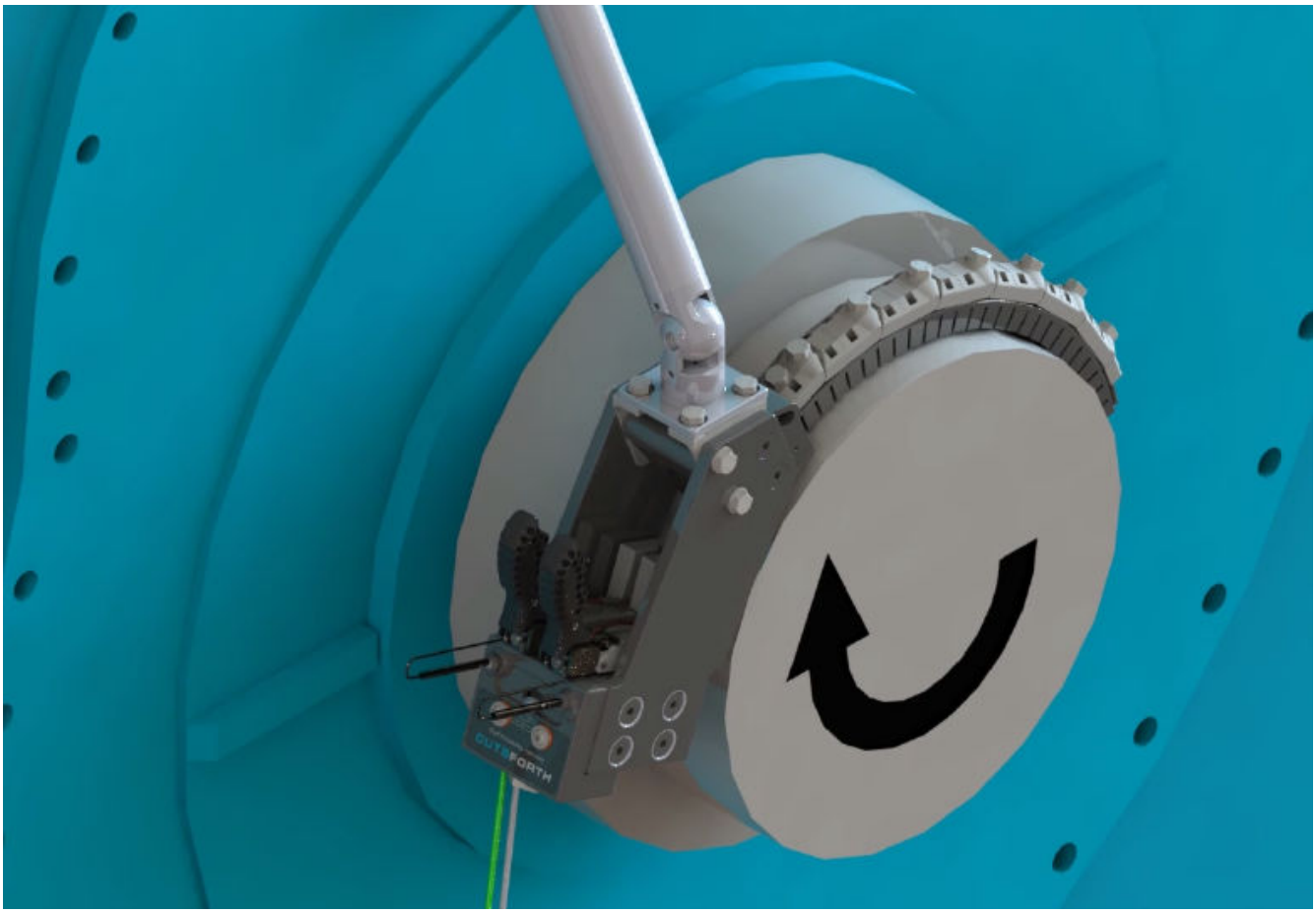
CUTSFORTH

THE POWER OF INNOVATION™

INSTALLATION MANUAL EZDP-2007 Rev Q

Shaft Grounding System



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1. About Cutsforth

Cutsforth specializes in developing innovative new technologies and services to support the power generation industry. Cutsforth's patented EASYchange® brush holder design, online truing service, and patented shaft grounding and monitoring systems have been installed across the globe in generators of all sizes and in nearly every industry application, including nuclear, natural gas, coal, wind, and hydroelectric.

Cutsforth's knowledge and commitment to excellence drives our innovative solutions for the changing needs of the power industry. Whether it is a quick response to a critical situation or a new way of solving an old problem, our commitment to quality ensures that our customers receive the best-in-class products and services—Cutsforth is the Power of Innovation.

Cutsforth, Inc. started back in 1991 as a small company focused primarily on making replacement brush holders for generators and exciters. Today, after 25+ years in business, Cutsforth's experience and innovative designs have brought its best-in-class excitation brush holder and shaft grounding replacements and collector ring services to some of the world's largest power companies.

1.1. Cutsforth Products

- EASYchange® Removable Brush Holders
- Cutsforth Shaft Grounding Systems

1.2. Cutsforth Field Services

Cutsforth provides comprehensive product installations for all product offerings as well as on-site training after the installation. We work efficiently during your outage to ensure a smooth upgrade to our innovative solutions.

- Product Installations
- Online Collector Ring and Commutator Truing
- Spiral Groove Restoration
- Consulting and Emergency Services

cutsforth.com

2. Legal Information

2.1. Limited Warranty

This document is provided 'as is' and is subject to being changed, without notice, in future editions. Cutsforth reviews this document carefully for technical accuracy; however, CUTSFORTH MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. Cutsforth warrants that its hardware products will be free of defects in materials and workmanship that cause the product to fail to substantially conform to the applicable Cutsforth published specifications for one (1) year from the date of invoice.

For a period of ninety (90) days from the date of invoice, Cutsforth warrants that (i) its software products will perform substantially in accordance with the applicable documentation provided with the software, and (ii) the software media will be free from defects in materials and workmanship. If Cutsforth receives notice of a defect or non-conformance during the applicable warranty period, Cutsforth will, in its discretion: (i) repair or replace the affected product, or (ii) refund the fees paid for the affected product. Repaired or replaced Hardware will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer. If Cutsforth elects to repair or replace the product, Cutsforth may use new or refurbished parts or products that are equivalent to new in performance and reliability and are at least functionally equivalent to the original part or product. You must obtain an RMA number from Cutsforth before returning any product to Cutsforth. Cutsforth reserves the right to charge a fee for examining and testing Hardware not covered by the Limited Warranty.

