January, 1988

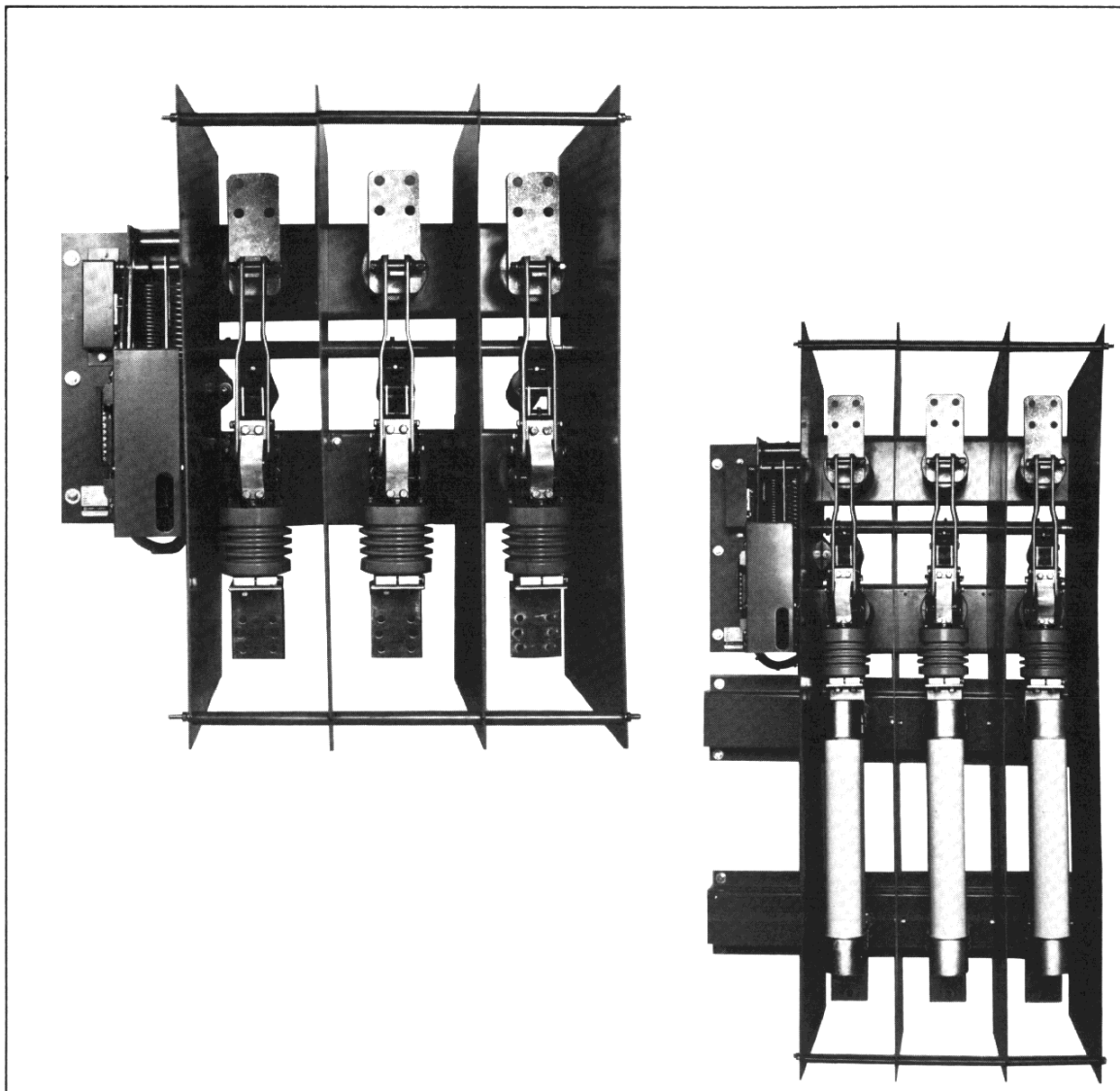
Manual 9845-2

Supersedes Manual 9845-2
Dated March, 1987

Instruction & Maintenance Manual

VISI/VAC™ Interrupter

TYPE-VA



SQUARE D COMPANY

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WARNING

STUDY THESE INSTRUCTIONS CAREFULLY AND BECOME FAMILIAR WITH THE EQUIPMENT PRIOR TO ATTEMPTING TO PUT IT INTO SERVICE. PROTECTION OF PERSONNEL AND EQUIPMENT DEPENDS UPON PROPER MAINTENANCE AND CARE AS INDICATED IN THESE INSTRUCTIONS. THROUGHOUT THESE PROCEDURES, THE OPENING AND CLOSING SPRINGS SHOULD BE DISCHARGED FOR SAFETY (UNLESS SPECIFICALLY REQUIRED DUE TO TESTING, ADJUSTING, OR TAKING MEASUREMENTS).

GENERAL

The VISI-VAC Interrupter from Square D is a single throw device, designed for use on 2.4KV to 15KV power distribution systems. It functions as a prime component in the system providing switching and overcurrent protection for medium voltage circuits. It has a visible blade disconnect in series with a vacuum interrupter and precludes arcing in the atmosphere, as all arcing during opening and closing operations of the device occurs within the envelope of the vacuum interrupter.

Statement of Warranty

Equipment warranty is voided if said equipment is **not** maintained per these instructions or if the components used for replacement are not manufacturer recognized replacement parts, or if the equipment is operated in a fashion **not** in accordance with the standards to which it was designed or qualified.

Safety

Because of the various conditions which may exist at any installation, the following suggestions are not intended to be complete and shall in no way diminish the user's responsibility for implementing an appropriate safety program covering installation, operation and maintenance of the equipment.

1. All personnel associated with the installation, operation and maintenance of the equipment should be thoroughly trained and supervised with respect to high voltage equipment in general, with respect to the specific operation of this particular equipment, and with respect to the types and severity of potential injury.
2. Maintenance and operation of the equipment should be well planned and in accordance with safe practices. Adequate safety related tools and equipment appropriate for the tasks involved should be provided.
3. Do **not** work on or near electrically energized equipment. Contact with energized parts can result in severe shock or burn.
4. Do **not** work on or near electrically energized parts where there is a possibility of accidentally contacting an energized part.
5. When installing or maintaining equipment, be sure the closing and opening springs are discharged so that spring energy cannot be accidentally released. Careless release of stored energy can result in serious personal injury.
6. Use only test equipment rated for the service intended. **Do not use instruments or multimeters rated for low voltage service** on high voltage circuits. Incorrect use can result in explosion and serious personal injury to the operator.

VISI-VAC Ratings

The ratings for the VISI-VAC interrupter (unfused) are as follows:

Maximum Design KV	15	KV
Continuous Current	600	amps
Impulse BIL	95	KV
60 Hz Withstand	36	KV
Load Break Interrupting	4	KA
Momentary Current	20	KA (Asym. RMS)
Fault Closing Current	20	KA (Asym. RMS)
One Second Rating	12.5	KA (Sym. RMS)

Table 1

The above ratings were established following the requirements of ANSI C37.72.1 (198x). The VISI-VAC interrupter has been tested in accordance with this and other applicable standards.

Inspection, Storage & Handling

Prior to leaving the factory all interrupters are carefully inspected and packaged by workmen experienced in the proper handling and packaging of electrical equipment. Upon receipt of the interrupter a careful inspection should be made to determine if any damage might have occurred during transit. If damage is evident, or there is any visible indication of rough handling, claims for damage should be filed at once with the

transportation company and the local Square D field office should be notified.

This device can be handled by a fork lift. Care should be observed to avoid sudden starts, stops or jolts that can cause damage to the equipment.

If it is necessary to store the interrupter, for any period of time, the following precautions should be taken to provide the best care for the equipment until installed and put into service:

1. Uncrate the VISI-VAC interrupter
2. Check for missing or damaged parts
3. Store the device in a clean dry location
4. Cover to prevent deposit of dirt or other foreign materials on movable parts and electrical contact surfaces.

To provide for proper operation of the interrupter a check should be made to make sure that there is no binding or misaligned parts. If the device is not properly aligned the interrupter may be damaged during operation.

INSTALLATION

WARNING

BEFORE ANY INSTALLATION IS STARTED, MAKE ABSOLUTELY SURE THAT APPLICABLE EQUIPMENT IS DE-ENERGIZED AND PROPERLY GROUNDED. PROTECT THE INSTALLERS, OPERATORS, AND MAINTENANCE PERSONNEL ADEQUATELY FROM ADJACENT LIVE PARTS BY USING BARRIERS, SCREENS, ETC.

I. Non-fused VISI-VAC Interrupter

The VISI-VAC interrupter comes fully assembled, ready for mounting. Lug kits are optional. Mounting hardware is not provided. Refer to FIG. #1 for mounting hole pattern.

Cable bracing is recommended within 18″ of the load side lug landing.

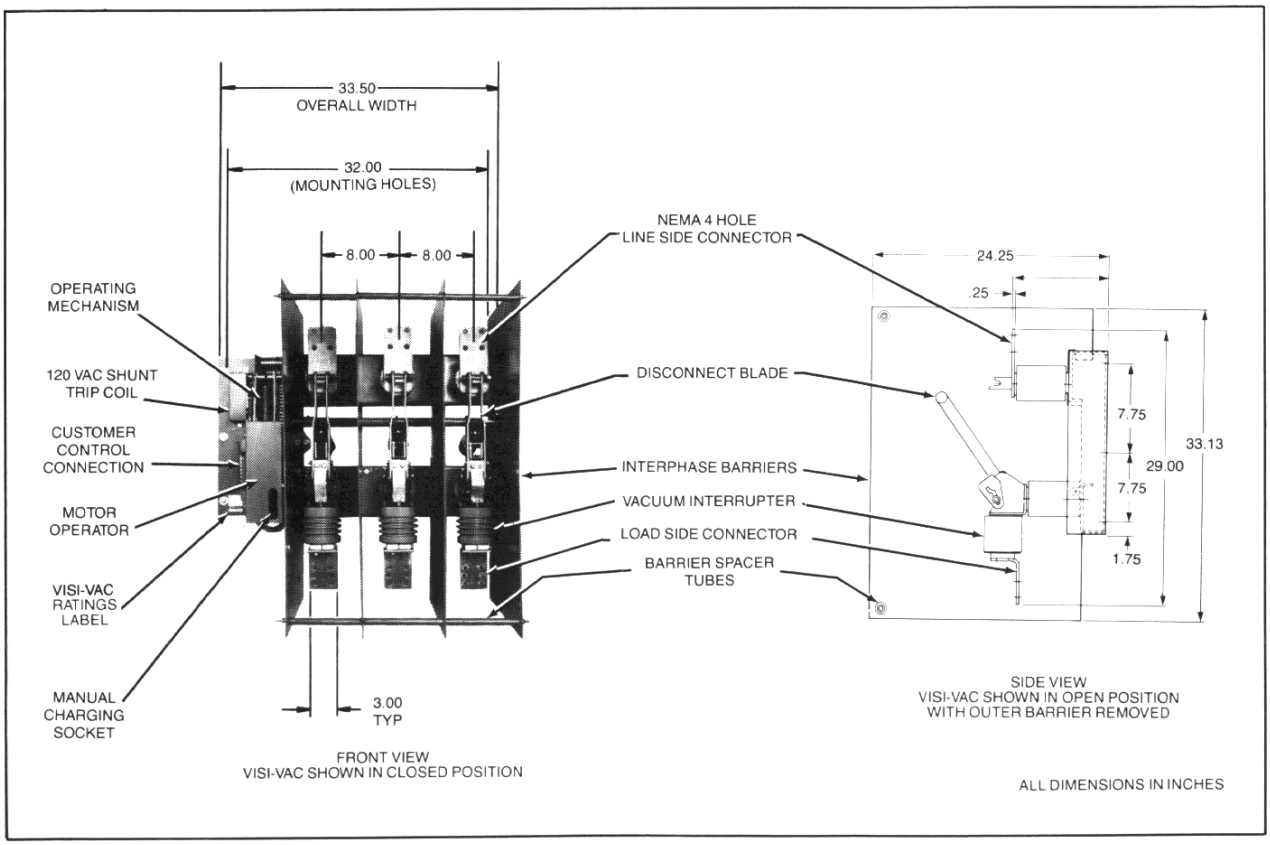

Figure 1
VISI-VAC Interrupter (Unfused)

