

TYPE TH1/TH2 VERTICAL BREAK SWITCHES

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred direct to the Turner Electric, LLC factory at 1-800-231-9422.

RECEIVING AND STORING:

STORING:

Each group operated vertical break switch consists of separately packaged items - (1) crated switch units including fastener and control parts, (2) skid of insulators, (3) banded operating pipe and interface, and (4) crated vacuum- interrupters (if required), and special mounting steel when needed.

Customer should check material against packing list (attached to crate in waterproof package) upon receipt, to be sure all parts have been received. If crated switch box or vacuum interrupter box is damaged, material should be checked against Bill of Material for broken or missing components.

If switches indicate possibility of damage, remove the interrupter and:

- (A) Locate so that there is proper clearance from surrounding objects.
- (B) Prop open interrupter unit with a piece of dry wood or fiberglass. Check that the contacts are open by listening for a "Pop" sound when the arm is moved to the open position.
- (C) High potential testing, in addition to careful visual inspection, provides the best means of verifying the condition of the interrupter. (E) A high potential voltage (20KV) is to be connected across each open interrupter contact and the voltage slowly increased. A defective module will break down well below 20KV. (See Photo #1). If damage is found or suspected, file a claim as soon as possible (no longer than 15 days after receipt) with the delivery transportation company and notify your Turner Electric representative.

STORING:

A reasonable amount of care should be taken when handling and storing air- break switches. Porcelain insulators and vacuum interrupters are fragile and must be handled with care. The live parts must not be subjected to rough handling.

Air-break switches are outdoor devices, and may be stowed indoors or outdoors; however, it is advisable to protect all moisture absorbing cartons, such as cardboard, if they are to be stored for a long period of time. All parts should be left in crates or packaging until time of assembly.

Plastic envelope attached to switch blade contains instruction book, control and switch outline drawings. These should be removed from the switch prior to installation.

INSTALLATION

1.0 Purpose:

The purpose of the procedure is to provide guidelines for the installation, adjustment and inspection of Turner Electric Corp. vertical break switches.

2.0 Scope:

This procedure is applicable to Turner Electric Corp. vertical break air and load break switches.

3.0 Installation - Insulation:

When insulators are shipped separately, remove live parts (jaw contact, blade and hinge assembly) and mount insulators to base castings. Base castings have been leveled at the factory, align the insulator stacks perpendicular to the base, utilizing leveling screws.

4.0 Installation - Live Parts:

- 4.1 After all the insulators have been leveled, live parts are to be mounted. If interrupters are to be used on this installation, the vacuum interrupter mounting bracket and spacers (if required) are to be located between live parts and the insulators. Tighten only the bolts on the center rotating insulator. Bolts on rear insulator and contact jaw insulator are to be left loose for adjustment as detailed in .2.
- 4.2 Slowly close each switch pole with the rotating insulator, jaw contact to be aligned to properly receive blade tip squarely. Tighten contact jaw mounting bolts. (See Photo #2).
- 4.3 Caution to be exercised at this point to be certain that jaw enters contact without interference between blade latch and contact finger. If interference is eminent, adjust leveling screw (See Photo #3) to slightly tilt insulator back toward rotating insulator, thereby providing adequate clearance.
- 4.4 At this point, level and tighten rear insulator on each pole.
- 4.5 Slowly open and close each pole with the rotating insulator, you will note that the blade tip almost bottoms out on stop prior to coming up and latching.
- 4.6 Check to make sure that switches supplied with arcing horns, touch lightly throughout their length when opening and closing. Should the arcing horns bind or rub too hard to cause difficult operation, the stationary horn should be detented slightly to correct the problem.
- 4.7 Rewire switches closed against stops prior to raising switch to structure.
- 4.8 Check the mounting structure for proper elevation and levelness. If the mounting surface is not level, shims should be used to level switch base.
- 4.9 Mount switch poles to structure. Crane slings are to be placed under the switch base for raising switch. Do not attach sling to live parts or to the insulators.

5.0 Installation - Vacuum Interrupter (If required.)

6.0 Operating Mechanism Installation

- 6.1 Generally speaking, the same method is used to operate all types of switches. The only difference being in relatively minor details made necessary by different types of structures, different requirements for vertical operating pipe rotations, clearances, etc. See attached installation drawings for clarification.
- 6.2 Mount on the structure as shown on attached installation sheet.
 - A). Outboard bearing.
 - B). Intermediate guide bracket.
 - C). Position indicator if specified.
 - D). Operating handle assembly or gear operator with ground shunt.

