



The Quality Name in High Voltage Switching

## **TYPE EC-2V**

Aluminum  
Center Break Vee  
Disconnect Switch

ALL Ratings

**INSTALLATION &**

**INSTRUCTION**

**MANUAL**





Southern  
States

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The Quality Name in High Voltage Switching

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## 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 (EST) 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



**Southern States, LLC****Equipment Receipt, Installation, Use, Operation and Maintenance Terms****("Terms of Use")**

The purchaser ("Purchaser") of certain Equipment (the "Equipment") identified in the Instruction Manual accompanying these Terms of Use sold by Southern States, LLC ("Southern States"), by Purchaser's acceptance or Use of Equipment in any way, agrees to the Terms of Use set forth below (the word "Use" herein means receipt, testing, inspection, installation, operation, maintenance and otherwise handling the Equipment):

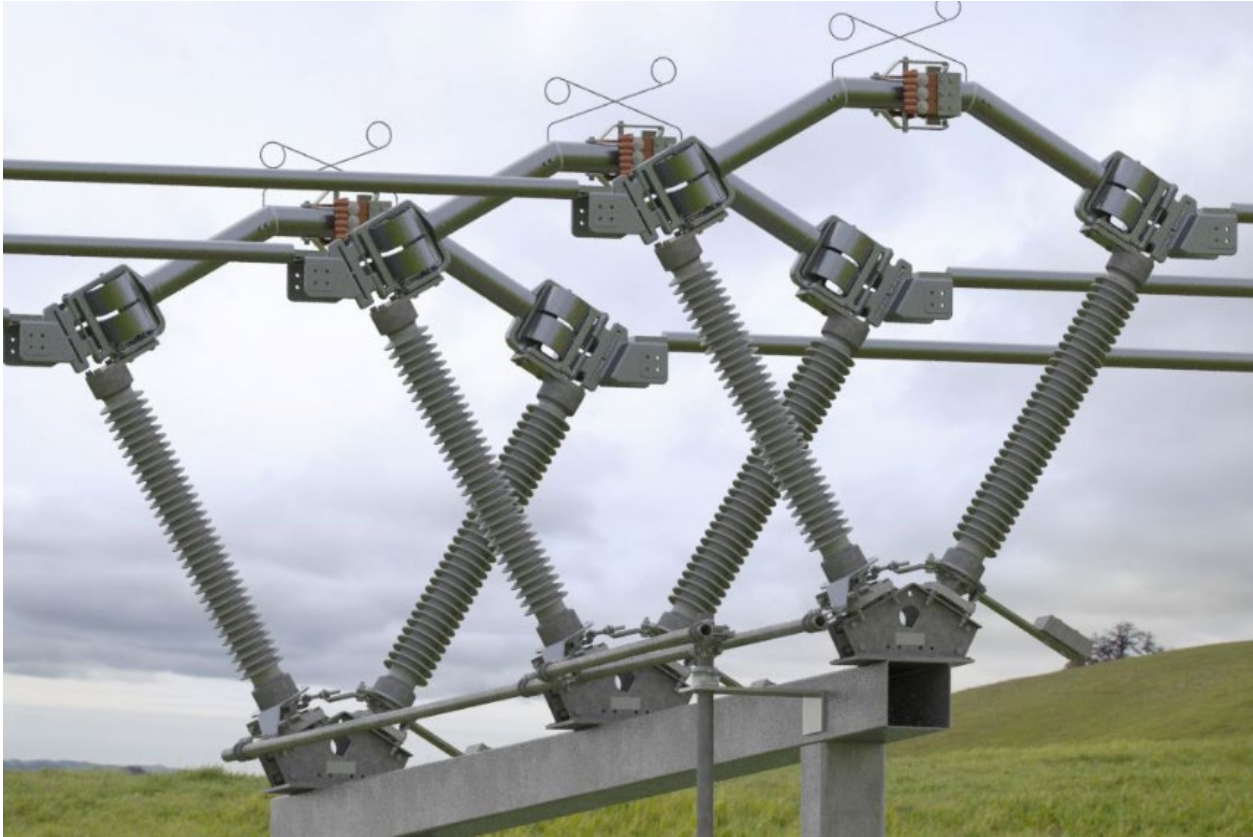
- Purchaser represents and warrants that it is fully qualified to Use the Equipment, and that it is a sophisticated user of the Equipment with a high level of expertise in the Use of the Equipment and Purchaser knows that Southern States is relying on Purchaser's sophistication and expertise with respect to the Equipment.
- The Purchaser will, within seven (7) days after receipt of the Equipment, inspect the Equipment and identify and notify Southern States in writing of any missing parts, damage or defects observed in the Equipment.
- The Purchaser will Use the Equipment, only in conformity with all manuals, data sheets and instructions provided by Southern States, and in keeping with sound engineering, utility and safety practice. Purchaser will at its own expense, provide all necessary labor, supplies, and facilities required to Use the Equipment.
  - The Purchaser may use its own personnel or engage a third party to Use the Equipment. The Purchaser shall insure that it only utilizes personnel who are fully qualified or certified by a reputable certification agency to Use the Equipment. In the event that Purchaser cannot find such qualified personnel, the Purchaser will notify Southern States and seek its advice to determine a mutually agreeable solution.
  - By separate agreement, Southern States may provide such services and the personnel to conduct such services in connection with the installation of the Equipment. In the event Southern States agrees to provide personnel to install, maintain, and operate the Equipment, such personnel will function only in an advisory capacity and shall have no responsibility for the supervision, or the quality or workmanship of such installation, maintenance, or operation of the Equipment.
- The Purchaser shall not install and operate the Equipment in a way such that a single point of Equipment failure leads to a cascading event or consequential damage to any person or property. Purchaser shall ensure redundancy in its system at all times. Purchaser acknowledges and agrees that electric service is by nature subject to interruptions due to Equipment failures and shall not agree to provide service free from the effects of Equipment failures.
- The Equipment will be maintained and inspected as provided by this instruction manual and in compliance with best industry practices, but in no event will the Equipment be inspected and tested less frequently than once in every 6 months.
- The Purchaser shall not repair, dismantle, or alter any of the Equipment without Southern States' written consent.
- Any failure of Equipment either in service, testing or inspection will be promptly reported in writing to Southern States within 24 hours of the failure so that adequate evidence can be collected, appropriate diagnostic tests can be conducted, and analysis of the failure can be determined.
- Southern States will have no liability for any direct, indirect, consequential or remote damage or injury, whether or not foreseen or foreseeable, to the Purchaser or any third party or person for any damages or injury to person or property caused by Purchaser's or any third party's actions, whether or not negligent, in the Use of the Equipment. Purchaser shall indemnify and hold Southern States and its employees, officers and directors against any damage or injury caused in whole or part by Purchaser's or any third party's action whether or not negligent, resulting from the Use of the Equipment. Southern States expressly rejects any liability to third parties. The Purchaser expressly waives any claim against Southern States, its employees, officers, directors and affiliates, for injury or damage to person or property resulting from Use of the Equipment not directly and solely caused by Southern States' negligence. For the purposes of clarity, Southern States shall not be liable, and be fully indemnified by the Purchaser, for the following related to the Equipment: normal wear and tear, excessive use and loading, improper interference or maintenance on the part of the Purchaser or third parties, incomplete or false information given by the Purchaser, inappropriate or improper Use, faulty operation, installation or start-up, faulty or careless handling, improper maintenance, use of unsuitable operating materials/substitute materials, defective construction work, hazardous ambient conditions unknown to the Purchaser, chemical, electro-chemical or electrical influences, changes to the subject of delivery made without Southern States consent.
- In the event that Southern States is found by a court of competent jurisdiction or a properly empaneled arbitral body to be liable to the Purchaser for any reason, Southern States shall be entitled to a reduction in the liability by taking into account the exceptions provided by statute, law, and any counterclaims Southern States may have against Purchaser.
- The failure of Purchaser to comply with these Terms of Use herein shall void any and all warranties related to the Equipment. These Terms of Use shall be deemed to be part of the binding contractual agreements between Purchaser and Southern States related to the Equipment and shall govern over any inconsistent term or provision in such other contractual agreements.



