears, bearings, and latch surfaces on the mechanism, the operator, and the interrupter pole units. Also use SHC-32 to lubricate the disconnect blade contact surfaces. Clean the disconnect blade contact surfaces with a solvent such as mineral spirits before re-lubricating.

Do not substitute unspecified types of grease for SHC-32; they may not be compatible with synthetic grease and may impair the lubricating properties of the grease applied at the factory. Mobil 28 is the military-specified version of SHC-32.

SECTION 9—TESTING

The tests listed below are performed at the factory before shipment. The values and procedures are listed here as a guide to re-testing interrupter performance after maintenance.

⚠ WARNING

HAZARD OF ELECTRICAL SHOCK OR BURN.

- Keep clear of moving parts; moving the disconnect blades and the spring discharging mechanism can cause injury.
- De-energize and ground the high voltage bus before performing any of these tests.

Failure to observe these precautions can result in severe personal injury or death!

General Information

- The mechanism charges both operating springs (closing and opening) simultaneously within 8.0 seconds at 100% rated control voltage after the motor is energized.
- The mechanism charges both operating springs at minimum rated control voltage. The time required is longer than at 100% control voltage.
- The vacuum interrupter module contact opens and clears the circuit within three cycles after the trip coil has been energized at 100% of rated critical voltage.

Contact Overlap Timing Check

Vacuum interrupter module contacts and interrupter switch disconnect blades (which are connected in series) have a time differential between them during closing and opening operations.

- During closing (blades close first), the time differential is 11–14 milliseconds for a 12.5 kA rated VISI/VAC circuit interrupter.
- During opening (vacuum interrupter module contacts open first), the differential time is 15–20 milliseconds for a 12.5 kA rated VISI/VAC circuit interrupter.

Consult the factory for repair instructions if the times you measure are less than those listed.

Contact Resistance (Circuit Interrupter Closed)

Measure contact resistance from the upper stationary contact pad (upper jaw) to the pad at the bottom of the vacuum interrupter module. When the equipment is new, resistance values should not exceed 90 microhms. Field acceptance value after extended service is 180 microhms. The resistance of the vacuum interrupter alone normally does not exceed 30 microhms. Resistance values change after the interrupter is in service.

Dielectric Tests (Field Tests)

⚠ WARNING

HAZARD OF ELECTRICAL SHOCK OR BURN, OR EQUIPMENT DAMAGE.

- High voltage incoming line cables and outgoing load cables must be de-energized and isolated from the circuit interrupter.
- Keep the testing area clear of all personnel. Use recognized safety precautions while performing the dielectric test.
- Maintain a distance of six feet between personnel and the energized device.
- Do not exceed specified test voltages; excessive voltages cause dangerous x-rays to be emitted.
- During application of the test voltage, there may be displays and sounds of corona discharge. This is no problem unless there is an electrical breakdown.

Failure to observe these precautions can result in severe personal injury or death, or equipment damage or flashover!

Interrupter, Primary Parts—Apply 27 kVac, 60 Hz to each of the following connections for one minute:

- *Circuit Interrupter Closed, Phase-To-Phase*:
  Energize each phase individually, with other phases and interrupter frame grounded.
- *Circuit Interrupter Open, Across Contacts*:
  Energize the top stationary terminals of each phase of the circuit interrupter separately, grounding the bottom contact of the interrupter module frame and both ends of all other phases.
- *Circuit Interrupter Open, Across Vacuum Interrupter Module Alone*:
  Energize the bottom contact of each vacuum interrupter module, grounding the disconnect switch blade. Perform this test to verify the presence of a vacuum within the vacuum interrupter module.

⚠ WARNING

HAZARD OF ELECTRICAL SHOCK OR BURN.

Discharge the vacuum interrupter contacts (movable and stationary). Verify that the circuit interrupter is disconnected from high voltage sources and the interrupter terminals are grounded. These areas can retain static charge after a 60 Hz, high potential dielectric test (hi-pot test).

Failure to observe this precaution can result in personal injury or death!

Dielectric Tests (cont.)

Control Circuits—Isolate all control circuits from ground. Isolate the charging motor and solid state devices from the rest of the control circuits. Do not test the solid-state devices dielectrically.

