



The Quality Name in High Voltage Switching

Type EVG – EVG-1

Grounding Switches

Volt: All

Amp: All

INSTALLATION &

INSTRUCTION

MANUAL

Safety Information

DANGER

IMPROPER HANDLING, INSTALLATION, OPERATION OR MAINTENANCE OF THIS EQUIPMENT MAY CAUSE IMMEDIATE HAZARDS WHICH WILL LIKELY RESULT IN SERIOUS PERSONNEL INJURY OR DEATH.

WARNING

The equipment covered by this publication must be handled, installed, operated and maintained by qualified persons who have direct knowledge and experience dealing with the hazards involved and are thoroughly trained in the handling, installation, operation and maintenance of high voltage transmission and distribution equipment. These instructions are meant for only such **Qualified Persons**. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

A **Qualified Person** is one who is trained in and has skills necessary:

- to read and comprehend this instruction book – understanding that these instructions are general in nature
- to accept personal responsibility to prepare and maintain an intrinsically safe work environment and maintain control of the work site to safeguard all persons present
- to develop and implement a proper rigging, lifting, and installation plan along with all safety precautions required to insure safe and proper lifting and installation of the equipment.
- to distinguish between energized and non energized parts
- to determine proper approach distances to energized parts
- to properly work with and around energized or de-energized equipment that may be pressurized with gas
- for proper use of personal protective equipment, insulating and shielding materials, insulated tools for working near energized and /or pressurized electrical equipment
- to recognize and take necessary precautions for the unique and dynamic conditions of site and specialized equipment to maintain a safe work environment during handling, installation, operation, and maintenance of high voltage switching equipment

The instructions in this manual are general guidelines for this type of equipment and not specific to the equipment supplied. Portions of it may not be applicable or may not have complete instructions for your specific equipment.

If you do not understand any part of these instructions or need assistance, contact Southern States Service Division at 770-946-4562 during normal business hours (8:00am – 4:30pm EST, M-F) or 770-946-4565 after normal business hours.

LIMITED WARRANTY

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Product Purchased Region	Product Installed Region	Warranty Holder	Warranty Duration
U.S and Canada	U.S and Canada	End User	Five (5) Years
All Other Conditions		Immediate Purchaser	Earlier of 1 year from installation or 18 months from shipment

Type EVG and EVG-1 Grounding Switches

Volt: All

Amp: All

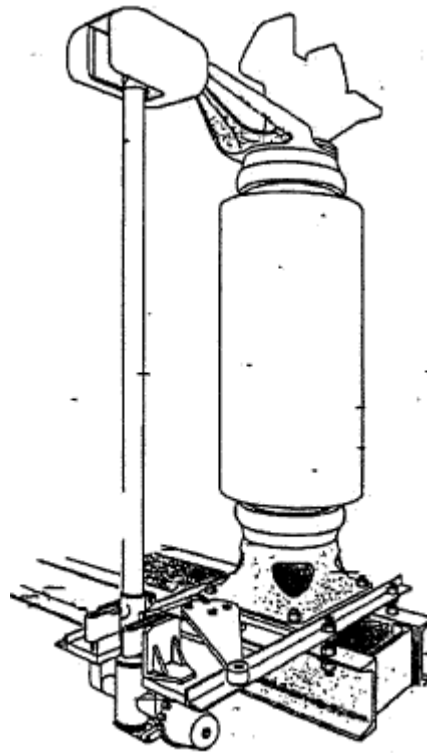


Figure 1: Typical grounding switch usage, shown mounted on the jaw end of a vertical break switch. Depending upon customer specifications, clearances, etc., the grounding switch may be rotated 90° to the left or right so that the blade opens parallel to the switch base. (Although installation and adjustment procedures are identical, this is not a modification to be made in the field).

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Summary & Introduction

Summary

These instructions do not intend to cover all details or variations in equipment, or provide for every possible contingency to be met in connection with installation, operation or maintenance. Should information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Southern States Representative.

The contents of this instruction manual should not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligations of Southern States. The Warranty contained in the contract between the parties is the sole warranty of Southern States. Any statements contained herein do not create new warranties or modify the existing warranty.

Important

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Southern States reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material, or both, the latter shall take precedence.

Introduction

The EVG and EVG-1 are grounding switches available in ratings from 69 through 1,100kV (the Types LH or G-WAG generally used below 69kV).