II. Adding Fuse Kit Assembly

Fuse kits are available for current limiting & boric acid fuses. Fuse kit assembly is similar for both. The following steps will explain the assembly required:

1. Remove the polyester glass barriers from the unfused interrupter.

   a. Remove the nuts and washers from the barrier support rods (two places) which in turn will allow for removal of the all-thread rods and spacer tubes. DO NOT DISCARD NUTS, WASHERS, RODS, OR SPACER TUBES AS THEY WILL BE REUSED WITH THE FUSE/INTERRUPTER ASSEMBLY.

   b. Remove the 1/4" screws from the barrier mounting angles (4 places).

   c. Lift "up" on barriers allowing them to exit the retaining slots located in the interrupter's mounting pan.

   NOTE: It would be a good idea to save these barriers for spares as they will not be needed during fuse kit assembly.

2. Mount the interrupter assembly, referring to FIG. #1 for hole pattern. See FIG. #2 for interrupter mounted with barriers removed.

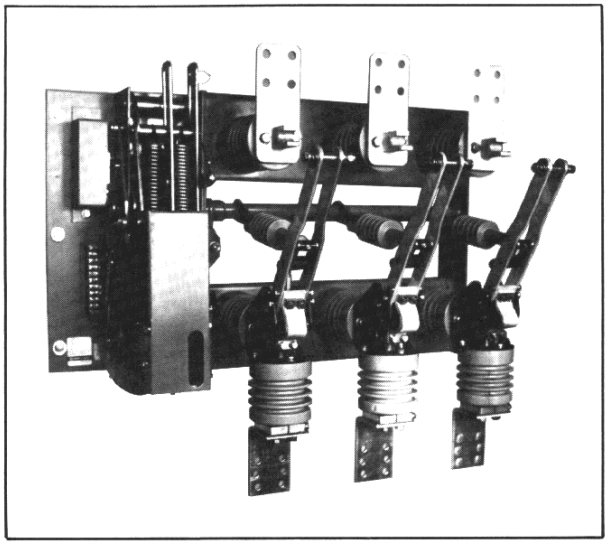

Figure 2
VISI-VAC Shown in Open Position (Barriers Removed)

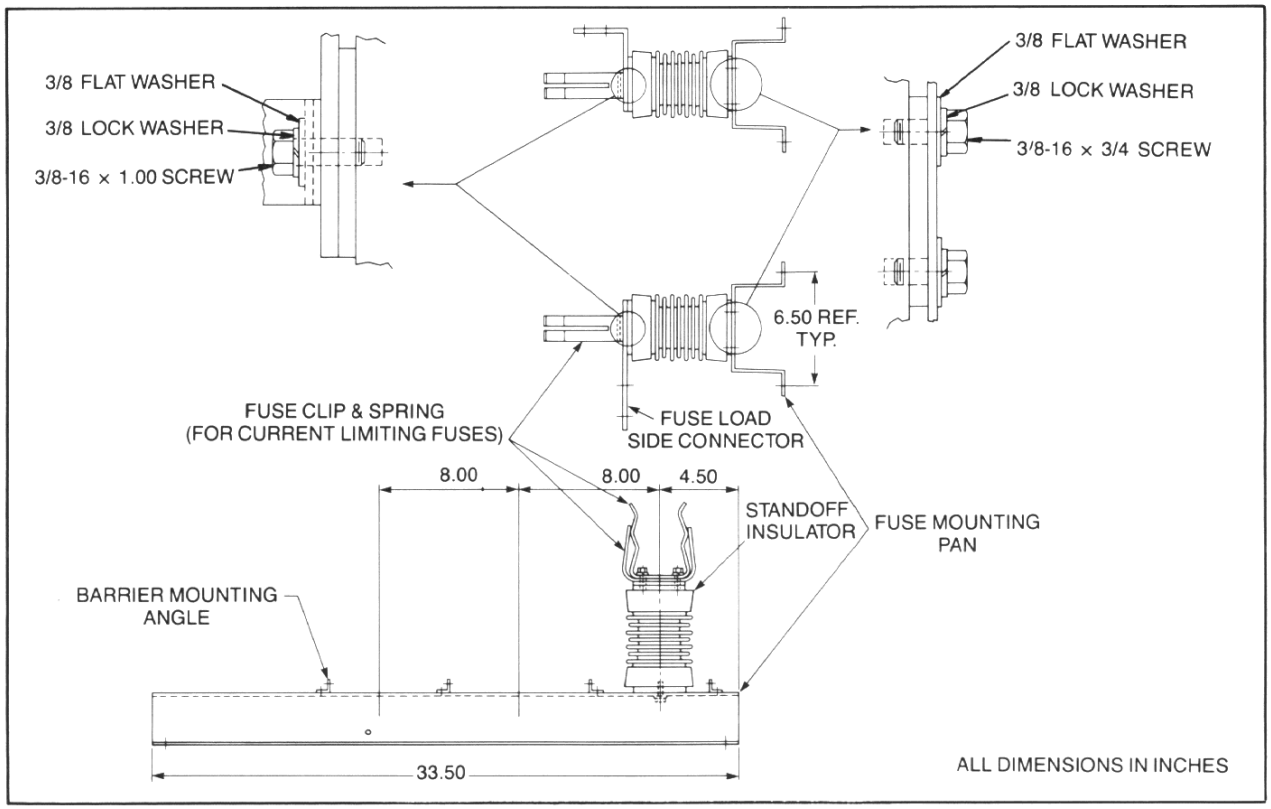

Figure 3
Fuse Clip, Insulator and Mounting Pan Assembly

3. Locate the two (identical) insulator mounting pans and mount the six insulators using the 3/8–16 × 3/4 screws, lock washers, and flat washers as shown in FIG. #3.

4. Slide one of the insulator mounting pans under the interrupter's load side connectors, aligning the insulator's screw sockets with corresponding holes in the load side connectors. DO NOT BOLT THE LOAD SIDE CONNECTORS TO THE INSULATORS UNTIL AFTER THE MOUNTING PAN HAS BEEN BOLTED TO THE ENCLOSURE AS THE WEIGHT OF THE INSULATOR/MOUNTING PAN ASSEMBLY MAY DAMAGE THE VACUUM INTERRUPTER. Using the mounting holes in the insulator/mounting bracket assembly for a template, mark the four holes required, remove the mounting pan and drill the holes.

5. Re-align the mounting pan assembly beneath the load side connectors and secure the mounting pan using bolts, lock washers, flat washers, and nuts (not provided).

6. Locate a fuse clip and fuse clip spring. Align the fuse clip and spring as shown in FIG. #3, and secure (two places) with 3/8–16 × 1.00 screw, lock washer, and flat washer. Repeat for the other two poles. This completes the assembly of the upper fuse mounting pan.

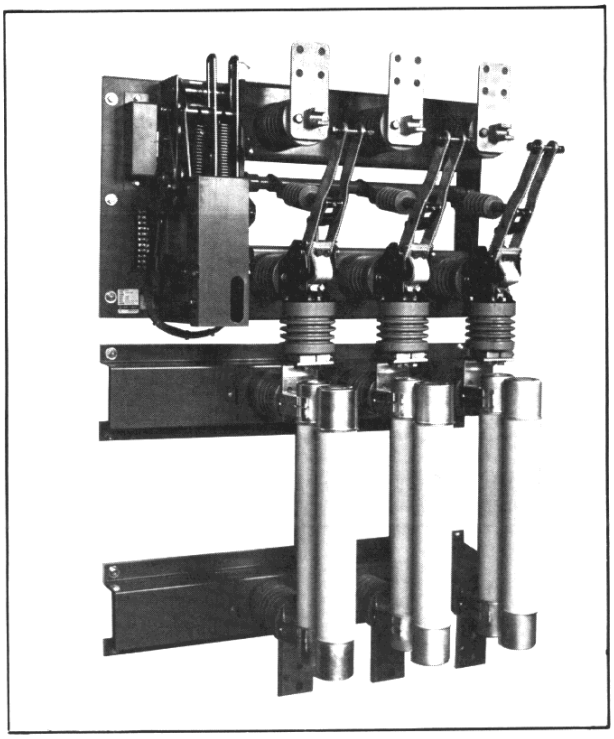

Figure 4
VISI-VAC Fused Interrupter (Shown Prior to Barrier Installation)

7. Locate and mount the remaining fuse clips and fuse clip springs to the lower mounting pan.

8. Determine distance between ferrules on the fuse. Measurement should be taken midway on the upper ferrule to midway on the lower ferrule. This is the distance required from center-line of the upper fuse clip assembly to the center-line of the lower fuse clip assembly.

9. Maintaining the fuse clip center-line distance established in the previous step, drill, mount, and secure the lower fuse mounting pan (see FIG. #4 for fuse assembly mounted prior to barrier installation).

10. Locate and secure the barrier mounting angles (12 provided) and pop rivets (provided). Rivet the angles to the barriers in the locations shown in FIG. #5.

11. Insert a barrier into the slot provided at the top of the switch mounting pan and secure the barrier mounting bracket to the interrupter pan with the 1/4–20 × 7/16 hex screw and 1/4 conical washer provided. Repeat this procedure for the remaining three barriers.

12. Re-connect the barrier spacer tubes, all-thread rods, washers, and nuts. IMPORTANT: THERE ARE TWO SIZES OF SPACERS PROVIDED. THE SPACERS 6.69″ IN LENGTH SHOULD BE INSTALLED AT 'A' AND 'C' PHASE, WITH THE 7.75″ SPACERS INSTALLED AT 'B' PHASE (see FIG. #5).

13. Install fuses.

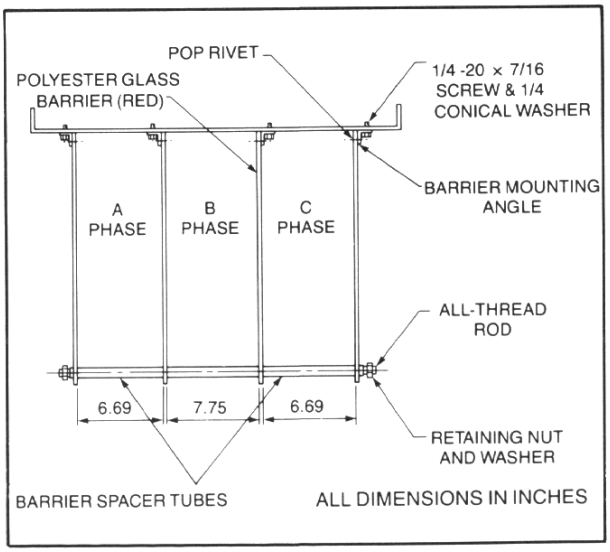

Figure 5
Top View, Showing Location of Barrier Support Angles, Rivets, Screws, and Barrier Spacer Tubes

14. IMPORTANT: Make sure all current-carrying joints are secure before energizing the equipment. See Table 2 for recommended torque values.

