



TYPE EC-2

Aluminum
Center Side Break
Disconnect Switch

For 38 – 362 kV Ratings

INSTALLATION &

INSTRUCTION

MANUAL

Safety Information

WARNING

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

Southern States, LLC (“SLLC”) 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 SLLC 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 SLLC. 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. SLLC shall, upon prompt written notice from the Warranty Holder, correct a nonconforming Product by repair or replacement at the sole discretion of SLLC of the nonconforming Product or any part or component of a nonconforming Product necessary in SLLC’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 SLLC’s liabilities and responsibilities hereunder. SLLC’s duty to perform under this limited warranty may be delayed, at SLLC’s sole option, until SLLC has been paid in full for all products purchased by the Warranty Holder. No such delay will extend the Warranty Period. If SLLC does not make such repair or replacement, SLLC’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 SLLC. This Limited Warranty will not apply to any Product that has been subjected to improper or abnormal use of the Product. SLLC has no responsibility to repair or replace any Product or component thereof manufactured by another party, but SLLC will assign, to the extent assignable, to the Warranty Holder any manufacturers’ warranty that applies to products and components not manufactured by SLLC.

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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 EC-2

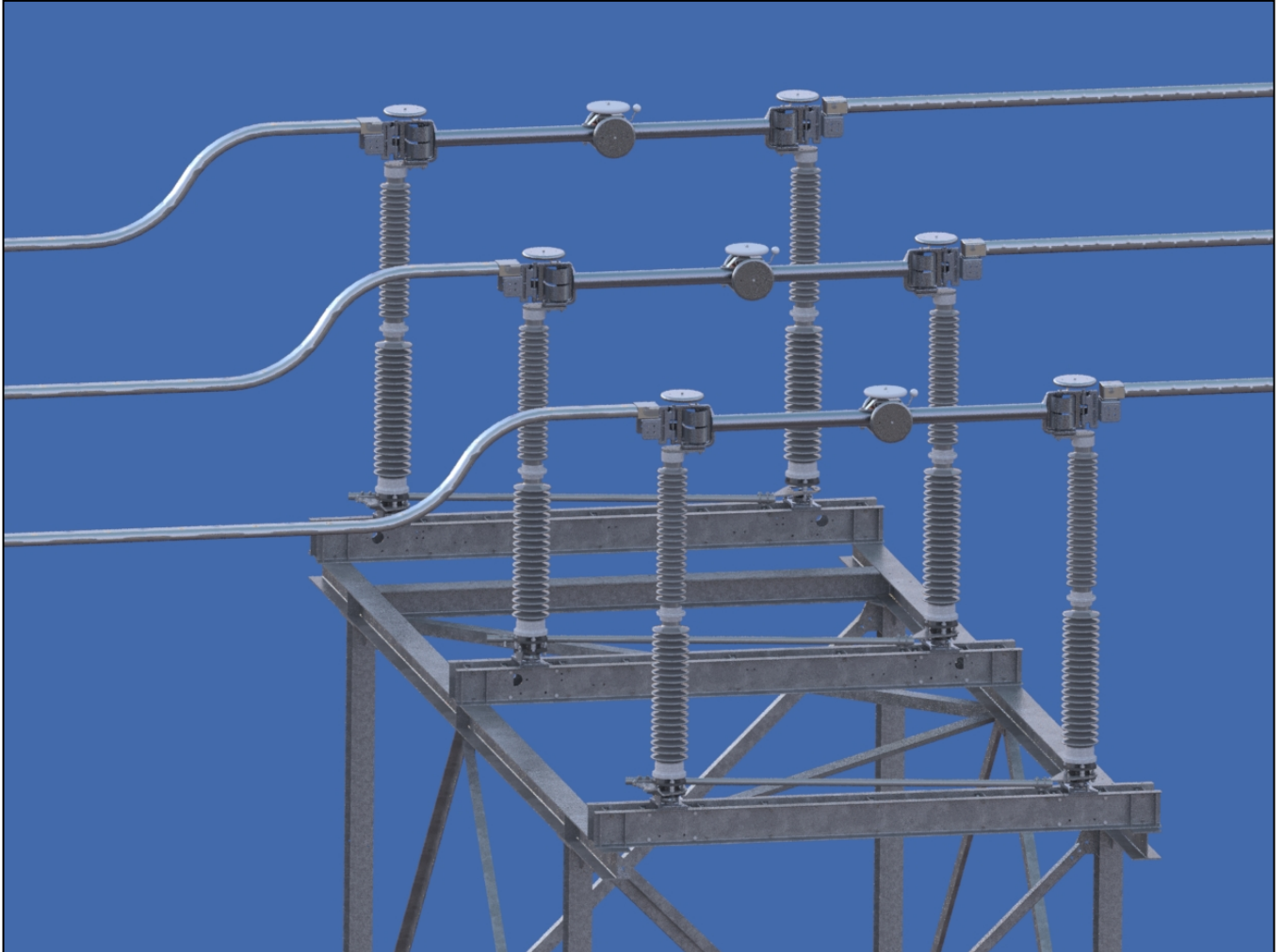


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Summary & Introduction

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-2 is a three phase, group operated, center side break 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-2 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-2 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

RATINGS							
Maximum Voltage Rating (kV)							
38	48.3	72.5	123	145	170	245	362
BIL (kV)							
200	250	350	550	650	750	900/1050	1050/1300

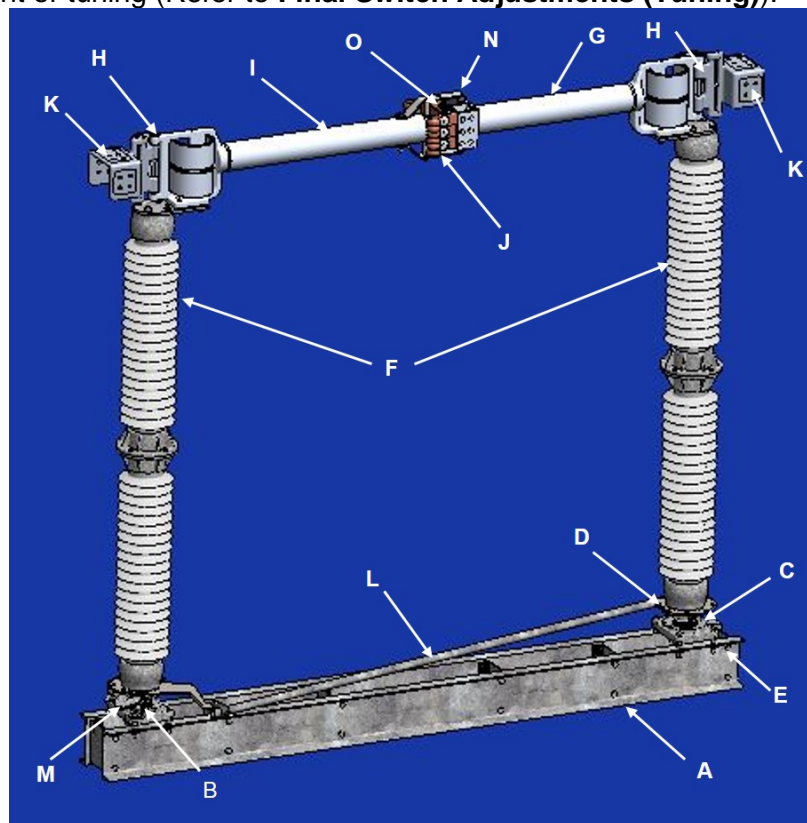
ADDITIONAL RATINGS		
Rated Power Frequency	60 Hz	
Continuous Current	3000 A	4000 A
Short-Time Symmetrical Withstand (3 Sec.)	63 kA RMS	63 kA RMS 75 kA RMS
Peak Withstand	164 kA	164 kA 195 kA
Ambient Temperature Rating	-40°C to +50°C Standard 50°C Optional	

Product Description

Typical Disconnect Switch

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

- Mounting the insulators (F) to the switch base (A) (Refer to **Preferred Switch Assembly Method**).
- Mounting the live parts (G & I) to the insulators (Refer to **Live Part Installation & Contact Adjustment**).
- Mounting the switch base (A) 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)**).
- Mounting the switch base (A) 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)**).