These switches can be used on either the jaw or hinge end of a line switch, or both. On center break switches they are arranged so that their jaw is attached to either (or both) line switch blades. They also are sometimes mounted on station post columns, and not attached to a line switch.

As with line switches, these grounding switches can be mounted upright, underhung, or vertically. Operation can either be three-pole, group operated, or single pole, by manual crank or motor drive.

And, finally, they may be arranged so that their blades open parallel to the base (or at a slight angle to it) or perpendicular.

Thus, theoretically, there are some 144 different ways to use and EVG or EVG-1.

Fortunately, the installation procedures for all these mounting and operating schemes are very similar, as well as simple. Regardless of the configuration, they all use a system of pipes, bearings and adjustable-length arms to open and close the switch from the ground.

Usually, mechanical interlocks are also used to ensure personnel and equipment safety. Interlocks (mechanical and/or electrical) prevent the line switch from being closed while the grounding switch is closed, and vice-versa. The instructions for their installation are on a separate sheet.

It is important to remember the adjustments to these switches are made to the jack screws that support the grounding switch – not to the jack screws that support the insulator. This is so as not to disturb the adjustments already made to the line switch, which should be installed first.

All photographs and sketches in this manual are for illustration purposes only and may not be to scale. Refer to the Unit Assembly drawing or the Operating Mechanism drawing provided with each disconnect switch for specific details. During installation, it may be necessary to make adjustments other than those described in this manual. Contact your local representative or the factory if questions should arise.

Southern States After Sales and Service Department is available for field installation assistance along with providing parts support for all Southern States products.

Contact After Sales and Service at 770-946-4562.

⚠ DANGER

Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

⚠ WARNING

Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

Recommended Tools & Values

Table 1: Recommended Tools and Torque Values

Recommended Tools		Recommended Torque Values	
Type	Sizes	Bolt/Nut size	Torque (Ft-lb)
Hand Wrenches and/or Sockets	15/16", 3/4", 5/8", 9/16"	1/2"	40
Drill Bit	1/4"	5/8"	92
		3/4"	127
		1"	286

Typical Disconnect Switch

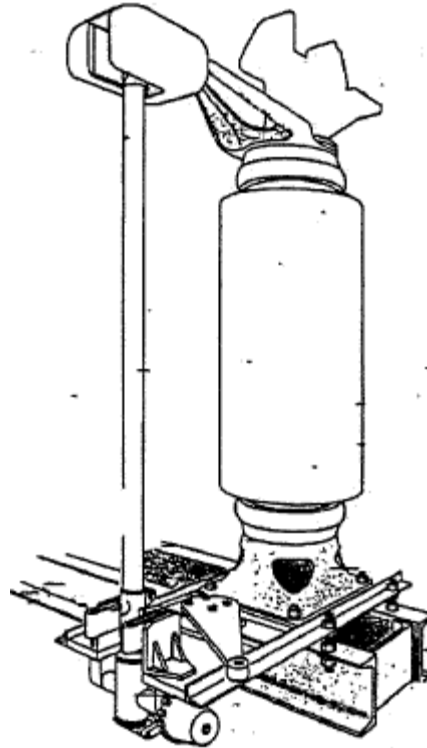


Figure 1: Typical grounding switch usage, shown mounted on the jaw end of a vertical break switch. Depending upon customer specifications, clearances, etc., the grounding switch may be rotated 90° to the left or right so that the blade opens parallel to the switch base. (Although installation and adjustment procedures are identical, this is not a modification to be made in the field).

Installation & Adjustment Procedures

Assembly

1. Preferred Switch Assembly Method

It may be necessary to make adjustments not described in this manual. If any question should arise during installation or adjustment of this equipment, call your local Southern States representative, or the factory.

The general procedure for installing these switches is as follows:

1. Uncrate all equipment and check for damage in transit. If any damage is noted, file a claim with the carrier immediately, and notify the factory.

NOTE: Do not readjust any component unless specifically instructed to in this manual.

⚠ DANGER HIGH PRESSURE SPRINGS! Do not tamper with counterbalance springs.