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## Type EC-2V





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## Summary & Introduction

### 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.



## Summary & Introduction

### Introduction

Southern States Type EC-2V is a three phase, group operated, center break “vee” air disconnect switch constructed primarily of high strength aluminum. Applications for these switches included disconnecting and sectionalizing of lines, and isolating or bypassing other electrical equipment. Poles can be mounted in a horizontal “upright,” vertical, or under-hung position. The switch can be operated using a manual operator or electrical motor operator (Operating Mechanism).

For easy installation, all models use jack screws which provide infinite adjustments and eliminate time consuming shimming of insulator stacks.

The installation procedure for all mounting positions and operating schemes is similar and explained herein. A system of pipes, bearing, and adjustable length arms is utilized to open and close the switch from a ground level operator.

The instructions contained within this manual are necessary for the safe installation, maintenance, and operation of the EC-2V switch. A qualified person, familiar with this of type equipment, should carefully read and follow the instructions.

These instructions are intended to provide a general guideline for the installation, adjustment, and maintenance of the EC-2V switch. It is not possible to cover all details, equipment variations, and potential conditions. Contact Southern States, LLC in the event conditions associated with a specific application are not sufficiently addressed.

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, 7:30am-4:00pm EST Monday-Friday.  
After Hours: 770-946-4565

Distinctive signal words are used to indicate the degree of hazard that may be encountered by the user. Identification of the signal words and their definition follow:

**▲ 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.



## Summary & Introduction

### Ratings

Table 1: Ratings Table

<b>RATINGS</b>					
Maximum Voltage Rating (kV)	72.5	123	145	170	245
BIL (kV)	350	550	650	75	900
Rated Power Frequency	60 Hz				
Continuous Current	3000 A – 4000 A				
Short-Time Symmetrical Withstand (3 Sec.)	80 kA RMS				
Peak Withstand	208 kA				
Ambient Temperature Rating	-40°C to +50°C Standard -50°C Optional				

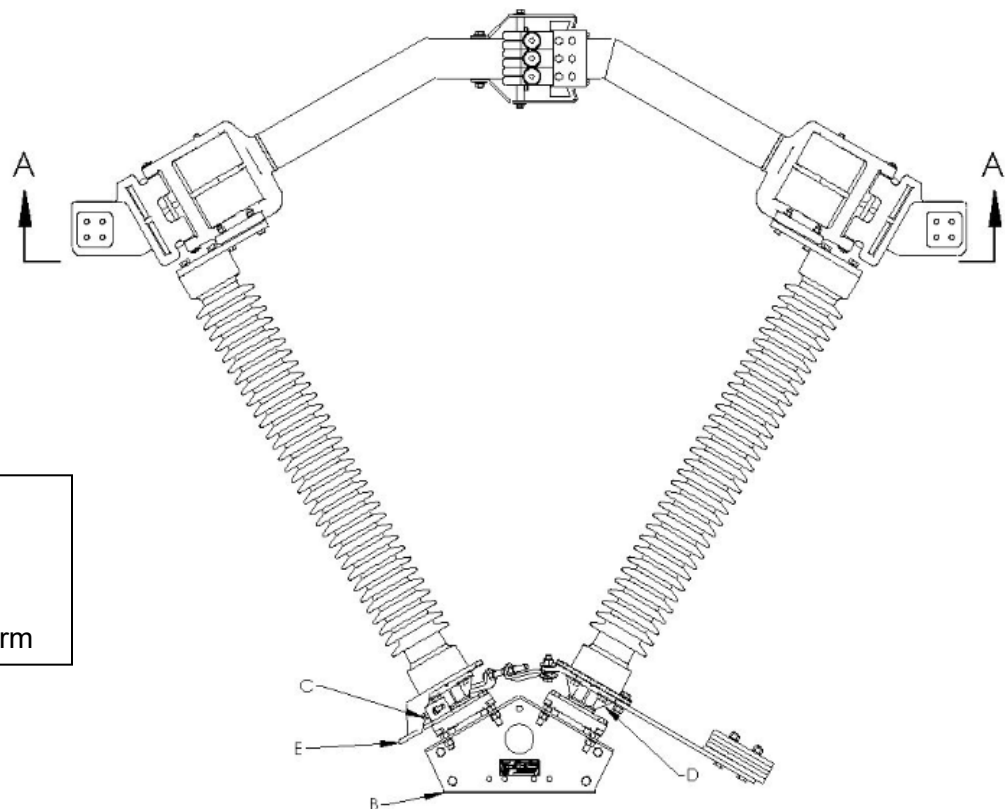


## Product Description

### Typical Disconnect Switch

In general, installing a disconnect switch consists of the following:

- Mounting the insulators to the switch base (**B**) (Refer to **Preferred Switch Assembly Method**, page 7).
- Mounting the live parts (**A**) to the insulators. Note Vee style switches are typically shipped with insulators mounted
- Mounting the switch base (**B**) to the structure (Refer to the **Operating Mechanism Drawings** for structure and mounting details)
- Installing operating mechanism components
- Final adjustment or tuning (Refer to **Final Switch Adjustments (Tuning)**, page 16).



A – Live Parts  
B – Switch Base  
C – Bearing Stops  
D – Bearing Hub  
E – Switch Operating Arm

**Figure 1: Typical EC-2V Switch Pole Assembled & Common Terminology**  
(123kV, 4000 amp shown.)



## Receiving, Handling & Storage

### Receiving, Handling & Storage

**⚠ CAUTION** These switches are top-heavy and unstable unless bolted down. To prevent personnel injury or equipment damage, use extreme care when uncrating.

### Unpacking

Unpack the equipment and check for damages or material shortages immediately. The bill-of-material from the Unit Assembly (switch) and Operating Mechanism drawings should be used for this purpose. If damage or a shortage is noted, file a claim immediately with the carrier and contact the factory.

### Storage

All components of the EC-1 aluminum center side break disconnect switch are suitable for outdoor use and do not have any special storage requirements. Keep bearings out of standing water. Keep upright and support live parts with base. If a motor operator is furnished, be sure to connect the heater circuit using the provided external wiring, while the unit is in storage. Discard the wiring upon installation.

*Typical crating is intended for storage less than 1 year.* If long term storage is required please notify factory at time of order placement so that special crating can be used.



## Installation & Adjustment Procedures

# Installation & Adjustment Procedures

## Recommended Tools & Values

Table 2: 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"	50 (S. Steel) 40 (All Others)
Drill Bit	1/4"	5/8"	92
		3/4"	127
		1"	286

## General Information & Mandatory Pre-Installation Requirements

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 on switch opening direction and handle location(s). *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 Service Department is available for field installation assistance along with providing parts support for all Southern States products.

Contact the Service Department at 770-946-4562.



## Installation & Adjustment Procedures

### Preferred Switch Assembly Method

The Type EC-2V center break Vee switch is normally shipped assembled on insulators. Control components are packed separately. Installation consists of mounting the switch pole on the structure and installing the operating linkage.

