[redacted]

Southern States

The Quality Name in High Voltage Switching

Type EVR
Aluminum
Vertical Reach
Disconnect Switch

Single Pole

> 5000A

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 (EST) or 770-946-4565 after normal business hours.

LIMITED WARRANTY

Southern States, LLC ("SSLLC") warrants only to the Warranty Holder (hereinafter defined as the "End User" or the "Immediate Purchaser", as applicable, pursuant to the terms and conditions of this Limited Warranty as set forth below), that the Product identified below will, upon shipment, be free of defects in workmanship and material for the applicable Warranty Period. The "Warranty Period" is that period of time during which this Limited Warranty is effective, and such period begins on the invoice date issued by SSLLC for the Product, and continues until the earlier to occur of (1) the expiration of the Warranty Duration period, or (2) the Number of Operations, both as specified in the table below. If the Product is both purchased and installed within the United States or Canada, this Limited Warranty is granted to each end user of the Product who acquired the Product for its own use during the Warranty Period ("End User"). In all other situations, this Limited Warranty is granted only to the first purchaser of the Product ("Immediate Purchaser") from SSLLC. No primary or remote purchaser or owner of the Product who is not a Warranty Holder may claim any benefit under this Limited Warranty, or any remedial promise included in this Limited Warranty. SSLLC shall, upon prompt written notice from the Warranty Holder, correct a nonconforming Product by repair or replacement at the sole discretion of SSLLC of the nonconforming Product or any part or component of a nonconforming Product necessary in SSLLC's discretion to make such Product conforming. Any transportation charges, labor for removing, reinstalling the Product or part, and/or costs related to providing access to the Product shall be the responsibility of the Warranty Holder. Correction in this manner will constitute the Warranty Holder's exclusive remedy and fulfillment of all SSLLC's liabilities and responsibilities hereunder. SSLLC's duty to perform under this limited warranty may be delayed, at SSLLC's sole option, until SSLLC has been paid in full for all products purchased by the Warranty Holder. No such delay will extend the Warranty Period. If SSLLC does not make such repair or replacement, SSLLC's liability for damages on account of any claimed nonconformity will in no event exceed the purchase price of the Product in question. This Limited Warranty does not apply to any Product that has been disassembled, repaired, or altered by anyone other than SSLLC. This Limited Warranty will not apply to any Product that has been subjected to improper or abnormal use of the Product. SSLLC has no responsibility to repair or replace any Product or component thereof manufactured by another party, but SSLLC will assign, to the extent assignable, to the Warranty Holder any manufacturers' warranty that applies to products and components not manufactured by SSLLC.

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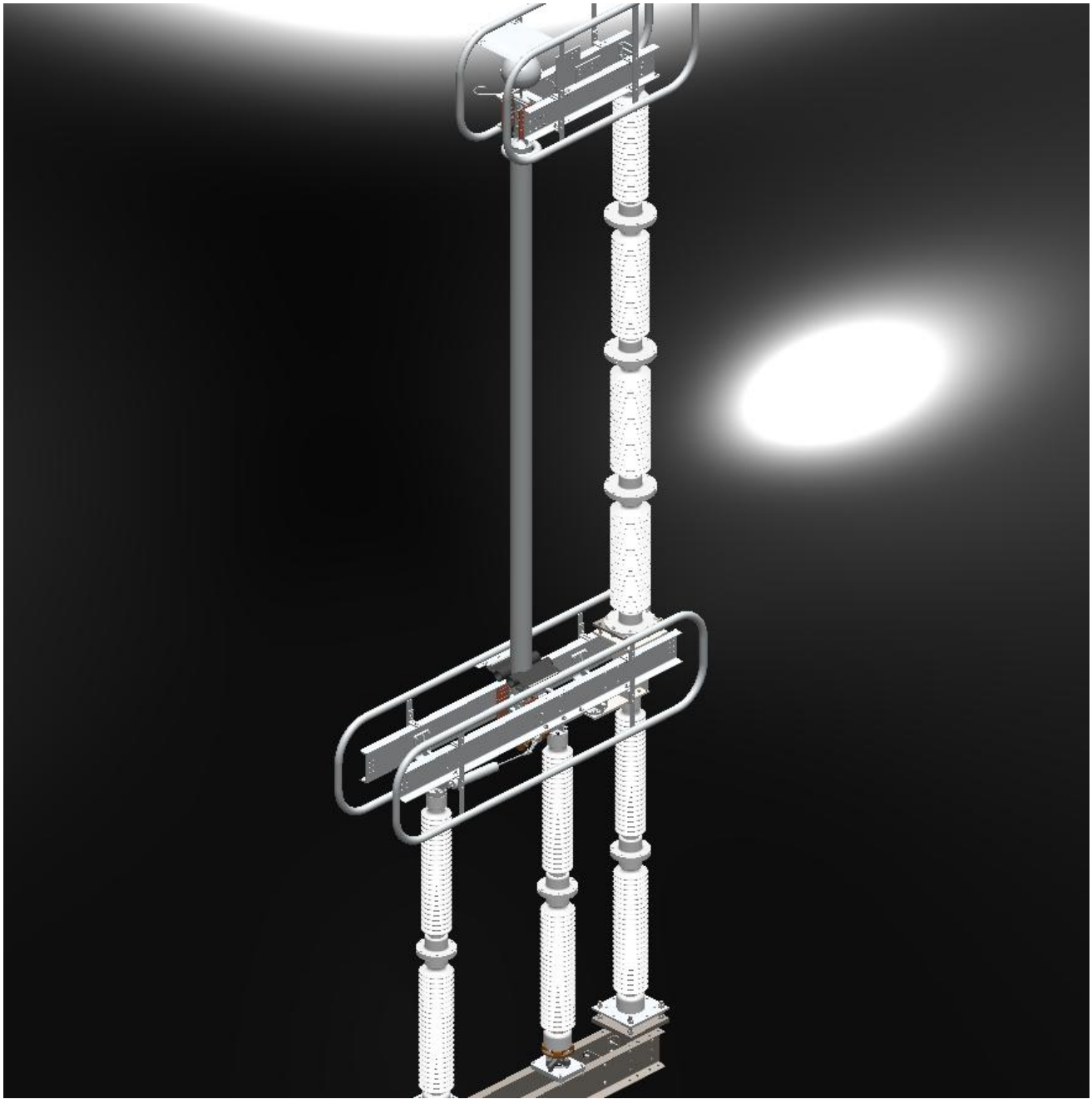
Product Purchased Region	Product Installed Region	Warranty Holder	Warranty Duration
U.S and Canada	U.S and Canada	End User	Five (5) Years
All Other Conditions		Immediate Purchaser	Earlier of 1 year from installation or 18 months from shipment

Revised 7/14/15

The Quality Name in High Voltage Switching

Type EVR



Installation and Adjustment Procedures

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Installation and Adjustment Procedures

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.

