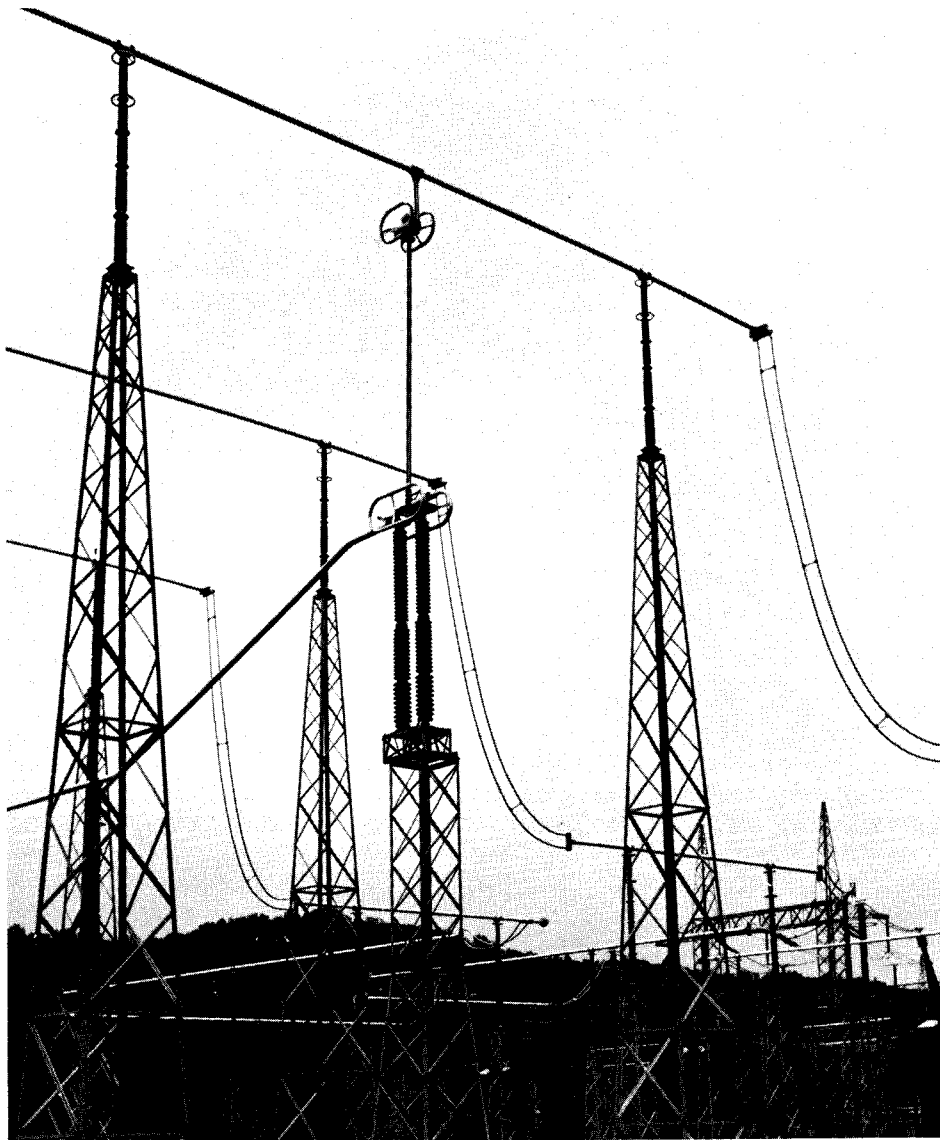


**AIR SWITCHES – OUTDOOR**

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**INSTRUCTIONS**

**VT1 VERTICAL-REACH  
230 THRU 500 KV**



**ITE Imperial**  
CORPORATION



## INSTRUCTIONS FOR 230-THRU 500-KV VT1 VERTICAL-REACH SWITCHES

### RECEIPT

Check the total shipment of switch-pole units and operating mechanism components against the shipping notice, bill of material and installation drawings.