These instructions give the general procedure for adjusting EC-2V switches. It may be necessary to make adjustments not described in the manual. If any questions should arise concerning the installation or adjustment of its equipment, please call your local Southern States representative or the factory direct.

1. Prior to mounting preassembled switches on the structure, each pole should be thoroughly inspected for damage in shipment. If damage is noted, immediately file a claim with the carrier and notify the factory.
2. Assemble the switch pole on the ground and hoist it to the structure as a complete unit.

**▲ CAUTION** To prevent overturning during assembly, the switch base must be securely attached to a level, stable platform.

**▲ CAUTION** Lift fully assembled pole unit by the base only. **DO NOT** lift the pole unit by the live parts. Refer to Error! Reference source not found..

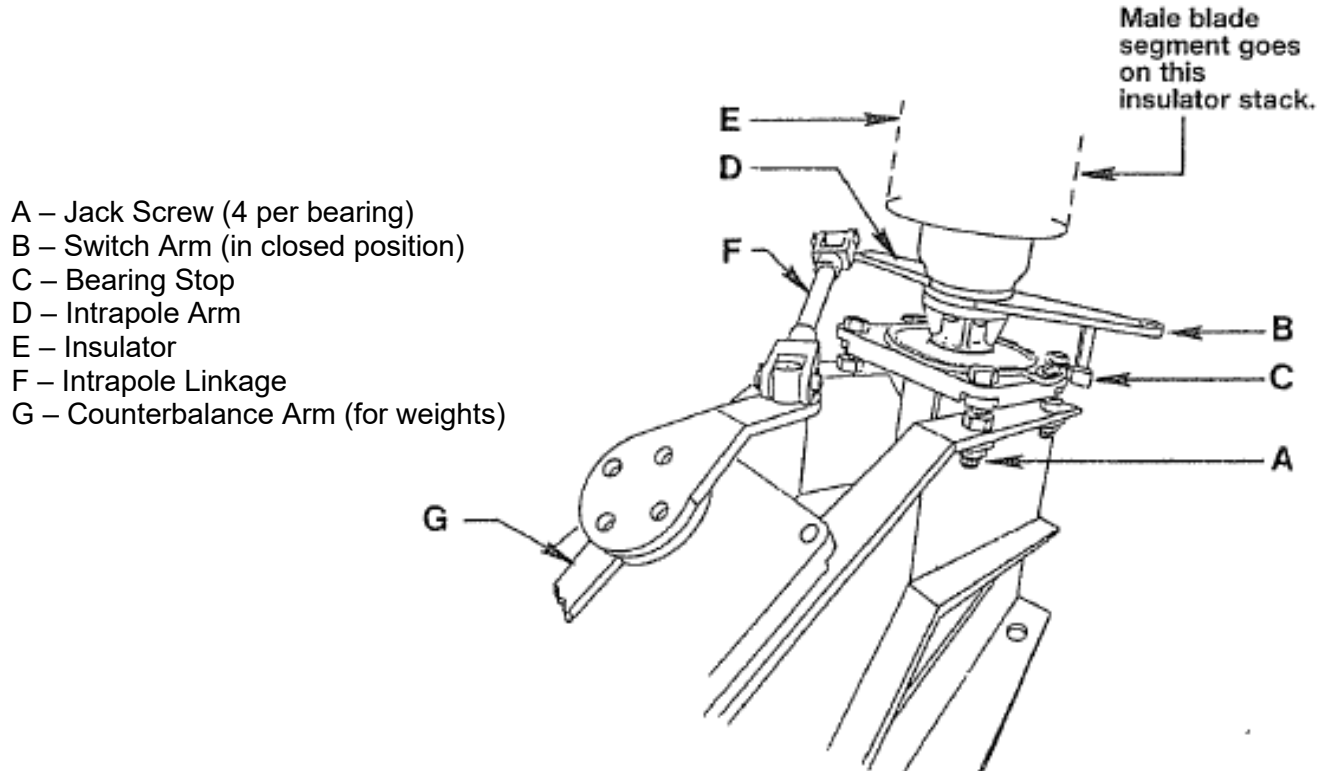
4. Test each switch pole for free operation and blade alignment. When closed, the blades should be in a straight line with the bearing stops touching. These stops can be adjusted if necessary.
5. After mounting the switch, shimming the base or other minor adjustments may be necessary.
6. **Using main sling attachment to the switch base only** and auxiliary sling attachment to keep the switch upright, mount the switches on the structure as shown on the plan view of the operating mechanism drawing. Be sure to orient each pole with the switch operating arm in the proper position. When lifting, positively lock the switch closed. This can be done by using clamps, wire, or straps to keep the switch operating arm ("E" on **Figure 1**) hard against the bearing stop.



## Installation & Adjustment Procedures

### Installation of the EC-2V When Shipped Unassembled

1. Prior to assembly, all components should be checked for any obvious damage in shipment. If damage is noted, immediately file a claim with the carrier and notify the factory.
2. The preferred method of field assembly is to bolt the switch base directly to its mounting structure and assemble the switch in place. Refer to the operating mechanism and the unit assembly drawing to ensure proper positioning of the base.
  - An alternative method is to assembly the switch on the ground and hoist to structure as a completely assembled unit. To do this:
  - Bolt the base to a firm, level surface sturdy enough to prevent overturn. These switches are top-heavy and very unstable. To prevent possible personal injury or equipment damage, select an assembly surface that will prevent overturn in both planes, end-to-end and side-to-side.
3. Refer to the unit assembly drawing. Check jack screw dimensions for proper height. Be certain that all four jack screws on each bearing are set correctly. Tighten jam nuts securely.
4. To install insulators, refer to the unit assembly drawing for proper orientation of parts. Only one set of bearing stops (positioned on control end of base) is used. Position switch arm directly on hub of bearing with bearing stops. Place an intrapole arm on top, being careful to set at proper angle with respect to the switch arm when against the bearing stop. Bolt insulators directly to the intrapole arm plate (**Figure 2**).



**Figure 2: Insulator Bearing Components**



## Installation & Adjustment Procedures

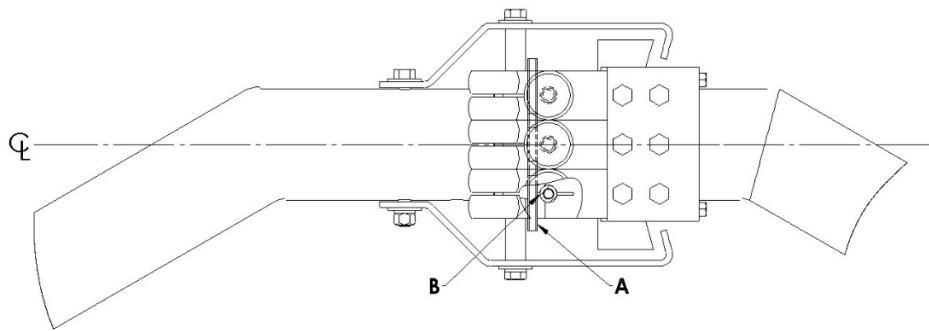
5. Place counterbalance arm directly on the other bearing hub and other intrapole arm on top. Be certain the angle between the two arms is set correctly. Bolt insulators directly to the intrapole arm plate.

NOTE: Field assembly of switches with multiple unit insulator stacks is easier when the lowest unit is mounted first and balance of units mounted to it rather than mount the entire stack as a single unit.