Southern States type EV-R is a single phase operated, vertical reach air disconnect switch. The switch should be mounted in a horizontal "upright" only. The switch may be operated using a manual operator or an electrical motor operator.
The installation procedure for all mounting positions and operating schemes are similar and explained herein. A system of pipes, bearings may be utilized to open and close the switch from a ground level operator.

1. Unpacking

Unpack the equipment and check for damages or shortages immediately. Remove shipping ties from hinge and the jaw, **DO NOT CHANGE ANY FACTORY SETTING**. The bill-of-material from the Unit Assembly (switch) and Operating Mechanism drawings should be used to check for shortage. If damage or a shortage is noted contact the factory immediately.

2. Storage

All components of the EV-R vertical break disconnect switch are suitable for outdoor use and do not have any special storage requirements. 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.

3. General Information

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 maybe 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.

Table 1: Recommended Tools and Torque Values

Recommended Tools	
Type	**Sizes (inch)**
Hand Wrenches and/or Sockets	15/16, 3/4, 5/8, 9/16 1-1/8, 1-1/2
Drill Bit	3/16, 5/16
Wire Brush, Electrical Grease	St. Steel No-Oxid Sp.A

Recommended Torque Values	
Bolt/Nut size (inch)	**Torque (Ft-lb)**
1/2	40
5/8	92
3/4	127
1	286

4. Typical Disconnect Switch

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

- Mounting the insulators to the switch base
- Mounting the live parts to the insulators
- Mounting the switch base to the structure
- Installing operating components
- Final adjustment or tuning.

A – GAP INSULATOR
B – JAW ASSEMBLY
C – JAW CORONA RING
D – BLADE
E – HINGE CORONA RING
F – HINGE ASSEMBLY
G – SUPPORT INSULATOR
H – ROTATING INSULATOR
I – INSULATOR SUPPORT
J – JAW ICE SHIELD
K – BASE
L – BEARING
M – HINGE ICE SHIELD
N – BEARING EXTENSION
X – TERMINAL PAD
Y – TERMINAL PAD
Z – TERMINAL PAD

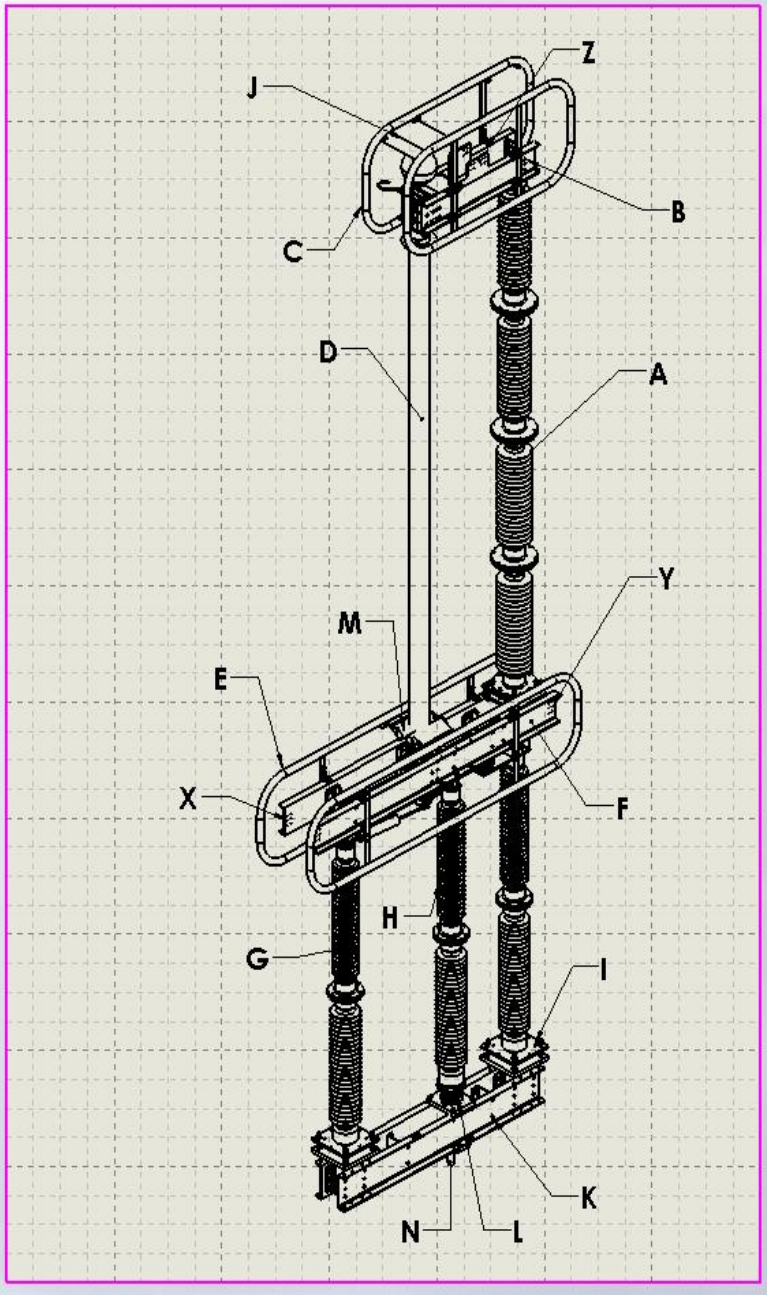


Figure 1: Typical EVR disconnect switch Terminology

Installation and Adjustment Procedures

5. Removal of Live Parts:

EVR hinge mechanisms are NOT typically shipped mounted on switch base. Counter-balances are usually shipped assembled and NO adjustment will be required. Blade is shipped separately, however there will be a short disposable pipe shipped with all hinge assemblies. Do not remove this pipe until indicated.

CAUTION:

Place the unit on a firm, level surface.

Read the instruction before attempting to assemble or install the switch.

6. Mounting of Base

Mount the base on the structure as specified on the operating mechanism drawing after checking for proper spacing and elevation, NOTE direction of blade opening. Use the bolts specified on the operating mechanism drawing for this purpose.

