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## **Installation Instructions for SEECO Multi-Bottle Interrupter For Use With Vertical Break Switches.**

Thank you for purchasing a SEECO Monoruptr® vacuum interrupter. We are pleased to be able to provide this product to you, and we believe that it will meet or exceed your performance expectations. We appreciate all comments with regard to our product, and welcome any suggested modifications to the design or installation procedures which would better suit your future application needs.

The following pages provide a generalized, step-by-step descriptive procedure for the field installation and adjustment of SEECO-style multi-bottle vacuum interrupters onto vertical break switch gear. This procedure covers many of the most common configurations; however it cannot cover all details or every variation in equipment. As you review the installation instructions, please refer to the accompanying drawings for the complete bills of material with quantities, locations and adjustment parameters for the specific interrupter being installed. These instructions are intended to complement the drawings provided and are not a replacement or substitute for the drawings.

A word about safety: These instructions are general guidelines and should not supersede your organization's own work and safety procedures. These guidelines must always be interpreted in light of the specific workplace or site conditions, personnel experience and equipment capability.

If at any point during the installation process you have questions or need additional information or assistance, you are encouraged to call us at 704-392-1396. We welcome the opportunity to assist you.

### **I. SUGGESTED TOOLS AND EQUIPMENT**

1. 3/8" Open-End Wrench
2. 7/16" Open-End Wrench
3. 1/2" Open-End Wrench
4. 9/16" Open-End Wrench
5. 3/4" Open-End Wrench
6. 1/2" Drive Ratchet
7. 3/8" Socket
8. 7/16" Socket
9. 9/16" Socket
10. 3/4" Socket
11. Tape Measure
12. 1/8" Drill Bits & Drill

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## II. RECEIVING, STORAGE AND UNCRATING

### A. Receiving

Each three phase set of interrupters is typically shipped on a single (large) pallet. Depending on the material ordered, a second smaller crate of blade clamps and auxiliary contacts may accompany the larger interrupter pallet. All material should be checked against the accompanying bill of lading when the interrupter set is received. Confirm that the number of shipping units (crates) received exactly matches the number of shipping units on the bill of lading.

All interrupter crates must also be visually inspected for physical damage. If physical damage is apparent or suspected, you must file a claim immediately with the transportation company and notify your SEECO representative. Physical damage is indicated by broken or bent trip arms, bent mounting brackets, or any other abrasions, scratches or deformation to the surface of the interrupter units. In the absence of visible damage to the interrupter units, hidden damage may be indicated by crating lumber that is broken or cracked, crating members that have pulled away from the main crate, missing members or torn shrink wrap, all of which may be indications of rough or inappropriate handling by the transportation company. If you suspect hidden damage we advise you to note this on the bill of lading before the driver has departed your location.

Please note that the responsibility to determine if a shipment is complete and without damage rests with you and your organization. Failure to identify shortages or transit damage at the time the material is delivered may compromise your claim with the transportation company and result in the material being replaced at additional cost to your organization.

### B. Storage

Material may be stored outdoors. All interrupter units should be left in their original shipping containers until ready for use. Please exercise care in handling and storage as interrupter units are easily damaged. Damage due to rough handling is not covered under warranty and will be corrected at additional cost.

### C. Uncrating materials at the job site

1. The mounting hardware for each interrupter unit is included in a plastic bag, which is stapled to the wooden pallet or inside the packaging box.
2. An installation drawing, with accompanying bill of material and adjustment dimensions, is provided in a sealed black plastic bag, which is secured (taped) to one of the interrupter unit u-tube arms. The sealed bag also includes

instructions for hi-potting the interrupter. Please locate the black plastic bag and review the drawing before proceeding with installation.