This Limited Warranty does not apply if the defect of the product resulted from improper or inadequate maintenance, installation, repair, or calibration performed by a party other than Cutsforth; unauthorized modification; improper environment; use of an improper hardware or software key; improper use or operation outside of the specification for the product; improper voltages; accident, abuse, or neglect; or a hazard such as lightning, flood, or other act of nature.

THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND THE CUSTOMER'S SOLE REMEDIES, AND SHALL APPLY EVEN IF SUCH REMEDIES FAIL OF THEIR ESSENTIAL PURPOSE.

WARNING REGARDING USE OF CUTSFORTH SHAFT MONITORING EQUIPMENT: CUSTOMER IS ULTIMATELY RESPONSIBLE FOR VERIFYING AND VALIDATING THE SUITABILITY AND RELIABILITY OF THE PRODUCTS WHENEVER THE PRODUCTS ARE INCORPORATED IN THEIR SYSTEM OR APPLICATION, INCLUDING THE APPROPRIATE DESIGN, PROCESS, AND SAFETY LEVEL OF SUCH SYSTEM OR APPLICATION. PRODUCTS ARE NOT DESIGNED, MANUFACTURED, OR TESTED FOR USE IN LIFE OR SAFETY CRITICAL SYSTEMS, OR ANY OTHER APPLICATION IN WHICH THE FAILURE OF THE PRODUCT OR SERVICE COULD LEAD TO DEATH, PERSONAL INJURY, SEVERE PROPERTY DAMAGE OR ENVIRONMENTAL HARM (COLLECTIVELY, "HIGH-RISK USES"). FURTHER, PRUDENT STEPS MUST BE TAKEN TO PROTECT AGAINST FAILURES, INCLUDING PROVIDING BACK-UP AND SHUT-DOWN MECHANISMS. CUTSFORTH EXPRESSLY DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY OF FITNESS OF THE PRODUCTS OR SERVICES FOR HIGH-RISK USES.

CUTSFORTH DOES NOT WARRANT, GUARANTEE, OR MAKE ANY REPRESENTATIONS REGARDING THE USE OF OR THE RESULTS OF THE USE OF THE PRODUCTS IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE. CUTSFORTH DOES NOT WARRANT THAT THE OPERATION OF THE PRODUCTS WILL BE UNINTERRUPTED OR ERROR FREE. INCIDENTAL AND CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF USE, ARE SPECIFICALLY EXCLUDED FROM THIS WARRANTY; THE MAXIMUM VALUE OF A WARRANTY CLAIM CANNOT EXCEED THE ORIGINAL VALUE OF THE ASSEMBLY OR COMPONENT.

2.2. Copyright

2.3. Patents

Please send patent information requests to patents@cutsforth.com.

3. Safety Information

Following is important safety information. For safe installation and operation of this equipment, be sure to read and understand all cautions and warnings.

3.1. Safety Conventions

NOTE

Additional information.

ELECTRICAL DANGER

Indicates an action or specific equipment area that can result in personal injury or death from an electrical hazard if proper precautions are not taken.

CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury or equipment damage.

WARNING

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

ROTATING PART CAUTION

Indicates possible injury from rotating parts.

DANGER

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

3.2. General Safety Instructions

ELECTRICAL DANGER

Only qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid injury should work with Cutsforth products. Among the many considerations are the following:

- Avoid contact with energized circuits.
- Avoid contact with rotating parts.
- Never install any component that appears not to be functioning in a normal manner.
- Always ensure proper installation of the holder assembly and rope refresh kit.

ELECTRICAL DANGER

Before working on the generator, de-energize, lock out, and tag out all power sources to the generator, shaft, and accessory devices. Electric shock and death may result due to failure to heed this warning.

ROTATING PART CAUTION

High-voltage and rotating parts can cause serious or fatal injury. Installation, operation, and maintenance of this product must be performed only by qualified personnel, in accordance with all applicable safety regulations and guidelines.

4. The Cutsforth Shaft Grounding System

This manual describes the installation of the Cutsforth Shaft Grounding System.

If this system is replacing an OEM system, see the documentation that came with the OEM system for instructions on how to remove it.

NOTE

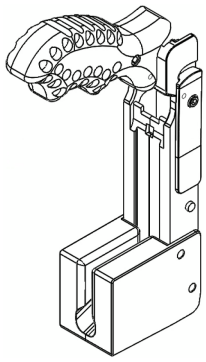
This manual does not cover all details or variations in equipment, nor does it consider every possible contingency for installation, operation, or maintenance. If you have questions or concerns that are not addressed in this manual, contact Cutsforth Engineering Support.

4.1. Components

The following parts are included in the Shaft Grounding System installation package:

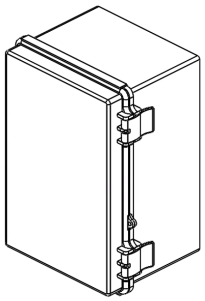
2 Cutsforth Shaft grounding rope holders

Part # EGHA-003



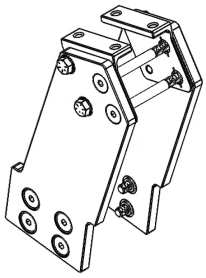
1 Remote Meter Point for Shaft Grounding Assembly - Comes with four wall mounting brackets and 4 M4 x 10 mm self-tapping screws

Part # EGSA-017 - Dimensions: 11.81 x 7.87 x 6.29 in



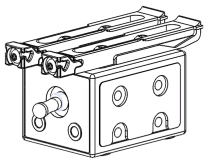
1 Panel kit

Part # EGSK-007



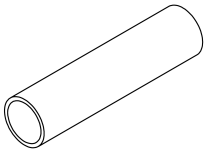
1 Junction box assembly

Part # EGBA-001



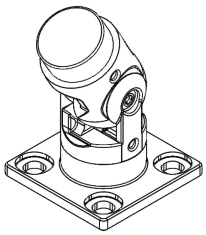
1 Section of attachment arm tubing

Part # EGSM-012



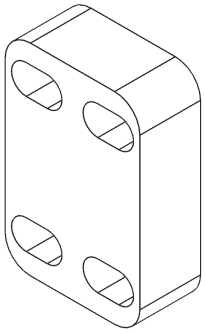
2 Elbow assemblies

Part # EGSA-003



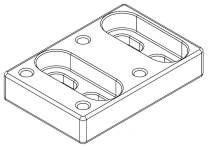
1 Mounting bracket spacer for GE units (Optional)

Part # EGSM-016



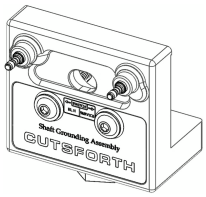
1 Mounting bracket adapter for GE Units (Optional)