15. This completes the installation of the fuse kit assembly. See FIG. #6 for completed assembly.

VISI-VAC Bolt/Screw Torques		
Screw Thread Size	Torque (min) LB-IN	Applications
8-32	17 1.9	terminal block mtg, solenoid mtg
1/4-20	60 5	foil connector, mtg. bracket to insulator, closing spring ear, trip shaft stop, solenoid cover mtg., motor cover mtg., barrier mtg., blade/cam/pivot mtg., bus clamp mtg.
5/16-18	125 10.5	motor housing mtg., mechanism
3/8-16	225 18.75	main shaft stop plate mtg., stationary contact terminal mtg., insulator mtg.

Table 2

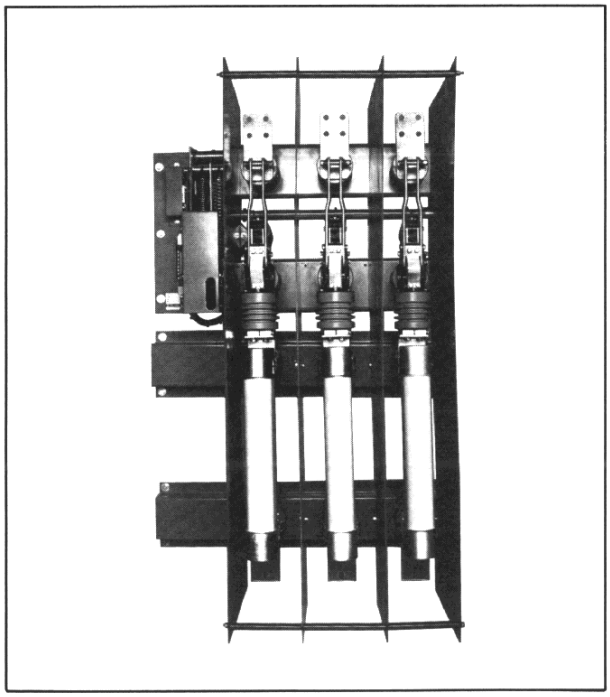

Figure 6
VISI-VAC Interrupter with Fuse Kit Assembly Installed

OPERATION (GENERAL)

Manual Operation

WARNING

PRIOR TO OPERATING THE INTERRUPTER, ADEQUATELY PROTECT INSTALLERS, OPERATORS, AND MAINTENANCE PERSONNEL FROM ADJACENT LIVE PARTS BY USING BARRIERS, SCREENS, ETC.

THIS DEVICE SHOULD ONLY BE OPERATED MANUALLY FOR MAINTENANCE PURPOSES. REMOVE ALL POWER TO THE INTERRUPTER PRIOR TO MANUAL OPERATION.

The interrupter is operated manually by use of a detachable handle. Steps to operate the interrupter manually are as follows (see section entitled "Mechanism - Description And Sequence Of Operation" for a detailed explanation):

a. Place the operating handle, fully home, on the operating lever extension.

b. **To Close (assuming interrupter is open and all springs are discharged):**
Move handle **upward & downward** until the interrupter closes. During this time the opening spring has been armed, and the trip and close trigger latches have been reset.

c. **To Open (assuming interrupter is closed and opening spring is armed):**
Move handle **upward & downward** until the interrupter opens.

Electrical Operation
(reference wiring diagram - FIG. #7)

a. **To Close (assuming the interrupter is open and all springs are discharged)**

NOTE: Detachable handle should be removed during electrical operations.

When control switch (supplied by others) 'CS' is switched to the "closed" position, seal-in relay 'SR' (supplied by others) is actuated closing contact 'SR/1'. Charging motor 'M' charges and latches the interrupter's opening spring first, then the closing spring. The charging motor becomes disconnected when the interrupter's activator roller engages limit switch 'MS' opening contact 'NC (b)'.

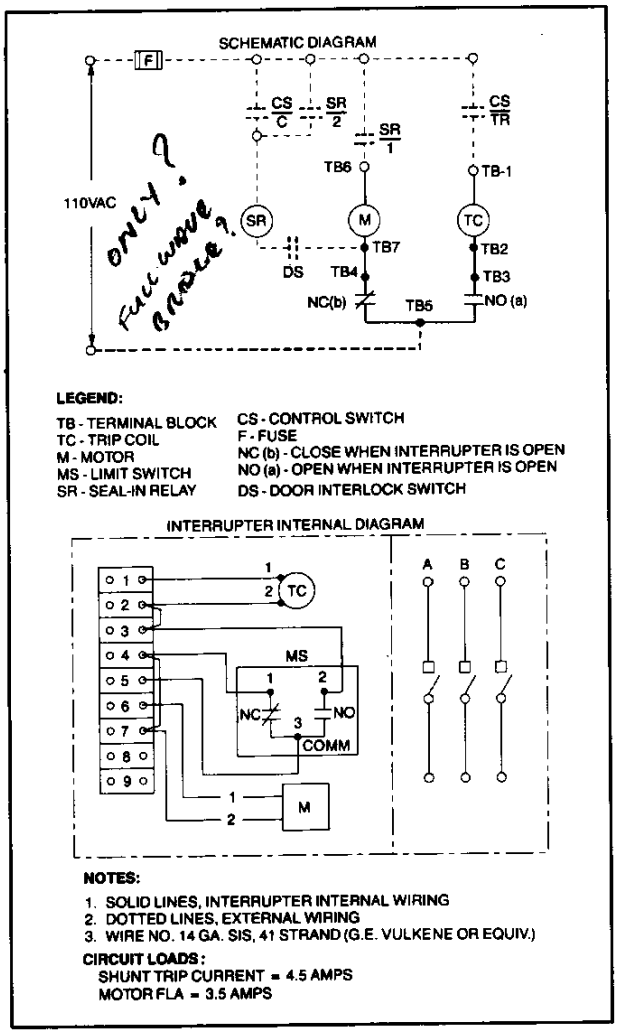

Figure 7
Interrupter Schematic and Internal Wiring Diagram

NOTE: The interrupter is in the proper fully closed position **only** if the blades are fully closed **and** the bell crank and linkage shaft are in toggle (see FIG. #11).

b. **To Open**
With the main contacts closed, and contact 'NO (a)' now closed, the trip coil 'TC' is actuated by closing the control switch 'CS' (supplied by others) to the "tripped" position. The trip solenoid plunger engages the trip arm, rotating the trip shaft, which in turn, allows the trip linkage to collapse, discharging the interrupter's opening spring, causing the interrupter to open.

DESCRIPTION AND SEQUENCE OF OPERATION

Mechanism

Start: Both springs discharged, interrupter open

A. **To Reset Latch & Arm Opening Spring** (see FIG. #8)

1. Arming rod from motor arming mechanism rotates shaft 'A'.

   NOTE: Arming rod 'Z' may be operated using the motor (electrically) or by use of the detachable manual handle (manual - several strokes); either rotates shaft 'A'.

2. As shaft 'A' rotates (CCW), parts 'B' and 'C' also rotate pushing rod 'D' and rotating bottom shaft assembly 'E'. Part 'G' is resting against the adjustable opening stop and does not rotate.

3. Pin 'E-1' moves along the slot in slider assembly 'H'. Continued motion allows pin 'B-1' on the charging cam 'B' to pass the notch on 'F'. Closing catch 'F' then rotates upward to engage a "catch" at pin 'B-1'. **At the same time** pin 'E-1' moving in the slider slot is resetting the trip latch 'J' under trip latch shaft 'K'. The linkage system assumes the position shown by the heavy dotted lines. Lever 'G' is still stationary since it is attached to the main shaft which is rotated against the "opening stop" when interrupter is open.

   Latch 'J' should engage and reset beyond shaft 'K' **and** pin 'B-1' on the charging cam should lock behind the notch in closing catch 'F' **at the same time.** The opening stop engaging the main shaft arm is adjustable to permit setting this coordination (see section entitled "Main Shaft Stop Adjustment").

4. At this point the opening spring is armed, the trip latch is reset. The mechanism is ready to be closed.

   NOTE: The adjustable length of arming rod 'Z' must be set so there is sufficient stroke from the motor arming assembly to rotate shaft 'A' sufficient distance to reset the trip latch 'J' and permit pin 'B-1' to engage in the notch on closing catch 'F'.

B. **To Close Interrupter**

1. Arming rod from motor arming mechanism rotates shaft 'A'.

   NOTE: Arming rod 'Z' may be operated using the motor (electrically) or by use of the detachable manual handle (manual - several strokes); either rotates shaft 'A'.

2. Shaft 'A' is now rotated in the opposite direction (CW) from that required to reset the latch and arm the opening spring (see FIG. #8).

   NOTE: In the motor mechanism the arming rod and motor arming shaft arm have gone 'over-center'. At the extreme end of the arming rod stroke, the arming rod is now pulled in the opposite direction which changes the rotation of shaft 'A'.

3. As shaft 'A' is rotated (CW), part 'B' remains stationary since it is held by the trip latch 'J', the trip latch links, and parts 'E' and 'D'. 'B' is also held stationary by pin 'B-1' engaged in the notch on part 'F'.

4. Part 'C' moves with shaft 'A' and separates from part 'B'. Part 'C' carries one end of the closing spring (other end is on pin 'E-1'). As part 'C' moves away from part 'B' the closing spring is extended and armed. Arming continues until pin 'C-1' engages closing catch 'F' and depresses it. Depressing closing catch 'F' allows it to release pin 'B-1'. Releasing pin 'B-1' allows part 'B' to rotate (CW) pulled by the full amount of stored energy in the closing spring.

5. Motion of 'B' (CW) pulls part 'D', rotating 'E'. The trip latch linkages **remain** in their rigid conditions (heavy dotted lines) due to the trip latch still being engaged. Link 'M' rotates along with arms 'G' and 'E'. Rotating arm 'G' (CCW) rotates the main shaft which in turn pulls on the push rods connected to the disconnect blades. The disconnect blades are pulled towards the interrupter's upper stationary contacts.

   The interrupter continues to the closed position.

   NOTE: The interrupter is in the proper fully closed position **only** when the push rods have pulled the disconnect blades fully "home" and **then** pulls the **bell crank** (see FIG. #11) **assembly and linkage shaft into toggle.**

   The interrupter is now closed and armed to open when actuated.

C. **To Open the Interrupter**

1. **Manually**

   WARNING

   THIS DEVICE SHOULD ONLY BE OPERATED MANUALLY FOR MAINTENANCE PURPOSES. REMOVE ALL POWER TO THE INTERRUPTER PRIOR TO MANUAL OPERATION.

   a. Move the manual handle up and down several strokes.

   b. Movement rotates shaft 'A' (CCW). Cam surface on 'A1' on the operating arm engages the projection 'N1' on trip arm 'N'. Movement of rod 'N' (left) causes roll pin 'N-2' to engage roll pin 'O-1' which rotates trip shaft 'K' and releases trip latch 'J'. Trip linkages collapse to original position (see FIG. #8, Section A-A) and allows 'G' to rotate (CW) by force of the opening spring stretched between pins 'G-1' and 'E-1'. Rotation of main shaft 'G' opens the interrupter.