Report any shortages or damages immediately to the carrier and file proper claim. The shipping notice (designated S/N and a number) identifies the numbered crate or carton in which the various item numbered parts of the bill of material are to be found.

**Typical example:** The bill of material drawing covering switch and control lists Item 15 as a ground clamp. The shipping notice lists Item 15 and its drawing number as being included in Carton 1252-54. Similarly, all component parts of the switch and control will be identified by inclusion in properly numbered cartons or crates.

### INSTALLATION AND ADJUSTMENT

#### Step 1 - Checking Bases

Check bases to make sure that the two insulator supports are square and level. Also they must be exactly the same height. If necessary, adjust leveling screws to achieve this - Refer to Fig. 1.

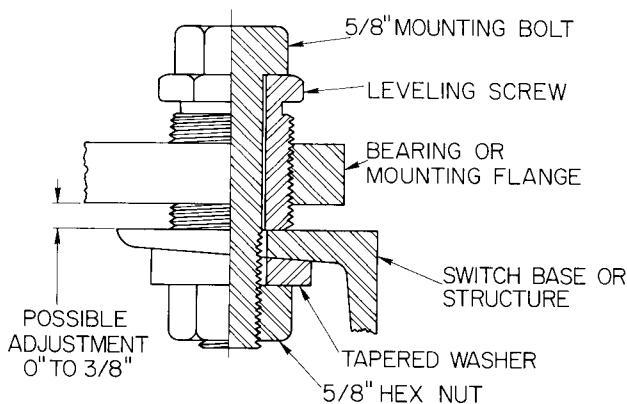


Fig. 1. Insulator leveling screw

#### Step 2 - Mounting Bases

Referring to the installation drawing, assemble the bases on the supporting structures, making sure they are level and properly oriented.

#### Step 3 - Mounting Insulators

Assemble the insulator columns in accordance with the installation and single-pole switch drawings. Leveling screws are provided to adjust for variations in heights or the angles of the insulator columns to the mounting surface, Fig. 1. Special care must be exercised to be sure insulators are plumb.

#### Step 4 - Mounting Blade Assemblies

Do not remove steel banding which holds blade locked in best position for shipment, until assembly is bolted in place.

Install blade hinge assemblies on insulator columns. Care should be exercised when hoisting these assemblies into position to prevent scratches or damage to parts.

Remove steel banding and by moving cranks or couplings turn the rotating insulators in a clockwise direction (looking down from the top) and lower all three blades to full open position.

#### Step 5 - Installing Operating Pipes and Mechanisms

##### ON SWITCHES WITH PUSH-PULL INTERPHASE RODS

With all blades resting on their open position stops, install interphase rods. Next install the offset bearing and offset link to the drive switch. The adjustable radius crank on the offset bearing should be checked for proper position and radius according to the drawings.

Install the vertical-operating pipe and then the gear mechanism at ground level. Remove the position indicators on the gear mechanism temporarily and then drill or pierce pipe at coupling as directed on drawing. With blades open and offset bearing stop crank against open position stop, re-assemble the open position indicator on the worm gear coupling 1/4" away from the raised boss on the cast housing, see Fig. 2.

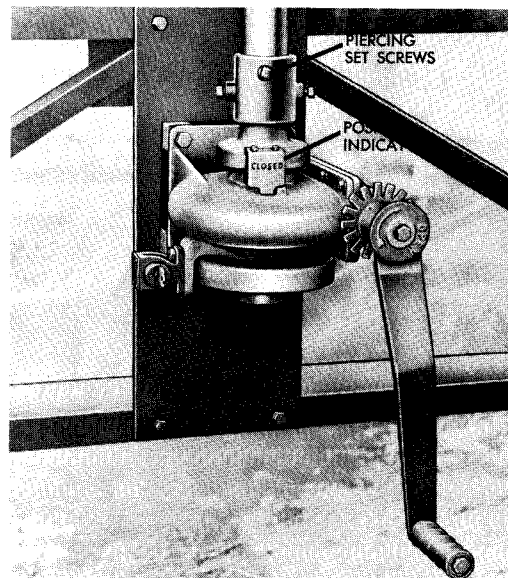


Fig. 2. Geared mechanism



### Step 5 - Installing Operating Pipes and Mechanisms (continued)

ON SWITCHES WITH TORSIONAL INTERPHASE RODS  
With all blades resting on their open position stops, install all gear boxes and interphase rods at switch base level. Next install the vertical-operating pipe and operating mechanism at ground level, as follows:

For manually-operated switches, install the manual mechanism on the bottom of the pipe. On motor-operated switches, a stop mechanism similar to the manual mechanism but without a handle, is installed on the bottom of the vertical-operating pipe and then the motor mechanism directly under it. The open and closed positions of the stop mechanism, or the manual operating mechanism should be set in the following manner: (Refer to Figs. 3 and 4).

- a. With the 3-pole switch in the fully open position, remove Bolts (3) and Cover (4) from front of mechanism.
- b. Turn operating handle toward the open position until Stop Bolt (10) or (16) hits Stop (11) or (14), which is part of the Traveling Indicator (21). Check to see that the stop bolt interferes with the Stop by  $3/32"$ . Turn operating handle toward the closed position to be sure that the stop bolt clears the stop after one (1) revolution, then return handle to the open position.
- c. Drill a  $5/8"$  diameter hole in operating pipe using holes in Coupling (1) as a template and install Pin (2).
- d. Turn operating handle until closed position Stop Bolt hits Stop. Check to see that all three blades are vertical, and blade ends are turned over to a flat position.
- e. If more or less travel is necessary to fully open (or close) switch, Stop Bolts may be repositioned to any of the three (3) other holes in the Stop Discs. Adjust open position stop bolt to just clear stop after one revolution towards open, similar to adjustment in Step b.

AT THIS POINT, PROCEED TO STEPS 6 AND 7.

- f. If Key Interlocks (7) are used, they may be mounted at this time by removing the small rectangular Cover Plates (5). When Interlock Bolts are extended in Slot (17) (locked position), there should be a minimum clearance between the bolt and the edge of the Blinder Plate (15). To adjust blinder plates, remove Bolts (12) and take blinder plate assembly from mechanism. Each blinder plate may be moved up or down by loosening Bolts (13). After making adjustments, return blinder plate assembly to operating mechanism and recheck clearance.
- g. After operating mechanism is fully adjusted, replace Cover and Bolts (3 & 4).
- h. If direction of rotation does not agree with words on Cover Plate (6) and Direction Indicator (9), they should be turned over.
- i. Station Ground may be attached to any of the Mounting Pads (18).

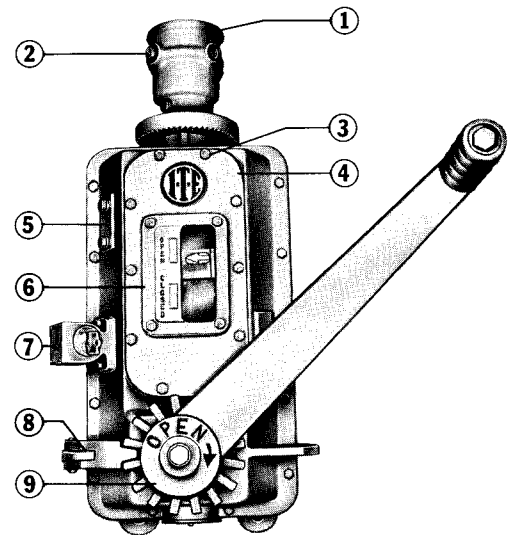


Fig. 3. Manual operating mechanism with stops

#### IDENTIFICATION OF PARTS - FIGS. 3 & 4

- 1,2 - Coupling and Pin
- 3, 4, 5, 6 - Cover Plates and Bolts
- 7 - Key Interlock
- 8 - Provision for Padlocking
- 9 - Direction Indicator
- 10, 16 - Stop Bolts
- 11, 14 - Stops
- 12, 13 - Bolts
- 15 - Blinder Plate
- 17 - Interlock Bolt Slot
- 18 - Mounting Pad
- 19 - Grounding Device Contact Fingers
- 20, 23 - Stop Discs
- 21 - Traveling Indicator
- 22 - Threaded Operating Shaft