Part # EGSM-013



1 Junction box adapter assembly

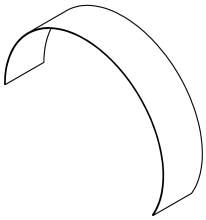
Part # EGBA-006



2 Grounding ropes with signal wires

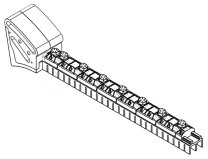
Part # EGHK-007, EGHK-008, or EGHK-011

1 Rope guide spacer (1/16 in thick)



1 Rope Guide channel assembly

Part # EGSK-013



4.2. Required Tools

- Welder, TIG preferred
- 1/2 in hex wrench socket
- 9/16 in socket wrench
- 1/4 in hex key wrench
- 3/16 in hex key wrench
- Drill
- 5/16 in-18 tap
- Letter F drill bit
- Wire cutters
- Wire strippers
- Wire crimpers
- Tape, banding, and/or clamps

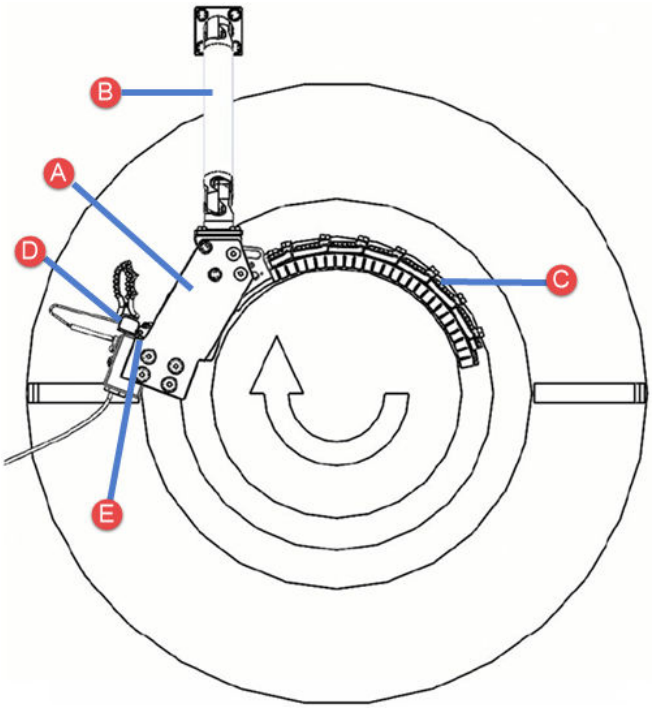
5. Installation Procedure

Before installation, remove all original/OEM shaft grounding system equipment and clean the shaft of any surface defects, rust, and other contaminants. Review the documentation for the original/OEM Shaft Grounding System to plan its removal.

5.1. Installation Overview

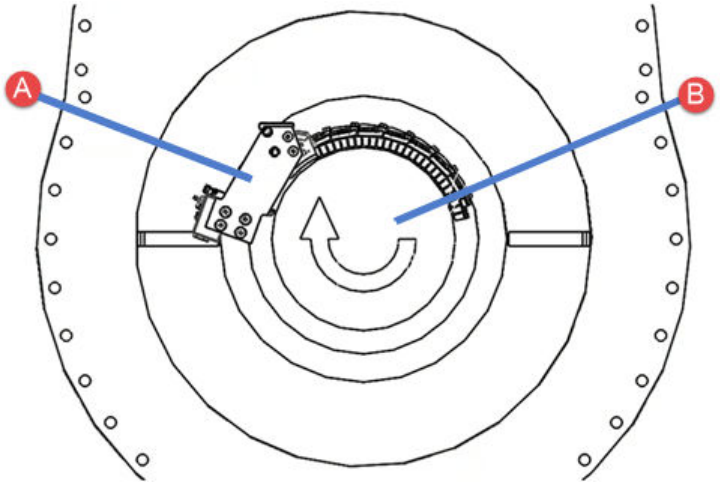
The following figure shows the Shaft Grounding System installed:

- Panel assembly (A). The portion of the Shaft Grounding System that lays over the rope guide.
- Attachment arm (B). An articulating arm assembly used to mount the Shaft Grounding Assembly to a secure structure.
- Rope guide (C). The portion of the Shaft Grounding System that lays over the shaft and holds the grounding and metering ropes.
- Grounding rope kit (D). The portion of the Shaft Grounding System that ensure a continuous ground.
- Rope holders (E). The portion of the Shaft Grounding System that holds the ropes in place.



5.2. Positioning the Panel Assembly

1. Place the panel assembly (A) and rope guide on the shaft (B).
2. Orient the top face of the assembly so that is is relatively horizontal. Temporarily attach the panel assembly to the shaft using hands, clamps, tape, banding, wood frame, etc.



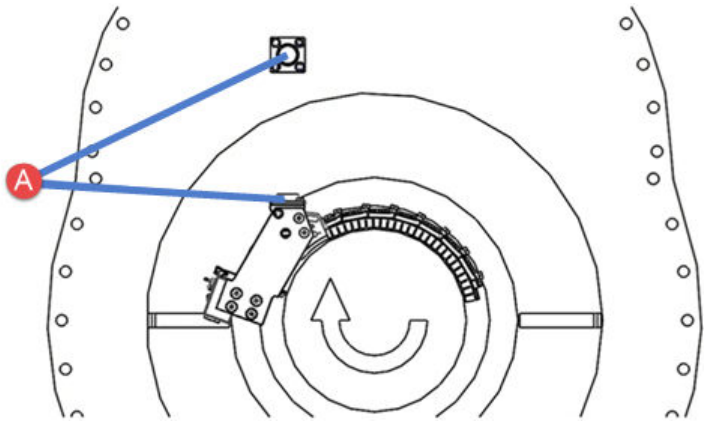
5.3. Installing the Attachment Arm

Complete the steps in these sections to install the attachment arm:

1. Attach the Connector Plate (page 13)
2. Mount the Adapter (for GE Units) (page 14)
3. Secure Position and Remove the Attachment Arm (page 15)
4. Weld Seams

5.3.1. Attach the Connector Plate

1. Place the connector plates (A) as shown. The location of the connector plate that mounts to the unit may vary.
   - For GE units, a mounting bracket adapter is available for mounting to the OEM mounting location. Proceed to Mount the Adapter (for GE Units) (page 14).
   - For units not compatible with the GE mounting adapter, proceed to Step 2.