2. **Electrically**

   a. Energize the trip coil.

   b. Trip solenoid plunger engages trip arm 'O', causing trip shaft 'K' to rotate releasing trip latch 'J'. This causes the trip linkage to collapse allowing 'G' to rotate (CW) by the force of the opening spring. Rotation of main shaft 'G' opens the interrupter.

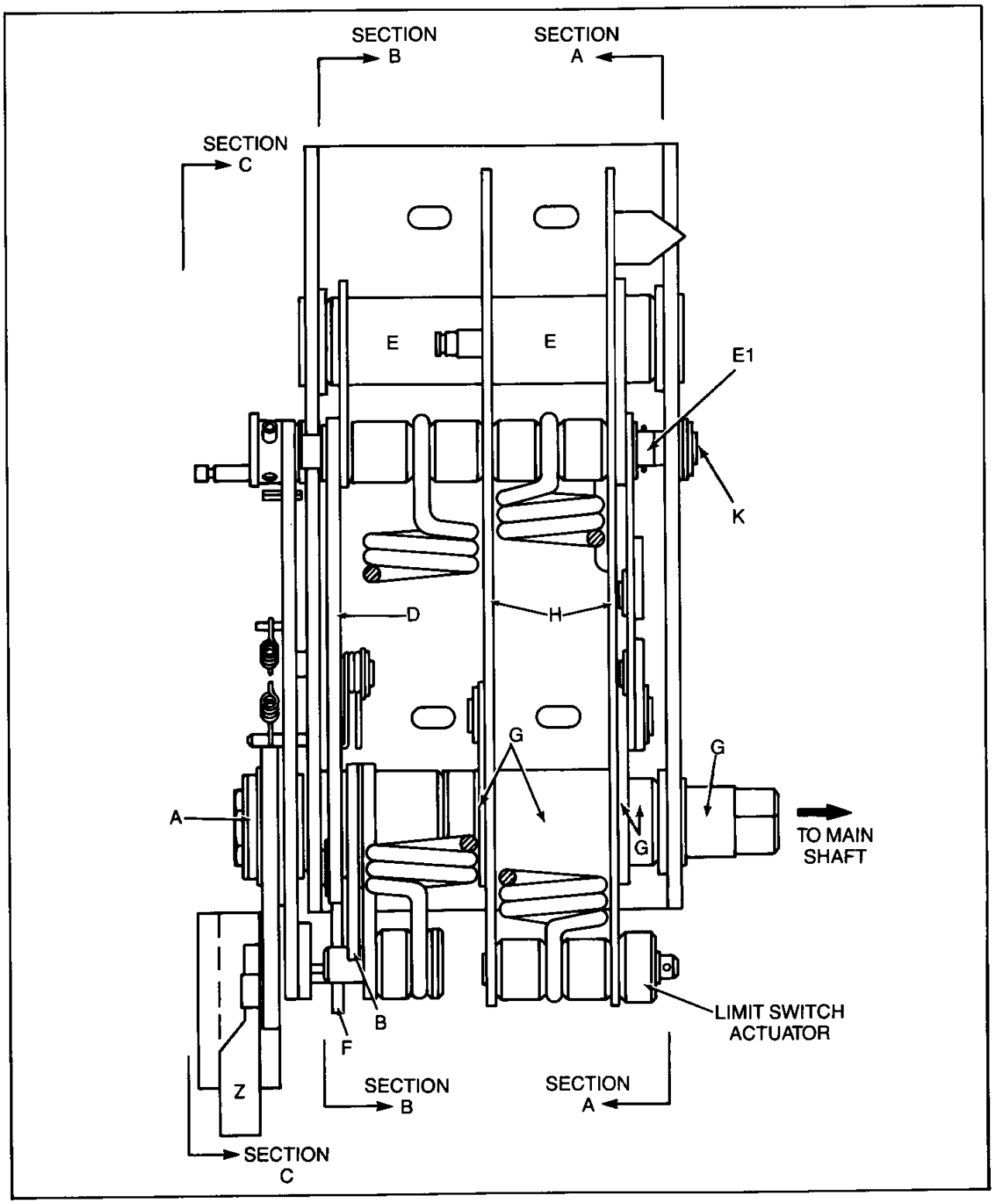

Figure 8
Mechanism-Sequence of Operation (Sheet 1 of 2)

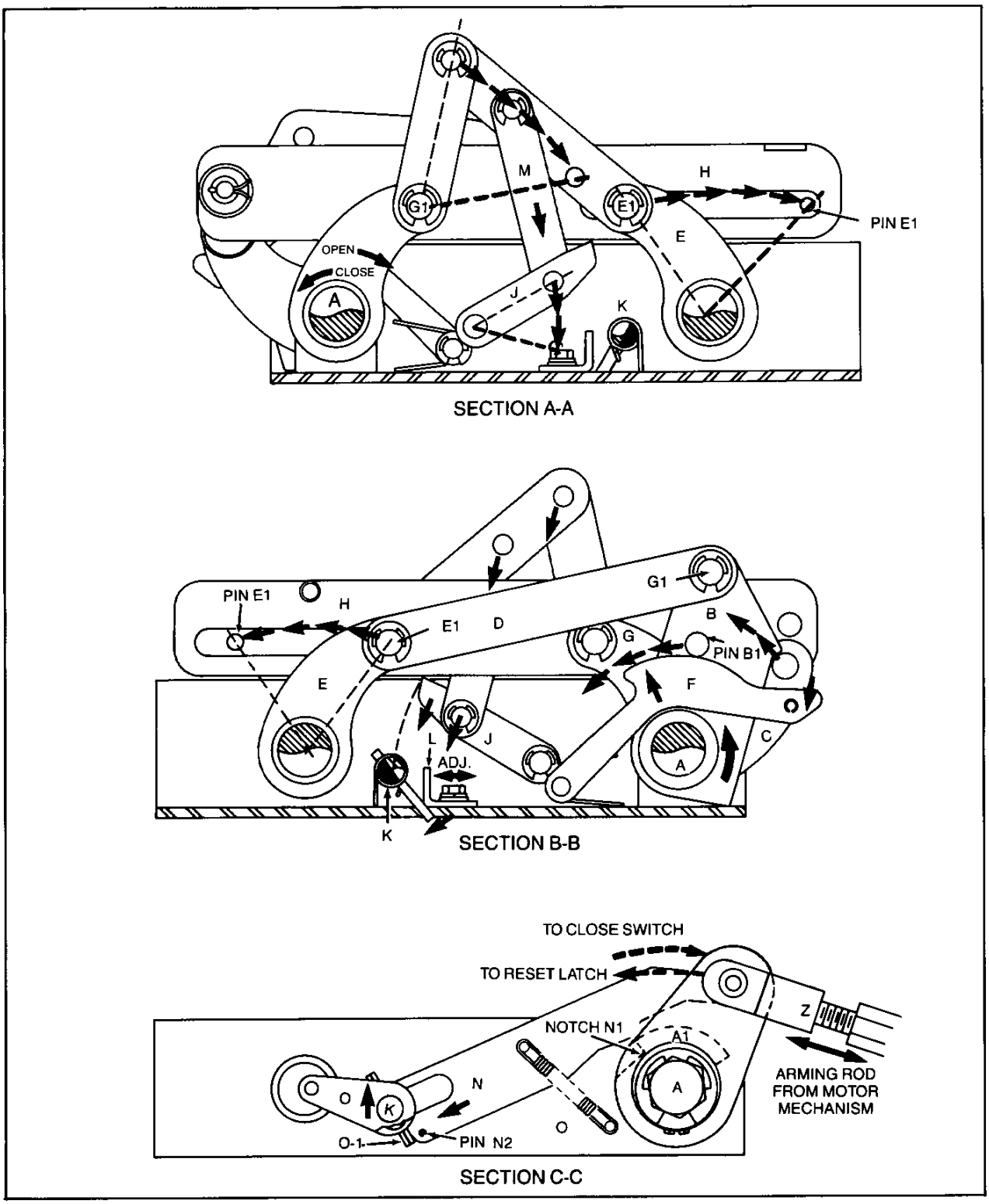

Figure 8
Mechanism-Sequence of Operation (Sheet 2 of 2)

Pole Assembly

With reference to FIG. #9, the VISI-VAC interrupter incorporates a vacuum interrupter and disconnect blade assembly. Each pole of the interrupter consists of two disconnect blades which are kept in a spaced and fixed relation to each other by a spacer element associated with springs and lock nuts.

The vacuum interrupter is attached by a threaded shaft (of the fixed contact) to a bus clamp, which is electrically connected to a power source or load. The vacuum bottle is encased in a cylindrical epoxy insulator housing. The vacuum within the bottle is approximately 10^{-7} Torr. A potting compound is inserted between the insulator housing and the vacuum bottle.

Contacts are disposed within the vacuum bottle wherein the vacuum serves as an effective insulator. When the connection is open, as shown in FIG. #10, the stationary and movable contacts are separated by about 0.25 inch. A small displacement of the movable contact is sufficient to open or close the power connection to a load. A bellows allows the contact to move without loss of vacuum from the bottle.

Movement of the movable contact is minute during the breaking or connecting of the circuit.

The disconnect blade assembly is visible, allowing the operator to see whether the disconnect is open or closed.

The opening and closing operations are achieved by means of the positive interlock mechanism located between the vacuum interrupter and the visible disconnect. For the opening operation, a simple one stroke applied force effectuates three distinct sequential steps which (a) releases the spring bias forcing the movable contact against the fixed contact of the vacuum interrupter; then (b) retracts the movable contact away from the fixed contact; and finally (c) disengages the disconnect blades from the blade's fixed contact.

With reference to FIG. #9, a push rod (attached to the disconnect blade assembly) is pushed by the main shaft. The push rod is connected to a pivot. The applied upward force on the push rod is translated through the pivot to a bell crank mechanism that rotates counterclockwise about a pivotal shaft. This causes a linkage shaft to move about the pivot so that a pivot wing pivots clockwise. As a result, an interrupter pivot, illustrated in FIG. #9, acts to close the erosion gap between the pivot and a lock nut attached to the end of the shaft by releasing the bias force of a bias spring (mounted on the shaft).

The movable contact is located at the end of the shaft within the vacuum bottle. The bias force on the contact from the spring can be released. At this point which is the end of the first phase of the sequence, the contacts are still "made" by virtue of a force arising from the difference in pressure between the vacuum in the bottle and the external atmospheric environment (although the spring bias force no longer is being applied). In the closed circuit state, a roller shaft coupled through a configured slot in an activator cam is fixed at the bottom of the slot. At the end of the first phase, when the spring is no longer biased by the action of the pivot wing, the roller shaft is still in position "A" and the cam is still oriented as illustrated in FIG. #9.

With the continuing force on the push rod, the bell crank pivots, causing the movable contact to move outwardly from the vacuum bottle. Pivoting of the bell crank causes the linkage shaft to move downward causing the pivot wing to pivot, resulting in a counterclockwise rotation of the activator cam so that the roller shaft is moved and guided to position "B" (FIG. #10). A retainer ring prevents the escape of the roller shaft from the slot in the cam. At this point in the sequence, the contacts of the vacuum interrupter are open or disconnected so that power is interrupted.