2. Refer to the operating mechanism drawing and the unit assembly drawing that accompanies each switch. If the grounding switch was not shipped attached to the line switch base, (if applicable) mount it on the jack screws as shown in Figure 1 (of Figure 2, depending upon rating).
3. Because the grounding switch cannot be adjusted until after the line switch adjustments are complete, at this point, refer to the line switch instruction manual and completely install and adjust that equipment. (The grounding switch jaw is installed when mounting the line switch live parts to the insulators. Note: When a grounding switch jaw bracket and a spacer both are used, the spacer goes above the bracket).
4. After the line switch is completely installed and adjusted, insert the grounding switch blade into its blade socket and tighten the clamping bolts. Because it is likely that the position of the blade will have to be changed later, do not drive in the self-piercing set screw at this time.

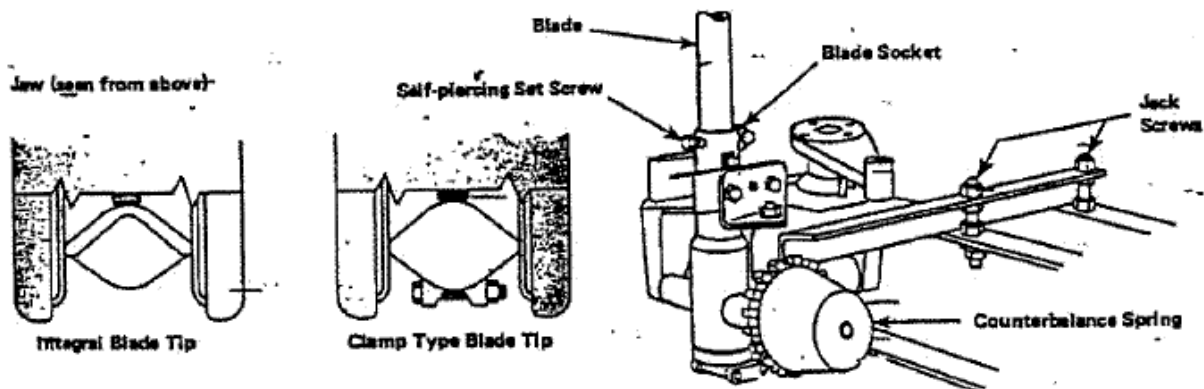


Figure 2: Blade Orientation and jack screw mounting

Summary & Introduction

5. Operate the switch arm by hand and close the grounding switch, checking for proper contact alignment. As with the line switch, certain conditions must be present for proper contact:
 - a. The blade tip must enter the jaw in the center without dragging on either side.
 - b. The silver of the blade tip must be centered on the silver of the jaw contact leaves.
 - c. The blade tip must penetrate deeply enough into the jaw that it comes firmly against the blade stop.
 - d. The blade must stop rotating with the tip squarely on the jaw contact leaves.

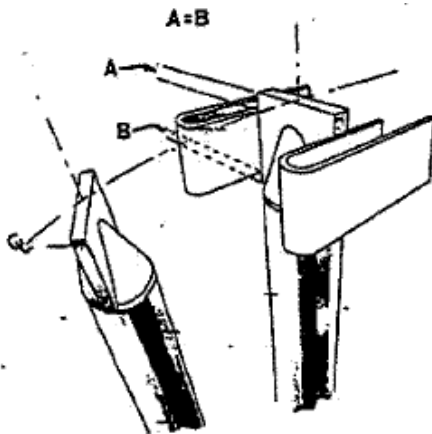


Figure 2: The blade must enter the jaw in the center, without dragging on either side. Also the silver strips on the blade tip must be centered lengthwise in the jaw.

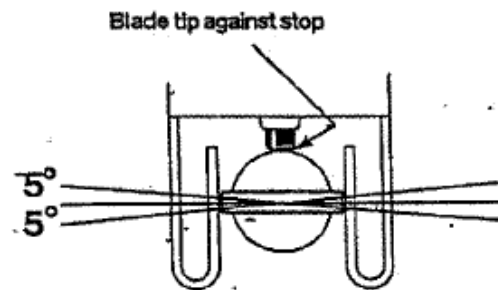


Figure 3: The blade tip must be firmly against the stop in the jaw. Allowable rotation misalignment is 5°.