- *Control And Secondary Wiring To Ground*:
  Apply 1500 Vac for one minute between the isolated control circuits and ground. All switches must be closed or shorted during this test.
- *Charging Motor*:
  With the motor isolated from the rest of the control circuit, apply 900 Vac for one minute between the motor leads and grounded frames of the interrupter.

SECTION 10—GENERAL ADJUSTMENTS

General adjustments can be made to these parts:

- Circuit interrupter assembly pole unit
- Mechanism closing stop
- Latch engagement
- Interrupter shaft stop and mechanism
- Interrupter assembly and mechanism connection (when changing the pole assembly)
- Connection link in enclosure
- Special adjustments to control stroke dimensions

These adjustments are discussed separately in the following paragraphs. Adjustments found in this section are normally required only when installing new interrupter assemblies. Connection link adjustments (page 28) may be required for new assemblies installed by an OEM.

Circuit Interrupter Pole Assembly Unit Adjustment

Follow the steps outlined below to adjust the circuit interrupter pole assembly unit:

1. Install each pole assembly unit on the switch base frame (with blades in the closed position). Align the disconnect switch blades on each pole with the stationary contact jaw assembly so both are straight. Move the stationary contact assembly to the center blade spacer in the jaw. Tighten the insulators onto the base.
2. Adjust the clamping force on the stationary contact jaw by adjusting the distance between the outside surfaces of the spring retaining washers to 2.44" ± 0.06" (62 mm ± 1.5 mm), as shown in figure 11, page 18.
3. Open the interrupter pole unit by pushing on the pushrod (figure 11). *Do not pull directly on the blades.*
4. Use the bias spring nut (figure 11) to adjust the length of the interrupter bias spring (figure 11, Detail *A*). Tighten the spring length to 1.10" max. (28 mm) on a device rated 12.5 kA.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE.

Adjust the bias spring nut *only* when the switch and interrupter module are in the *open* position.

Failure to observe this precaution can result in equipment damage.

5. Close the interrupter pole assembly unit by pulling on the pushrod (figure 11). Ensure that the toggle linkage (figure 11) and erosion gap turnbuckle (figure 11) go "over toggle" as shown in figure 10, page 17.
6. In the *closed* position, measure and record the *Y* (closed) dimension. The initial dimension should be approximately 0.220" (6 mm) for a device rated 12.5 kA.

Circuit Interrupter Pole Assembly Unit Adjustment (cont.)

7. Adjust the erosion gap turnbuckle so dimension Z is 0.08" (2 mm) for a device for a device rated 12.5 kA. Adjust the turnbuckle with the switch open; it may be necessary to close and open the interrupter pole unit several times to complete the adjustment. Lock the erosion gap turnbuckle with the set screw (figure 11, page 18). Apply Locktite 262 red (or equivalent) to set the screw threads.

   Adjust the turnbuckle with the flat side toward the front of the switch, against the flexible connector connection block.

Mechanism Closing Stop Adjustment

Before making this adjustment, be sure that the interrupter shaft stop bolt (figure 12) is not already engaging the interrupter shaft crank arm (figure 12). *While making this adjustment, operate the switch manually only.*

Follow the steps below to adjust the mechanism closing stop.

1. The mechanism must be fully assembled with interrupter shaft stop arm and interrupter shaft stop bolt in place.
2. Move the manual charging handle up and down to charge both main springs by means of a ratchet mechanism as described in section 6, page 8.
3. As the springs are charged, the closing roller (figure 8, page 12) moves from right to left to engage the closing latch. The adjustment screw (figure 8) stays against the stop bar.
4. Adjustment of the length of screw *A* determines the point at which the closing and tripping latches fall into place.
5. As the closing roller moves, links *B*, *C*, *D*, and *E* move from the positions shown when the mechanism is disarmed to the corresponding positions shown when the mechanism is armed; see figure 8.