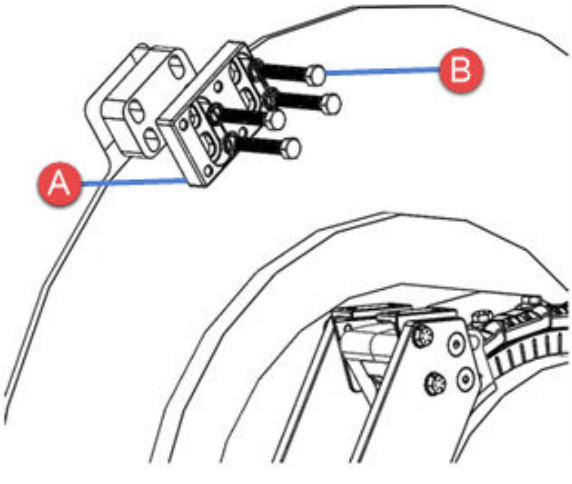


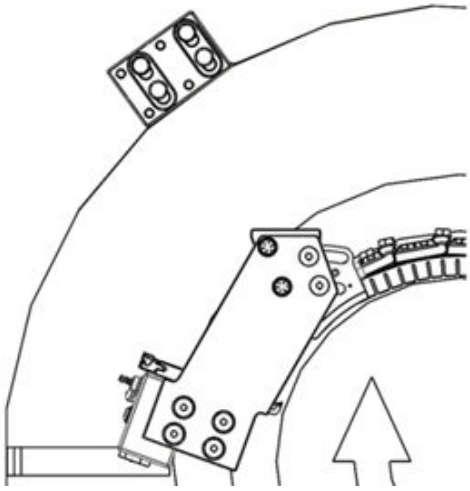
2. Drill four holes (5/16 in-18 tap x 3/4 in deep) for mounting to the unit using the Cutsforth connector plate as a template.
3. Attach the upper connector plate to the mounting location using the provided 5/16 in-18 x 3/4 in hex bolts and Nordlock washers.

5.3.2. Mount the Adapter (for GE Units)

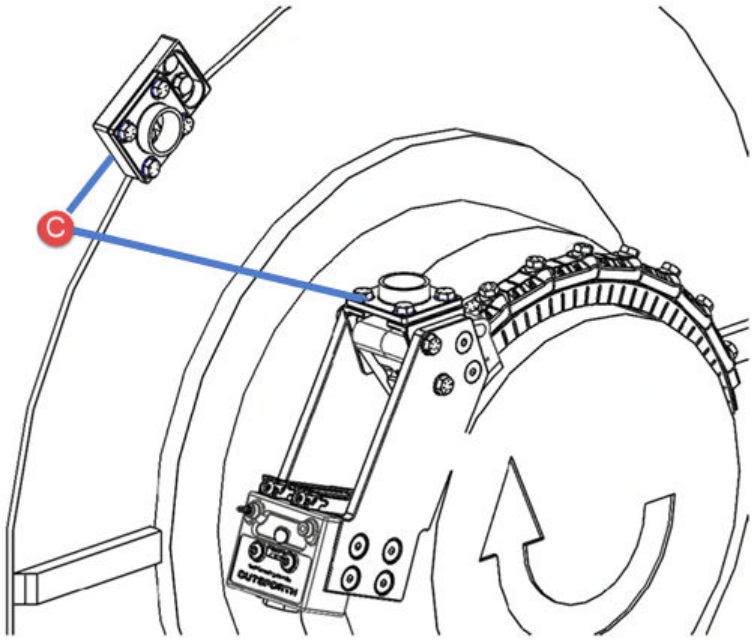
Follow these steps to mount the adapter onto compatible GE OEM mounting locations. If the unit is not compatible with Cutsforth's GE mounting adapter, return to step 2 of Attach the Connector Plate (page 13).

1. Remove the OEM mounting bolts and the existing OEM shim plate.
2. Align a Cutsforth mounting bracket adapter A on the OEM mounting holes. Replace the OEM bolts with new 3/8-16 x 2 in length bolts and Nordlock washers B. Torque to 38 ft lbs.





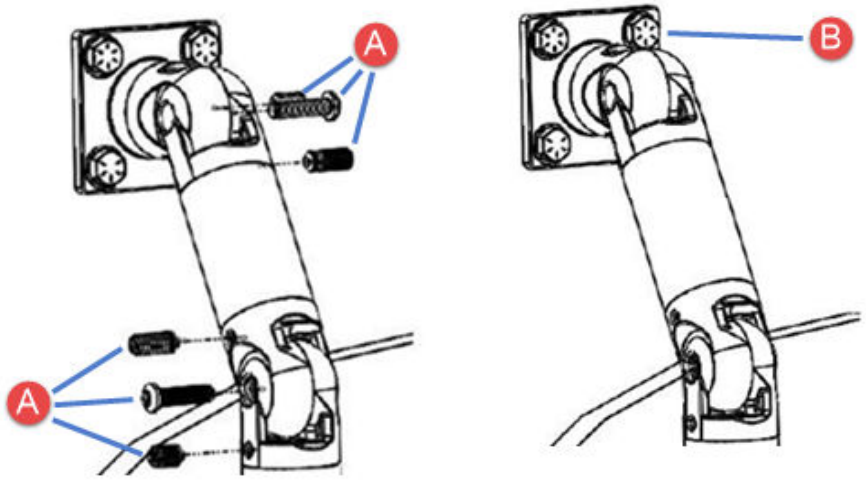
3. Attach a connector plate C to the mounting adapter and panel assembly using the provided 5/16 in-18 x 1/2 in length bolts and Nordlock washers.



5.3.3. Secure Position and Remove the Attachment Arm

1. Using a 5/32 in hex key wrench, tighten the three fasteners (A) on both the elbow assemblies to 120 in lbs. This holds the attachment arm assembly together so it can be removed and welded away from the generator.

2. Remove the four hex bolts from the connector plate (B). Carefully remove the attachment arm assembly and Shaft Grounding Assembly, while taking care not to disturb the elbow assemblies, as this will cause misalignment.



5.3.4. Weld the Seams

The attachment arm is made of 300 series stainless steel. TIG welding is the preferred welding method. If a weld filler is needed, AWS E/ER 308, 308L, or 347 are acceptable.