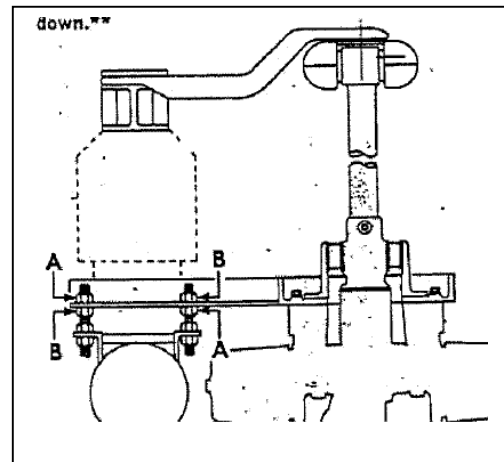
6. Contact misalignments and corrective procedures:
 - a. Blade does not enter jaw centrally:

Adjust the jack screws that support the grounding switch hinge (only) to tilt the entire hinge left or right as required. Adjust opposite nuts equally (two up the same number of turns, opposite two down the same turns) to pivot the hinge about a central point without changing its height.**
 - b. Blade tip is not centered on contact leaves:

Either run the four supporting jack screw nuts up or down (equally), or loosen the blade socked clamping bolts and slide the blade up or down.**

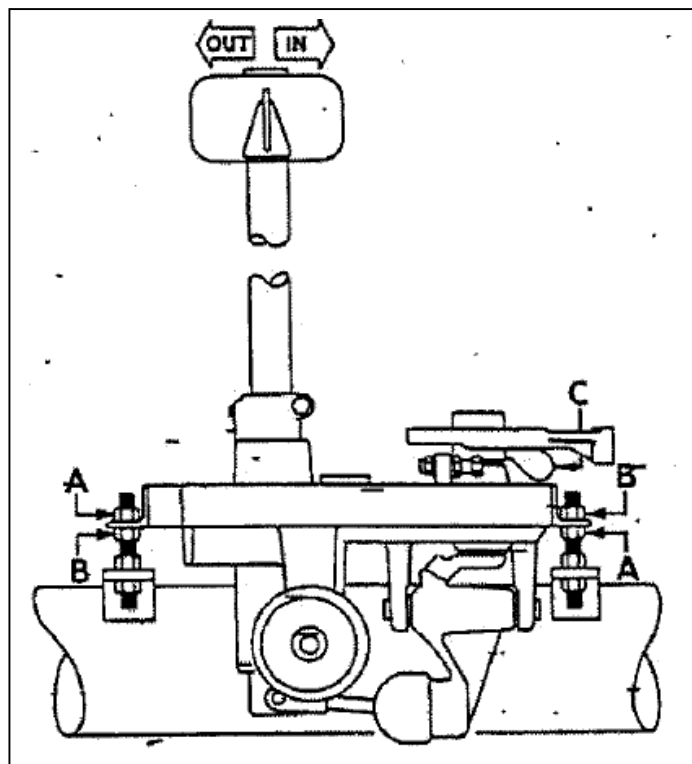
Summary & Introduction

Figure 4: Blade shown opening parallel to the switch base – To adjust the grounding switch blade from left to right in this illustration, first loosen all four jack screw nuts “A”. Then, run both left nuts “B” up, and both right nuts “B” down an equal number of turns. (Up is counterclockwise, down is clockwise). By adjusting opposite nuts equally, the hinge will pivot about a central point and maintain the proper geometry for good operation. **NOTE:** On some higher ratings, additional bolts solidly mount the grounding switch hinge to the switch base. These bolts are located under the hinge. **The MUST BE LOOSENED** before adjustment. Be sure to retighten all nuts and mounting bolts securely.



- c. Blade tip does not penetrate the jaw deeply enough to come firmly against the stop, or the blade tip goes in too deeply and strikes the stop prematurely:
Use the jack screws to tilt the grounding switch hinge as required.**

Figure 5: Blade shown opening to the left, parallel to the switch base – If the grounding switch blade does not come to rest firmly against the blade stop, loosen all four jack screw nuts “A”. Then run both left nuts “B” up, and both right nuts “B” down and equal number of turns (see “NOTE” in Figure 4). Reverse this procedure if the blade hits the stop prematurely. Adjusting the blade to come too firmly against the stop could result in the blade resting above horizontal in the open position an excessive amount. Be sure to retighten all nuts and mounting bolts securely. When adjusting jack screws, turn the nuts only a few flats at a time; relatively small adjustments produce considerable movement of the blade tip, especially in larger switches.