- 6.3 Once outboard bearing has been secured, feed 2" IFS vertical operator through bearing, secure control pipe bell crank in proper position on vertical operator and pierce screws. Please note that an additional half turn of piercing screw after piercing is sufficient. Additional tightening will cause the pipe to concave and possibly result in a failed casting.
- 6.4 Close all switch poles after adjustment has been completed, making sure they are in the fully locked position.
- 6.5 Install interphase devices to each pole and vertical operator bell crank.
- 6.6 Insert interphase pipes into each clevis and tighten set screw snugly. Where threaded clevis assemblies are used, snug with lockout on either side.
- 6.7 Use any convenient means to match-mark all clevis connections,
- 6.8 All switch pole operating levers should be parallel with one another. The interconnecting lever and vertical operator should be located in the relative plane as shown on the installation drawing.

7.0 Installation - Adjustment

- 7.1 If motor operator is used, DO NOT use electrical operation until all live switch adjustments are made.
- 7.2 The interphase linkage should travel approximately 120" from close to full open.
- 7.3 If switch does not fully open, the adjustment on the group control arm needs to be adjusted slightly. To correct:
 - a). Check first to see that nothing has slipped.
 - b). Return the switch to the full close position.
 - c). Loosen the adjustable clevis on the vertical control arm.
 - d). Adjust the group control arm in 1/4" increments and secure snugly. DO NOT PIERCE.
 - e). Test operate open, and adjust as necessary.
- 7.4 If switch does not fully close and lock up:
 - a). Check to see that nothing slipped.
 - b). Return to full open position.
 - c). Loosen the adjustable clevis on the vertical control arm.
 - d). Adjust the Group control arm in 1/4" increments and secure. DO NOT PIERCE.
- 7.5 If vacuum interrupters are used, make sure that they are making
- 7.6 When the switch is completely adjusted, securely tighten all piercing screws until side walls of interphase pipe are pierced.

8.0 Installation - Control Handle

- 8.1 With switch fully closed and all blade locks in place, locate and pierce in place manual operating handle assembly.
- 8.2 Open switch to full open position and drop handle into adjustable slot. Tighten slot adjustment as necessary.

8.3 Connect ground braid to customer supplied ground system with furnished split bolt connector.

8.4 When gear operators are used, start with the switch in the closed position, open 120" and set stops.

9.0 Guide for maintenance of High Voltage Disconnecting switches (ANSI C-37, 35-1976)

INTRODUCTION: It cannot be stressed too strongly that prescribed safety rules should be adhered to at all times when operating or maintaining high voltage disconnecting switches near energized equipment or conductors. **MAKE ABSOLUTELY SURE APPLICABLE EQUIPMENT IS DE-ENERGIZED AND PROPERLY GROUNDED BEFORE PROCEEDING WITH ANY INSTALLATION OR MAINTENANCE.**

9.1 Disconnecting Switches:

These switches are not readily serviced at frequent intervals. This does not, however, relieve the user of the responsibility for care and inspection. Frequency of inspection will be a function of atmospheric combination, use of combination control coatings, frequency of operation, fault current exposure, etc., and a suitable program must be established and followed by the user. If a switch cannot be maintained on a periodic basis, its service life may be affected. It is recommended that such a switch be opened and closed several times in order to clean the contacts and free the moving parts whenever it is necessary to operate it for any reason. The following procedures are suggested for maintaining de-energized switches:

- A). Be sure that the switch is disconnected from all electric power sources before servicing.
- B). Ground leads or their equivalent should be attached to both sides of the switch. All safety precautions, including local and applicable OSHA regulations, should be followed.
- C). Inspect the insulators for breaks, cracks, burns, or cement deterioration. Clean the insulators, particularly where abnormal conditions such as salt deposits, cement dust, or acid fumes prevail. This is necessary to avoid flashover as a result of the accumulation of foreign substance on the insulator surfaces.
- D). Check the switch for alignment, contact pressure, eroded contacts, corrosion, and mechanical malfunction. Replace damaged or badly eroded components. If contact pitting is of minor nature, smooth the surface with clean, fine sandpaper (not emery) or as the manufacturer recommends. Inspect arcing horns for signs of excessive are damage and replace if necessary.
- E). Check the blade lock or latch for adjustment.
- F). Inspect all live parts for scarring, gouging, or sharp points which could contribute to excessive radio noise and corona. Check corona balls and rings for damage.
- G). Inspect interphase linkage, operating rods, levers, bearings, etc. to assure that adjustments are correct, all joints are tight, and pipes are not bent. Clean and lubricate the switch parts only when recommended by the manufacturer. Check for simultaneous closing of all blades and for proper contact in the closed position. Check gear boxes for moisture which could cause damage due to corrosion or ice formation. Inspect the flexible braids or slip-ring contacts used for grounding the operating handle. Replace braids showing signs of corrosion, wear, or having broken strands.
- H). Power - operating mechanisms for switches are usually of the motor-driven, or hydraulic type. The particular manufacturer's instructions for each mechanism should be followed. Check the limit switch adjustment and associated relay equipment for poor contacts, burned out coils, adequacy of supply voltage and any other conditions that might prevent the proper functioning of the complete switch assembly.