6. Rotate insulator with switch arm clockwise (facing down) against the stop and attach intrapole linkage. Be sure length of this linkage is properly set to dimension shown on drawing.
7. Depending upon its application, this type switch will be counterbalanced either by weight or by spring. Refer to unit assembly drawing and attach appropriate number of weights – or the spring – to the counterbalance.
8. On top of stack with the switch arm only, securely bolt the male blade assembly in line with length of the base.
9. On the other stack, securely bolt the female blade assembly. The switch will have to be opened slightly to do this.

## Contact Misalignments

Check for proper blade alignment. The blade segments should meet on centerline of base, on center of each other and the stop plug centered and touching (not jamming) the male contact stirrup (**Figure 3**).



**Figure 3: Proper Contact Alignment**

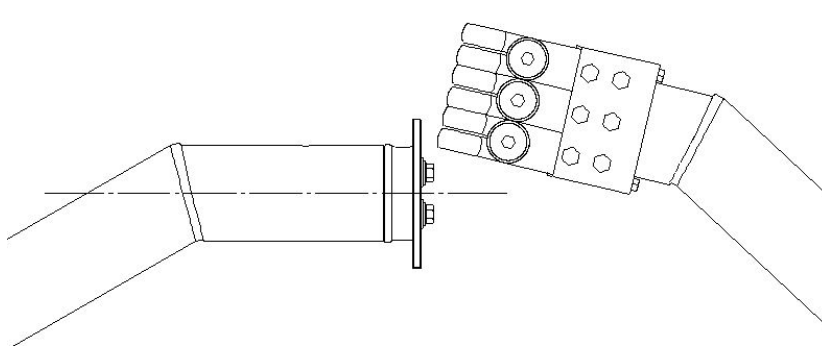
There are three general types of blade misalignments correctable by jack screws and two correctable by linkage adjustments.

**Field Assembly Note:** Due to probable insulator stack deflection caused by conductor loads, the following adjustments can be “rough” adjustments but not considered final adjustment until the conductors are attached to both ends of the switch.

**IMPORTANT:** When adjusting jack screws, adjust each pair of jack screws equally (count the flats). This is to ensure the insulators will move along the centerline of the base in a straight line. See **Figure 2**.

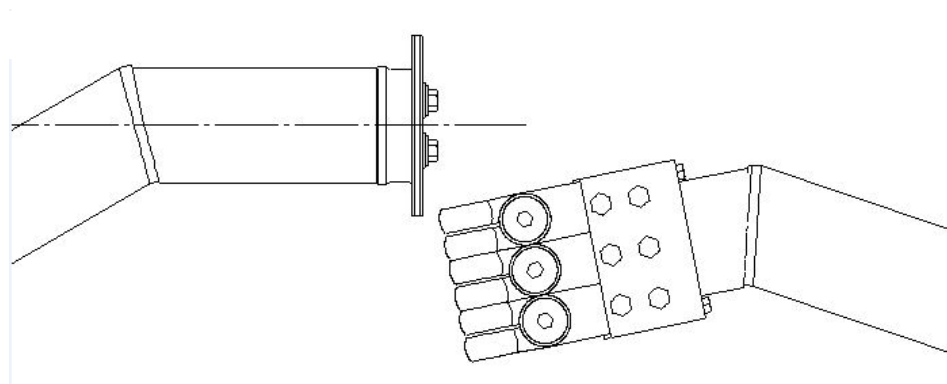


## Installation & Adjustment Procedures



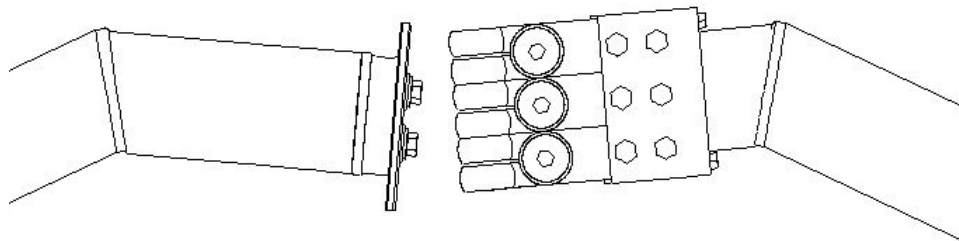
**Figure 4: Misalignment "A"**

- A. **Misalignment "A"**: Jack the left insulator to the left and the right insulator to the left until the stop plug is centered on the stirrup. Adjust insulators one at a time and in equal increments.



**Figure 5: Misalignment "B"**

- B. **Misalignment "B"**: Jack the left insulator to the right and the right insulator to the right until the stop plug is centered on the stirrup. Adjust insulators one at a time and in equal increments.

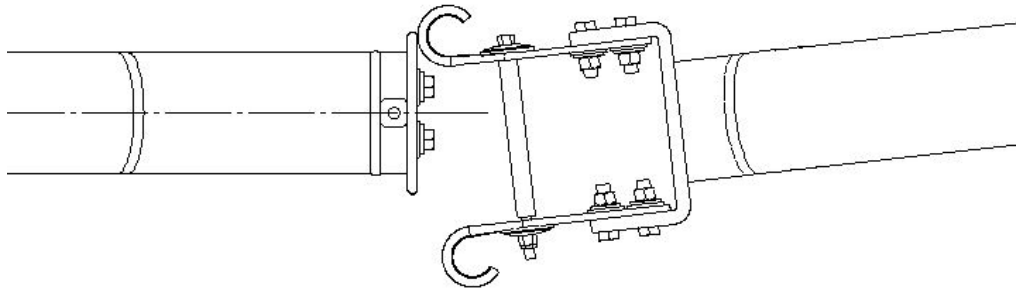


**Figure 6: Misalignment "C"**

- C. **Misalignment "C"**: Jack insulators toward each other – one at a time and in equal increments – until stop plug is centered on the stirrup.

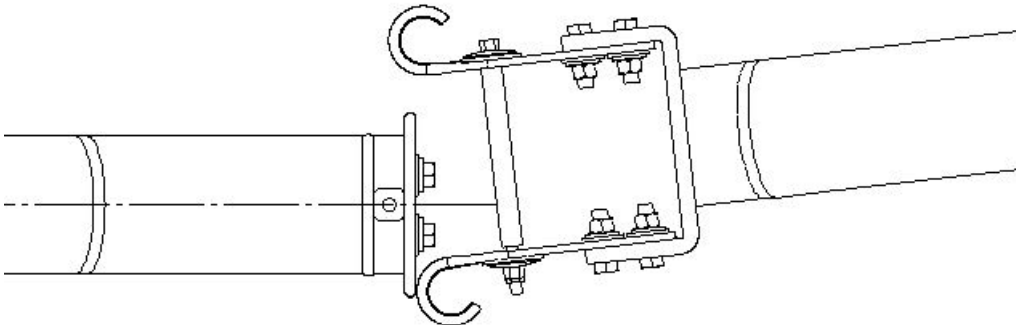


## Installation & Adjustment Procedures



**Figure 7: Misalignment “D”**

- D. **Misalignment “D”:** The stirrup striking the trailing edge of the female contact is the result of the intrapole linkage being too short. Lengthen this linkage as required for smooth closing without interference or dragging.