- d. Blade tip is not square in the contact leaves:
First, make sure that the blade socket is square in the hinge contacts and that the closed position stop on the switch arm is against the stop bolt on

Summary & Introduction

the hinge (Figure 5, Item C). Loosen the blade socket clamping bolts and rotate the blade as required. Use a pipe wrench if necessary. These switches have adequate contact pressure if the blade tip is within 5° of true perpendicular. However, every attempt should be made to get tip as nearly square in the contacts as possible.

***Some 500kV and above ratings have additional mounting bolts under the grounding switch hinge that screw into a bracket on the line switch base. These bolts must be loosened before adjustment can be made. Be sure to retighten these bolts securely after adjustments are complete.*

7. After each switch pole is adjusted and operating satisfactorily, drive in the set screw in the blade socket. It may be necessary to pre-drill the set screw hole.
8. After a thorough check of all bolts for tightness, go on to the operating mechanism section of this manual.

NOTE: In certain cases the grounding switch blade in the open position may rest a few degrees above or below horizontal. This in no way will affect the line-to-ground clearance of this equipment.

Operating Mechanism Installation & Adjustment

Three Phase Operation

1. Refer to the operating mechanism drawing and lay out all parts and check them against the bill of materials.
2. Using the sketch in Figures 6 and 7 as a guide and the operating mechanism drawing for specifics and dimensions, install mounting brackets, bearings and bushings, pipes, clevises, manual operating device, adjustable arm, etc. Be sure to install any encircling member (such as key interlock, pipe guide, etc.) on the vertical pipe at this time.

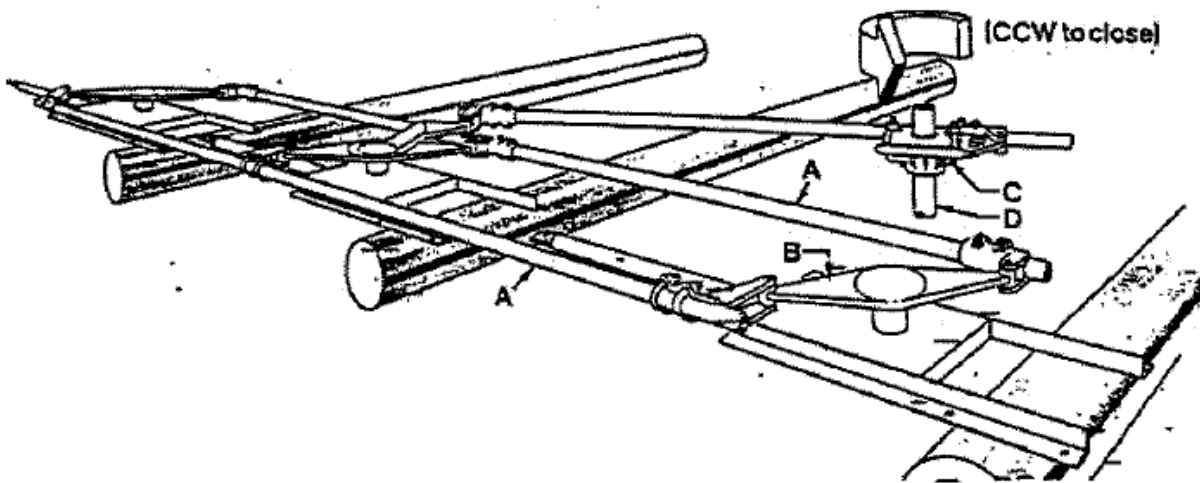


Figure 6: Sketch (no scale) of a typical grounding switch operating mechanism, with the switch open. This illustration shows a 345kV switch, on which double interphase pipes normally are used (item A). On lower ratings the usual mechanism uses only one interphase pipe. The operating mechanism drawing shows the layout for your switch, and also mounting dimensions, rotational requirements, etc.