### **III. HI-POT PROCEDURE**

#### **A. Each interrupter unit is fully hi-pot tested prior to shipment.**

1. It is not normally necessary to repeat this test unless you suspect that damage has occurred in-transit. If you suspect damage we recommend that you hi-pot test prior to installation to confirm the condition of the interrupter unit.
  - a. A copy of SEECO's suggested hi-pot test procedure is included in the sealed bag containing the installation drawing. Note: This procedure is offered as general guidance and should not supersede your organization's own work and safety procedures.
  - b. In place of the complete hi-pot test, a continuity test of each vacuum bottle in both the closed and open contact position may be substituted if there is no visible external damage to the interrupter unit.
  - c. A hi-pot test is the only absolute way to confirm the integrity of the vacuum bottles. Please contact SEECO for guidance if there is doubt about the appropriate use of a continuity test vs. the more complete and definitive hi-pot procedure
2. Each organization will have its own policy for routine hi-pot testing of newly received interrupter units. Please refer to your own policy for guidance in this situation

### **IV. INSTALLING INTERRUPTER UNITS**

#### **A. Mounting the Interrupter Units**

1. The mounting hardware and appropriate spacers are located in a plastic bag which is stapled to the wooden pallet. Line personnel will need the hardware bag to attach the interrupter unit to the mounting plate.
2. With one person holding the unit in place, the appropriate hardware and spacers (if needed) can be installed per the supplied drawings by a second crew member.
3. Do not use the interrupter arm to prop or hold the unit up, this can cause damage to the unit.

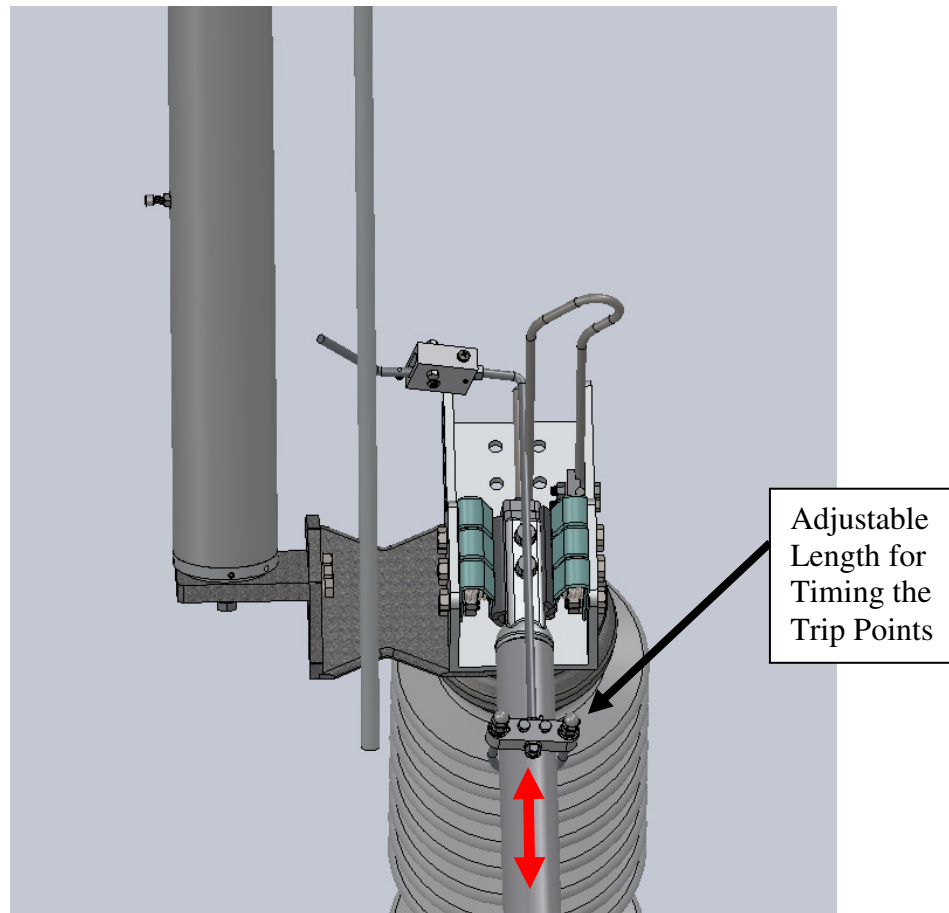
## V. BLADE CLAMP/PICK-UP ARM INSTALLATION

Pick-up arms are provided to engage the interrupter unit operating arm in the opening direction of switch operation. The stainless pick-up rod of the blade clamp assembly catches the operating arm and pulls the arm out to the required point of interruption.