After the second phase of the sequence has been completed, the continuing upward force on the push rod causes the disconnect blade assembly to move, thereby disconnecting the blade assembly from the stationary terminal. (The vacuum interrupter has previously been disconnected during the second phase, so there is no problem of arcing.) The disconnect blade assembly is now in a position well removed from the terminal, and the operator has a clear visual indication of the disconnection. During this third phase of the sequence, the roller shaft moves along the guide slot of the cam to position "C" and locks the vacuum interrupter's movable contact in the open position. To make a closing operation, the sequence of three phases (or steps) is reversed, while the operator pulls the push rod down in a continuous one stroke motion. A retraction of the push rod causes the disconnect blade assembly to close, seating the blades in the stationary terminal. The pivot wing and wing roller follow the cam to the center position "B". At this point, the vacuum interrupter contacts are in close contact, but in an unbiased state. It should be noted that the disconnect blade assembly has closed before the vacuum interrupter's contacts have met during the close mode.

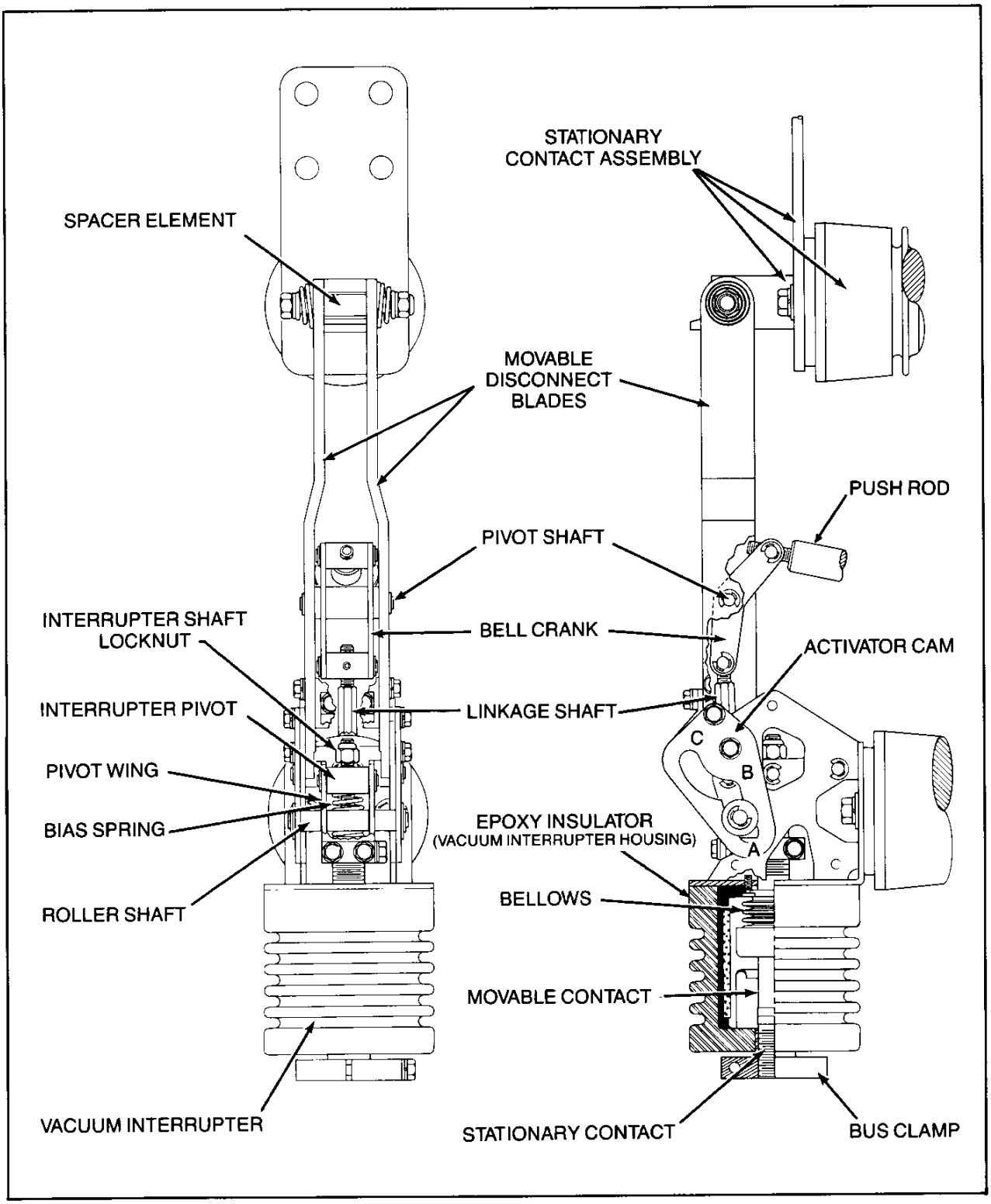

Figure 9
Vacuum Interrupter and Disconnect Blade Assembly (Shown in the Closed Position)

After the disconnect has closed, the bell crank pivots clockwise, causing the linkage shaft to move upward, thereby pushing the pivot wing linearly towards the vacuum interrupter. The wing roller follows the activator cam to the closed position "A" (FIG. #9), which causes the biasing of the spring and locking of the disconnect blades in a closed position. The bell crank continues to rotate clockwise and **overtoggles** to a position that locks the vacuum interrupter's contacts closed in a bias position. (In this position, the combination of the bell crank and spring are fixed and the contacts of the vacuum interrupter are securely closed) (see FIG. #11).

The components described in the previous paragraph are made of electrically conducting materials (i.e., copper or steel) except where insulation is required. Electrical foil connectors (FIG. #10), are responsible for maintaining the electrical integrity between the blade disconnect and the vacuum interrupter. The foil connector block serves as a limiter (or stop) for the linkage shaft, which in turn limits the extent of travel of the bell crank. Foil retainers provide a constant uniform pressure to the foil connectors.

TESTING

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

WARNING

KEEP CLEAR OF MOVING PARTS, AS INJURY MAY OCCUR DUE TO MOVING BLADES AND SPRING DISCHARGING MECHANISM. HIGH VOLTAGE BUS MUST BE DE-ENERGIZED AND GROUNDED BEFORE PERFORMING TESTS 1., 2., & 3.

1. **Operation and Time Limits**

   a. Interrupter arms and closes within 18 seconds (max) after the motor is energized at 100% (120 VAC) rated control voltage.

   b. Interrupter arms and closes when energized at 85% (100 VAC) rated control voltage. Time to close may be longer than at 100% rated voltage.

   c. Interrupter opens within 3.5 cycles after trip coil is energized at 85 to 100% rated control voltage.

2. **Contact Overlap Timing Check**

   Vacuum interrupter and disconnect blades (which are connected in series) have a time differential between making and breaking during closing and opening operations.

   During "closing", the differential is 9-12 milliseconds (blade closes first **then** vacuum interrupter).

   During "opening", the differential is 12-18 milliseconds (vacuum interrupter opens **first** then blade).

3. **Contact Resistance (Interrupter Closed)**

   Measure contact resistance from the upper contact pad (disconnect stationary contact) to the block at the bottom of the vacuum interrupter. Resistance values normally will not exceed 85 microhms. (For reference, the resistance of the vacuum interrupter (alone) normally will not exceed 30 microhms.) Resistance **values will change** after the interrupter is in service.

4. **Dielectric Tests**

WARNING

HIGH VOLTAGE INCOMING LINE CABLES ARE TO BE DE-ENERGIZED AND ISOLATED FROM INTERRUPTER. OUTGOING LOAD CABLES ARE TO BE DE-ENERGIZED AND ISOLATED FROM INTERRUPTER.

DISCHARGE TO GROUND THE VACUUM INTERRUPTER CONTACTS (MOVABLE & STATIONARY) AND DISCONNECT BLADES BEFORE HANDLING. THESE AREAS CAN RETAIN STATIC CHARGE AFTER A HIPOT TEST.

KEEP AREA CLEAR OF PERSONNEL NOT INVOLVED IN TEST. USE RECOGNIZED SAFETY PRECAUTIONS WHILE PERFORMING DIELECTRIC TEST.

WHILE HIGH VOLTAGE IS PRESENT, MAINTAIN A DISTANCE OF 6 FEET FROM THE INTERRUPTER.

DO NOT EXCEED THE SPECIFIED TEST VOLTAGE AS RADIATION INJURIOUS TO PERSONNEL MAY BE EMITTED.

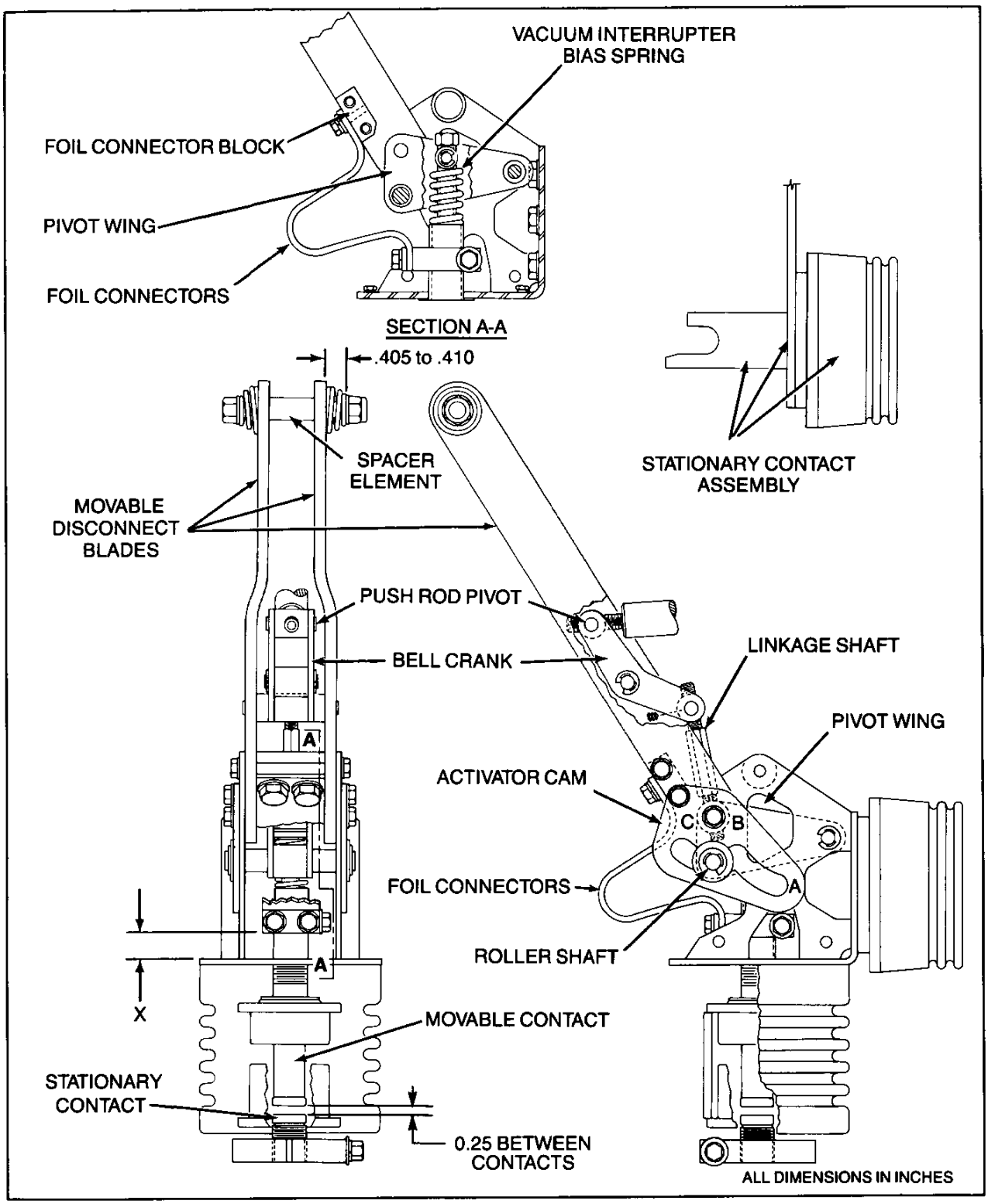

Figure 10
Vacuum Interrupter and Disconnect Blade Assembly (Shown in the Open Position)

a. **Interrupter - Primary Parts Apply 36KV AC, 60Hz to each of the following connections for one minute:**

1. **Interrupter Closed**

Phase to Phase. Energize each phase separately with other phases and interrupter frame grounded.