A – Interphase pipe
B – Switch Arm
C – Adjustable arm
D – Vertical pipe

Operating Mechanism Installation & Adjustment

- A – Interphase pipe
- B – Switch Arm
- C – Adjustable arm
- D – Vertical pipe

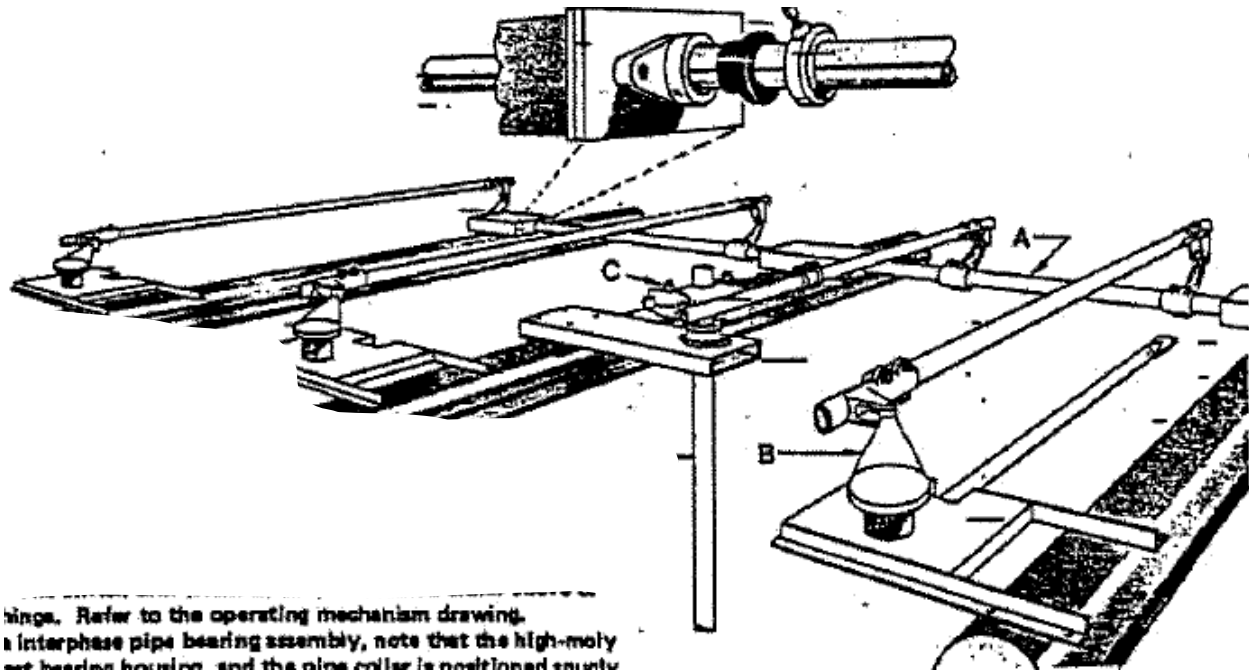


Figure 7: Three phase, torsional/crank arm system generally used on 500kV and above. The interphase pipes (Item A). Depending upon several factors, may pass above, below, or through the line switch base. The switch arm (Item B) may be located either above or below the grounding switch hinge. Refer to the operating mechanism drawing. In the detail sketch of the interphase pipe bearing assembly, note that the high moly bushing is inserted into the case bearing housing and the pipe collar is positioned snugly against the bushing. This prevents lateral movement of the pipe.

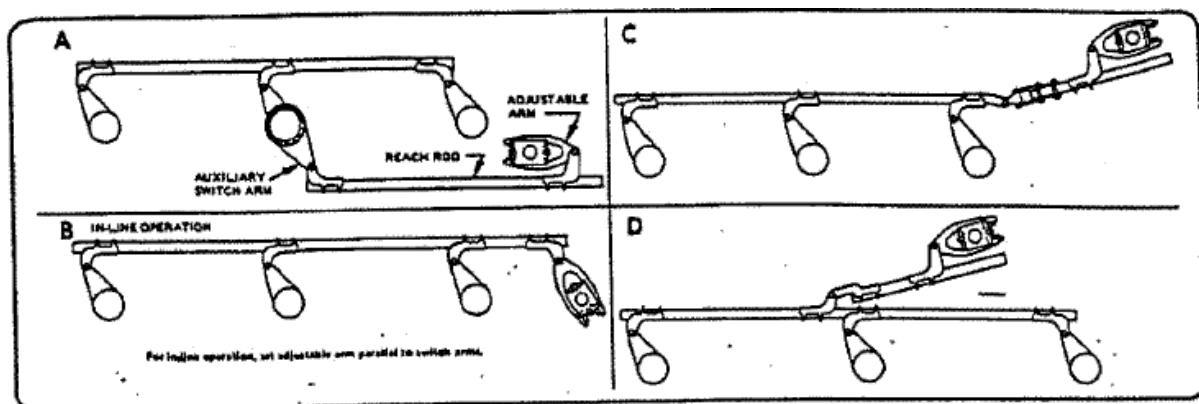


Figure 8: Variations of pipe arrangements shown in Figure 7 (using a single interphase pipe).