NOTE

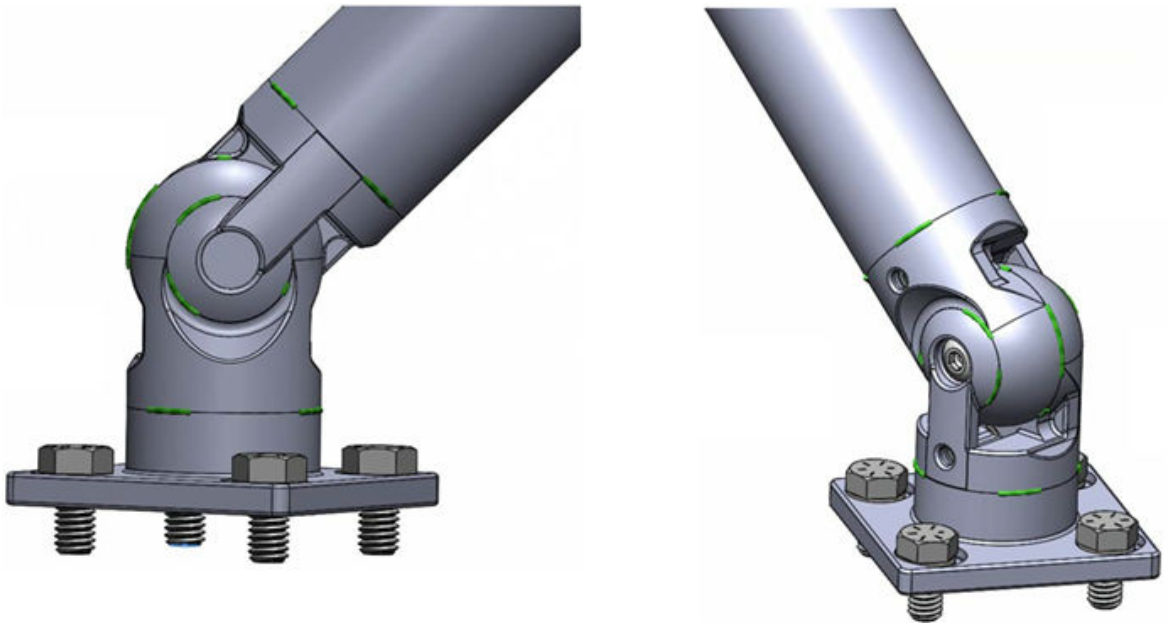
The customer must provide a qualified welder to perform support arm welding.

1. Begin by tack or stitch welding at the marks. The goal is a “stitch” or “fuse” weld. No additional welding material needs to be added at this time. The arm joints simply need to be locked in place by the tacks.

CAUTION

If the tacking step is overlooked and the welder commences to weld the seam, the attachment arm positioning will be compromised, resulting in a distorted arm, which is unusable and must be replaced.

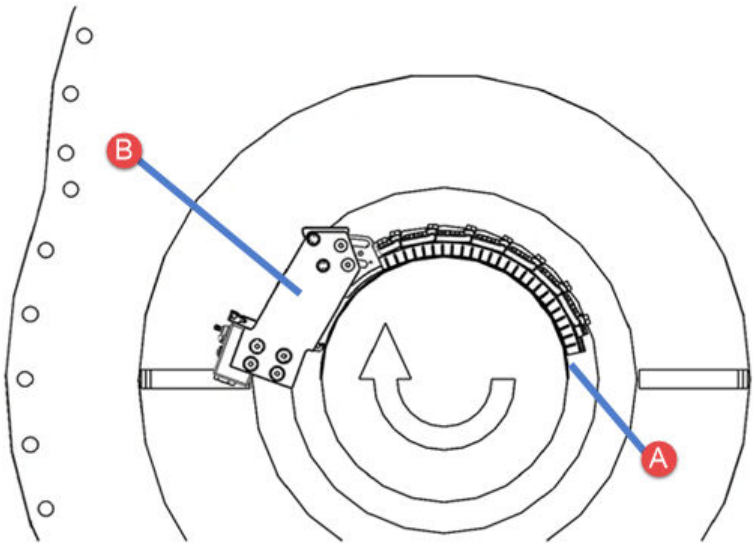
2. After tack welding, proceed to weld all of the seams as indicated with the red lines shown in the illustration below. Weld both ends and follow accepted welding practices to minimize distortions that would compromise proper alignments.



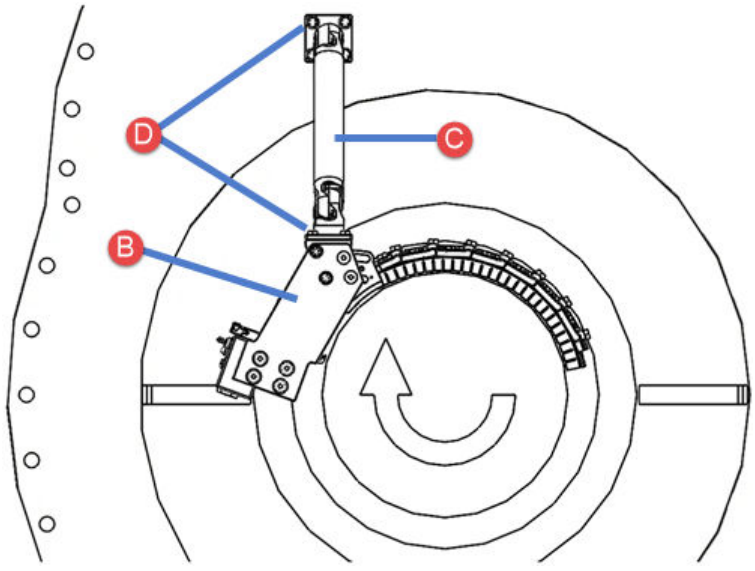
3. Return the fully welded arm to the Cutsforth technician for final assembly on the generator.

5.4. Installing the Rope Guide

1. Place the 1/16 in thick rope guide spacer (A) on the shaft, and place the panel assembly (B) back on the shaft, over the rope guide spacer.

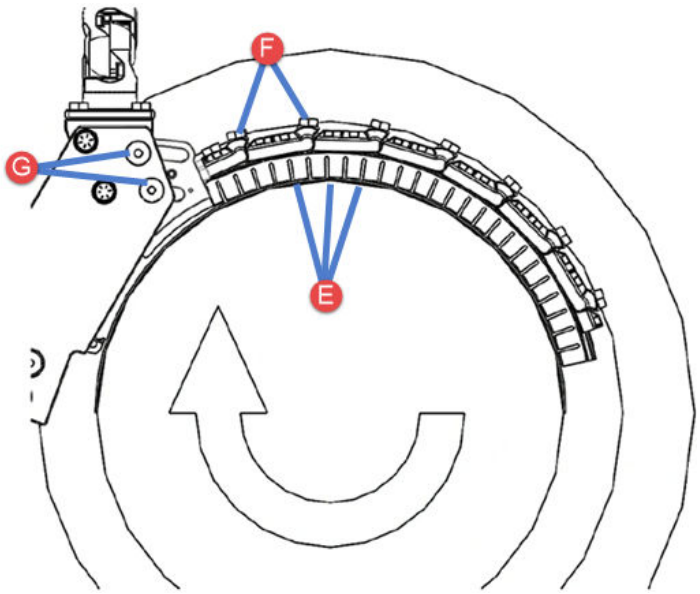


2. Install the welded attachment arm (C) and check the gap between the shaft and the contact points on the panel assembly (B) to make sure there are no misalignments. Torque all eight of the 5/16 in-18 x 1/2 in and 3/4 in length hex bolts with Nordlock washers (D) to 240 in-lbs.