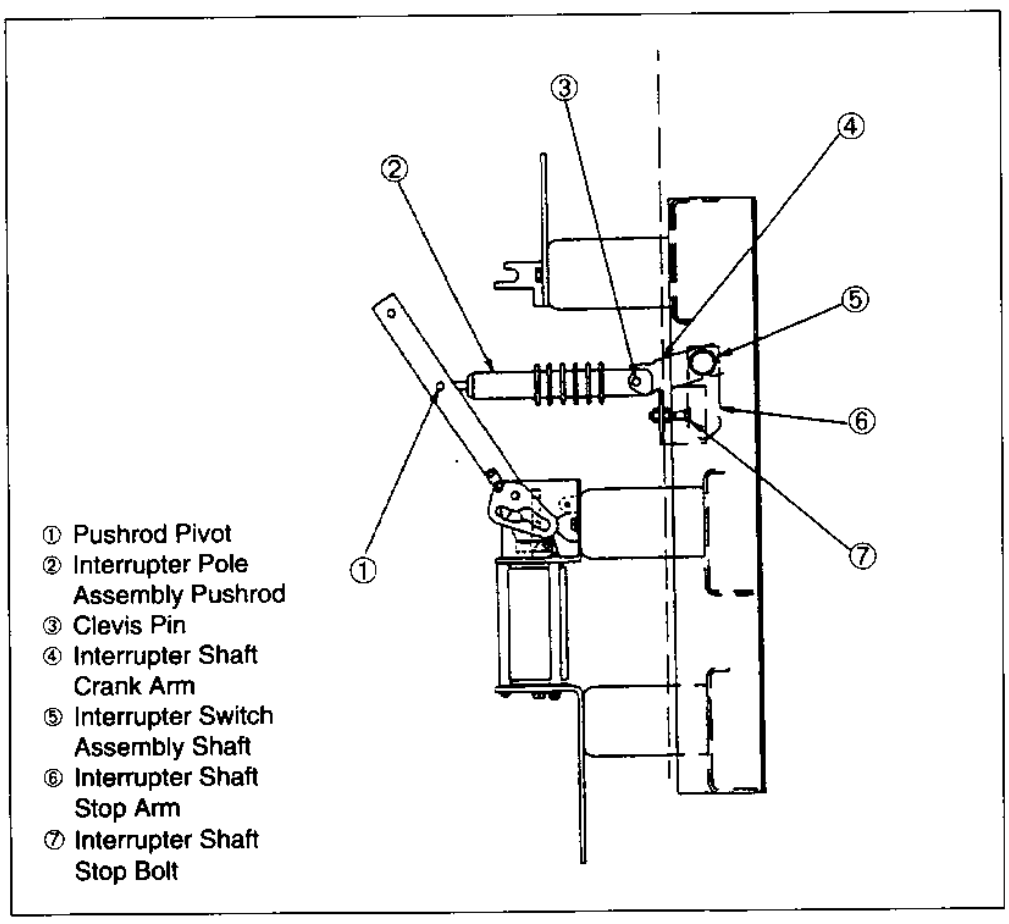


Figure 12: Interrupter closing stop adjustment

Mechanism Closing Stop Adjustment (cont.)

6. Following this adjustment process, the final adjusted position of the stop must ensure that:
   a. The closing latch and roller have engaged.
   b. The tripping latch and roller have engaged.
   c. Links *B* and *C* are "out of toggle" upward as shown in figure 8, "Mechanism Armed."

NOTE

If the stop adjustment screw is too long (extending from the driven link), links *B* and *C* go too far "over toggle"; this could reverse their intended motion.

If the stop adjustment screw is too short (insufficiently extended), links *B* and *C* may not go far enough "over toggle" to allow the tripping latch to engage and hold the tripping roller.

Latch Engagement Adjustment

Perform this procedure manually (no control power), after the mechanism closing stop adjustment is set.

Follow the steps outlined below to adjust the latch engagement. Refer to figure 13 while following these adjustment steps.

1. Set the latch adjustment screws to have excessive engagement for both latches (closing and opening). Adjust the screws so the top surfaces of the closing and opening latch arms are approximately horizontal.
2. Charge the mechanism manually until the ratchet mechanism no longer advances the pawls. In this position, the following conditions should exist:
   a. Both latches are in the engaged position.
   b. The closing latch rests on the closing roller.
   c. The tripping latch is in position to block the mechanism from opening, but the latch face does not quite engage the opening latch roller.