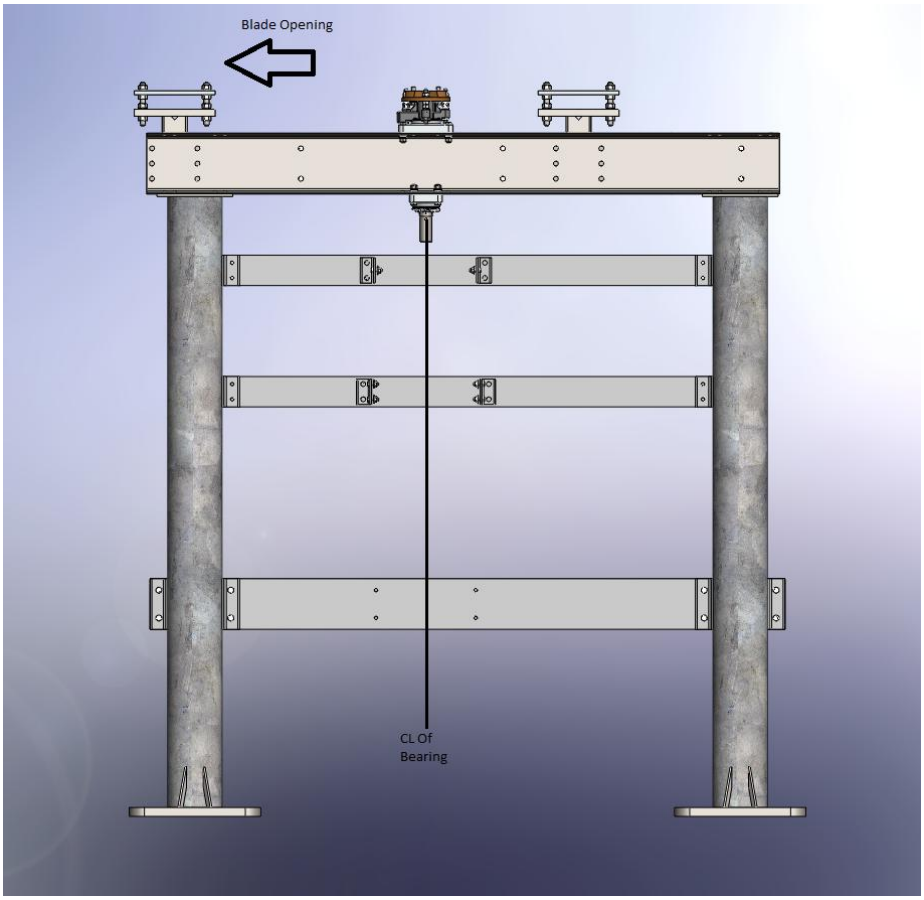


Figure 2: Mounting of switch base on structure

Installation and Adjustment Procedures

7. Mounting of support Insulators

Assemble all insulators units on the ground if possible.
Hoist the insulator stacks, and install on base see **Figure 3**

7.1. Refer to the Unit Assembly and Field Assembly (SF) Drawings for bolt sizes. Mount the insulators to the base adapters and the switch arm plate on the bearing. Confirm match marks are aligned and properly torque the bolts (see **Table 1** on page 2).

7.2. Confirm proper insulator alignment, the rotating insulator must be as near to perpendicular as possible to both the long and short axis of the disconnect switch base. **NOTE:** The original insulator stack height must be maintained. When the nuts on the jack bolts are used to adjust insulator tilt, opposite nuts must be turned equally (run one nut up a certain number of turns, turn the opposite nut down the same number of turns).

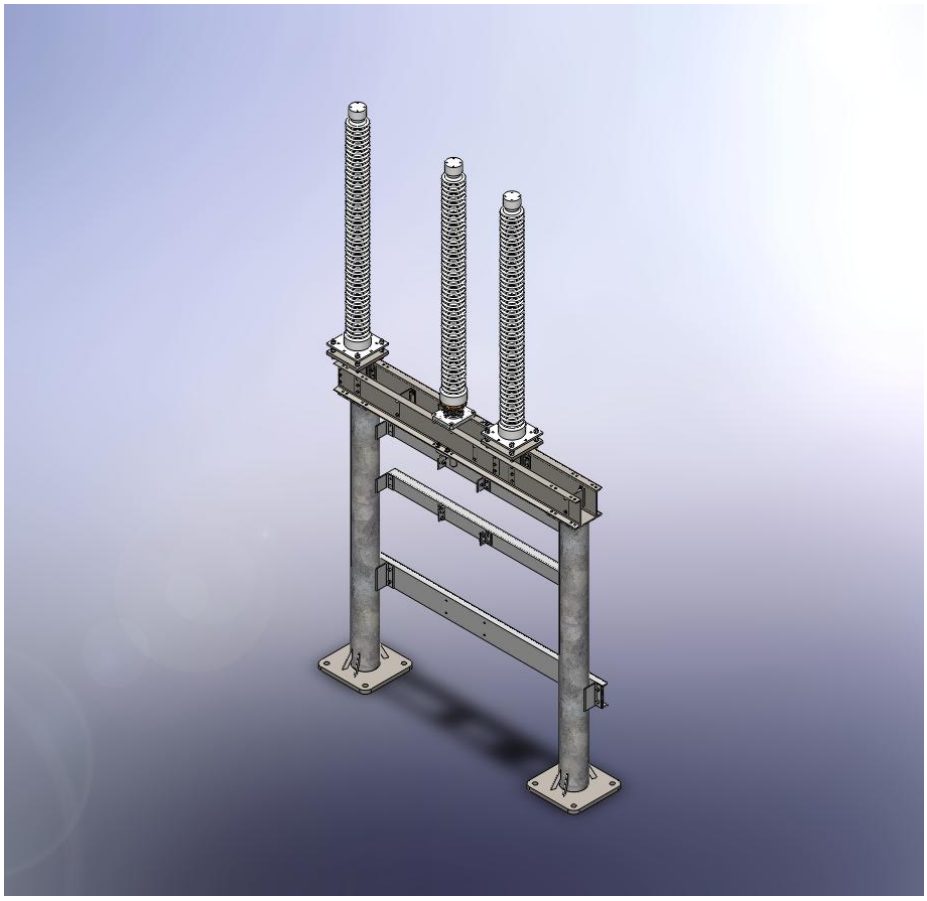


Figure 3: Mounting of Support insulators

7.3. Plum insulators using a plumb-bob or a level. Check insulator's to be on the same height as shown in **Figure 4** using a level.