A – Switch Base	F – Insulator	K – Terminal Pad
B – Bearing Stop	G – Female Blade Assembly	L – Interpole Rod
C – Insulator Bearing	H – Hinge	M – Switch Operating Arm
D – Inter-Pole Arm	I – Male Blade Assembly	N – Locking Mechanism
E – Jacking Bolts	J – Contact Fingers	O – Contact Bar

Figure 1: Typical EC-2 Switch Pole Assembled & Common Terminology
 (Corona Rings are for 245kV and above and are not shown.)

Receiving, Handling & Storage

Receiving, Handling & Storage

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-2 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

1. If Disconnect switch is shipped assembled on insulators Skip this section and continue to next section **Mounting disconnect switch onto the structure.**
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 **Figure 15.**
3. Before disassembling the live parts from the switch base you must match mark each of the parts indicated to ensure correct re-assembly. Match-mark A to B and B to C as shown in **Figure 2.**
4. Remove the switch live parts from the shipping spacer (painted red) [if provided], insulator bearings, and inter-pole arms. Make sure to save and reuse hardware if required by the Unit Assembly drawing.
 - 4.1. While it is typically not necessary to disconnect the operating rod from the inter-pole arm (Refer to **Figure 1**), if it must be disconnected match mark it first. *Failure to complete this step will remove the factory adjustment.*
5. Mount the insulator to the inter-pole arm and then to the bearing. Confirm match marks are aligned and properly torque the bolts (see **Table 2**).
6. Confirm proper insulator alignment, both insulators 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). Refer to **Figure 4** and **Figure 5.**

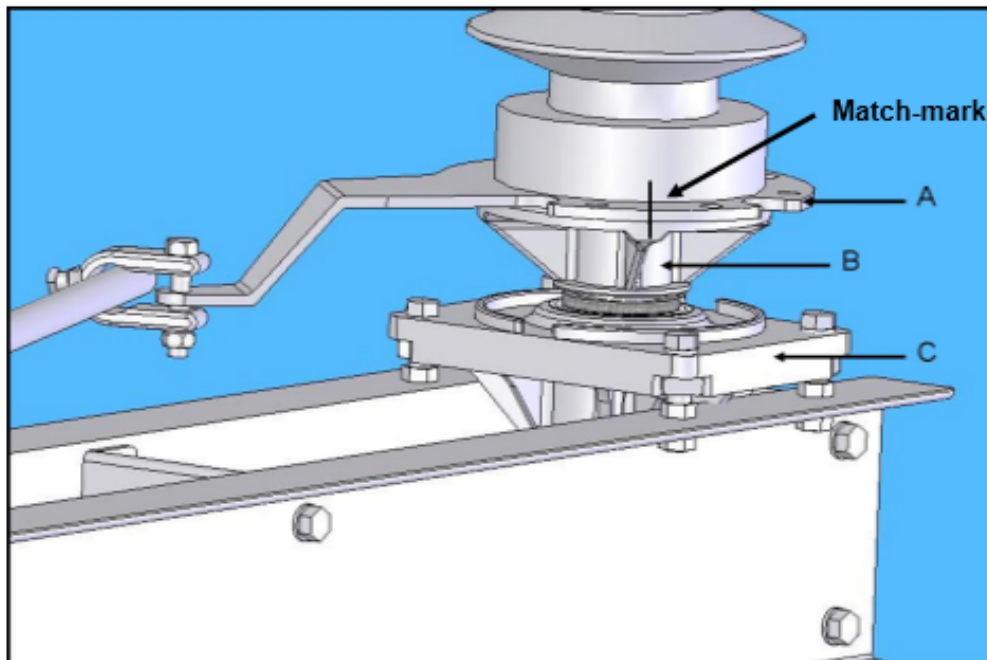


Figure 2: Match-Marked Components (Heavy Duty bearing)

A = Inter-pole Arm B = Bearing Hub C = Bearing

Installation & Adjustment Procedures

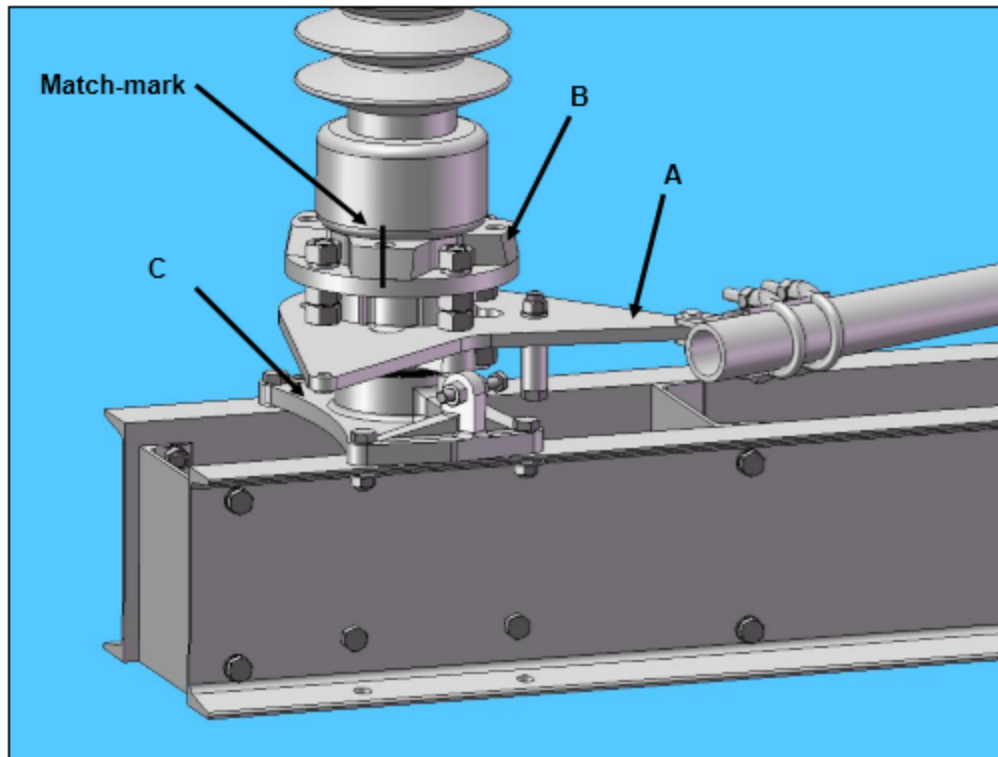


Figure 3: Match-Marked Components (Extra Heavy Duty bearing)

A = Inter-pole Arm B = Bearing Hub C = Bearing

7. Rotate the insulator to the closed position stop on the bearing.
8. Use a plumb bob or other straight line tool (e.g. laser level) to verify that the insulator is level.
9. If the insulator needs adjustment, use the nuts on the jack bolts of the insulator bearing to tilt the insulator in the needed direction. Refer to **Figure 4** and **Figure 5**.
10. **NOTE:** Vertically mounted switches may require the following additional steps once mounted due to extra deflection, or sagging:

Refer to **Figure 4:**

Caution: Do not turn stud!