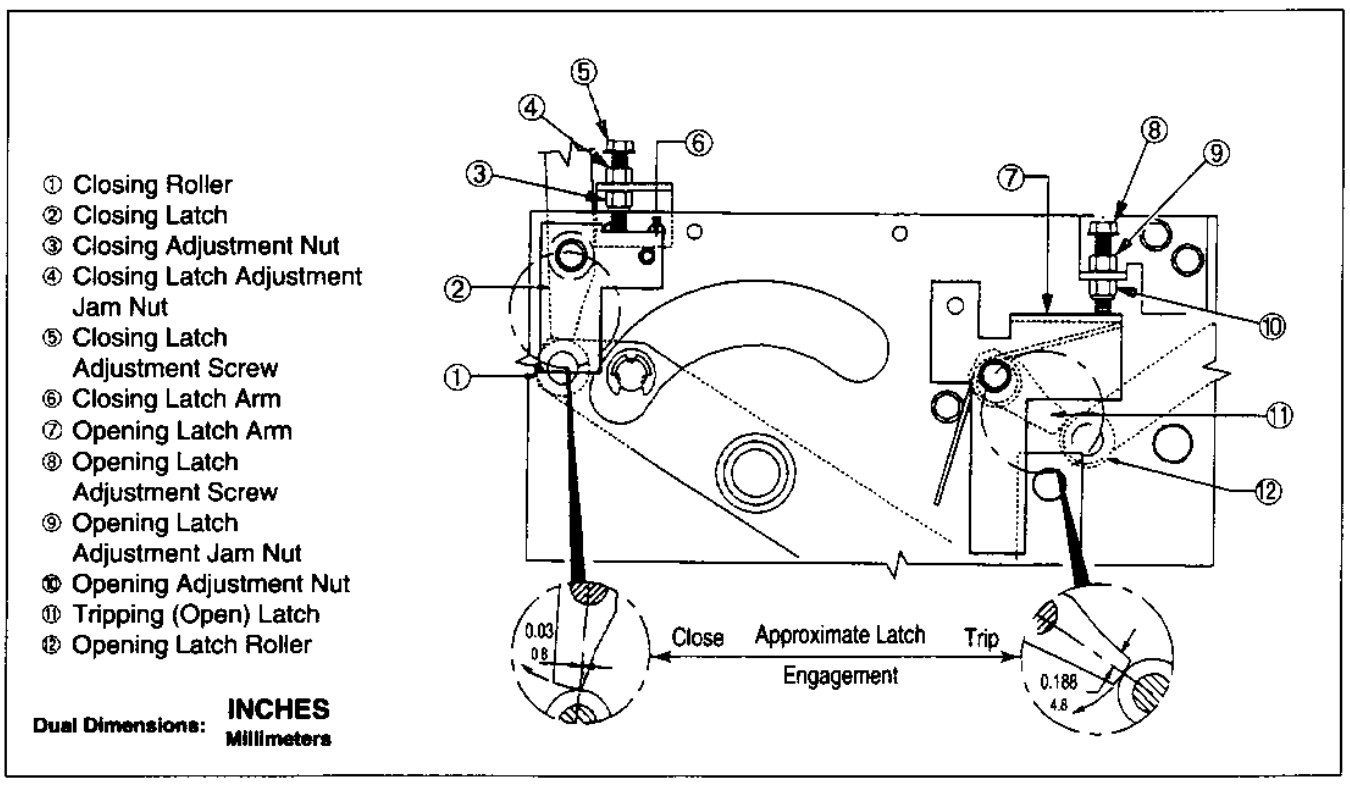


Figure 13: Latch engagement adjustment

Latch Engagement Adjustment (cont.)

3. **Closing Latch Adjustment**—To adjust the closing latch, follow these steps:
   a. Loosen the closing latch adjustment jam nut.
   b. Holding the closing adjustment nut, turn the closing latch adjustment screw downward slowly until the closing latch releases the closing roller. The device closes.
   c. Reverse the motion of the closing latch adjustment screw, backing off three full turns. Holding the closing adjustment screw in position, turn the closing latch adjustment jam nut to hold the screw in its new position. The latch engagement, or "bite," should be 0.030" (0.8 mm).
4. **Opening Latch Adjustment**—To adjust the opening latch, follow these steps:
   a. Loosen the opening latch adjustment jam nut.
   b. Holding the opening adjustment nut, turn the opening latch adjustment screw downward slowly until the opening latch roller is released. The device opens.
   c. Reverse the motion of the opening adjustment screw, backing off five full turns. Holding the screw in position, turn the opening latch adjustment jam nut to lock the screw in its new position. The opening latch engagement, or "bite," should be 0.188" (4.8 mm).