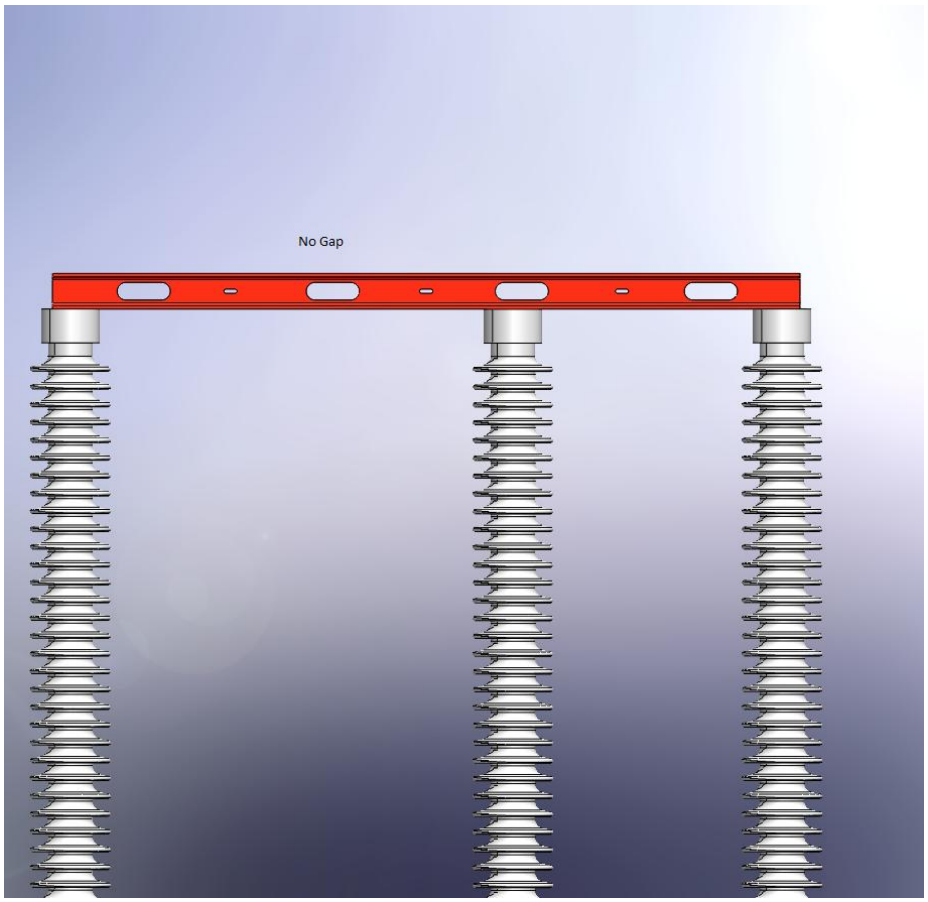


Figure 4: Leveling insulators

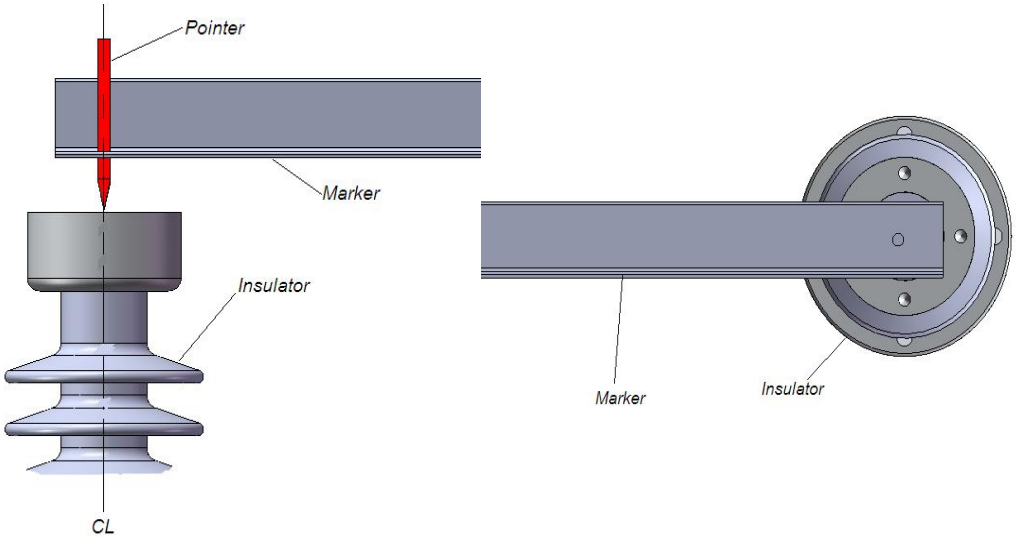
7.4. The rotating insulators require special attention to ensure good switch operation. It will be necessary to insure insulators rotate about their axis uniformly; that is, they do not WOBBLE as they rotate. This may become important due to irregularities in insulator‘s mounting faces. It is not unusual for an insulator to be out of alignment six inches or more. While this switch is designed to tolerate certain misalignment, the rotating insulators may be adjusted to reduce the wobble to 1/4-inch or less.

To true the insulators:

7.4.1. Make a mark at the center of insulator cap.

7.4.2. Make a marker of any convenient material; ie: metal angle

7.4.3. Make a sharp pointer and attach it to one end of marker.



(Front View) **(Top View)**

Figure 5: Marker Placement

7.4.4. The pointer should be placed on the center of the insulator, and the marker on a support outside of insulator rotation.

7.4.5. Rotate the insulator against a stop, and position the reference pointer over the center of insulator cap.

7.4.6. Rotate the insulator to the opposite bearing stop, observe for concentricity.

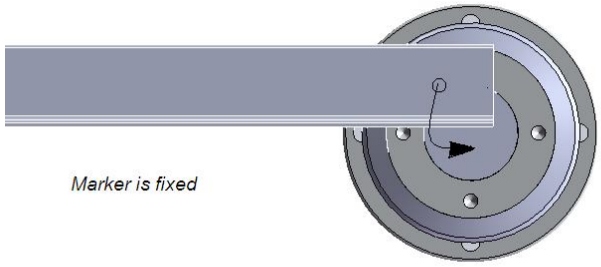


Figure 6: Insulator Adjustment

Insulator rotates away

7.4.7. If insulator wobbles, leave it at the same position in previous step. Use the jacking screws, and tilt the insulator one-half the distance toward the reference point.