For interrupter units ordered and shipped with switches, the blade clamp assemblies are shipped mounted to the blades. For interrupter units ordered and shipped for addition to an existing switch, the blade clamp and auxiliary contact assemblies are shipped in a separate crate.

### A. Positioning the Assembly

1. If shipped mounted to the blade, the blade clamp assembly is located close to the correct position for proper operation. It may still need minor tweaks but only after checking the operation after all parts are installed.
2. If installing on a new application it is best to start with the blade out of toggle and ready to be lifted vertically. Please refer to the picture sequence below for more details.



**Image 1.**

**Step 1.**

After installing the interrupter to the mount, open the switch to the point where it is ready to lift vertically. There should be no toggle on any of the linkages.

**Step 2.**

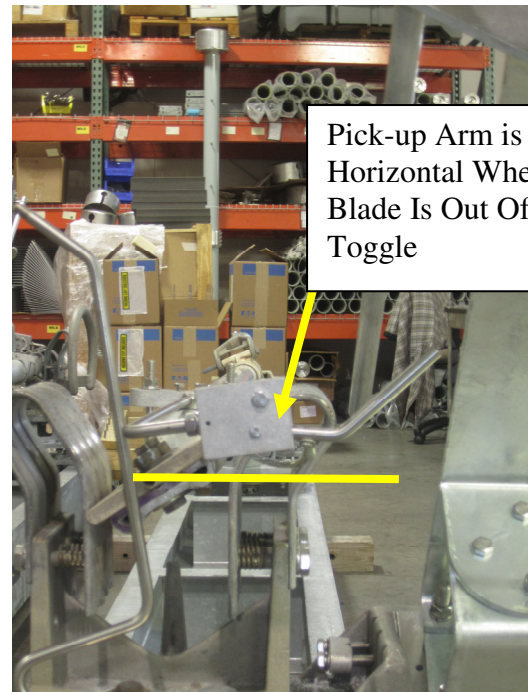
Attach the pick-up arm to the blade with the supplied U-bolt as shown in image 1.

**Step 3.**

The arm should be horizontal to the ground when the switch blade is un-toggled and ready to move vertically as seen in image 2 & 3.