Interrupter Switch Assembly Shaft Stop And Mechanism Adjustment

Readjustment is required if a connecting link adjustment has altered the interrupter switch assembly shaft stop adjustment. Refer to figure 12 on page 24, for the parts mentioned in this section.

Follow the steps below to adjust the operator shaft stop and mechanism.

1. Adjust the interrupter shaft stop bolt until the clearance between the interrupter shaft stop bolt and the interrupter shaft stop arm is 0.040" (1 mm). Secure the bolt in its position with the jam nuts provided.
2. Any adjustment of the connection link may require readjustment of the adjustment screw (dimension *S*). See figure 8, page 12, for instructions on adjusting the interrupter shaft stop bolt.

Adjusting The Interrupter Switch Assembly And Mechanism Connection, When Changing Pole Assembly

Perform this procedure manually, without control power.

Follow the steps below to adjust the interrupter switch assembly and mechanism connection.

⚠ WARNING

HAZARD OF PERSONAL INJURY OR EQUIPMENT DAMAGE.

To prevent injury, follow the steps in the order presented.

Failure to observe this precaution can result in personal injury or equipment damage!

1. Ensure that *no* power can be supplied to the mechanism trip coil.
2. Discharge both main operating springs and open the circuit interrupter.
3. Remove the removable manual arming handle from the mechanism.

Adjusting The Interrupter Switch Assembly And Mechanism Connection, When Changing Pole Assembly (cont.)

4. Disconnect all three interrupter pole assembly pushrods from the interrupter shaft crank arms (figure 12, page 24) by removing the cotter pin and clevis pin from each.
5. Disconnect the mechanism/interrupter link assembly (figure 1, page 1) between the mechanism and interrupter switch assembly shaft (figure 12) by removing the cotter pin and clevis pin at the switch operating shaft assembly.
6. Adjust one interrupter pole assembly pushrod until three threads extend through the pushrod pivot. See figure 12.
7. Rotate the interrupter switch assembly shaft (figure 12), and use the clevis pin and cotter pin to re-connect the previously adjusted pole assembly pushrod to the shaft crank. The clevis pin should turn freely.
8. Adjust the mechanism/interrupter link assembly length (figure 1) until the hole in the pullrod aligns with the hole in the interrupter crank. Reconnect, using the clevis pin and cotter pin. When tightened, the clevis pin should still be loose enough to turn by hand.
9. Adjust the two remaining pushrods until the holes in the pushrods line up with the holes in the interrupter shaft crank arms. See figure 12.
10. Re-connect the pushrods to the interrupter shaft crank arms, using the clevis pins and cotter pins (figure 12). When tightened, the clevis pins should still be loose enough to turn by hand.
11. Insert the manual charging handle and operate the mechanism through the complete charging operation. See section 6, page 8, for instructions on the use of this handle. Close and open the circuit interrupter manually using the *Pull-Close/Push-Trip* lever.
12. With the interrupter switch assembly closed, ensure that the disconnect blades can be moved in and out approximately 0.125" (3 mm) at the contact jaw without the toggle linkage and erosion gap turnbuckles going "out of toggle." See figure 11, page 18.
13. With the interrupter switch assembly open, set the distance between the interrupter shaft stop bolt and the operator shaft stop arm to approximately 0.06" (1.5 mm). See figure 12.
14. Following the above adjustments, operate the circuit interrupter (manually or electrically) through 30 closing and opening operations to pre-condition the vacuum interrupter modules.
15. Following the 30 operations, readjust the contact erosion measurement, if necessary. For instructions, refer to section 8, page 17.

Also check the stroke of the vacuum interrupter module. See **Vacuum Interrupter Module Contact Stroke Measurement**, page 18.

The stroke dimension for a device rated 12.5 kA should be 0.315" to 0.440" (8 mm to 11 mm). If the dimension is outside of this range, see the instructions for special adjustments, page 28.

Connection Link Adjustment In Enclosure

OEMs must make only the following adjustments while installing VISI/VAC circuit interrupters in their OEM enclosures.