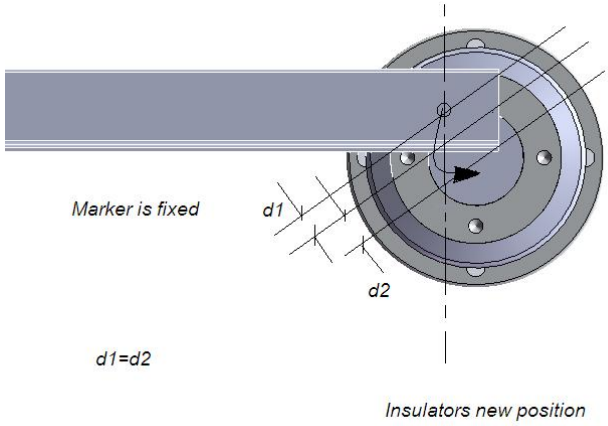


Figure 7: Insulator Adjustment

Tilt Insulator Half way (if necessary).

7.4.8. Bring the bearing back to beginning position step 7.4.5.

7.4.9. Repeat previous steps for all insulators

The above method can be used to adjust insulator rotation Axially, Laterally or combination of both.

8. Installing Hinge mechanism

There is gap between far support and the other hinge support and hinge mechanism. Use the disc spacer provided on top of far support insulator. Use hardware as specified on the unit assembly. Refer to **Table 1** for proper torque requirements.

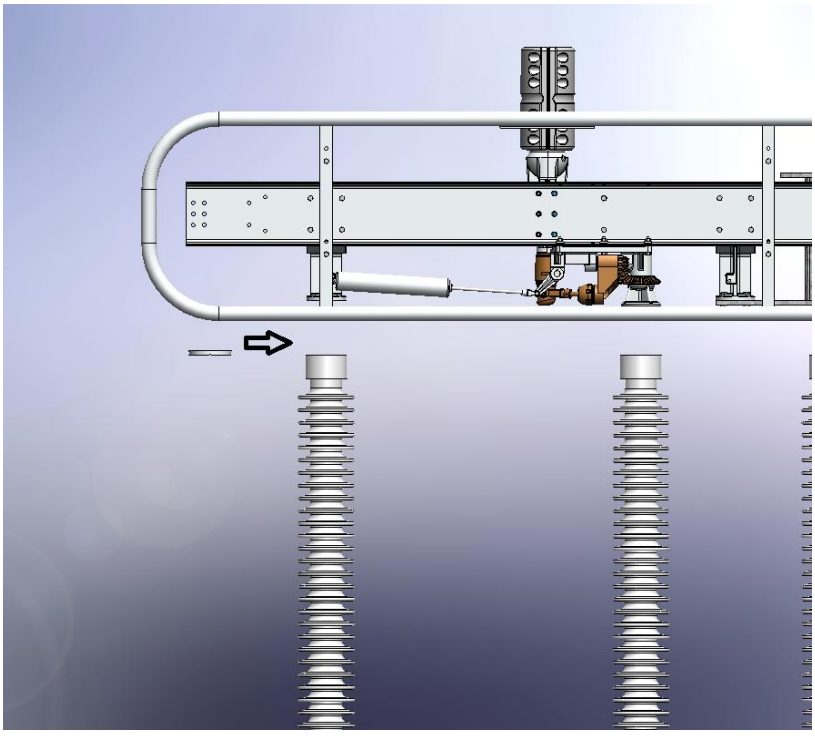


Figure 8: Installing hinge mechanism

9. Installing gap insulator

9.1. Gap insulator is a 185-inches tall 2050kV BIL insulator of multiple segments. Assemble the insulator on firm ground. Pay close attention to the orientation of mounting holes on top and bottom when assembling the insulators together. The insulator then can be hoisted into place by attaching lifting bolts (eye bolts or cross bars).

9.2. Tighten all bolts as per operating mechanism hardware call out.

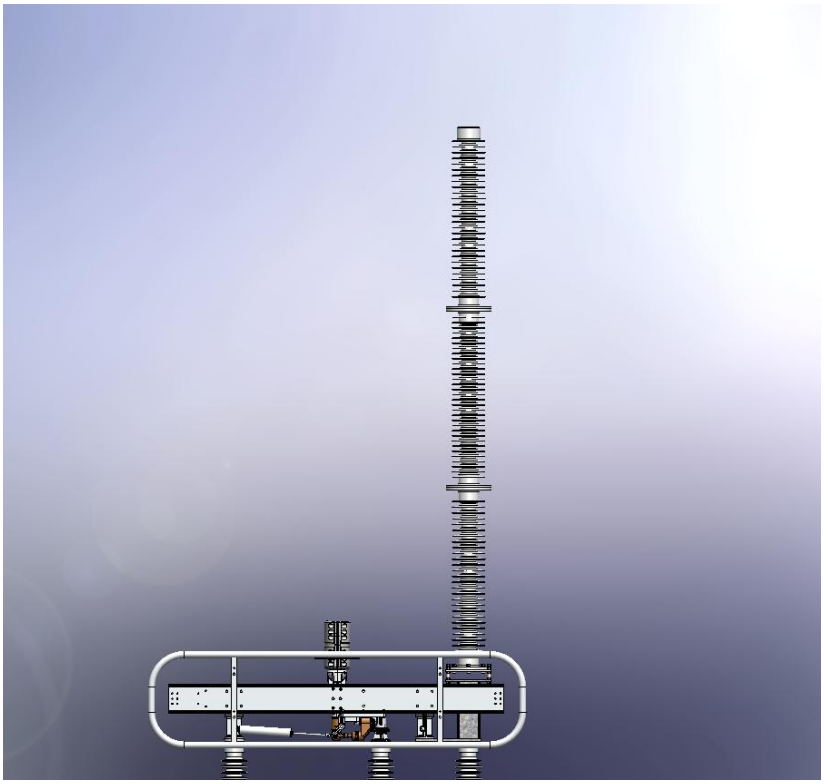


Figure 9: Gap Insulator

10. Installing Blade

Note: Follow factory match marks.

The hinge mechanism typically shipped with its mechanism toggled (locked) in closed position

10.1. Rotate bearing enough to remove the mechanism out of toggle. Do not over rotate, as the force of counterbalance will damage the mechanism. This can be achieved by inserting a crowbar between bearing adjusting screws.