Operating Mechanism Installation & Adjustment

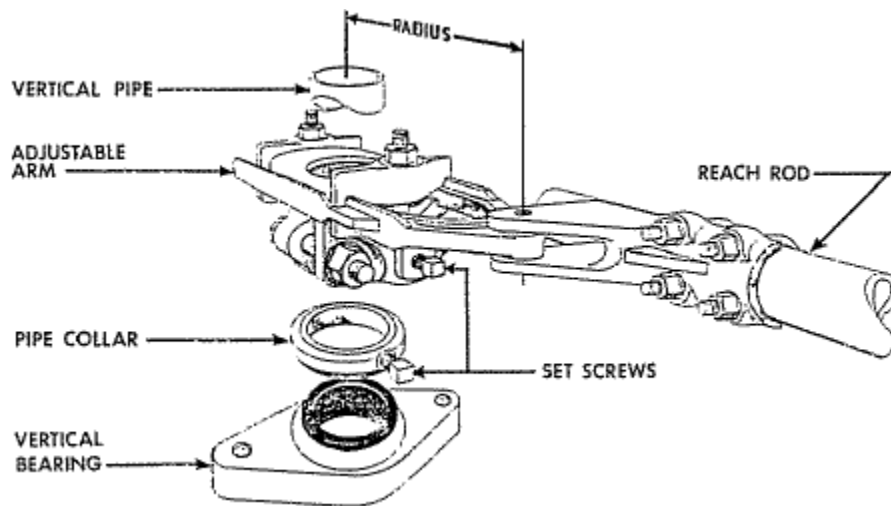


Figure 9: Adjustable arm assembly (item "C", Figures 6 & 7).

⚠ CAUTION Pipe collar must support full weight of pipe.

3. Tighten all set screws to grip the pipe securely, but do not drive any set screws through the wall of the pipe at this time.
4. After mounting all operating mechanism components, use any convenient means to match mark all clevis connections, adjustable arm, and manual operator attachments to check for slippage during trial operations.
5. If a motor operator is used, at this point refer to the motor operator installation instructions for mounting and trial operations.
6. **ADJUSTMENT:** If a motor operator is used, **DO NOT** use electrical operations until all adjustments are made. All grounding switch poles should be closed, all line switch poles open.
 - The adjustable arm should travel 180° from toggle closed to toggle open. Manually test operate.
 - If the switch does not fully open, the radius of the arm is too short. To correct:
 - a. Check first to see that nothing has slipped.
 - b. Return the switch to the closed position.
 - c. Loosen the adjustable arm and clevis bolts as shown below.
 - d. Lengthen the radius of the adjustable arm about $\frac{1}{4}$ inch and allow the clevis to reposition itself the same distance (shortening the pipe).
 - e. Test operate again and adjust as necessary.