2. **Interrupter Open**

Across Contacts. Energize each of the top stationary terminals of each phase of the interrupter separately, ground bottom contact of interrupter frame and both ends of all other phases.

Across Vacuum Interrupter Alone. Energize bottom contact of each vacuum interrupter, ground pivot assembly (between blade pivot and vacuum interrupter). This test is performed to verify the presence of vacuum within the vacuum interrupter.

b. **Control Circuits**

NOTE: Isolate all control wires running to ground. Isolate solid state devices. Do not Hi-Pot these devices.

1. **Control and secondary wiring to ground. Apply 1500 volts AC for (1) one minute. All switches closed during test.**

2. **Motor. Disconnect leads and short together, apply 900 volts AC for (1) one minute between motor lead and grounded frame of interrupter.**

ADJUSTMENTS AND MEASUREMENTS

WARNING

BEFORE SERVICING, COMPLETELY ISOLATE THE INTERRUPTER ASSEMBLY FROM ALL SOURCES OR BACK-FEEDS. DISCHARGE TO GROUND THE VACUUM INTERRUPTER CONTACTS (MOVABLE AND STATIONARY) AND DISCONNECT BLADES. MAKE SURE SPRING ENERGY IS RELEASED FROM THE OPENING AND CLOSING SPRINGS WITHIN THE MECHANISM.

Adjustments are set at the factory prior to shipment and should not require re-adjustment prior to installation.

Adjustments and measurements below are listed for checking purposes. Should future adjusting be required due to a change of parts or at maintenance period shutdown, the values and procedures listed below should be followed.

Erosion Indicator And Interrupter Contact Pressure

Erosion of interrupter contacts occurs due to the loss of contact material following many interruptions. Erosion is indicated by a reduction in the "y" dimension shown on each bottle label and measured as shown in Figure 12 in the closed position. Contacts must be replaced after .080" reduction in the "y" dimension. This dimension was measured on the right hand side of each pole between the vacuum interrupter mounting bracket and the interrupter foil connector.

The bell crank assembly and linkage shaft must "overtoggle" when the measurement is made. (see FIG.#10 & #11)

The erosion gap should be checked after the interrupter has seen 600 load break operations (600A) or after withstanding a fault.

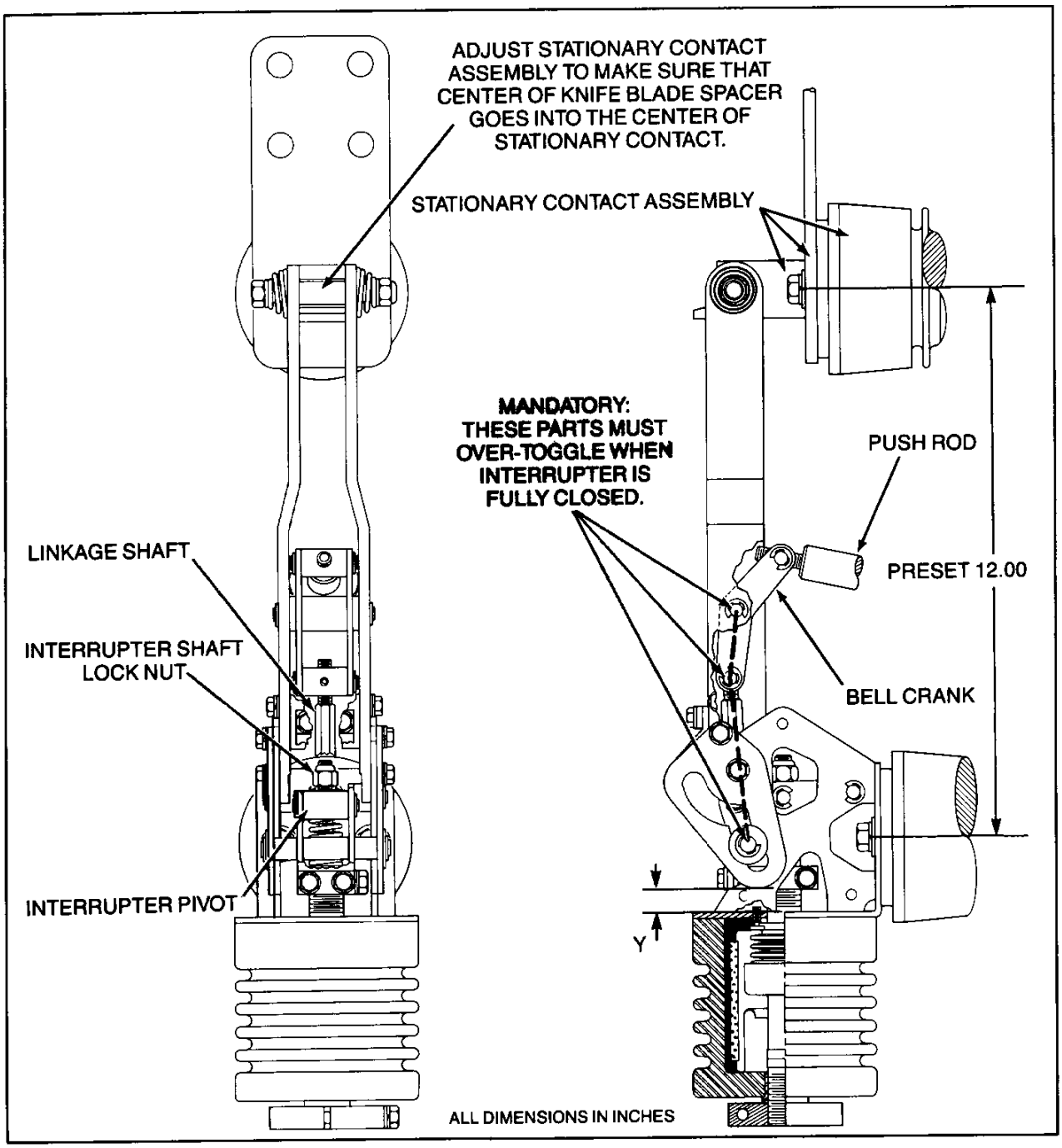

Figure 11
Vacuum Interrupter and Disconnect Blade Assembly (Shown in the Closed Position)

Vacuum Interrupter Contact Stroke

The primary contact stroke is preset at the factory at .25″ ± .031″ (see FIG. #12). This dimension can be measured as the **difference** between the "X" dimension (distance between the vacuum interrupter mounting bracket and vacuum interrupter foil connector while the interrupter is in the fully "open" position) and the "Y" dimension (distance between the vacuum interrupter mounting bracket and vacuum interrupter foil connector while the interrupter is in the fully "closed" position).

Vacuum Interrupter Bias Spring

The vacuum interrupter bias spring is factory set at 1.15 ± .03" max with approximately .100" gap between the interrupter shaft locknut and interrupter pivot with the interrupter in the fully "closed" position. This distance is measured between the vacuum interrupter pivot and the end of the vacuum interrupter's movable contact shaft. Adjustment is made by tightening or loosening of the linkage shaft (see FIG. #12, section A-A). THIS ADJUSTMENT IS FACTORY SET AND SHOULD ONLY BE PERFORMED WHEN INSTALLING A NEW VACUUM INTERRUPTER AS ANY CHANGE SUBSEQUENT TO THE FACTORY ADJUSTMENT WILL EFFECT THE CONTACT EROSION ALLOWANCE.

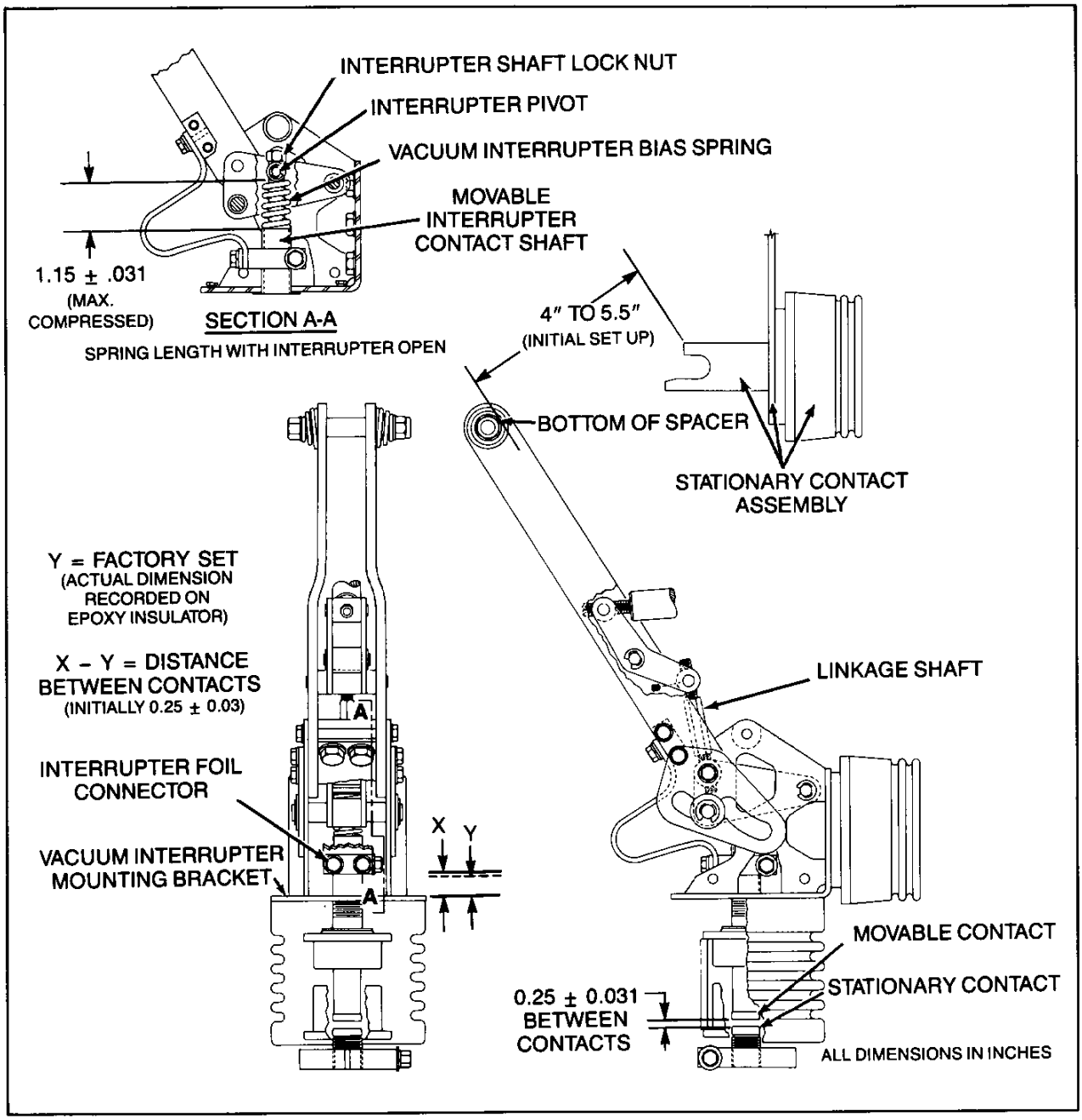

Figure 12
Vacuum Interrupter and Disconnect Assembly (Shown in the Open Position)

WARNING

EXTREME CARE MUST BE OBSERVED TO AVOID APPLYING ANY TWISTING FORCE UPON THE MOVING TERMINAL (AND BELLOWS) OF THE VACUUM INTERRUPTER. TWISTING THE TERMINAL WILL DAMAGE THE INTERRUPTER AND MAY CAUSE LOSS OF VACUUM.