- i. Loosen all four "A" nuts.
- ii. Loosen both "C" nuts if provided.
- iii. Tilt insulator to necessary angle.
- iv. Adjust all four "B" nuts (up or down) until proper alignment is achieved.
- v. Retighten nuts to proper torque.

Installation & Adjustment Procedures

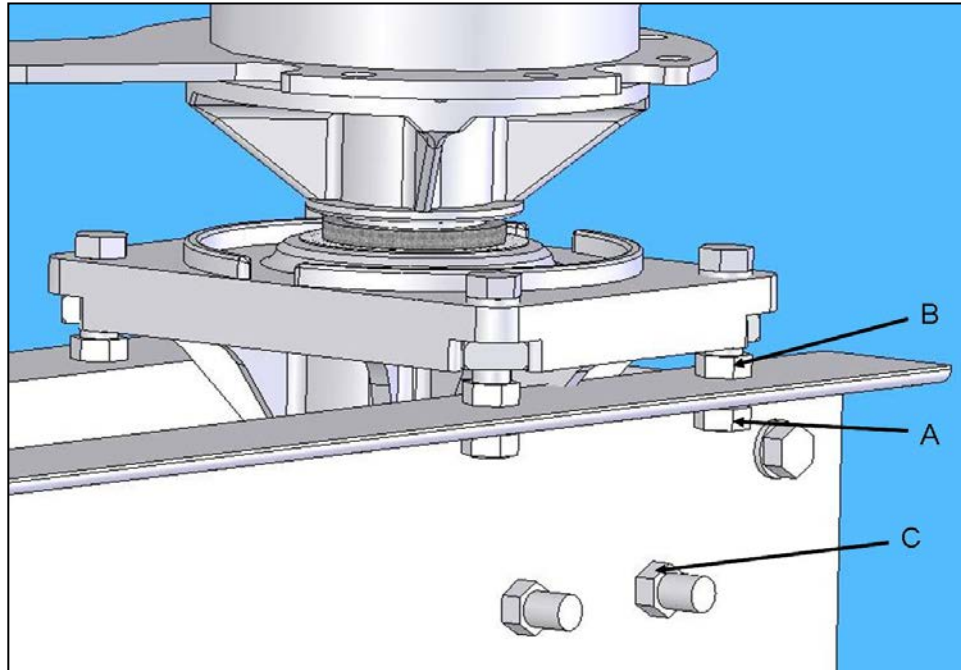


Figure 4: Insulator Stack Alignment (Heavy Duty Bearing)

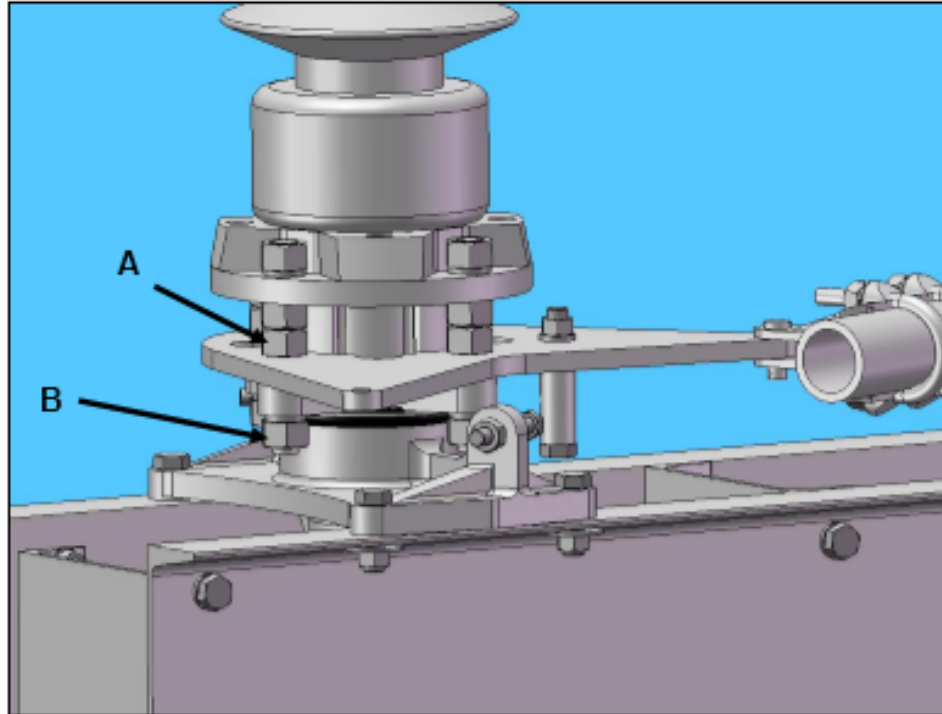


Figure 5: Insulator Stack Alignment (Extra Heavy Duty Bearing)
(A = Jacking Bolt, B = Jacking Nut, C = Adjustment Bolt)