**Figure 8: Misalignment “E”**

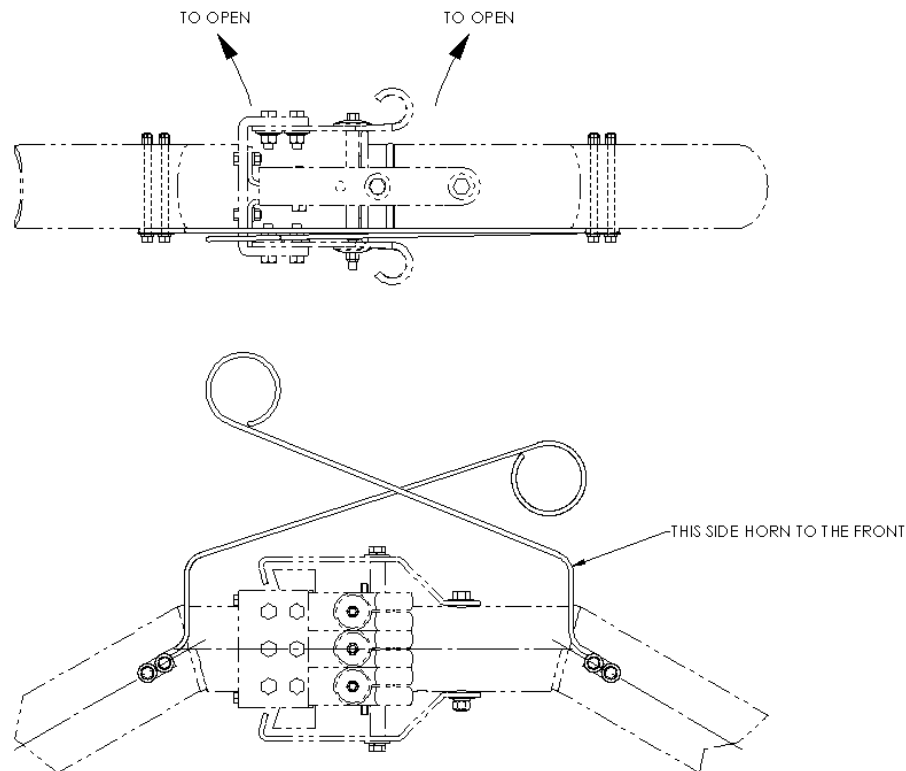
- E. **Misalignment “E”:** The stirrup strikes the **leading** edge of the female contact. Shorten the linkage to correct this condition.



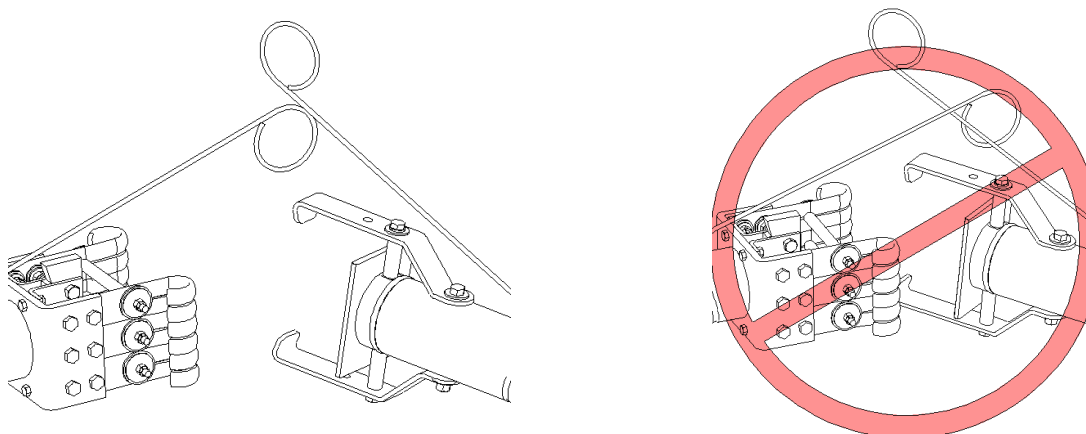
## Installation & Adjustment Procedures

### Arcing Horn Alignment

1. If arcing horns are used, refer to **Figure 9** and the unit assembly drawing for installation. Arcing horns should rub against the male contact with enough pressure to maintain contact but not so hard as to cause binding. The horns can be bent if necessary to achieve proper contact. Ensure arcing horn contact each other at the right position see **Figure 10**.



**Figure 9: Attach Arcing Horns as Shown**



**Figure 10: Arcing Horn Contact Position**

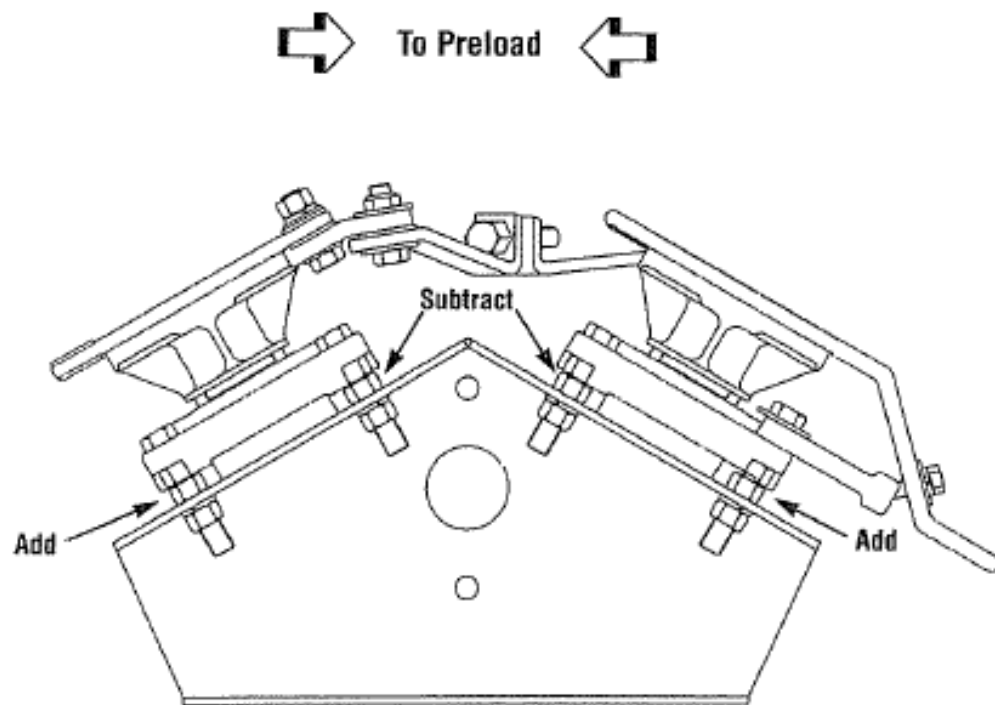


## Installation & Adjustment Procedures

### Insulator Preload

1. When the contact engagement is correctly set, preload the insulators toward the center of the gap. Add one flat on both outside jack screw nuts and subtract one flat on both inside nuts (**Figure 11**). This is done on both bearings.

To add, turn the nuts clockwise (facing down). To subtract, turn the nuts counter-clockwise.