Operating Mechanism Installation & Adjustment

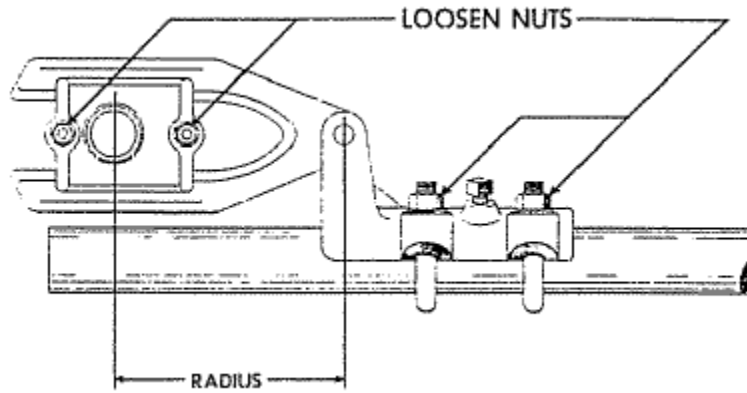


Figure 10: Adjustable arm assembly

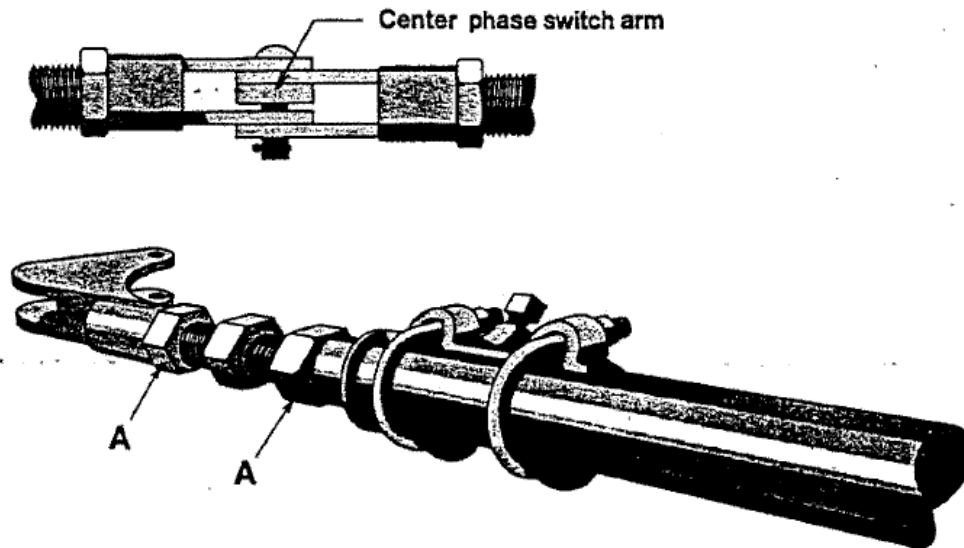
Recommended Inspection and Maintenance

It is recommended that maintenance on these switches be performed in accordance with ANSI STANDARDS C37.35-1976.

General Instructions for Threaded Clevises

General Instructions for Threaded Clevises

When threaded clevises are specified, one is generally attached to the adjustable arm, and two more to the center phase switch arm (refer to the plan view of the operating mechanism drawing and the illustration below).



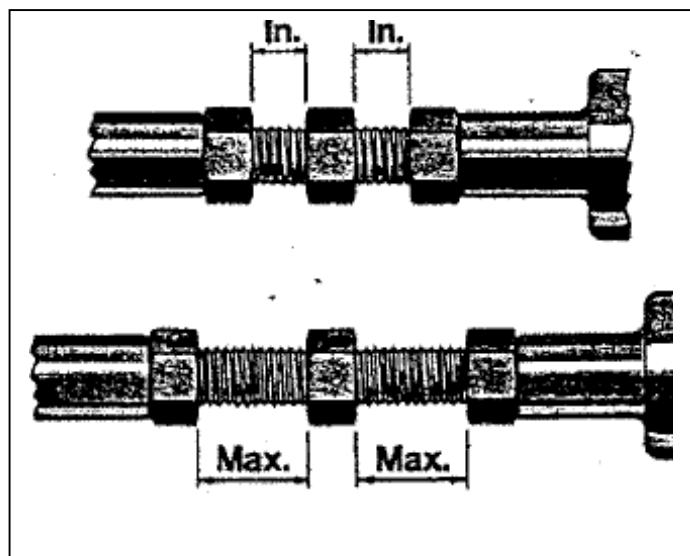
Operating mechanism adjustments consist mainly of incremental lengthenings and/or shortenings of the pipe that connect the switch arms together. To make these adjustments, simply loosen both jam nuts "A" and screw the stud in or out as required. Be sure to retighten both jam nuts securely.

▲ CAUTION ▲ DANGER Do not screw the stud out of the clevises. This could cause the pipe to fall, resulting in serious injury to personnel below.

Be sure the initial setting is correct, and do not adjust beyond the maximum allowable dimension. If adjustment beyond the maximum allowable dimension is needed loosen the U-bolts on the outboard phase clevis and reposition the pipe toward the center phase.

Initial dimension for $\frac{3}{4}$ " stud is $11/16$ "; 1" stud is $\frac{1}{2}$ ".

Maximum allowable for $\frac{3}{4}$ " stud is $1-3/16$ ".
Maximum allowable for 1" stud is 1".





The Quality Name in High Voltage Switching

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