After mounting the interrupter assembly and mechanism assembly in the enclosure, the following adjustments are required:

- Charge the mechanism manually as described in section 6, page 8. Be sure that both the close and open latches are engaged.
- Using the manual operating handle, close the circuit interrupter.
- The interrupter assembly *must* close and go "over toggle" as shown in figure 10, page 17.

If the circuit interrupter pole assemblies have not gone "over toggle," move them "over toggle" by hand by pulling on the pole pushrods. Then adjust as follows:

- Disconnect the mechanism/interrupter link assembly from the interrupter switch crank shaft by removing the cotter pin and clevis pin (figure 1, page 1).
- Adjust the connection length until the hole in the clevis pin aligns with the hole in the interrupter crank. Reconnect, using the clevis pin and cotter pin. When tightened, the clevis pin should still be loose enough to turn by hand.
- Use the manual charging handle to operate the circuit interrupter several times. If the interrupter switch assembly and mechanism do not operate properly, readjust them. See instructions for adjusting the interrupter switch assembly and the mechanism on page 26.

Special Adjustments

The stroke dimensions can be affected by the length tolerances of the vacuum interrupter module parts when manufactured. These variations can result in stroke values which do not conform to the ranges indicated in step 15 on page 27, after the 30 pre-conditioning operations are complete.

Follow these procedures to conform to the specified stroke range values:

- Stroke between 0.285" (7 mm) and 0.314" (8 mm). Compress the bias spring length to 0.315" (8 mm) by turning the bias spring nut (figure 11, page 18) downward (clockwise). Reset the contact erosion measurement to the value shown in section 8, page 17.
- Stroke above 0.440" (11 mm). Add shims between the bias spring bushing and interrupter module terminal stem (Detail *A*, figure 11, page 17) to change the stroke to 0.440" (11 mm) or less. Reset the contact erosion measurement to the value shown in section 8, page 17.
- Stroke less than 0.285" (7 mm) to change vacuum interrupter module. Repeat all adjustments given in the **Circuit Interrupter Pole Assembly Unit Adjustment** section on page 23.

SECTION 11 — RECOMMENDED SPARE PARTS

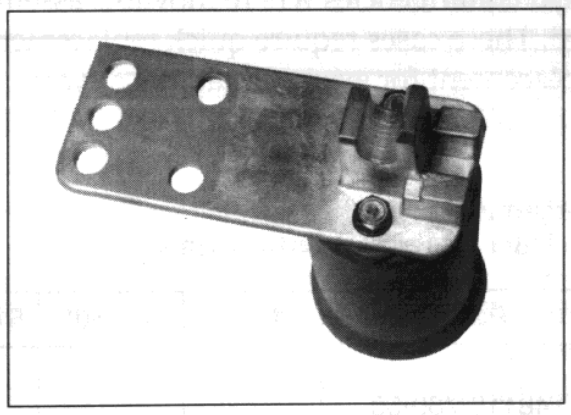
Quantities are based on possible field contingencies where movable assemblies are operated and possibly damaged. These cases require quick replacement. These quantities do not include replacement for expected fatigue or wear.