Trip Shaft Stop

The trip shaft stop is factory adjusted to give a latch engagement of .062" ± .005" (see FIG. #13). Adjustment is only required should the mechanism not latch properly. To adjust, loosen the 1/4" - 20unc-2A × 1/2" hex steel cap screw and slide the trip shaft stop to rotate the trip shaft until a "latch engagement" distance of .062" ± .005" is achieved between the trip shaft and trip cam weldment (see Detail "A" & "B-B" of FIG. #13 and "Turnbuckle Adjustment" page 21). The slotted spring pin through the trip shaft should rest against the trip shaft stop. Tighten the hex cap screw to 60 LB-IN. Operate mechanism to verify proper latching is taking place.

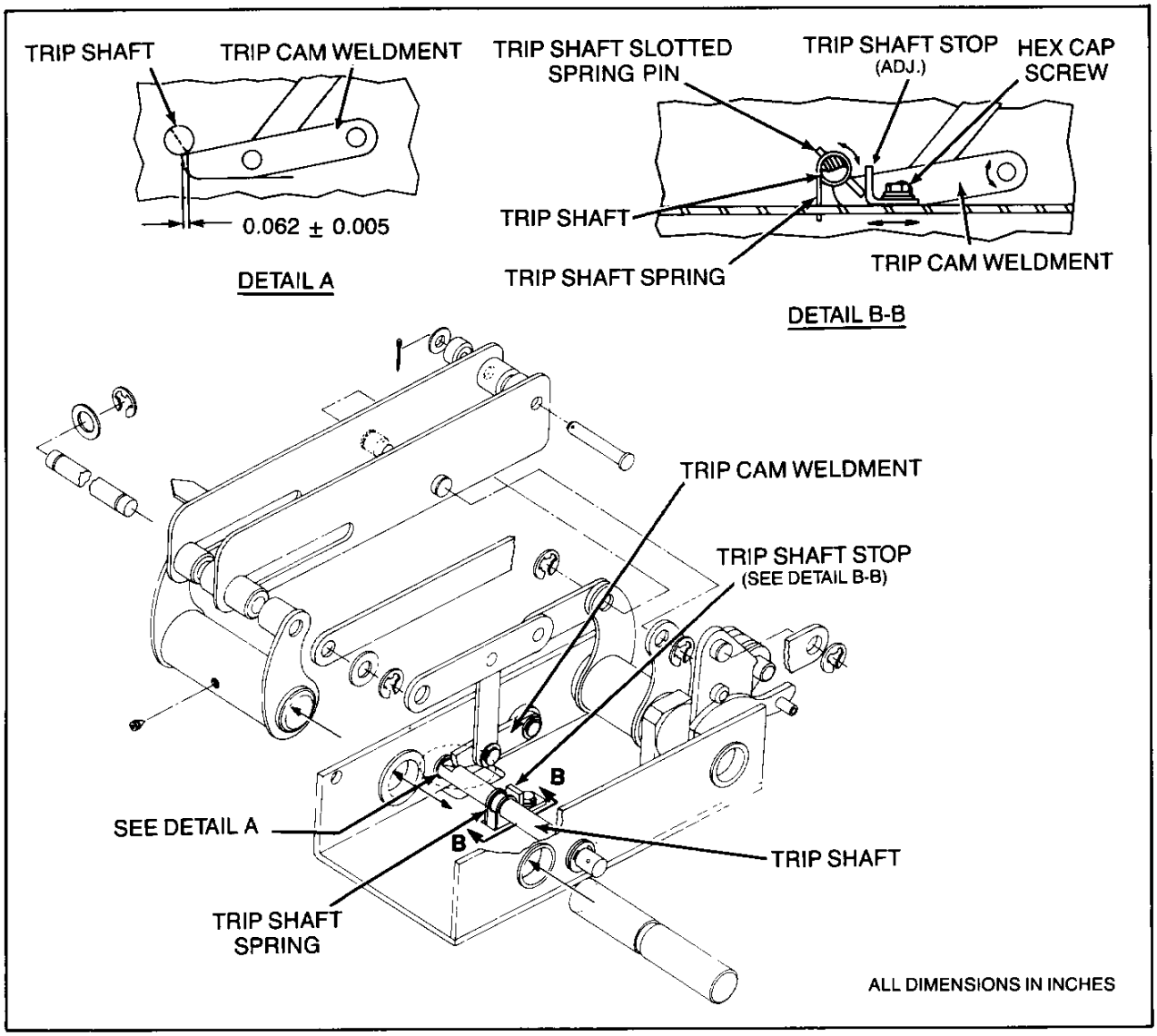

Figure 13
Mechanism - Trip Shaft Stop Adjustment (Exploded View)

Trip Lever/Solenoid Adjustment

The gap between the trip lever roll pin (located on the trip lever weldment) and the trip coil block (located on the solenoid) is factory set at .062" (see FIG. #14, detail - "A"). Adjustment is made by loosening the solenoid mounting screws and sliding the solenoid upward or downward until the gap distance specified is achieved. Tighten the mounting screws.

Limit Switch Setting

The limit switch has been factory adjusted. The switch is actuated by the roller shown in FIG. #15. The switch is adjusted making sure that when the interrupter is closed and the actuator roller 'P' is fully extended, the normally closed contact (NC) (which is in the closing circuit - see wiring diagram FIG. # 7) has been opened. Loosening of the lower mounting screw holding the mounting plate to the motor housing permits adjustment of the limit switch leaf and roller engagement by rotating the entire mounting plate.

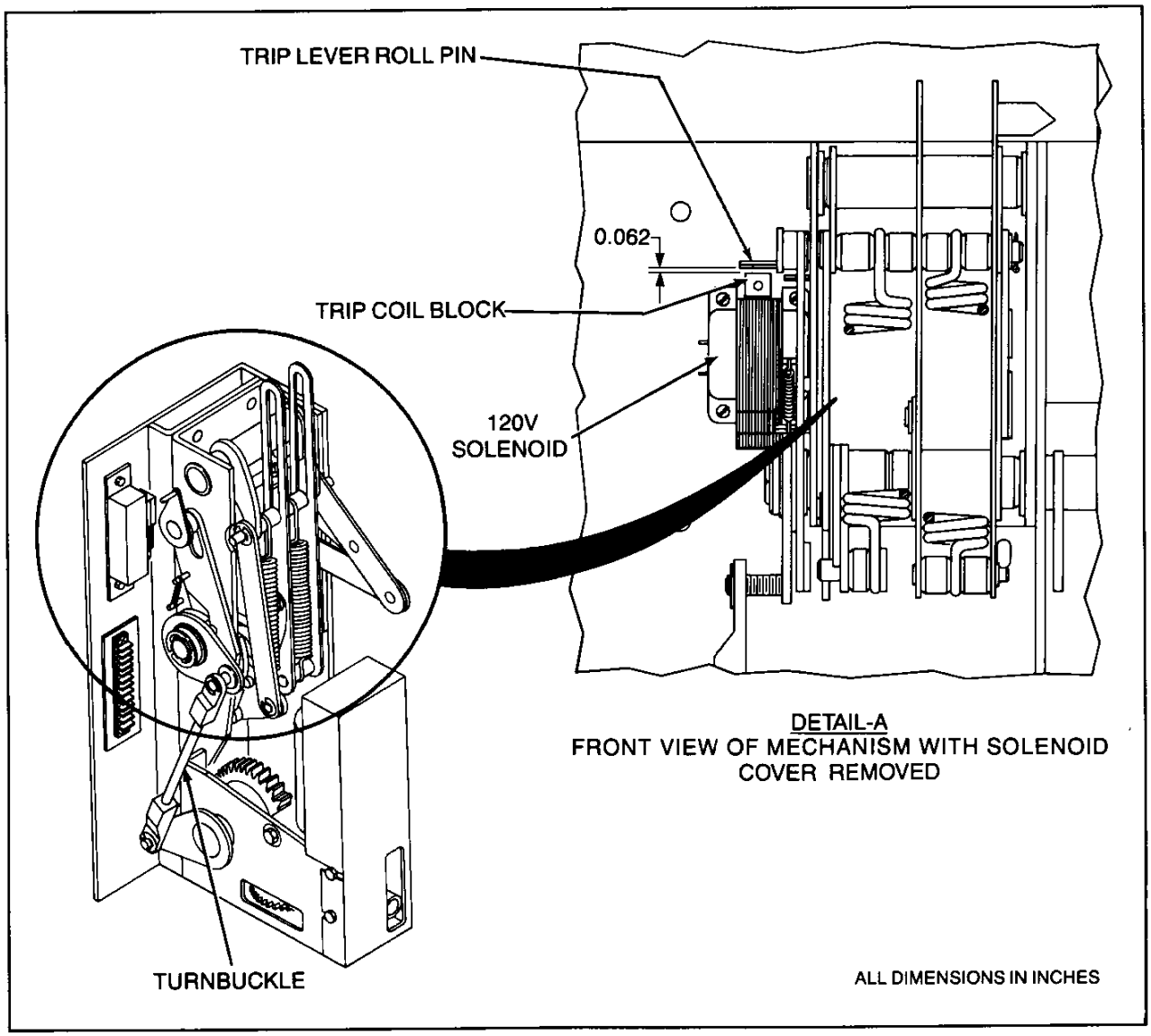

Figure 14
Solenoid Trip Lever Adjustment

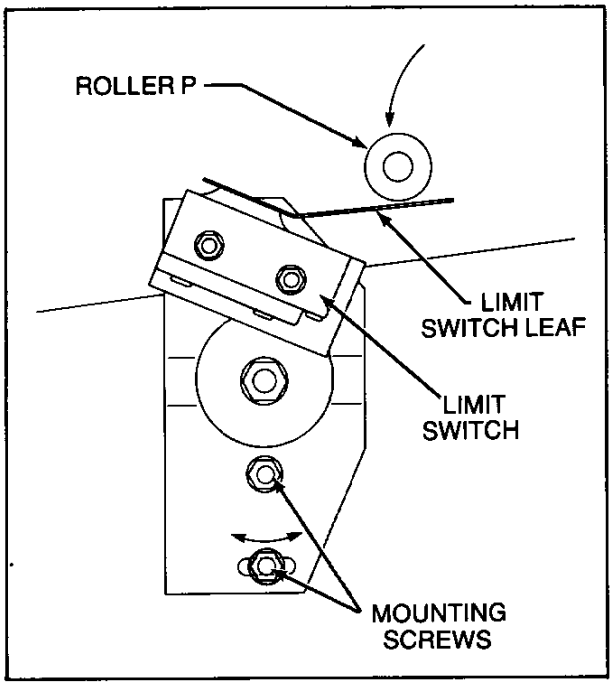

Figure 15
Limit Switch Adjustment (Located on Exterior of Motor Housing)

Turn Buckle Adjustment

The intitial adjustment has been made at the factory.