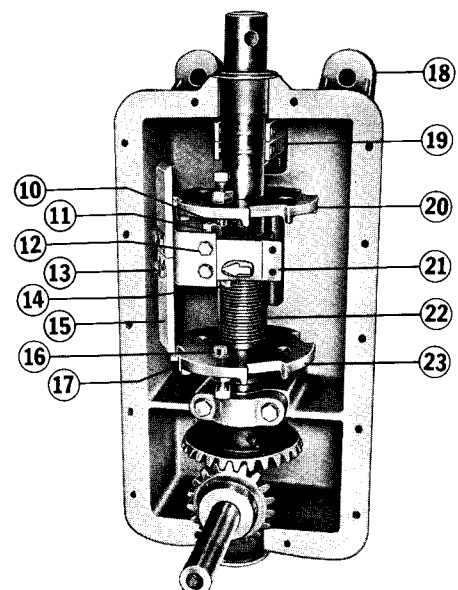


Fig. 4. Same as Fig. 3, exposing internal parts



**TERMINAL CONNECTIONS**

Because of the wide acceptance and use of aluminum conductors, the terminal surfaces are aluminum to provide an easy current transfer surface. (In cases where copper conductor is used, it is recommended that a tinned terminal clamp be bolted to the aluminum switch terminal pad.) However, if a non-tinned clamp is used, a liberal amount of grease should be used at the joint and all over the pad of the fitting.

An instruction tag is attached to the terminal clamps shipped with the switches for making aluminum connections as follows: (1) Clean all contact surfaces of conductors and fittings with a stiff wire brush to remove heavy oxide coatings until they become a typical fresh aluminum color. (2) Immediately coat these contact areas with a liberal amount of corrosion inhibitor such as NO-OX-ID Grade A Special or equivalent. (3) Abrade the contact surface again, this time through the applied compound with a stiff wire brush.

CAUTION - Do not remove the compound.

In making copper-to-aluminum connections: (1) Prepare all aluminum contact surfaces as described above. (2) Prepare any bare copper surfaces in the usual manner. (3) Do not abrade or wire brush any plated surfaces; a few light rubs with fine steel wool before greasing is sufficient. (4) Make connections and tighten bolts.

**ORDERING INFORMATION**

In ordering parts or in correspondence regarding this equipment, contact nearest I-T-E Sales Office and state the voltage, current rating, type and the serial number as indicated on the switch name plate.

**RECOMMENDED TORQUE FOR ALUMINUM BOLTS**

Bolt Diameter Inches	Lubricated Threads		Dry Threads	
	In.-Lbs.	Ft.-Lbs.	In.-Lbs.	Ft.-Lbs.
1/2	240	20	420	35
5/8	480	40	720	60
3/4	720	60	1140	95



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### Step 6 - Installation of Jaw Assemblies

Jaw assemblies are mounted in many ways. Three of the more common are as follows:

- By a vertical bus drop from a horizontal bus run. (No insulators)
- By a vertical bus drop off the end of an inverted insulator stack.
- By a vertical bus drop between the end of an inverted insulator and the top of an upright insulator usually mounted on the blade hinge assembly.

By referring to the drawings you can see which of these apply and then mount the parts accordingly.

When arrangement (c) applies, the jaw assembly must be assembled on the vertical bus member before the upright insulator is installed. Set screws are provided to hold the jaw in place temporarily.

Using the operating mechanism, move the blades to the nearly closed position and adjust the jaw location on the vertical drop so that the blades enter centrally and at the proper height. If necessary adjust levelling screws or use shims on insulator supports to help achieve proper entry. For proper depth of penetration see next step.