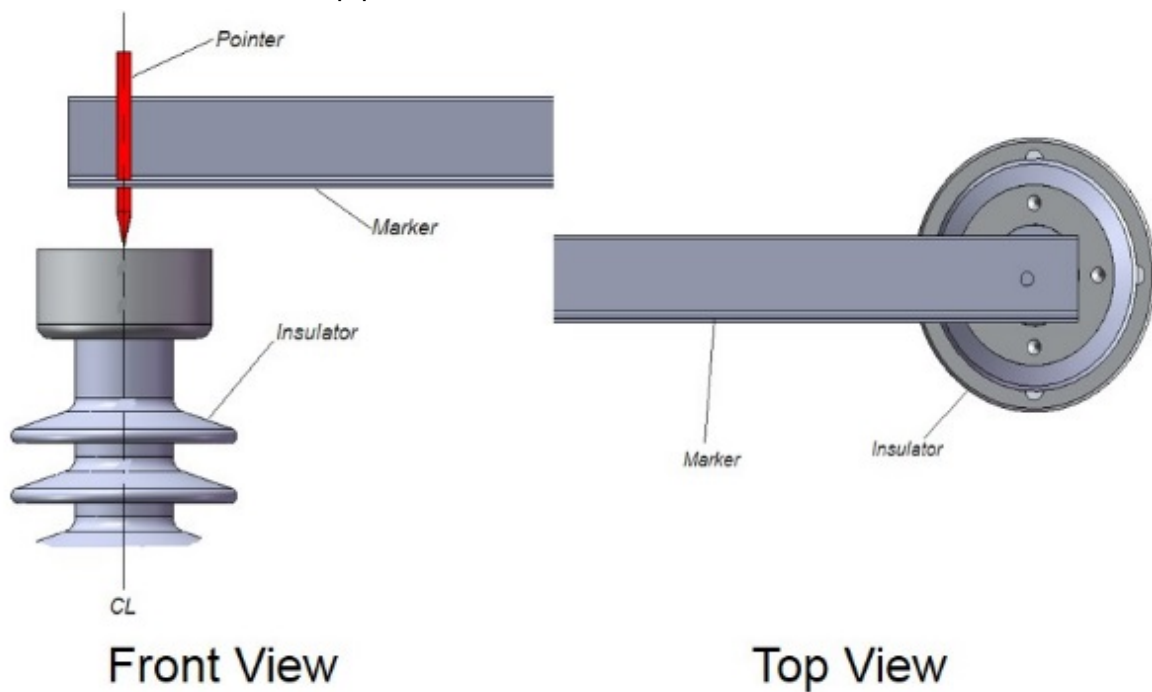
Installation & Adjustment Procedures

10. When installing insulators on high capacity bearings, the insulators require special attention to ensure good switch operation. It is necessary that the insulators rotate about their axis uniformly; that is, they do not **WOBBLE** as they rotate. This is important due to irregularities in insulators. It is not unusual for an insulator to be out of alignment. While this switch is designed to tolerate certain misalignment, the rotating insulators should be adjusted to reduce the wobble to 1/4" or less or as minimal as possible.

10.1. For plumbing refer to 6.1 and 6.2.

10.2. To true the insulators:

- Make a mark at the center of insulator cap.
- Make a marker of any convenient material; ie: metal angle
- Make a sharp pointer and attach it to one end of marker.



- The pointer should be placed on the center of the insulator, and the marker on a support outside of insulator rotation.
- Rotate the insulator against a stop, and position the reference pointer over the center of insulator cap.
- Rotate the insulator to the opposite bearing stop, observe for concentricity.

Installation & Adjustment Procedures

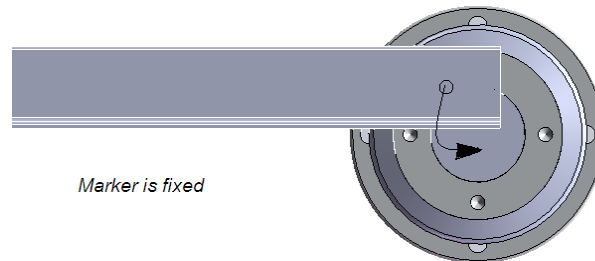


Figure 6: Insulator Adjustment (1)

Insulator rotates away

- 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.

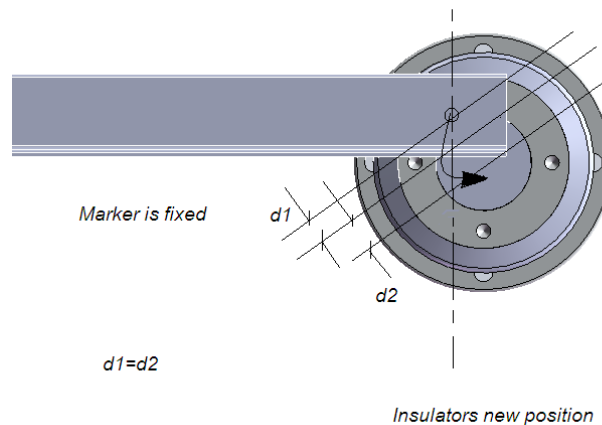


Figure 7: Insulator Adjustment (2)

Tilt Insulator Half way

- Bring the bearing back to beginning position step.
- Repeat previous steps for all insulators (if necessary).

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

Installation & Adjustment Procedures

Live Part Installation & Contact Adjustment

1. Rotate bearing slightly to open, mount the male and female blade assemblies on top of the insulators using the hardware indicated on the Unit Assembly drawing (see **Table 2**).
 - 1.1. Confirm that switch is oriented properly, per the unit assembly drawing.
 - 1.2. Confirm that the match marks are aligned before tightening hardware.
 - 1.3. If corona rings are provided, refer to the Unit Assembly drawing for installation location
2. Back off the Blade Stops on insulator stack, Refer to **Figure 10**.
3. With the male and female blade assemblies in the closed position verify, using a level, that both blades are in the same plane and that their centerlines are aligned. A slight variance is acceptable provided that the male contact is approximately perpendicular in the female contacts. Refer to **Figure 10**.
4. If contact adjustment is necessary, various sizes of stainless steel shims are provided for adjustment. Insert the shims between the insulator end cap and blade hinge until proper alignment is achieved. Torque the bolts to proper value (see **Table 2**). Refer to **Figure 9**.

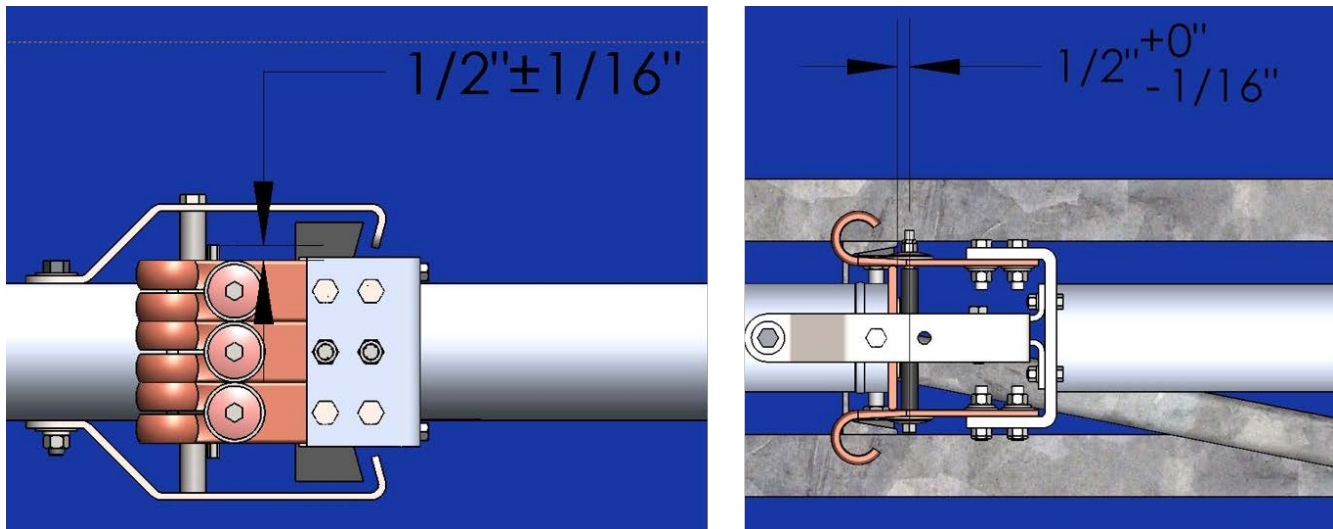


Figure 8: Switch - Fully Closed Position (Left: Side View, Right: Top View)