**Image 2.**

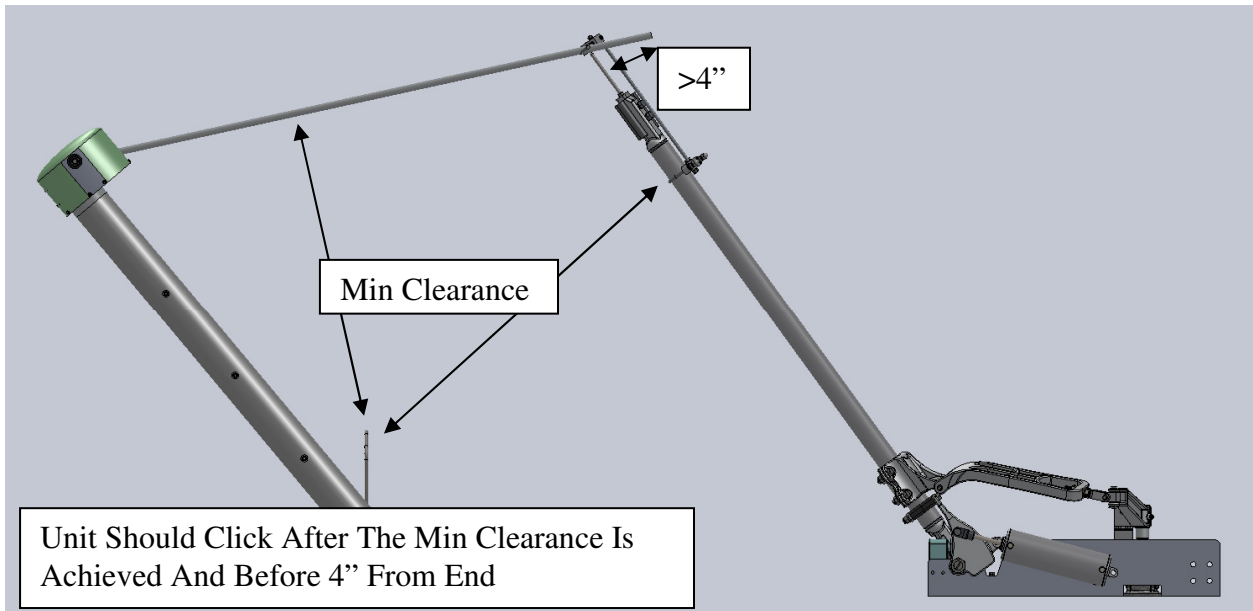


Pick-up Arm is  
Horizontal When  
Blade Is Out Of  
Toggle

**Image 3.**

**Step 4.**

Position the pick-up arm on the blade so that the interrupter will trip no closer than 4" from the end of the operating arm. By moving the arm up towards the jaw (lengthening the blade) will cause the unit to trip sooner; moving the arm down away from the jaw (shortening the blade) will cause the unit to trip later. It is the intent that the adjustment be such that when the unit "trips" (audible click) the blade, pickup arm, operating arm, and top of the interrupter be a minimum clearance from any hot part that will now be at the opposite potential. Because different switch manufactures use many different stationary arcing horns this measurement should be closely looked at on each installation. Refer to image 4 for some typical measurements to check and Table 1 for clearance measurements.

**Image 4.**

kV	Min Clearance
46	17"
69	25"
115	42"
138	50"
161	58"
230	71"

**Table 1.**

## VI. OPERATION AND RE-SET

After all adjustments have been completed, it is recommended that the switch be opened and closed several times so the sequence of operation among interrupters, switch auxiliary contacts and blade clamp assemblies can be observed. All components should operate in a similar and consistent fashion when compared to other switches on different phases.

Operate the switch at different speeds. A slower speed initially will allow for easier confirmation of proper sequence. Increase the speed to approximate the normal operating speed used by field personnel. Do not slam the switch and interrupter with violent force and high speed. SEECO's interrupters are to be operated with a smooth, continuous motion. No slamming is required. Often times, operating the switch too fast in an opening cycle can cause the arm to drop prematurely or bounce thus resulting in an arc formation. It is normal to see some small sparking during the open cycle when the pickup arm transitions from the arcing horn onto the interrupter arm fully.

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## A. Opening Sequence

1. Operate the switch in the open direction. The main contacts will separate and the current path will be carried for a brief interval by the auxiliary contacts until the blade clamp pick-up rod engages the interrupter operating arm.
2. Continue in the open direction pulling the operating arm vertically. At some distance vertically an audible “click” can be heard. This is the point where the vacuum bottle contacts have opened inside the interrupter unit.
  - a. This distance is pre-set in the factory; no field adjustment to the unit is required to attain the correct distance.
  - b. If you have questions about the trip point, refer to the installation drawing for the required switch open gap distance. If your questions are not resolved by the drawing, please contact SEECO for guidance.
3. Continue in the open direction until the interrupter trip arm is released by the blade clamp pick-up rod. The operating arm will return to its’ original rest position on the arm rest. At this point the unit will be fully reset and the operating arm is electrically the same potential as the base of the unit. Proper re-set of the trip arm must occur consistently at every speed of operation. If the operating arm does not return to the original position, contact SEECO for guidance.

## B. Closing Sequence

1. Operate the switch in the closing direction. The auxiliary contacts will be the first to engage in closing.
2. Continue in the closing direction until the blade clamp pick-up arm makes contact with the interrupter operating arm. The pick-up arm has a one directional knuckle (hinge) that will allow the pick-up arm to pass under as the switch continues to close. The pick-up rod is also flexible and will displace sideways somewhat as it passes under the interrupter’s operating arm. Confirm that the pick-up rod passes under consistently at every speed of operation.
3. Continue in the closing direction. Confirm that the auxiliary contacts remain engaged the entire length of travel along the upper leg of the stationary contact until the main contacts are fully closed. Ensure that the pick-up arm does not interfere with the proper operation of the auxiliary contacts.