3. Adjust the rope guide sections so that the contact points (E) are against the rope guide spacer. Tighten all the 5/16 in-18 x 5/8 in length bolts on the rope guide starting closest to the panel

assembly and then work around from there. Torque the 5/16 in-18 rope guide bolts (F) to 220 in-lbs and the rope guide adjustment slot bolts (G) to 240 in-lbs.



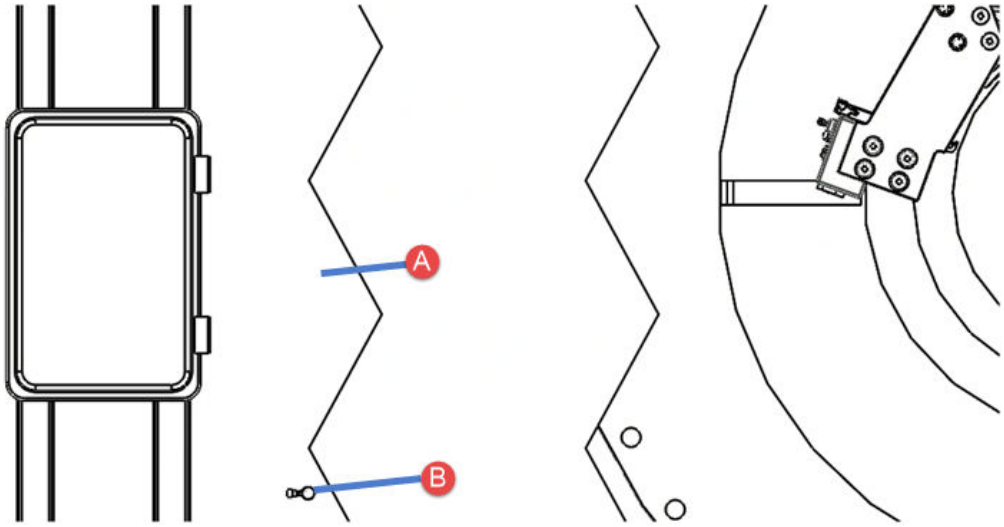
5.5. Installing the Grounding Wire

Complete the steps in these sections to install the grounding wire:

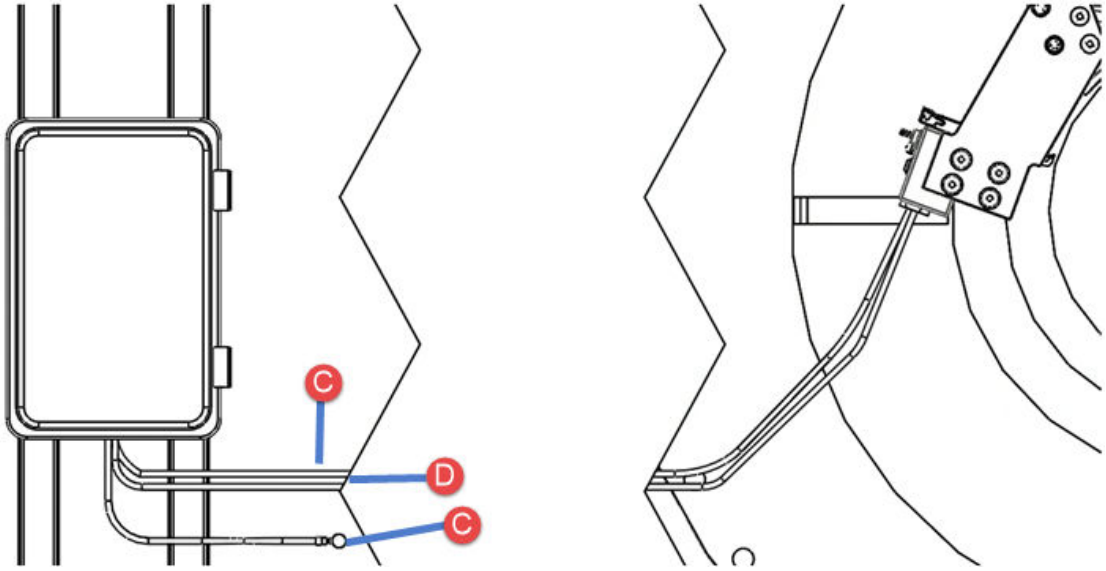
1. Complete a Shaft Grounding Continuity Test for the Shaft Grounding Assembly (page 21)
2. Complete a Shaft Grounding Continuity Test for the SCA (page 22)
3. Prepare the Grounding Wire and Twisted Pair Cables (page 18)
4. Route the Cables to the Remote Meter Point (page 19)
5. Test Point Inspections (page 22)

5.5.1. Prepare the Grounding Wire and Twisted Pair Cables

1. Drill and tap a 5/16 in-18 hole 3/4 in deep in a suitable grounding location on the outside of the unit case (A) to attach the grounding ring terminal (B) (3/8 in dia. terminal).