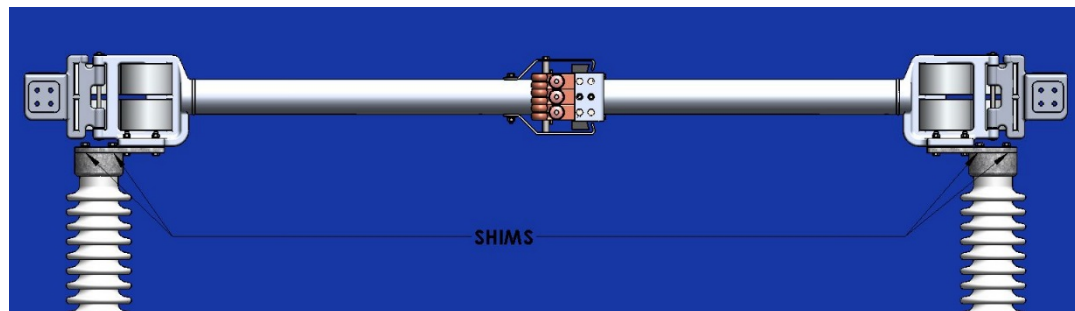


Figure 9: Blade Contact Adjustment

Installation & Adjustment Procedures

5. The male blade assembly should touch the blade stops as shown in **Figure 8**. If adjustment is necessary to achieve contact, loosen the bolts that attach the blades to the insulators, and use the bolt hole tolerances to adjust the spacing. If a gap is still present (**Figure 8**), utilize the insulator stack adjusting bolts to adjust further (Refer to **Figure 4** and **Figure 5**). Torque all bolts to the recommended value(s) shown in Table 2.
6. Contact fingers should be centered or as close as possible on contact bar. All contact fingers must make contact with silver on contact bar in closed position as shown in **Figure 8**.
7. Use only DRIVING phase stop to set up the switch, with the other two stops completely backed off, then adjust the crank arm stop or rest within 1/4" inch of the blade stops (Refer to **Figure 10**). If adjustment is necessary, loosen the nuts on the adjusting bolt and adjust the bolt until the distance between the blade stop and the stop is correct. Torque the nuts to proper value. (See Table 2)

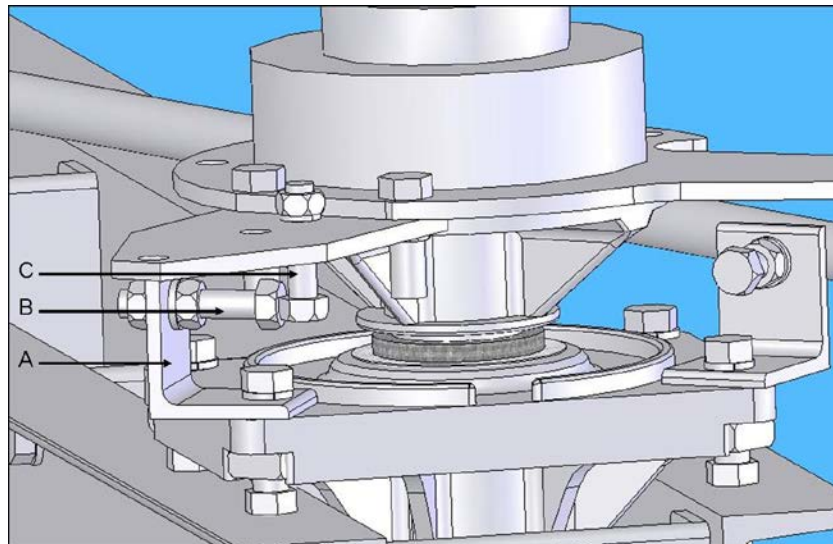


Figure 10: Blade Stops (Heavy Duty Bearing)
 A= Stop, B=Crank Arm stop, C= Adjusting bolt

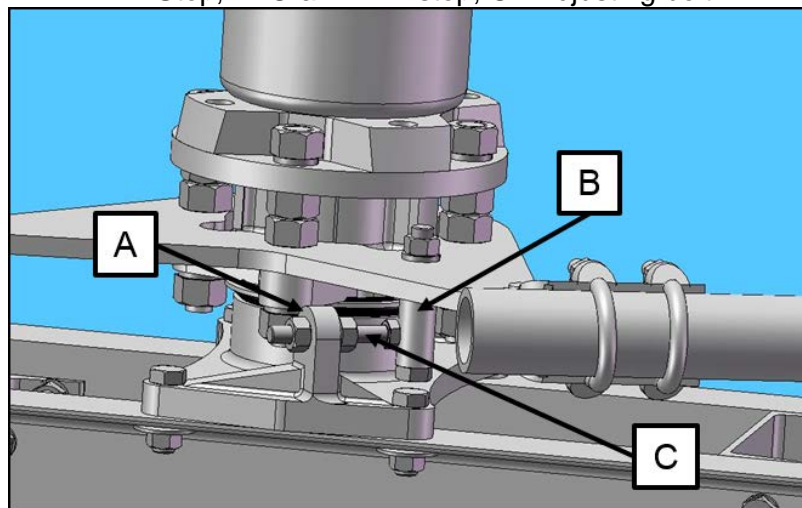


Figure 11: Blade Stops (Extra Heavy Duty Bearing)
 A= Stop, B=Crank Arm stop, C= Adjusting bolt

Installation & Adjustment Procedures

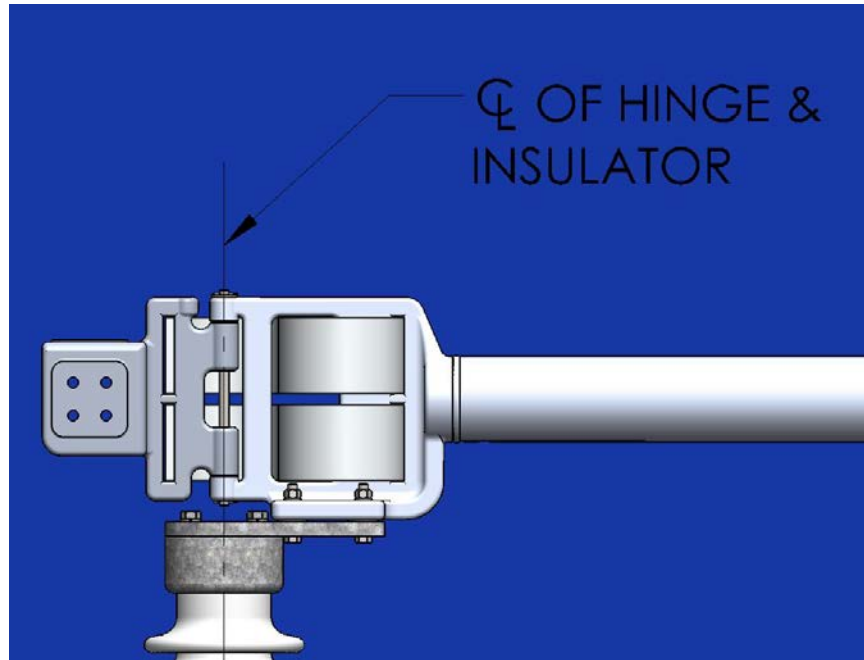


Figure 12: Hinge Assembly of 3000/4000A

Installation & Adjustment Procedures

Mounting disconnect switch onto the structure

1. Recheck the Operating Mechanism drawing to confirm the correct position of the disconnect switch pole on the structure.
2. With the switch closed, secure the male and female blade assemblies using rope or other type of strap, to avoid movement during lifting.
3. Secure the switch arm to the bearing stop prior to lifting.
4. Lift the assembled switch by the switch base only. Refer to **Figure 15**.
5. Mount the disconnect switch to the structure using the hardware indicated by the Operating Mechanism drawing (see **Table 2**).
6. **If possible** mount the conductors to both ends of the switch pole before adjusting switches.
7. Conductor loads can alter fine switch adjustments, so final adjustments should not be performed prior to connecting the conductors.
8. Verify that the insulators are still properly aligned.
9. Refer to **Figure 5**,
10. **Figure 13** and **Figure 14**. Adjust both “A” nuts and “B” nuts equally to prevent misalignment.
 - 10.1. After adjustment, torque the nuts properly (see **Table 2**).