10.2. Loosen blade socket bolts using a 15/16” Deep Socket.

10.3. Remove the dummy blade and discard

10.4. Prepare blade; wire brush and apply No-Oxide grease to engaging section of the blade.

10.5. Insert blade inside the blade socket

10.6. Snug two of the bolts using 15/16” deep socket to assure blade will not work itself out of blade socket.

10.7. **Do Not** move the bearing back into toggle.

Figure 10: Inserting blade

11. Installing Jaw assembly

11.1. Hoist the jaw assembly into position

11.2. Hold and push the blade out of the way to have a clear mounting area. This is doable because the hinge mechanism has been move out of toggle. Using a rope with enough slack to tie the blade to the gap insulator is highly recommended.

12. Adjusting Blade

12.1. Loosen all the bolts on the hinge blade socket.

12.2. Using a pipe strap, rotate blade into proper orientation

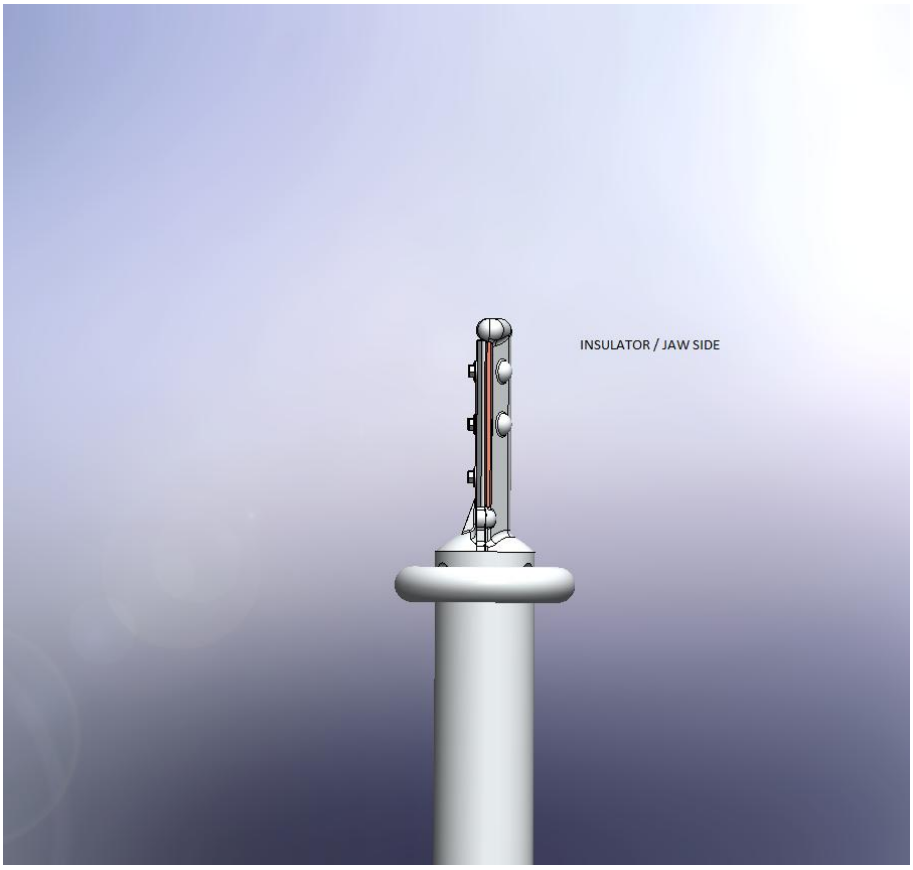


Figure 11: Blade orientation

12.3. Move the blade toward jaw using bearing assembly

12.4. Blade should enter jaw in the center. Adjust blade entrance into jaw using jacking bolts under gap insulator. See **Figure 12**.

12.5. Place bearing into toggle by closing it completely. Check hinge contact bar for alignment. Close the bearing more if more travel is required. See **Figure 13**.

