

# TYPE TCV2 CENTER SIDE 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 618-397-1865.

## **RECEIVING & STORING**

### **RECEIVING:**

Each group operated center side break "V" type switch consists of separately packaged items - (1) crated switch units with insulators installed including fasteners and control parts. (2) banded operating and interphase pipe, and (3) 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.
- D) Prior to applying test voltage across the open interrupter contact, the surface of its insulating envelope should be dry and clean of any surface contaminants. Normally wiping with methanol on a clean cloth or with any industrial wiper will be sufficient.
- 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 TECO 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 stored 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 located inside switch crate 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, LLC center side break "V" type switches.

## 2.0 Scope

This procedure is applicable to Turner Electric, LLC center side break “V” type and loop break switches.

## 3.0 Installation - Insulation

If insulators and live parts are shipped already installed go to section 4.7. 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 top surface of the pivot assembly, 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 can be mounted at this time. Tighten only the bolts on the top of each insulator. Bolts on bottom of each insulator are to be left loose for adjustment as detailed in 4.2
- 4.2 Slowly close each switch pole by rotating the blade and contact toward each other. Jaw blade tip to be centered both vertically and horizontally in the contact jaw. Horizontally the blade tip center should be located in line with the center of the contact adjustment screw. See photo #2. The insulators may need to be tipped by using the leveling screws at the base of the insulator, to achieve proper adjustment. See photo #3.
- 4.3 After blade tip and contact jaw alignment is satisfactorily completed, tighten remaining insulator bolts.
- 4.4 Caution to be exercised at this point to be certain that blade tip enters contact jaw without hitting excessively on either side of the contact fingers. If interference is eminent, adjust interconnecting clevis assembly by loosening both S.S. nuts and threading turnbuckle in out to align blade tip in jaw. See photo #4. When completed tighten both S.S. nuts against brass castings to lock turnbuckle in place.
- 4.5 Blade stops are located on the pivot assembly underneath each insulator. These may need to be adjusted slightly to ensure that the blade tip stops square in the jaw on closing and blade rotates 90 degrees on opening.
- 4.6 Check to make sure that switched supplied with arcing horns should be detented slightly to correct the problem.
- 4.7 Rewire switches closed against stops prior to raising switch structure.
- 4.8 Check the mounting structure for proper elevation and levelness. If mounting surface is not level, shim 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)

- 5.1 Unwire switch poles, and with rotating insulator, operate individually checking to be sure that each pole is in perfect adjustment. If not, Section 4 should be repeated.
- 5.2 Mount interrupter onto TECO-Rupter mounting bracket as shown in photo #5.
- 5.3 Locate and secure pick-up hardware to its blade at hook radius dimension and attitude shown on attached drawing and photo #5.
- 5.4 Open the blade slowly, making sure that:
  - A) Pick-up hook on blade engages interrupter arm while the auxiliary switch is still in contact. See photo #6.
  - B) Once the parallel circuit that was established via the auxiliary switch is broken, the primary circuit is through the interrupter.

- C) When the blade pick-up hook reaches the indicated red zone on the interrupter arm, the circuit will open. See photo #7.
  - D) Open circuit indication would be a loud pop signal, continued travel within the red zone is over travel that has been programmed.
  - E) The interrupter arm will drop off and recock itself for the next operation while the blade goes to the full open position.
- 5.5 close each blade slowly, paying particular attention to be sure that the blade pick-up toggle assembly springs past the interrupter actuator arm. See photo #8.
- 6.0 Installation - Operating Mechanism
- 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.
- 6.1.1 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.
- 6.2 Once outboard bearing has been secured, feed 2" IPS vertical operator through bearing, secure control pipe bell crank in proper position on vertical operator and pierce screws. Please note that an additional turn of piercing screw after piercing is sufficient. Additional tightening will cause the pipe to concave and possibly result in a failed casting.
- 6.3 Close all switch poles after adjustment has been completed, making sure they are in the fully closed position. Confirm by noting that close stops are making contact.
- 6.4 Install interphase clevises to each pole and vertical operator bell crank.
- 6.5 Insert interphase pipes into each clevis and clevis converter assemblies and tighten set screws snugly. Where threaded clevis assemblies are used, snug with locknut on either side.
- 6.6 Use any convenient means to match-mark all clevis connections, and vertical operator couplings to check for possible slippage.
- 6.7 All switch pole operating levers should be parallel with one another. The interconnecting level 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 a live switch adjustments are made.
- 7.2 The interphase linkage should travel approximately 90 degrees from close to full open.
- 7.2.1 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 adjustment clevis on the vertical control arm.
    - D) Adjust the group control arm in the 1/4 " increments and secure snugly. **DO NOT PIERCE.**
    - E) Test operate open, and adjust as necessary.
- 7.3 If switch does not fully close:
  - 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.**
- 7.3.1 If vacuum interrupters are used, make sure that they are making and breaking simultaneously.

7.4 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, 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 90 degrees 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 contamination control coatings, frequency of operation, fault current exposure, etc., and a suitable program must be established and followed by the user.

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 arc damage and replace if necessary.
- E) 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 which could impair their effectiveness.
- F) Inspect interphase linkage, operating rods, levers, bearings, etc. to assure that adjustments are correct, all joints are tight, and pipes are not bend. 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 operation handle. Replace braids showing signs of corrosion, wear, or having broken strands.
- G) 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.

H) 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.

I) Inspect and check all safety interlocks and test for proper operations.

## 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 increase the procedures outlined in Section 8.1.

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## 10.0 Guide for operation of High Voltage Disconnecting Switches (ANSI C-37, 25-1976)

### INTRODUCTION:

It cannot be stressed to 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 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 under force in the nature of an extension of the operating handle, or an extra person on the operating handle or switchstick, may cause severe damage to the switch or the operating mechanism. 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.

10.1.3 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-energized for this purpose, the operating mechanism should be disengages 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, 351976

### 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 Areas
- D) Blade
- E) Blade Hardware
- F) Arc Horns
- G) Knuckle Assembly
- H) Interrupters

## 11.2 Open Switch Operation.

11.2.1 Open switch slowly... observe sequential operation of switch.

11.2.2 Blade and jaw contact rotate simultaneously to relieve the contact pressure arc horns carry the current as the blade and contact rotate toward the open position.

11.2.3 Interrupter Application...

As the blade and contact rotate, 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 ensure 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.

## 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.

## 11.4 Open Switch.

11.4.1 Open switch at normal speed, checking simultaneously of 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 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 Article 5.4.

## 11.5 Close Switch.