### Step 7 - Switch Adjustment

#### BLADE PENETRATION

After making sure that offset bearing stops, stops at switch base (when used) and operating mechanism stops are all adjusted to permit it, close all blades completely so that blade end is twisted into contact. If penetration is not deep enough, move blades to a position near open and (see Fig. 5) remove Connecting Pin (A) and screw Clevis (B) OUT 1/2 turn then reconnect and try it.

Repeat until the desired position is reached. Clevis (B) should be screwed IN if less penetration is desired. Additional alignment is possible by using the leveling screws or shims at insulator mountings.

Additional adjustment for blade travel is available on switches with torsional interphase rods. See following instructions.

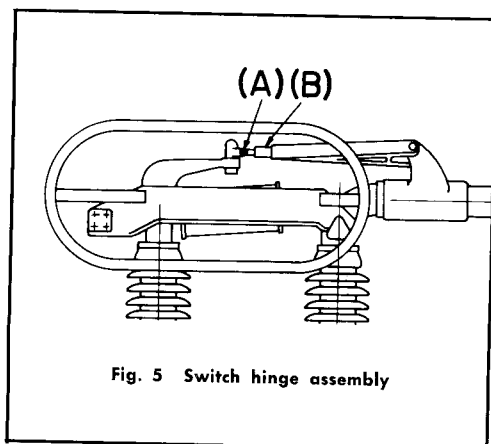


Fig. 5 Switch hinge assembly

#### ADDITIONAL BLADE TRAVEL

Some switches have an adjustable radius crank. This crank radius is set at the factory and normally should not require field adjustment. However, if the blade travels more or less than shown on drawings, adjustment to correct this can be made at the operating crank swivel by following directions below.

#### DIRECTIONS FOR CHANGING RADIUS (Fig 6)

- If either the open or closed position is satisfactory, then make these changes in the good position.
- Move linkage slightly to relieve pressure.
- Remove Pin (A).
- Loosen Locknut (C).
- Remove Locking Screw (B).
- Turn Adjusting Screw (D) clockwise to increase radius for more crank travel or counter-clockwise to reduce radius for less crank travel. Do not adjust more than one or two turns at one time. Replace Locking Screw (B) and tighten locknut.
- Before re-connecting, adjust clevis as follows:  
If adjustment was made in closed position, then clevis should be screwed into forked link approximately same amount that radius was increased; or out of forked link same amount that radius was decreased.
- If adjustment was made in open position, then clevis should be screwed out of forked link approximately the same amount that radius was increased or into forked link same amount that radius was decreased.
- Repeat steps (1) to (7) above until correct travel is achieved.
- After final adjustment has been made, secure locknut in position by drifting some of the metal of the countersunk thread into slot in nut.
- If necessary at any time, swivel assembly can be lifted out of crank by removing locknut entirely.

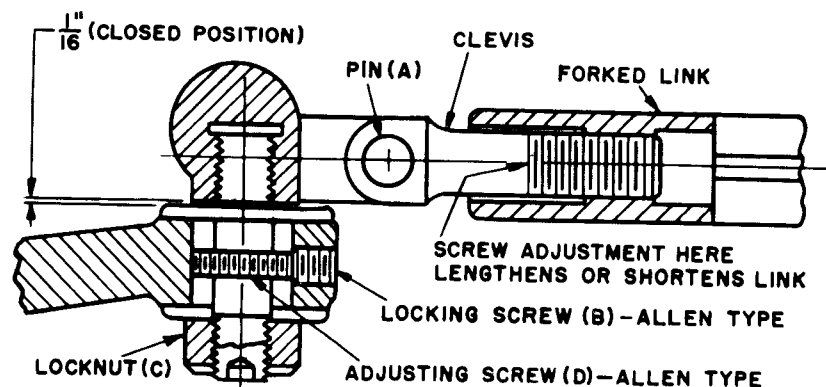


Fig. 6. Section of blade operating crank and connecting link screw adjustment



### Step 7 - Switch Adjustment (continued)

#### BLADE CONTACT ANGLE

Fig. 7 shows blade in closed position. The allowable difference in elevation from one side of the blade contact to the other (dimension X) is  $1/16''$  for each  $1''$  of contact width (A) is  $3''$ , then dimension (X) can be as much as  $3/16''$  and still be within the plus or minus  $4^\circ$  tolerance.