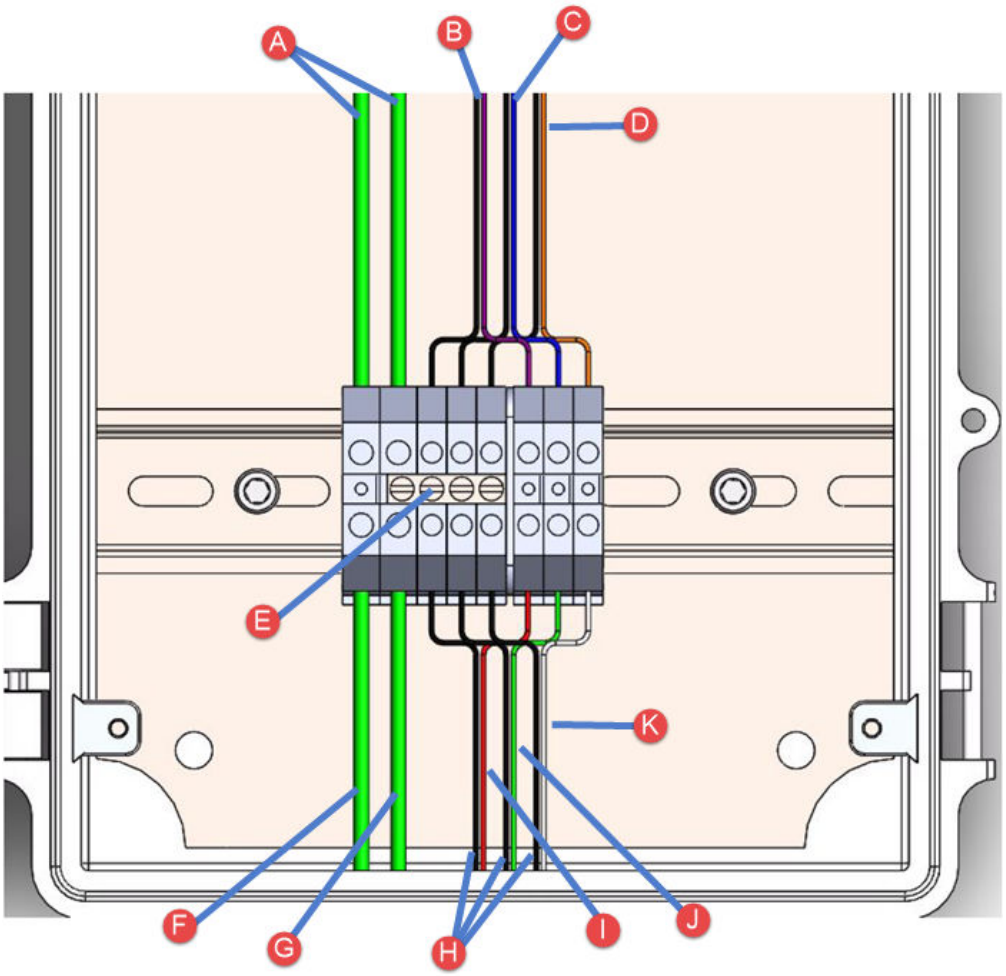


2. Cut the supplied grounding cable C and 4 twisted pair cable D to the appropriate length. Route the cables to the Remote Meter Point box as shown in Route the Cables to the Remote Meter Point (page 19) .



5.5.2. Route the Cables to the Remote Meter Point

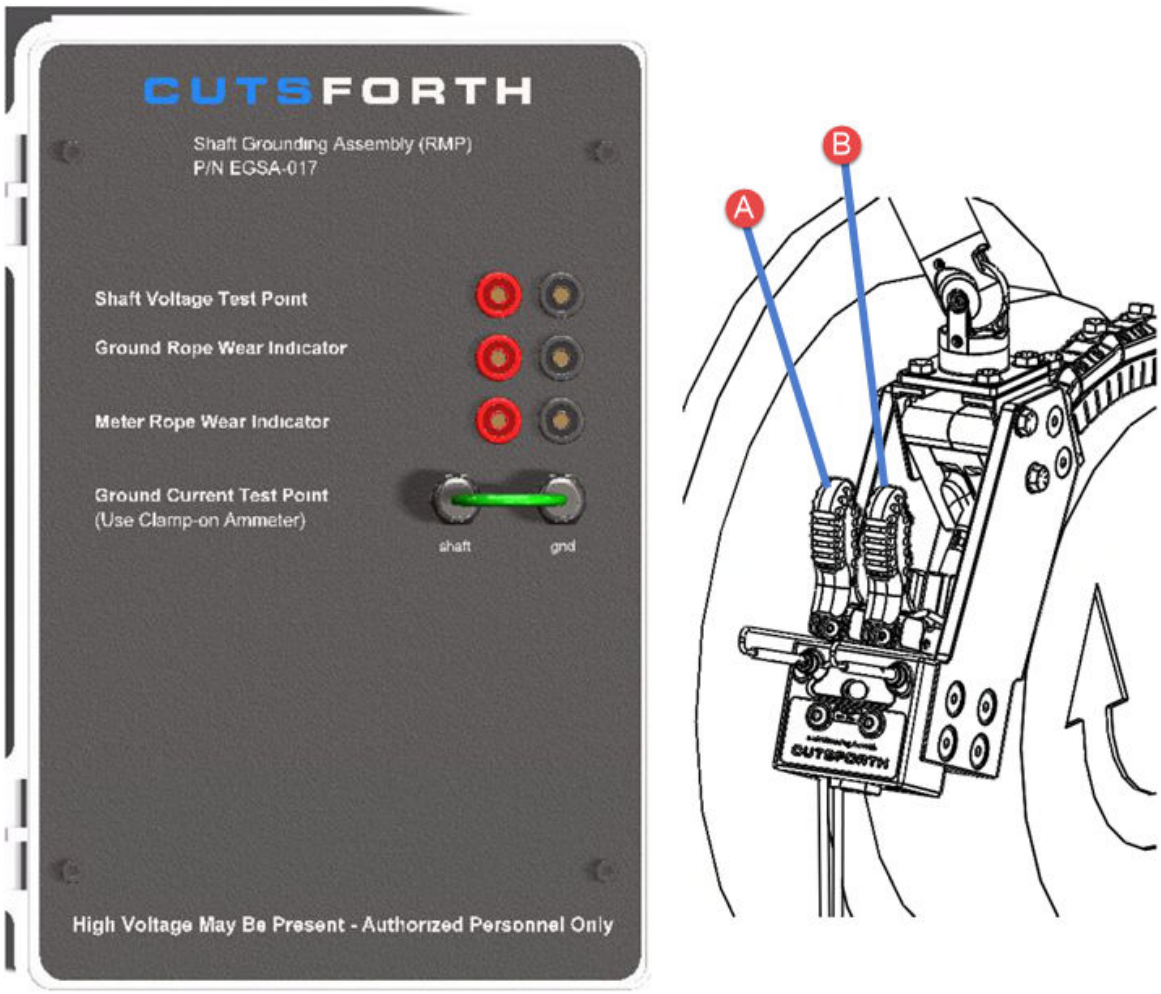
1. Remove four screws from the corners of the faceplate. Remove the faceplate to reveal the terminal connectors inside the Remote Meter Point box.
2. Route cables from the Shaft Grounding Assembly to the terminal connectors. If your wiring diagram differs from this one, contact Cutsforth Engineering Support.



Part	Description	Part	Description
A	To and From Ground Current Test Point	B	To Shaft Voltage Test Point
C	To Meter Rope Test Point	D	To Ground Rope Test Point
E	Screw-down Jumper	F	From Shaft Grounding Assembly
G	To Unit Case Ground	H	Black Wires & Drain from each Twisted Pair
I	From Meter Rope	J	From Meter Rope Wear Indicator
K	From Ground Rope Wear Indicator		

Only qualified electrical personnel should take measurements at the remote test points (A = Ground Rope, B = Meter Rope). For any of the test points located on the faceplate of the Remote Meter Point,

use a hand-held volt meter, oscilloscope, clamp-on ammeter, or other appropriate testing device. Always follow proper electrical safety procedures.