12.6. Using a pipe strap turn the blade. The contact orientation should be checked. See **Figure 13**.

12.7. Tighten blade socket bolts by alternating between bolts to assure even closing.

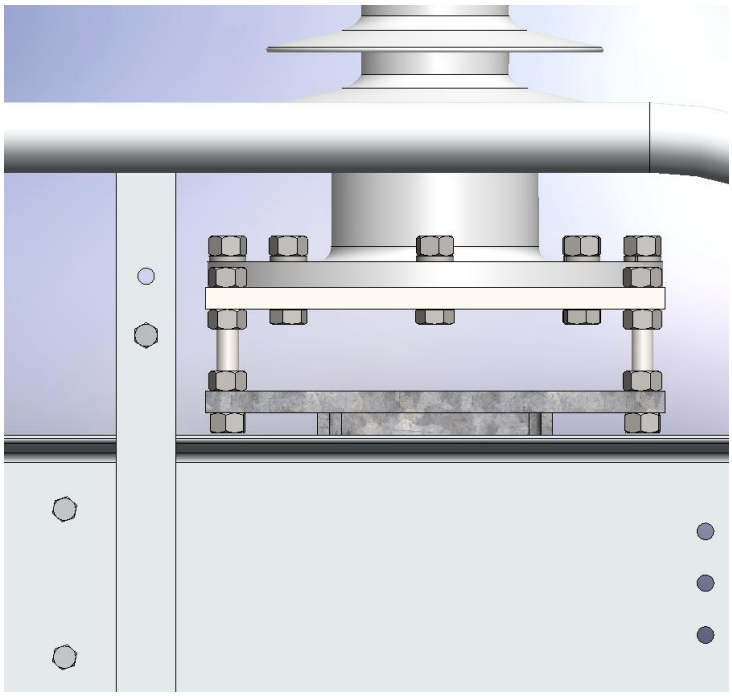


Figure 12: Gap insulator jacking screws

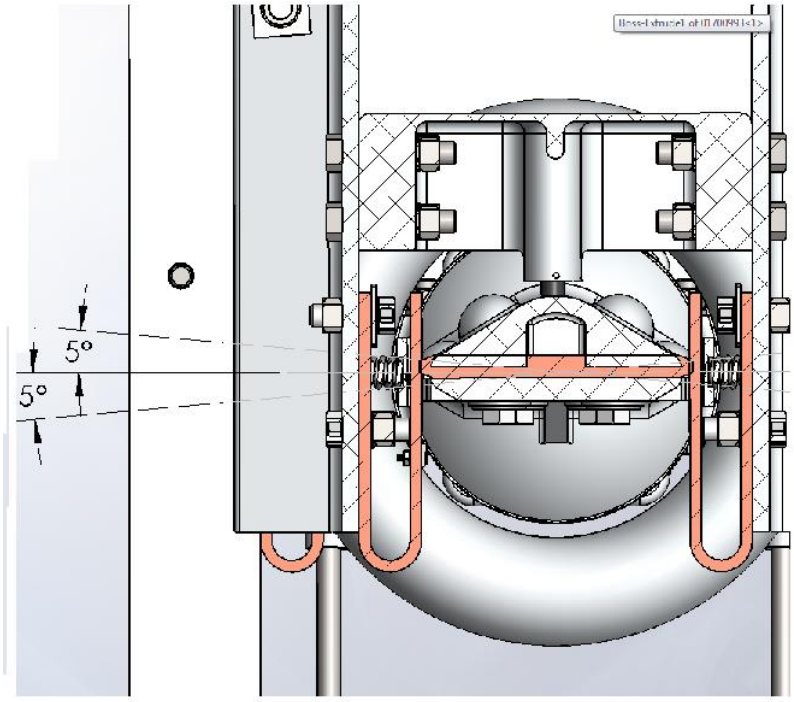


Figure 13: Jaw contact orientation

Hinge contact is similar in design

Installation and Adjustment Procedures

13. Operating Mechanism:

13.1. These switches are designed to be opened and closed as a single phase unit by a system of pipes that translates the rotational movement of an operator on the ground.

13.2. Lay out all the operating mechanism parts and check them against the Operating Mechanism drawing bill-of-material.

13.3. To aid switch inspection from the ground, threader bolts (piercing bolts) can be installed on the bottom sides of the clevises so they can be viewed from the ground when pinned.

13.4. To ensure that the bearing stops do not interfere with switch adjustments, loosen each open/close bearing stop and slide them out of the way.

13.5. 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.
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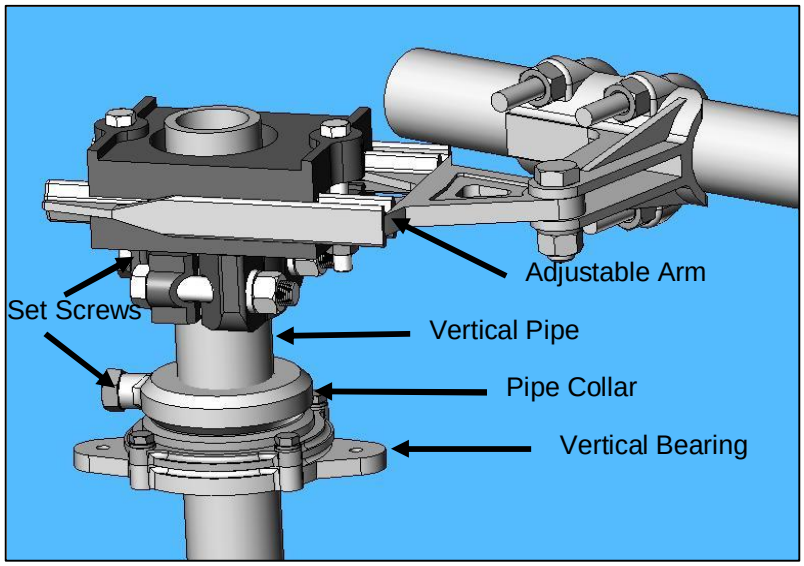

Figure 14: Typical Operating Arrangement

13.6. **CAUTION:** The pipe collar (above the vertical bearing support) must support the entire weight of the vertical operating pipe. **Do not allow the pipe to rest on the switch operating device refer to Figure 14**

13.7. While installing the pipes and clevises that have threader bolts (piercing bolts), do not pierce the pipe until instructed. Tighten the threader bolts such that they grip the pipe until all adjustments are made.

13.8. After mounting all the operating mechanism components, match-mark all clevis connections, the adjustable arm, and the switch operating device's coupling, so that you can tell if slippage occurs during trial operations.

14. Switch Adjustments (Tuning):

14.1. The operating mechanism is intended to fully open and fully close the disconnect switch by rotating the vertical operating pipe 180^{o} using an operator (manual or electrical). The connecting pipe controls the individual operation of each switch pole, using a push/pull control. The adjustable arm controls the total amount of switch operation available.

Installation and Adjustment Procedures

14.2. Final Adjustment:

14.2.1. 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.

14.2.2. Open the disconnect switch with the operator.

14.2.3. If the switch is not fully open before the operator reaches the fully open position, the adjustable arm radius is too short. To correct:

14.2.3.1. Check to see that nothing has slipped.

14.2.3.2. Return the switch to the closed position

14.2.3.3. Match-mark the adjustable arm and the pipe clevis

14.2.3.4. Loosen the bolts on the adjustable arm and pipe clevis

14.2.3.5. Lengthen the adjustable radius arm approximately 1/4-inch. Allow the pipe clevis to reposition itself the same 1/4- inch. Refer to **Figure 15**

14.2.3.6. Test operate and readjust as necessary.

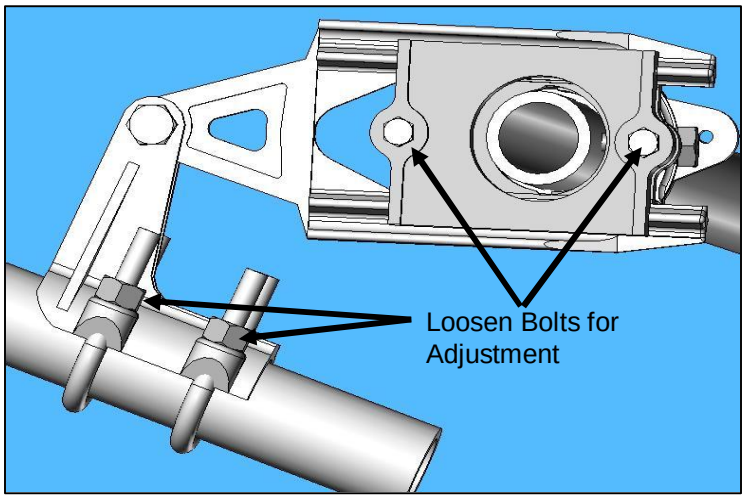

Figure 15: Adjustable Arm Assembly - Top View

14.2.4. If the switch is fully open before the operator reaches the fully open position, the adjustable arm radius is too long. To correct:

14.2.4.1. Check to see that nothing has slipped.

14.2.4.2. Return the switch to the closed position

14.2.4.3. Match-mark the adjustable arm and the pipe clevis

14.2.4.4. Loosen the bolts on the adjustable arm and pipe clevis

14.2.4.5. Shorten the adjustable radius arm approximately 1/4-inch. Allow the pipe clevis to reposition itself the same 1/4- inch. Refer to **Figure 15**

14.2.4.6. Test operate and readjust as necessary.

14.2.5. 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 interphase pipe clevises may be necessary for pole coordination.