The length of the turn buckle (see FIG. #14 for location) is set so that the motor charging shaft crank will move the mechanism arming shaft ('A' in sectional view B-B of FIG. #8) counter clockwise sufficient distance to arm the opening spring and re-set the trip latch. The same set length must also allow sufficient rotation (when 'A' is moved (CW) for closing the interrupter) to actuate the closing catch ('J' in sectional view B-B of FIG. #8).

Adjustment of the length is done by loosening the jam nut at one end of the assembly and rotating the hexagonal connecting rod as required. Tighten the jam nut after rod length has been set.

Push Rod Adjustment

The initial adjustment has been made at the factory.

The push rod is connected between the main shaft arm and the bell crank assembly. The length is adjusted (when required) so that when the main shaft is rotated to close the disconnect blades it will also pull the bell crank assembly and linkage shaft into toggle (see FIG. #11).

The adjustment is made by half-turn increments of the push rod after it has been disconnected from the main shaft arm. To assure "over toggle", adjust the push rod 1/2 to 1 full turn **beyond** the point where the bell crank "just over toggles". Reconnect the push rod to the main shaft and operate the interrupter several times to assure "over toggle" is taking place.

Main Shaft Stop Adjustment

The initial adjustment has been made at the factory.

No change in the stop adjustment should be required unless it becomes necessary to re-adjust the re-setting coordination of the trip latch and closing catch (see section entitled "Mechanism - Description And Sequence Of Operation").

To adjust, loosen jam nuts and turn the stop screw (see FIG. #16 for location) as required. Re-tighten jam nuts after adjustment.

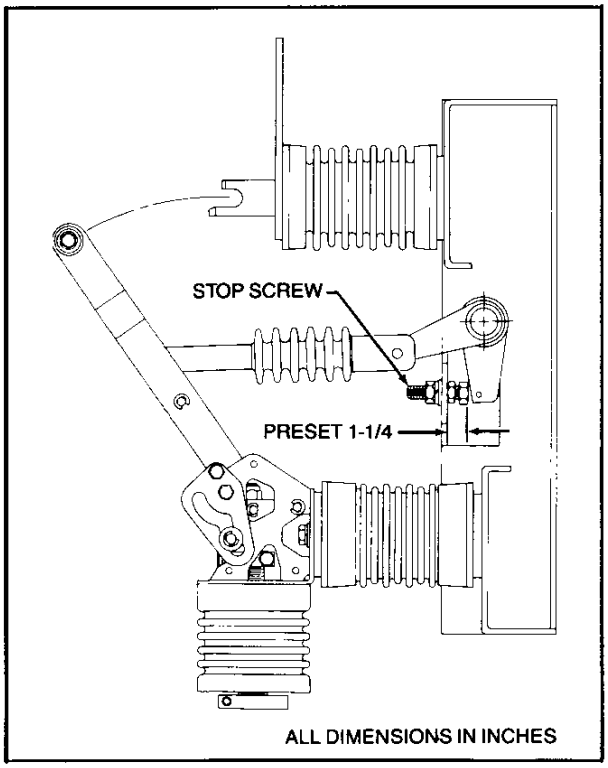

Figure 16
Main Shaft Stop Adjustment
(Side View with Interrupter Side Plate Weldment Removed)

MAINTENANCE

WARNING

BEFORE SERVICING, DISCONNECT ALL POWER SOURCES FROM THE INTERRUPTER ASSEMBLY. DISCHARGE TO GROUND THE VACUUM INTERRUPTER CONTACTS (MOVABLE AND STATIONARY) AND DISCONNECT BLADES. MAKE SURE SPRING ENERGY IS RELEASED FROM THE OPENING AND CLOSING SPRINGS WITHIN THE MECHANISM.

Because of the wide variations in operating uses and environments, each operating company should develop a maintenance schedule, based on operating experience, which will provide assurance of proper load interrupter condition. Until such a schedule is determined, it is recommended that load interrupters be inspected after one (1) year or every 150 operations, whichever occurs first. It is also recommended that load interrupters be inspected after severe fault operation and notation of any contact erosion be recorded.

Checks:

1. **Erosion Indicator and Interrupter Contact Pressure**

   Review erosion indicator information listed under "Adjustments".

2. **Insulating Surfaces**

   Using a clean, dry cloth, remove all dirt and moisture from the outside of all insulating parts.

3. **Mechanism**

   The entire operating mechanism should be inspected for loose hardware and worn or broken parts. All wiring should be checked for loose connections and damaged insulation. Inspect all bushings and contact surfaces for damage or excessive wear. Verify proper mechanism adjustment settings as previously specified.

4. **Lubrication**

   Square D type VISI-VAC interrupters as received from the factory have been properly lubricated. Periodic cleaning and lubrication of the device will be required and the maintenance interval between lubrications will be dependent upon the amount of usage, ambient conditions, etc.

   Interrupters that are normally closed, require lubrication of the knife blade contacts and mechanism every 600 open-close operations.

   Interrupters that are open for long periods of time should have the knife blade contacts cleaned and greased lightly as service conditions dictate.

   The operating mechanism should be periodically exercised.

   Lubrication of the mechanism and all movable **non-current carrying** interrupter parts should be lubricated with LUBRIPLATE #630-2 multipurpose grease or equivalent.

   Lubricate the **current carrying** main movable and stationary contacts with MOBILUX EP 2. MOBILUX is made by Mobil Oil Corporation, New York, New York 10017.

   It is recommended that the VISI-VAC interrupter be manually operated several times after lubrication and observed for proper operation.

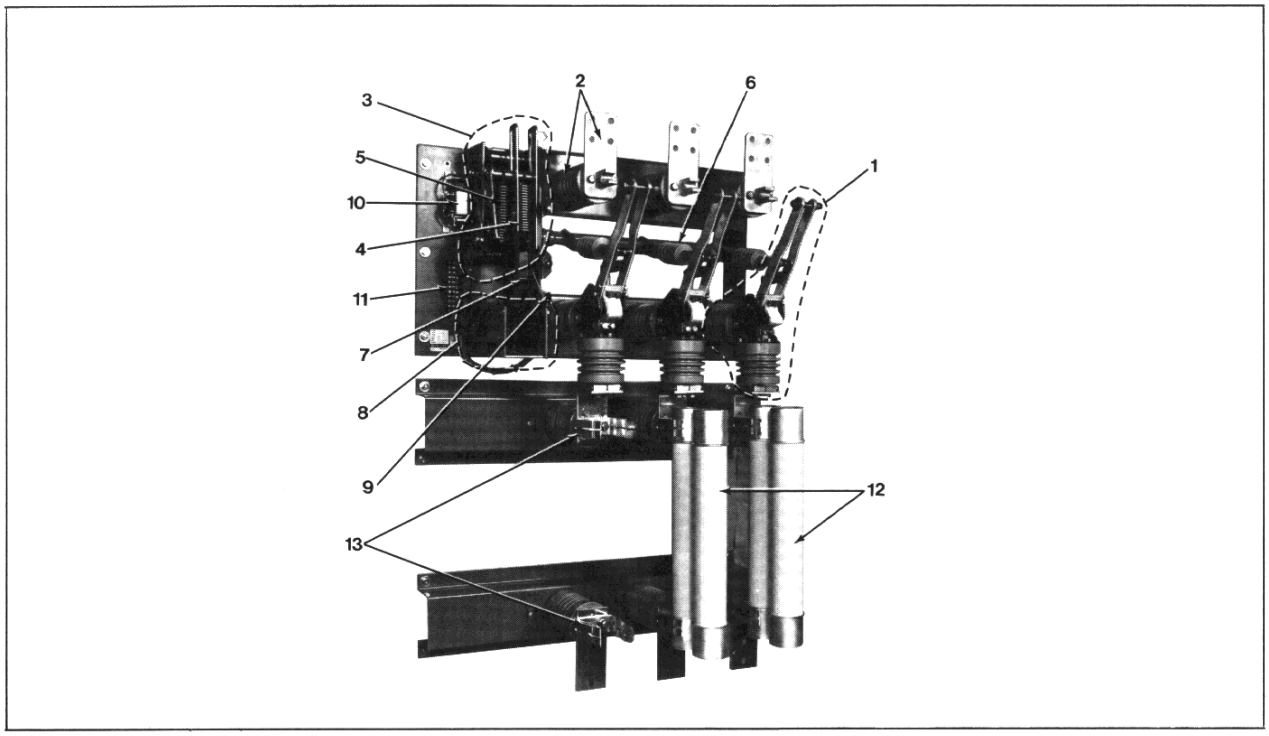

Figure 17
Fuse Interrupter with Barriers Removed

RECOMMENDED SPARE PARTS AND/OR RENEWAL PARTS

Quantities are **not** based upon expected fatigue or wear problems, but upon possible field contingencies where movable assemblies are operated and possibly damaged and may require fast replacement of such parts from stock.

	Interrupter Quantities On Hand		
Description	1-5	6-50	Part #'s
Interrupter Parts			
1. Lower Interrupter Ass'y	1	2	48119-067-50
2. Upper Interrupter Ass'y	—	1	48119-004-50
3. Mechanism	—	2	48119-144-52
4. Open Spring	1	2	48930-008-01
5. Close Spring	1	2	48930-011-01
6. Push Rods	1	2	48119-063-01
7. Charging Motor	—	1	48119-201-50
8. Worm Gear Ass'y	—	1	48119-202-50
9. Limit Switch Ass'y	1	2	26202-07093
10. Trip Solenoid Ass'y	1	2	48119-156-50
11. Terminal Block	1	2	48119-204-01

	Interrupter Quantities On Hand		
Description	1-5	6-50	Part #'s
Fuse Parts (Expulsion Type—Not Shown)			
Fuse Refills	6	12	*
Fuse "live parts" Kit	1	4	*
Fuse Silencers	1	4	*
Fuse Holders	1	4	*
Fuse Parts (Current Limiting)			
12. Fuses	6	12	*
13. Fuse "live parts" kit	1	4	*
Barriers (Not Shown)			
Interrupter Barriers			
Left	1	4	48119-198-50
Right	1	4	48119-197-50
Fuse/Interrupter Barriers	1	4	*

*Part numbers vary depending on fuse size. Contact your local Square D field office for applicable part numbers.

Table 3

SQUARE D COMPANY
330 Weakley Road, Smyrna, Tenn. 37167

Manual 9845-2

Litho 2M 4/88

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