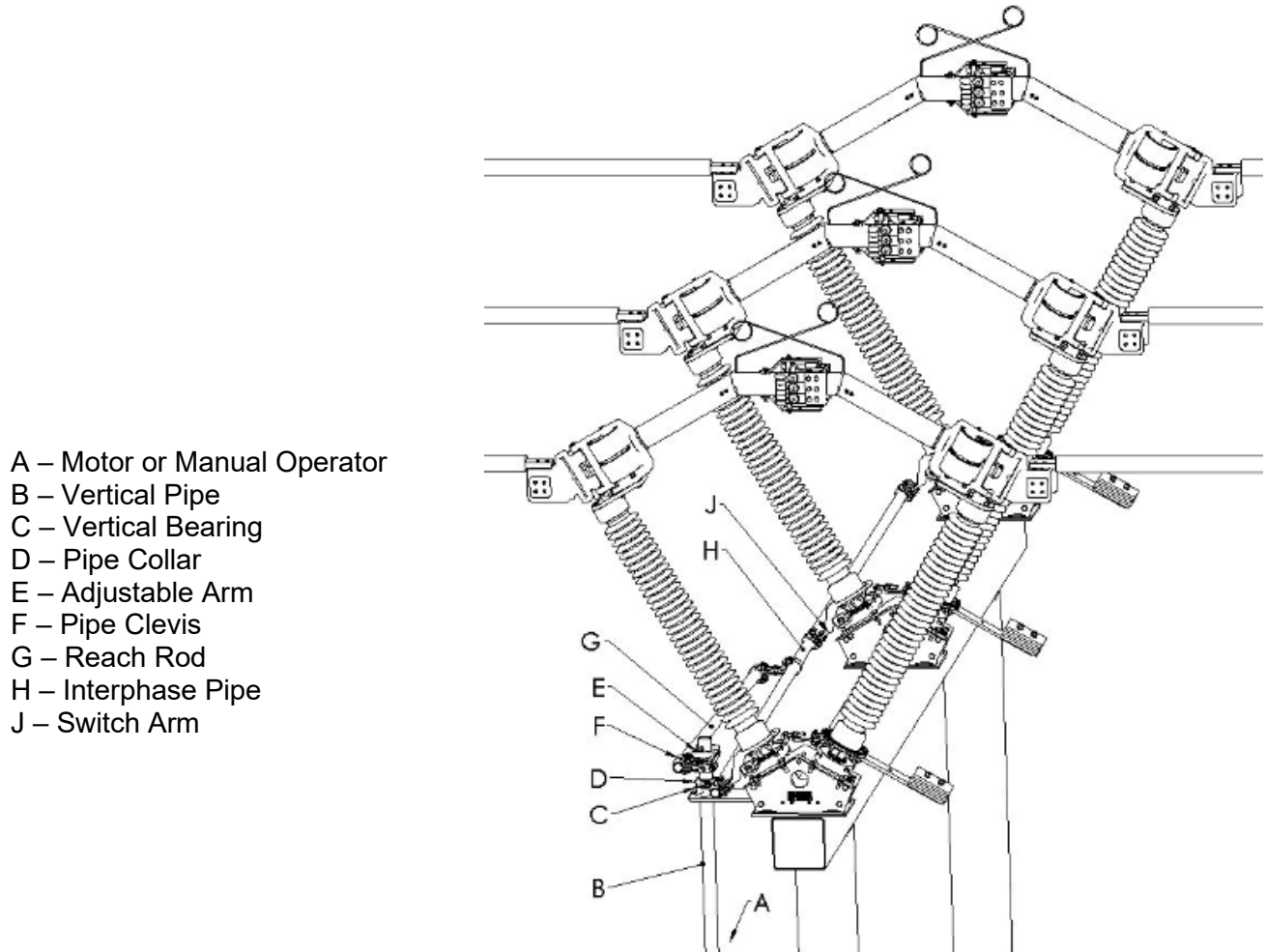


**Figure 11: Preload Insulators**



## Installation & Adjustment Procedures

### Operating Mechanism (See Operating mechanism drawings provided for details)



**Figure 12: Typical Operating Mechanism**

1. Lay out all Operating Mechanism parts and check them against the Op-Mech drawing bill-of-materials.
2. To ensure that the bearing stops do not interfere with switch adjustments, loosen all open/close bearing stops, and slide them out of the way.
3. Refer to the Operating Mechanism drawing, and install all mounting brackets, bearings, bushings, pipe clevises, switch operating device, adjustable arm, reach rod, and other necessary components. Refer to **Figure 12**.

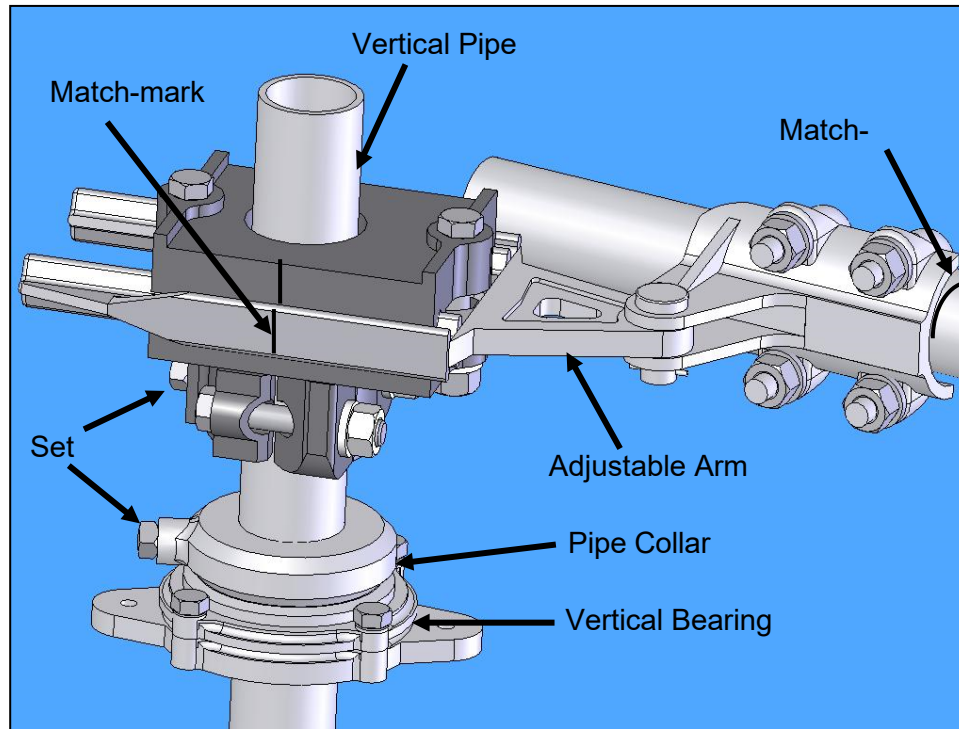
**⚠ CAUTION** The pipe collar (above the vertical bearing) must support the entire weight of the vertical operating pipe. To prevent unnecessary component damage, **do not allow the pipe to rest on the switch operating device**. Refer to **Figure 13**.

4. While installing the pipes and clevises that have piercing bolts/set screws, do not pierce the pipe until instructed. Tighten the piercing bolts such that they grip the pipe until all adjustments are made.



## Installation & Adjustment Procedures

5. After mounting all op-mech components, match-mark all clevis connections, the adjustable arm, and the switch operating devices' coupling, so that any slippage occurring during trial operations can be readily detected. Refer to **Figure 15**.