15. Blade penetration adjustment

15.1. A yoke, a ball and socket device and adjusting stud along with gear mechanism controls the movement of blade. The blade is factory adjusted to enter the jaw with a prescribed force. However this adjustment can be changed if necessary. To change penetration:

15.1.1. Use an adjustable wrench; turn the square end at the end of adjusting stud.

15.1.2. Lengthen for more closing and less opening

15.1.3. Shorten for more opening and less closing

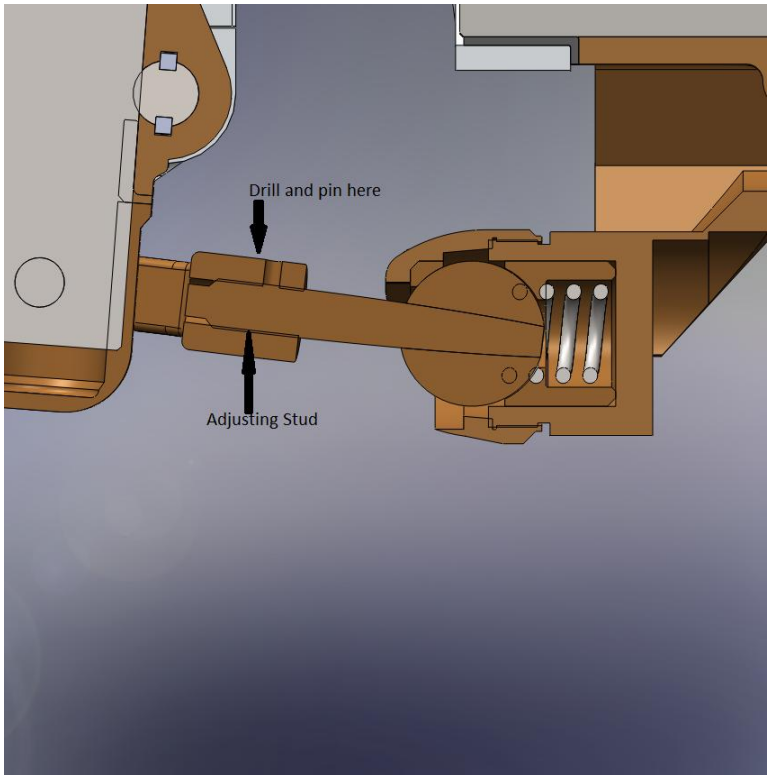

Figure 16: cross section of adjusting mechanism

16. Final Check:

16.1. These switches are designed to be opened and closed as a single phase unit by a system of pipes that translates the rotational movement of an operator on the ground.

16.2. Apply a minimal amount of grease to the point of each threader bolt (piercing screw) and then tighten the bolt until it pierces the pipe wall. For heavy walled pipe, (schedule 80 or above, 3 inch or above) pre-drill the threader bolt (piercing screw) holes with a threader drill guide (provided) and a 1/4- inch drill bit.

16.3. Apply a minimal amount of grease to the point of each threader bolt (piercing screw) and then tighten the bolt until it pierces the pipe wall. For heavy walled pipe, (schedule 80 or above, 3 inch or above) pre-drill the threader bolt (piercing screw) holes with a threader drill guide (provided) and a 1/4- inch drill bit.

16.4. Drill and pin Blade socket after final adjustment. See **Figure 17**.

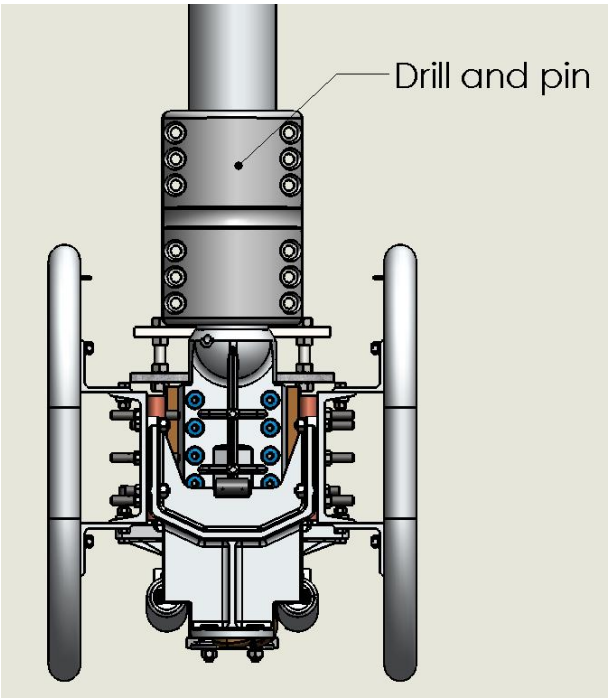

Figure 17: Blade socket pinning location

16.4.1. Drill and pin adjusting mechanism. See **Figure 16**

Installation and Adjustment Procedures

The EVR has been designed to operate with low maintenance. Periodic inspection is important for satisfactory operation. Frequency of inspection and maintenance depends on the installation site, weather and atmospheric conditions, experience of operating personnel and special operation requirements.

Table 2: Recommended Installation and Maintenance Table

		Installation Tests	Patrolling Inspection 6 month	Routine 5 Year	Periodic 10 Year
Insulators	Contamination	X	X	X	X
	Damage	X	X	X	X
Cabinet (if motor operator supplied)	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
Mechanical	Operational Tests	X		X	X
Electrical	Contact Resistance	X		X	X
Liveparts Inspection	Inspect Contacts				X
	Inspect Arcing Horns				X

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. Refer to **Table 2** for recommended inspection items.

Routine Inspection and Maintenance (5 year)

Routine inspection is performed on a de-energized unit. The frequency of the inspection is determined by the local conditions and policies of the owner of the equipment. Refer to **Table 2** for recommended inspection items.

Periodic Inspection and Maintenance (10 year)

Periodic inspection is performed on a de-energized unit. The frequency of the inspection is determined by the local conditions and policies of the owner of the equipment. Refer to **Table 2** for recommended inspection items.

The Quality Name in High Voltage Switching

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