Figure 13: Insulator Stack Adjustment (Heavy Duty Bearing)

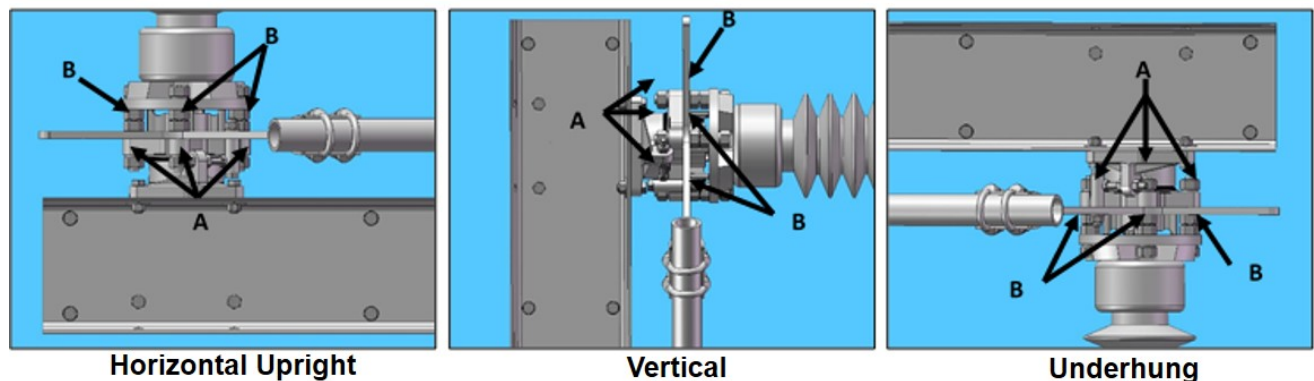


Figure 14: Insulator Stack Adjustment (Extra Heavy Duty Bearing)

(A = Jacking Bolt, B = Jacking Nut, C – Adjustment Bolt)

Installation & Adjustment Procedures

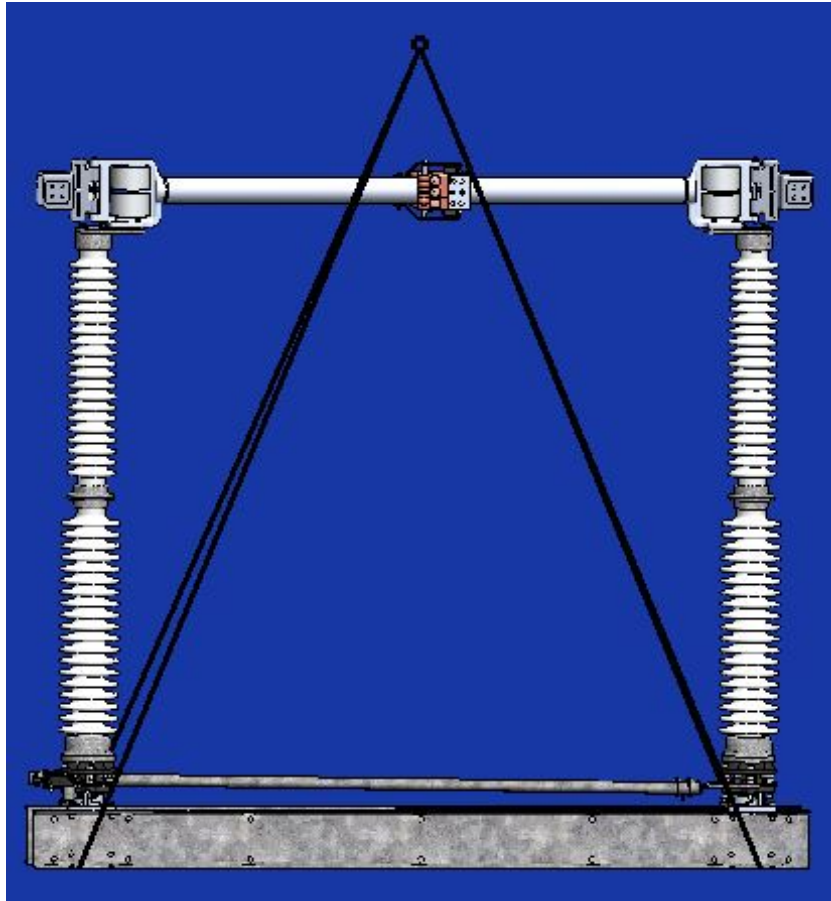


Figure 15: Sling Attachment

Installation & Adjustment Procedures

Optional Accessories

1. Blade Lock (if equipped):

In the closed position the blade lock hook should engage the locking post without touching it. There should be a 9/16" clearance between the locking hook and locking post. Refer to **Figure 16**. If adjustment is necessary, the insulators may need to be slightly tilted towards or away from each other depending on the adjustment necessary.

2. Arcing Horns (if equipped):

2.1. Refer to the Unit Assembly drawing for necessary hardware and installation location.

2.2. Arcing horns should rub together with sufficient pressure to maintain contact, but not to cause binding.

2.3. Arcing horns should be touching before switch contacts separate from each other. If necessary the arcing horn can be bent to achieve proper contact.

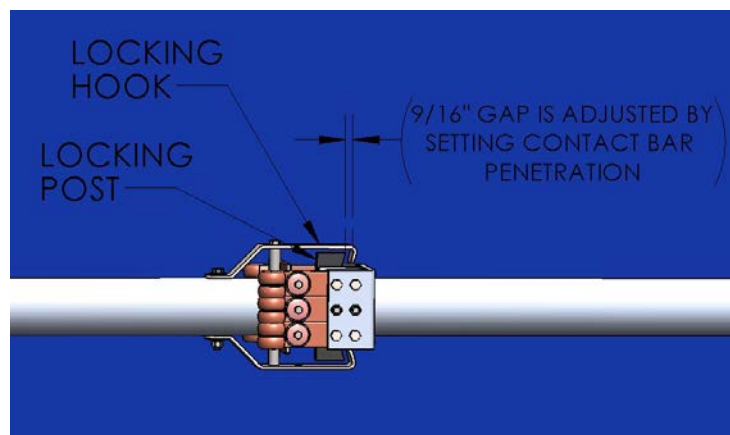


Figure 16: Blade Lock

Installation & Adjustment Procedures

Operating Mechanism (See Operating mechanism drawings provided for details)

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 17**.

▲ 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 17**.

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.
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 17**.