Table 2
Recommended Spare Part Stocking Quantities

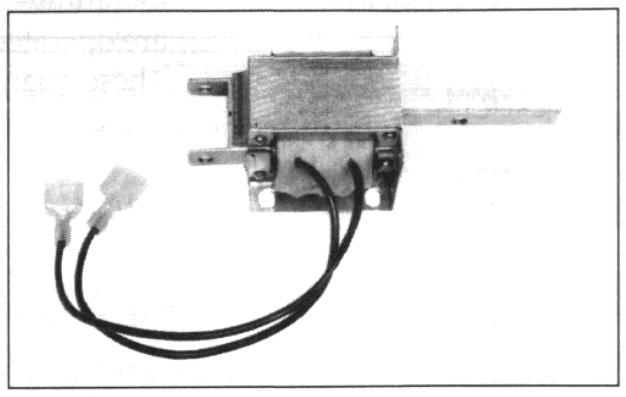
Description	Part No.	1–5*	6–50*	51–100*
Vacuum Interrupter Assembly Molded Insulator Porcelain Insulator	 48119-760-50 48119-760-51	1	2	4
Stationary Contact Assembly Molded Insulator Porcelain Insulator	 48119-761-50 48119-761-51	0	1	2
Basic Mechanism Assembly 48 Vdc Mtr/Cl/Anti-P 48 Vdc Trip 125 Vdc Mtr/Cl/Anti-P 125 Vdc Trip 250 Vdc Mtr/Cl/Anti-P 250 Vdc Trip 120 Vac Mtr/Cl/Anti-P 48 Vdc Trip 120 Vac Mtr/Cl/Anti-P 125 Vdc Trip 240 Vac Mtr/Cl/Anti-P 48 Vdc Trip 240 Vac Mtr/Cl/Anti-P 125 Vdc Trip	 48119-762-50 48119-762-51 48119-762-52 48119-762-53 48119-762-54 48119-762-55 48119-762-56	1	2	4
Connector Link Assembly	48119-763-50	0	0	1
Pushrod	48119-764-50	1	2	4
Solenoids 48 Vdc 120 Vac/125 Vdc 240 Vac/250 Vdc	 48119-765-50 48119-765-51 48119-765-52	1	2	4
Charging Motor Assembly 48 Vdc 120 Vac/125 Vdc 240 Vac/250 Vdc	 48119-766-50 48119-766-51 48119-766-52	0	1	2
Limit Switch/Lockout Switch Voltage/ac—2 contacts with common Voltage/ac—2 separate circuits Voltage/dc—2 circuits with common	 48119-767-50 48119-767-51 48119-767-52	1	2	4
Anti-Pump Relay 48 Vdc 125 Vdc 250 Vdc 120 Vac 240 Vac	 48119-768-50 48119-768-51 48119-768-52 48119-768-53 48119-768-54	1	2	4
Auxiliary Switch—10 contacts	48119-769-50	1	2	4

* The numbers in the heading (1–5, 6–50, and 51–100) represent the number of circuit interrupters in use at the installation site. For spare parts, order the number of parts in the appropriate column. For example, if there are two circuit interrupter assemblies, order one extra part for stock; if there are 10 circuit interrupter assemblies, order two extra parts for stock.

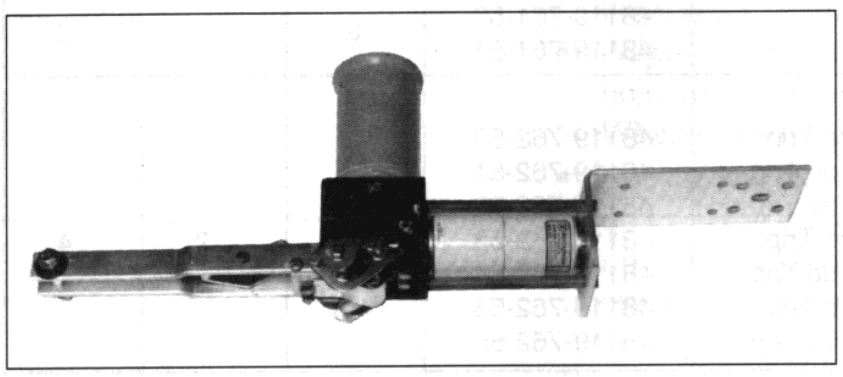
RECOMMENDED SPARE PARTS (cont.)