Also, Fig. 7 shows blade contact high on the right and low on the left. The reverse is also acceptable, high on the left and low on the right. It is common to have both situations on one three-pole switch. In fact, after all three poles have been adjusted in the open position, and then closed, you may find one pole will be high on the right, one fairly level and one high on the left. This is due to many variables and tolerances plus the free play or clearance in pin connections of all the switches and control parts.

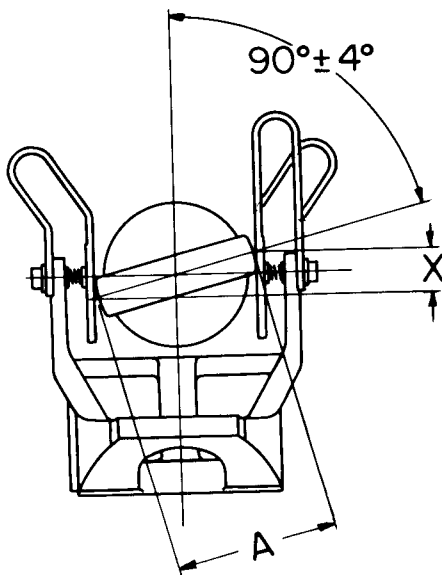


Fig. 7. End view showing blade contact angle

#### STOPS

If blade entry, penetration and contact angle are satisfactory, set all closed position stops.

On switches with Push-Pull Rods, install closed position indicator on worm gear coupling  $1/4''$  away from raised boss on housing.

On switches with Torsional Rods, return to the section on operating mechanisms (Step 5) and complete the instructions where applicable.

### Step 8 - Final Checks

The completed installation should be checked for the following:

- In the open position, the blade should rest on its stop.
- In closing, blade should make central entry into the jaw.
- In the closed position, blade must be in full contact and within tolerances described previously.

### Step 9 - Welding Jaw Assembly in Place

If all final checks have been made and prove satisfactory, then make all field welds for attaching jaw assembly as shown on drawings.

### Step 10 - Installation of Corona Rings and Balls

Corona rings should now be installed on the jaw and hinge ends of the switch as shown on the single-pole drawings. After these are in place, the corona balls should now be attached to the ends of the switch blades. The switches should now be ready for service.

### MAINTENANCE

A certain amount of care and inspection is recommended. The frequency of inspection depends on the atmospheric conditions at a given switch location and the frequency of operation. This service interval must be determined by the user. Before servicing the switch, be sure it is disconnected from all electric power sources and is properly grounded. Recommended maintenance is similar to that listed in the latest industry standards. First, it is important that the insulators are always clean. It is also important that the contacts be examined to see that they are aligned, clean, and bear with a firm uniform pressure. If the contacts are pitted, or burned to some extent, they should be removed and replaced.

Under normal service conditions, the jaw contacts should be examined and maintained at least once a year, depending upon the type of atmosphere to which they are exposed.

Periodic maintenance should consist of cleaning the contact surfaces thoroughly by carefully scraping off any contamination or deposit and sanding the surface to a smooth finish with clean fine emery or sand paper being careful to wipe off evidence of sand. With the contact surfaces entirely clean, a coating of lubricant should be applied. Suggested lubricants are Darina #2 grease or NO-OX-ID Grade A special. (Darina #2 grease is a Shell Oil Company product. NO-OX-ID is made by Dearborn Chemical Co., 310 South Michigan Ave., Chicago, Illinois.)

In general, operating linkages require virtually no maintenance. However, in contaminated atmospheres or where operation under sleet conditions is common, some lubrication at pivot points may be desirable. The grease used should be durable even when exposed to the elements, and should retain its viscosity over a wide temperature range.