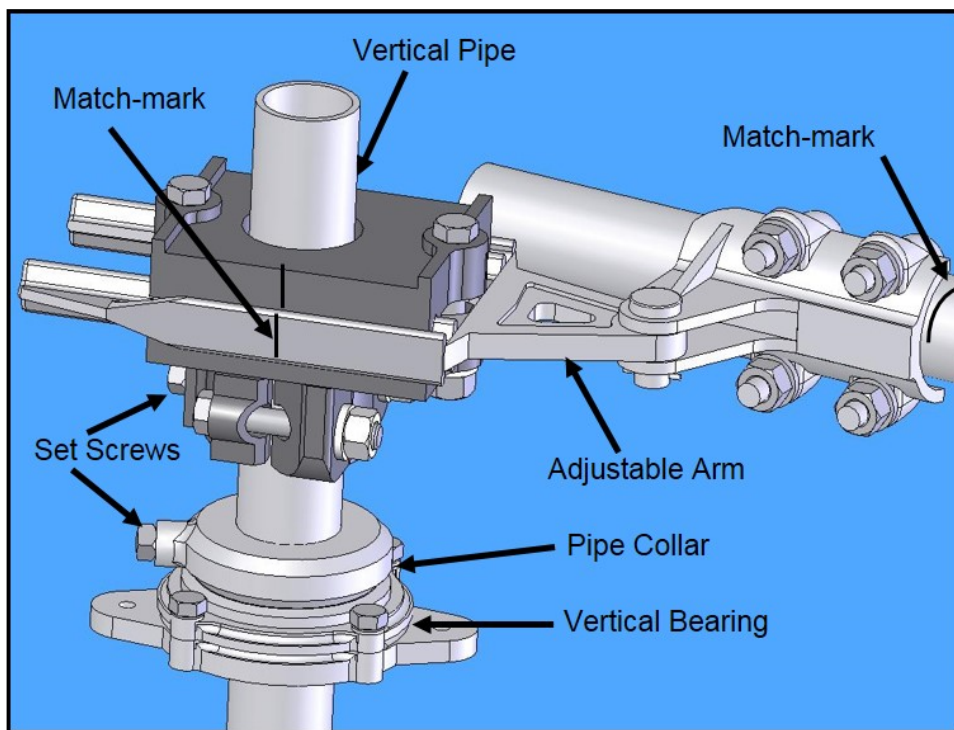


Figure 17: Typical Operating Arrangement

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.
 - 1.1. **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 operator handle is factory set to rotate clockwise to open the switch.
 - 2.1.2. The weight of the vertical operating pipe should be supported by pipe collar (**Figure 17**) by maintaining the 1/4 - 3/8" gap (**Figure 18**).
 - 2.1.3. 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 18**.

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

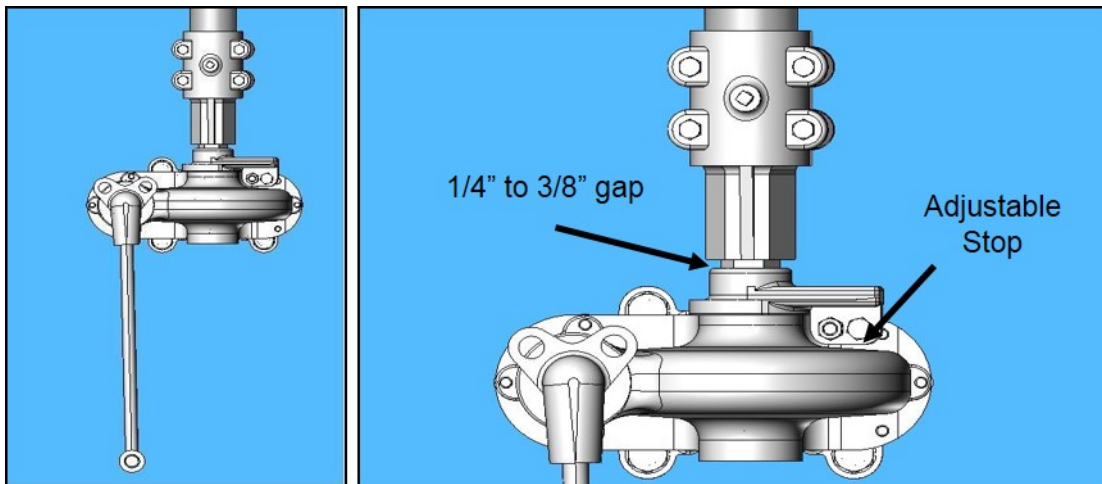


Figure 18: Type HOGO (High Output Geared Operator) Front View

- 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 (**Figure 19**) 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. Refer to **Figure 19**.

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

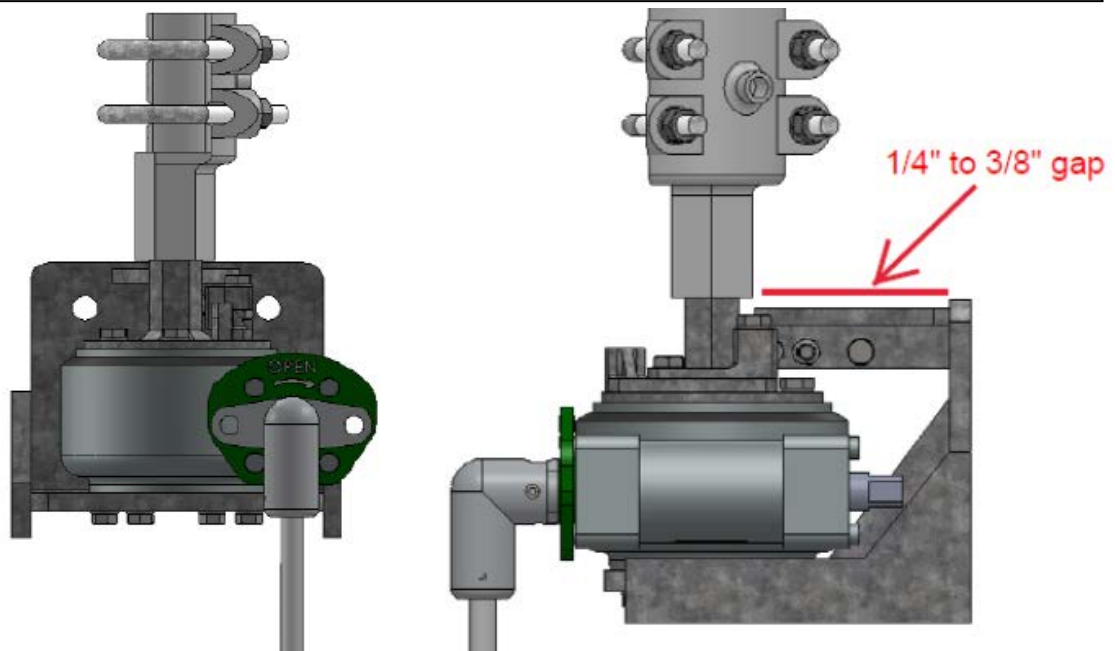


Figure 19: Type SEGO (Safety Enhanced Gear Operator)

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. Refer to Figure 20.

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.