## C. Utility Personnel

After all adjustments are complete and proper operation is verified, we recommend that the utility personnel responsible for operation of the switch be allowed to

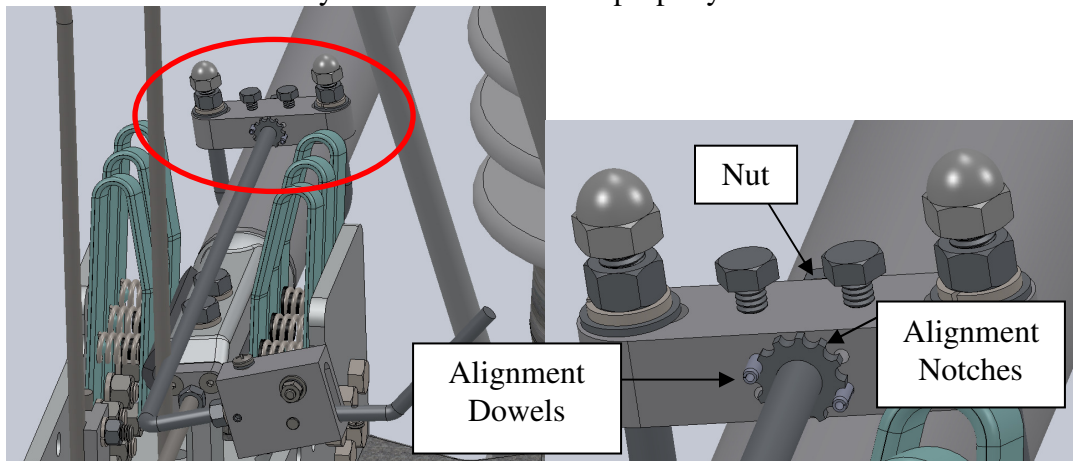
exercise it several times to gain experience and an understanding of the proper sequence of operation and expected operating effort.

## VII. TROUBLESHOOTING

- A. If at any point in the previous procedure (section VI) the operation of the interrupter unit, auxiliary contacts or blade clamp assemblies does not provide the described result, refer back to the original adjustment procedure and repeat the adjustment.

The auxiliary contacts, blade clamps and pick-up rods are the sole adjustment mechanisms provided for all field installation procedures described in this document.

1. All installation procedures and adjustments can be accomplished with these components alone.
  2. The interrupter unit is factory adjusted for proper trip arm opening and closing travel and for interruption at the required switch open gap dimension. No field adjustment to the interrupter unit is required for any procedure in this document. Any attempt to change the original factory settings will void the warranty and may require the unit to be returned to SEECO.
- B. Some switches, like a Southern States EV-1, utilize a blade that rotates thru the entire travel unlike a typical vertical break switch. These switches will require some special positioning of the pick-up arm for proper operation. Typically the pick-up arm will not be to the horizontal position as the switch begins to pivot vertically. More rotation will be necessary for the hook to work properly.



Pickup arm adjustments to allow for more or less rotational travel can be done in the following manner:

1. Typically, clocking can be accomplished by repositioning the u-bolt clamp. Otherwise see step 2.
2. The arm rotation is set by two alignment dowels and various alignment notches. The notches are spaced in 15°



increments and the dowels have two positions that allow 7.5° fine tune adjustments between notches.

3. To adjust, loosen the nut on the back of the clamp and slide the assembly forward until the alignment ring is no longer held by the dowels.
4. Turn the assembly to the desired rotation angle and slide back together.
5. If the desired angle is between notches, move the alignment dowels to the other two holes and reassemble. Do not overtighten the nut as it could damage the alignment ring.
6. Test the new settings as outlined in section VI.

- C. Please contact SEECO if you are not able to troubleshoot a problem through the adjustment procedures of this document. Do not attempt to improvise or freelance a solution to an adjustment problem. Contact us if you have any questions or concerns and we will provide you with immediate assistance.

## VIII. MAINTENANCE

- A. Interrupter units do not require regular, scheduled maintenance.
- B. Both the switch and interrupters should be visually inspected for external signs of damage whenever the line is removed from service for other line maintenance considerations. External indications that an interrupter unit may have been damaged include:
1. Tracking or burning on the surface of the fiberglass tubes, which indicates possible failure of the vacuum bottles. The integrity of the vacuum bottles must be confirmed through hi-pot testing.
  2. Interrupter trip arms that have broken off.
  3. Auxiliary contacts that have significantly burned or are deformed.
- C. If you recognize any of the above conditions or if you have any doubts or concerns about the ability of the interrupter units to perform their function, please contact SEECO for immediate assistance.