**Figure 13: Typical Operating Arrangement**



## Installation & Adjustment Procedures

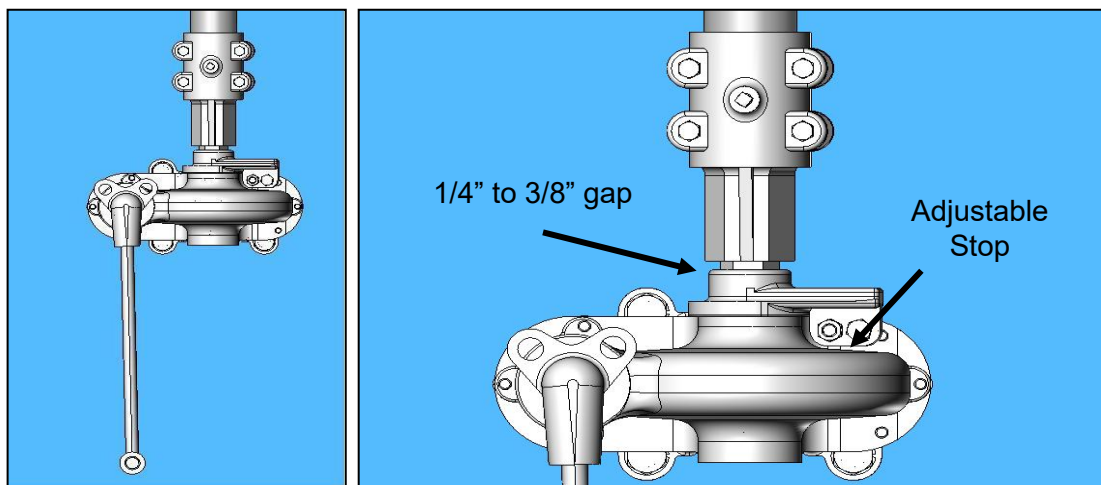
### Final Switch Adjustments (Tuning)

1. The operating mechanism is intended to fully open and fully close the disconnect switch by rotating the vertical operating pipe about 180° using an operator (manual or electrical). The interphase pipe controls the individual operation of each switch pole, using a push/pull control. The reach rod translates the motion of the vertical operating pipe to the interphase linkage. The adjustable arm controls the total amount of switch operation available.

**HINT:** For easiest adjustment start with the reach rod connected to the drive phase and the interphase pipe disconnected from the other two phases. Once the drive phase is properly adjusted, connect the interphase pipe and continue tuning the other two phases, one at a time.

2. Switch Operating Devices:
  - 2.1. Worm gear operator (HOGO – High Output Geared Operator) (Optional)
    - 2.1.1. The weight of the vertical operating pipe should be supported by pipe collar (**Figure 13**) by maintaining the 1/4" - 3/8" gap (**Figure 14**).
    - 2.1.2. When the switch is properly adjusted the operator handle should hang freely in both the open and closed positions to permit the use of a customer supplied padlock. Refer to **Figure 14**.

**⚠ CAUTION** Be aware that there is an adjustable stop on the operator. **Do not over operate as damage will occur to the operator.**



**Figure 14: Type HOGO (High Output Geared Operator) Front View**

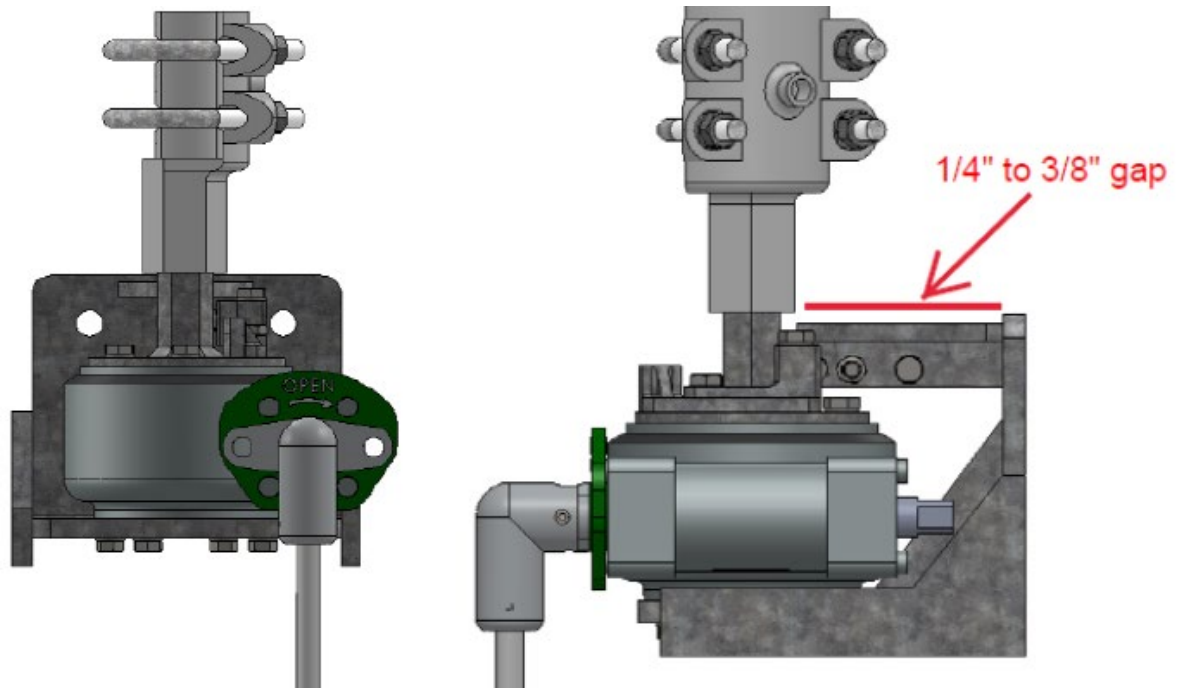
- 2.2. Worm gear operator (SEGO – Safety Enhanced Gear Operator) (Optional)
  - 2.2.1. The weight of the vertical operating pipe should be supported by pipe collar by maintaining the 1/4"-3/8" gap.
  - 2.2.2. When the switch is properly adjusted the operator handle should hang freely in both the open and closed positions to permit the use of the customer supplied padlock.



## Installation & Adjustment Procedures

### **CAUTION**

Be aware that there is an adjustable stop on the operator. **Do not** over operate as damage will occur to the operator.



**Figure 15: Type SEGO (Safety Enhanced Gear Operator)**

### 2.3. Swing handle operator

2.3.1. When the switch is properly adjusted the handle should hang vertically and free in both the open and closed positions to permit the use of a customer supplied padlock.

### 2.4. Electrical motor operator

2.4.1. Please refer to motor operator instruction manual for proper installation and setup.

2.4.2. Use manual operation while completing switch setup.

2.4.3. **Do not** electrically operate until all switch adjustments are complete. **ALWAYS** operate the motor operator decoupled first to ensure proper setup.

## 3. Preliminary Switch Settings:

3.1. Start with the disconnect switch and operating mechanism in the closed position.

3.1.1. The switch is in the fully closed position when the centerline of the male blade assembly is aligned with the centerline of the Female Blade Assembly.

3.2. Set the adjustable arm to the preliminary setting on the Operating Mechanism drawing, adjustment may be necessary to achieve proper operation.

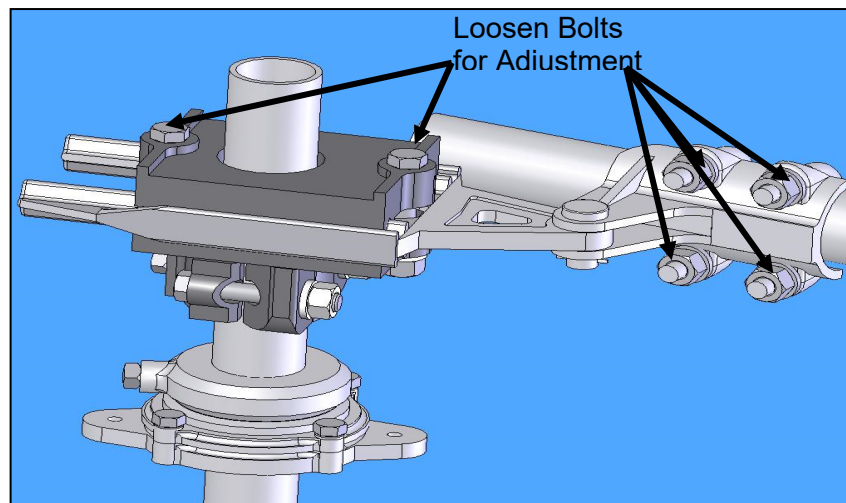
3.3. Be sure that all stops have been loosened to prevent binding during test operations.