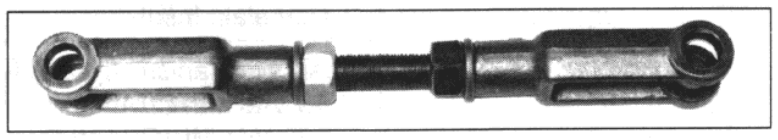
Stationary contact assembly



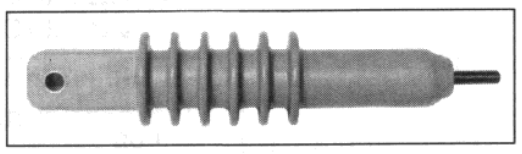
Solenoid



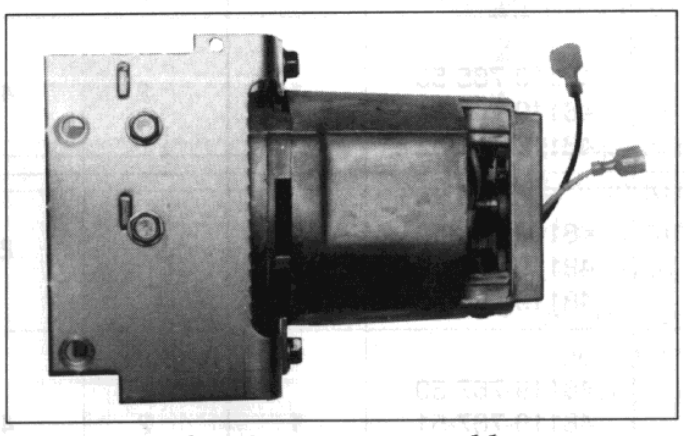
Vacuum interrupter assembly



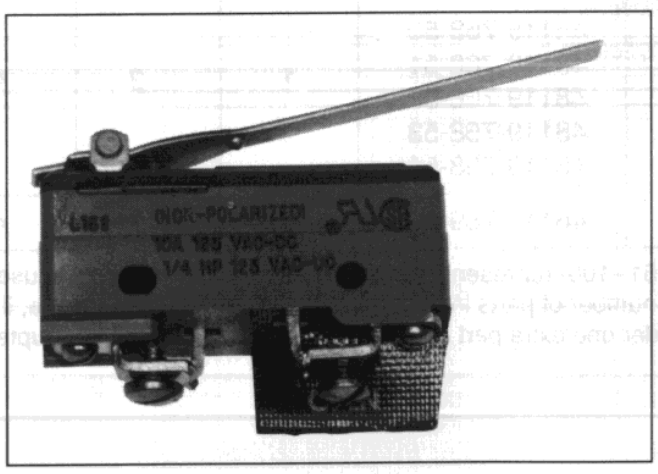
Connector link



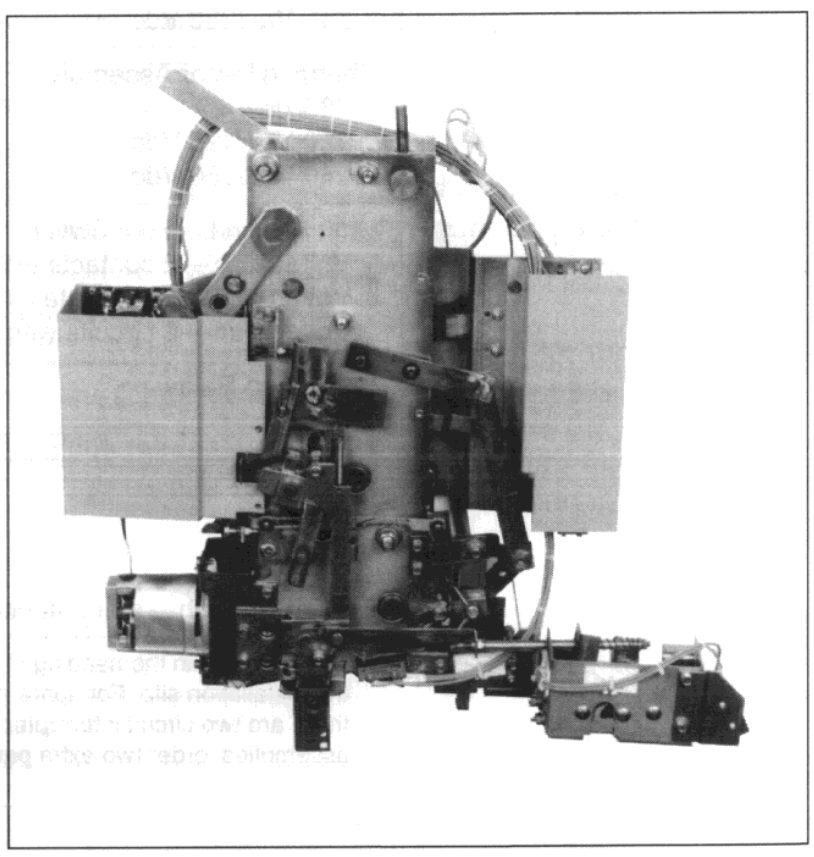
Pushrod



Charging motor assembly



Typical limit switch/lockout switch



Basic mechanism assembly

Square D Company
330 Weakley Road
Smyrna, TN 37167 U.S.A.

SQUARE D

Order No. 9845IM9302

FP 5M 10/93

Printed in U.S.A.
Part No. 9845-4