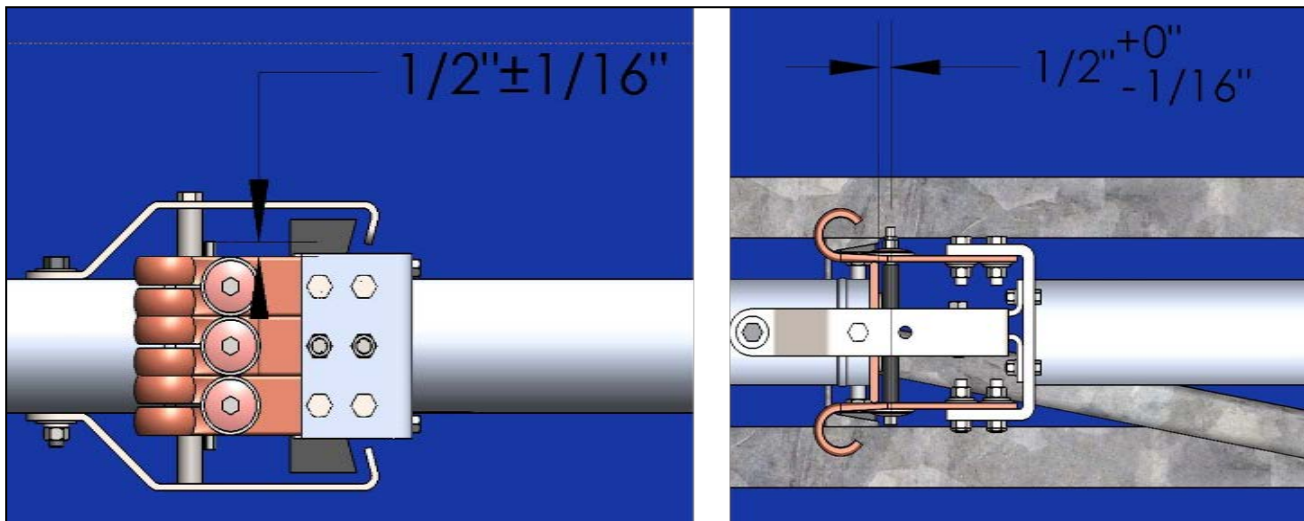


Figure 20: Switch - Fully Closed Position (Left: Side view, Right: Top view)

4. Final Adjustment:

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. Refer to **Figure 21**.

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 17**. Test operation and readjust as necessary.

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 17**. 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.

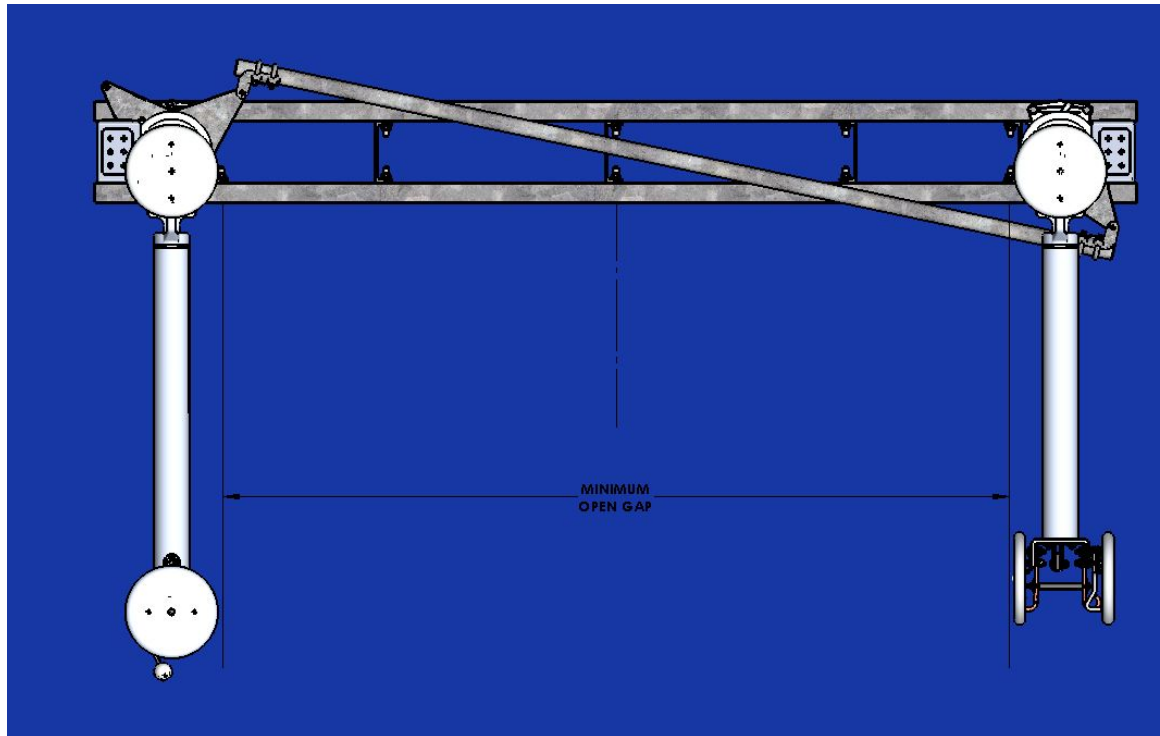


Figure 21: Switch – Fully Open Position (Top View)

Switch Rating (kV)	Recommended Minimum Distance between any metal parts (inches)
72.5	32
123	50
145	60
170	68
245 (900 BIL)	84
245 / 362 (1050 BIL)	104
362 (1300 BIL)	120

Table 3: Minimum opening

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 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 ¼" drill bit.
- 4.8.3. Position bearing stops to lightly touch, in both the open and closed positions

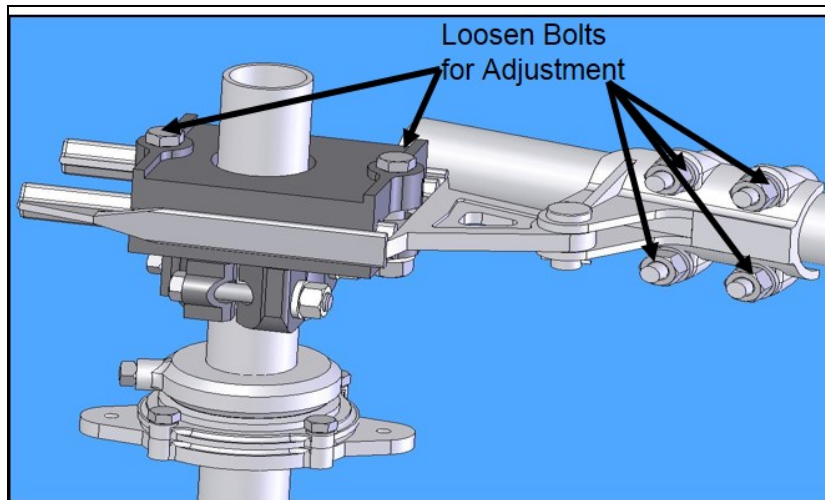


Figure 22: Adjustable Arm Assembly

Recommended Inspection Maintenance

Recommended Inspection Maintenance

The EC-2 has been designed to operate with minimum 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 4: 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		X	X
	Inspect Arcing Horns	X		X	X

*Note: Harsh environments with excessive airborne contaminants, such as, salt spray and industrial pollutants will require inspection/maintenance every two (2) years.

For specific instructions please refer to the SCE disconnect maintenance guidelines.

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 4** 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 4** 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 4** for recommended inspection items.



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