## 4. Final Adjustment:



## Installation & Adjustment Procedures

- 4.1. Before making any adjustments always check that none of the pinned joints have slipped. If slippage occurs, correct it and repeat the operation to verify that adjustment is really needed.
- 4.2. Open the disconnect switch with the operator. The switch is in the fully open position when both blades are approximately 90° to the switch base.
- 4.3. If the switch **does not** fully open before the operator reaches the fully open position, the adjustable arm radius is too short. Close the switch, match-mark the adjustable arm and the pipe clevis, and loosen the bolts on the adjustable arm and pipe clevis. ***Lengthen the adjustable radius arm approximately 1/4". Allow the pipe clevis to reposition itself the same 1/4".*** Refer to **Figure 16**. Test operation and readjust as necessary.



**Figure 16: Adjustable Arm Assembly**

- 4.4. If the switch is fully open before the operator reaches the fully open position, the adjustable arm radius is too long. Close the switch, match-mark the adjustable arm and the pipe clevis, and loosen the bolts on the adjustable arm and pipe clevis. ***Shorten the adjustable radius arm approximately 1/4". Allow the pipe clevis to reposition itself the same 1/4".*** Refer to **Figure 16**. Test operation and readjust as necessary.
- 4.5. If the switch has too much toggle in either open or closed position, loosen the pipe clevis and adjust to allow for an equal toggle amount in both positions.
- 4.6. All poles of the fully adjusted disconnect switch should operate together, although a slight variance between poles is acceptable. The primary objective is for all poles to fully open and fully close. Minor adjustments of the inter-phase pipe clevises may be necessary for pole coordination.
- 4.7. Setting Toggle:
  - 4.7.1. Toggle is obtained when the switch is in the either fully open or fully closed position and the connection point between the adjustable arm and pipe clevis has gone past the centerline of the vertical operating pipe. The operating linkage will almost seem to snap past this point.
  - 4.7.2. If possible the switch should go into toggle in both the open and closed positions. This is not always possible, it is most important that the switch goes into toggle in



## Installation & Adjustment Procedures

the closed position, because this will help to prevent the disconnect switch from trying to open during a fault condition.

### 4.8. Final Check:

- 4.8.1. Once all final adjustments are complete, be sure that all nuts are tightened to their specified torque (Refer to **Table 2**).
- 4.8.2. Apply a minimal amount of grease to the point of each piercing bolt and then tighten the bolt until it pierces the pipe wall. For heavy walled pipe, (schedule 80 or above, 3" or above) pre-drill the piercing bolt holes with a piercing bolt drill guide (provided) and a 1/4" drill bit.
- 4.8.3. Position bearing stops to lightly touch, in both the open and closed positions.



## Recommended Inspection Maintenance

### Recommended Inspection Maintenance

Southern States' disconnect switches are designed to operate with minimum maintenance. While disconnecting switches are not readily serviced at frequent intervals, *periodic inspection is important for satisfactory operation and maximized overall life*. Frequency of inspection and maintenance depends on the installation site, weather, atmospheric conditions, experience of operating personnel, and any special operation requirements.

During operational testing, the switch should be opened and closed several times, if possible, to clean the contacts and free the moving parts. A visual inspection, when the switch is wet, or temperature scanning detector may indicate hot spots that could serve as potential sources of trouble. Directional microphones or ultrasonic detectors can be used to locate local corona sources on the switches which can be eliminated during normal switch maintenance.

**NOTE**

It is recommended that maintenance on these switches be performed in accordance with ANSI STANDARDS **C37.30.1-2011**. In addition, well-established live-line servicing and maintenance procedures may be used in accordance with user practices and local and OSHA regulations.

Table 3: Recommended Installation and Maintenance Table

		Installation Tests	Patrolling Inspection 6-months	Routine 5 Year *	Periodic 10 Year *
<b>Insulators</b>	Contamination	X	X	X	X
	Damage	X	X	X	X
<b>Cabinet (if motor operator supplied)</b>	Any loose parts on the floor of the cabinet?	X	X	X	X
	Wiring Secure	X	X	X	X
	Links Secure	X	X	X	X
	Inspect Mechanism for loose parts	X	X	X	X
	Heaters Energized	X	X	X	X
	Door Seal	X	X	X	X
<b>Mechanical</b>	Operational Tests	X		X	X
<b>Electrical</b>	Contact Resistance	X		X	X
<b>Liveparts Inspection</b>	Inspect Contacts	X		X	X
	Inspect Arcing Horns	X		X	X

**\*NOTE:** Inspection/maintenance is suggested to be performed every two (2) years when installed in harsh environments with excessive airborne contaminants such as salt spray and industrial pollutants.



## Recommended Inspection Maintenance

### Patrolling Inspection (6 Months)

The patrolling inspection is a largely visual inspection on an energized unit in service. The frequency of the inspection is determined by the local conditions and policies of the owner of the equipment.

- Inspect the insulators for breaks, cracks, burns, or cement deterioration. Clean insulators particularly where abnormal conditions such as salt deposits, cement dust, or acid fumes exist to minimize possibility of a flashover.
- If an accompanying motor operator is supplied, check the cabinet for loose parts and ensure that all wiring is secure, the heater is energized, and the door is sealed.

### Routine Inspection and Maintenance (5 year)



The disconnect switch must be de-energized, disconnecting from all electrical power sources before servicing.

- Perform patrolling inspection (above), checking insulators and cabinet
- Once the disconnect switch is de-energized, test operate the switch multiple times.
- Check the switch for alignment, contact pressure, eroded contacts, corrosion, and mechanical malfunction, replacing damaged or eroded components if necessary. If contact pitting is minor, smooth the surface with a clean, fine sandpaper. It is recommended to clean and reapply C5-A grease during any operation or maintenance cycle, as exposed surfaces (*such as contacts*) are vulnerable to environmental conditions and contaminants that can decrease the effectiveness of the grease over time. During reapplication, clean and wipe down the contact surfaces with a green Scotchbrite pad, reapply C5-A grease, and remove any excess grease until an evenly coated, thin film is present.
- Inspect arcing horns for signs of excessive arc damage and replace if necessary.
- Check blade lock or latch for adjustment.
- Inspect all live parts for scarring, gouging, or sharp points that could contribute to excessive radio noise and corona. Check corona balls and rings for damage that could impair effectiveness.
- Inspect interphase linkages, operating rods, levers, bearings, etc. to assure that adjustments are correct, all joints are tight, and pipes are not bent.
- Check for simultaneous closing of all blades and for proper seating in the closed position.
- Inspect and check all safety interlocks while testing for proper operation.

### Periodic Inspection and Maintenance (10 year)



The disconnect switch must be de-energized, disconnecting from all electrical power sources before servicing.

- Follow instructions for 5-year Routine Inspection and Maintenance



[illegible]





**The Quality Name in High Voltage Switching**

30 Georgia Avenue  
Hampton, Georgia 30228  
Phone: 770-946-4562  
Fax: 770-946-8106  
E-mail: [support@southernstatesllc.com](mailto:support@southernstatesllc.com)  
<http://www.southernstatesllc.com>

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