- I). Inspect overall switch and operating mechanism for good working condition. Check that the bolts, nuts, washers, cotter pins, and terminal connectors are in place and in good condition. Replace items showing excessive wear or corrosion. Inspect all bus cable connections or signs of overheating or looseness.
- J). Inspect and check all safety interlocks and test for proper operation.

9.2 Load Interrupter Switches Interrupter switches should be periodically inspected to make certain that they are in condition to function properly. In addition, since interrupter switches include all the features of disconnecting switches, the maintenance procedures for interrupter switches should include the procedures outlined in Section 8.1.

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10.0 Guide For Operation of High Voltage Disconnecting Switches ANSI C-37,35-1976:

Introduction: It cannot be stressed too strongly that prescribed safety rules should be adhered to at all times when operating or maintaining high voltage disconnecting switches near energized equipment or conductors.

10.1 Operation Air Switches: High voltage disconnecting switches, grounding switches, and horn-gap switches are given no interrupting rating. Load interrupter switches may have limited load interrupting rating. Appropriate safety rules should be followed and the following general rules apply.

10.1.1 After operating a switch, check visually that the blade is fully closed and latched, or fully open as intended.

10.1.2 Do not use undue force in attempting to operate a switch. The operating mechanism is designed properly for the switch and any undue force in the nature of an extension of the operating handle, or an extra person on the operating handle or switch-stick, may cause severe to the switch or operating mechanism.

10.1.3 A few sharp raps on the vertical operating pipe, suddenly applied tugs on the operating pipe, or suddenly applied tugs on the operating handle may help to free an iced switch mechanism. Power-operated switches should be operated periodically to ensure that the switches and their mechanisms and control features are functioning properly. Where circuit conditions will not permit operating, an energized switch and the circuit cannot be de-energize for this purpose, the operating mechanism should be disengaged from the linkage. The control circuits and mechanism should be checked in this manner unless the overall adjustments are effected.

10.2 Load Interrupter Switches:

Interrupter switches have specific capabilities for switching one or more of the following circuit types: 0.8 minimum lagging power factor load, parallel or loop load, transformer magnetizing, line charging, cable charging, and capacitor bank. Follow the manufacturer's instructions when operating interrupter switches. ANSI C-37 35-1976

11.0 Inspection

11.1 Switches

11.1.1 Check tightness of fasteners at all assemblies.

- A. Top of insulators
- B. Bottom of insulators
- C. Contact area
- D. Blade
- E. Blade hardware
- F. Arc Horns
- G. Knuckle assembly

11.2 Open Switch Operation

11.2.1 Open switch slowly . .

Observe sequential operation of switch.

11.2.2 Blade uncams within jaw contact; arc horns carry the current as the blade moves out of the contact toward the open position.

11.2.3 Interrupter Application As the blade uncams, arc horns carry the current until such time that the interrupter pickup hardware engages the interrupter arm. For a short time, the arc horn provides a parallel path to insure that a firm connection between pickup hook and interrupter arm has taken place. The arc horn and blade tip separate, thereby establishing the circuit through the interrupter.

IMPORTANT: Interruption to take place before the pickup hook enters the red zone at the tip of the interrupter arm. The additional 1-1/2" to 2" travel within the red zone is overtravel designed to insure proper sequential operation of the interrupter. As the blade moves to full open position, the interrupter recocks itself for the next operation.

11.3 Close Switch Operation

11.3.1 Close switch slowly and observe if adjustments of blade tip in relation to the contact jaw, as defined in Article 4.2, are intact.

11.3.2 When closing, make sure blade lock is securing properly.

11.4 Open Switch:

11.4.1 Open switch at normal speed, checking simultaneously all three blades.

11.4.2 If interrupters are used, check to be sure that all phases have a firm connection between pickup hardware on the blade and interrupter arm of the interrupter before separation from the arc horn.

11.4.3 Check to be sure that all three phases interrupt prior to entry into red area on the tip of interrupter arm. (See Vacuum Interrupter Article 1.4).

11.5 Close Switch

11.5.1 If interrupter is used, be sure that blade pickup arm toggles past the interrupter arm. (See Photo #4).

11.6 Check after several open-close operations.

11.6.1 Make sure that no slippage has occurred.

11.7 Check the vertical operator, operating handle assembly, and ground wire.

11.7.1 Make sure all piercing bolts are firmly secured.

11.7.2 Make sure that when the manual handle is in the “closed” slot, it is lightly forcing or holding the operating linkage firm.