5.5.3. Complete a Shaft Grounding Continuity Test for the Shaft Grounding Assembly

Complete a shaft grounding continuity test before you connect the Shaft Grounding Assembly to the Remote Meter Point (ropes removed):

1. With the Shaft Grounding Assembly installed, place the switch on the junction box assembly to "Run" mode.
2. Strip all wires from the junction box assembly at the Remote Meter Point end and check that there is NO continuity between ANY wires.
3. Check for continuity to determine which color wire is connected to the following:
   - Junction Box Assembly Metering Rope Holder Mount – Wire Color _____

- Junction Box Assembly Metering Rope Wear Indicator Post – Wire Color _____
- Junction Box Assembly Grounding Rope Wear Indicator Post – Wire Color _____

4. Connect wires from the Junction Box Assembly to the Remote Meter Point.
5. Check that there is continuity between the Remote Meter Point panel ground points and turbine ground.
6. Check that there is continuity between the Remote Meter Point panel shaft voltage test point and the Shaft Grounding Assembly metering rope holder mount.
7. Install the ropes in the Shaft Grounding Assembly.
8. At the Remote Meter Point check that there is NO continuity between:
   - Grounding rope "wear indicator" test point and ground test point
   - Metering rope "wear indicator" and grounding test point

5.5.4. Complete a Shaft Grounding Continuity Test for the SCA

Complete a shaft grounding continuity test before you connect the SCA to the Remote Meter Point (ropes removed):

1. Strip all wires from the SCA at the Remote Meter Point end and check that there is NO continuity between ANY wires.
2. Check for continuity to determine which color wire is connected to:
   - SCA Metering Rope Holder Mount – Wire Color _____
   - SCA Metering Rope Wear Indicator Post – Wire Color _____
3. Connect the case ground and SCA wires to the Remote Meter Point. If there is no monitoring, run a small ground wire from the Remote Meter Point ground terminals to the unit case.
4. At the Remote Meter Point panel confirm that there is continuity between the Remote Meter Point panel ground points and unit case ground.
5. Check that there is continuity between the Remote Meter Point panel shaft voltage test point and the SCA rope holder mount.
6. At the Remote Meter Point panel confirm that there is NO continuity between the shaft voltage test point and ground test point.
7. Install ropes in the SCA.
8. Confirm there is NO continuity between the rope "wear indicator" test point and ground test point.

5.5.5. Test Point Inspections

5.5.5.1. Shaft Voltage Test Point

The resulting voltage or waveform read at this point represents the shaft voltage at the metering rope location.

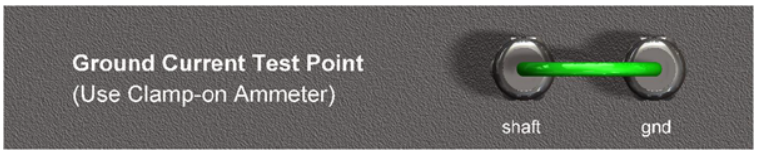
5.5.5.2. Ground Rope and Meter Rope (Wear Indicators)

Both of these test points connect to insulated conductors in the center of either the ground or metering ropes on the shaft.

- If a voltmeter indicates that a voltage is present (close to the shaft voltage read from the Shaft Voltage Test Point) then the insulated conductor has been worn through and the rope is in need of replacement.
- If for any reason you are unsure if the voltage test is indicating a replacement is necessary, a second test method is to measure the resistance or continuity of the wear indicator line in reference to ground.
- If there is infinite resistance or no continuity to ground then the insulation is still intact and the rope is less than 50% worn. Continuity, or little or no resistance, indicates the rope is worn to the point of needing replacement.

5.5.5.3. Ground Current Test Point

Use a clamp-on style current measuring device to test the current flowing to ground from the shaft. The panel indicates which end of the green ground conductor is connected to the shaft and which end is connected to the unit case ground.



5.5.6. Determining a Ground Conductor Termination Location

To most effectively ground your generator and minimize the effects of inductance on the 8 AWG ground conductor, it is imperative that the ground conductor take the shortest, most direct route from the Shaft Grounding Assembly to the unit case ground location.

NOTE

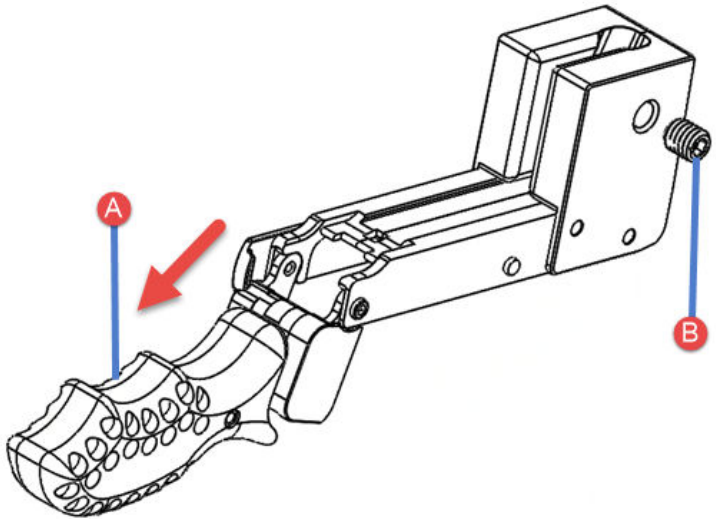
When it comes to the ground conductor, shorter is always better. Cutsforth requires the total run length of the ground conductor (from the Shaft Grounding Assembly, to the Remote Meter Point, to unit case ground) to be under 15 ft. Cutsforth recommends the installation of a High-Frequency Drain on any installation with a ground run greater than 5 ft. The purpose of the High-Frequency Drain is to combat the effects of impedance on the ground wire. The High-Frequency Drain does this by dissipating the high-frequency transient voltage spikes through a short ground run with an inline 1-ohm resistor.

It is not necessary for the ground conductor to be grounded to an existing generator grounding pad. A generator grounding pad is often not the ideal ground location, as it requires a longer ground conductor run. The goal when choosing a grounding location is to electrically bond the shaft to the unit case ground. Cutsforth suggests drilling and tapping into the lower half of the unit case to create a grounding location closer to the Shaft Grounding Assembly. The location at which the ground wire will be terminated should have all paint removed and should be free of all contaminants in order to create a smooth, conductive surface.

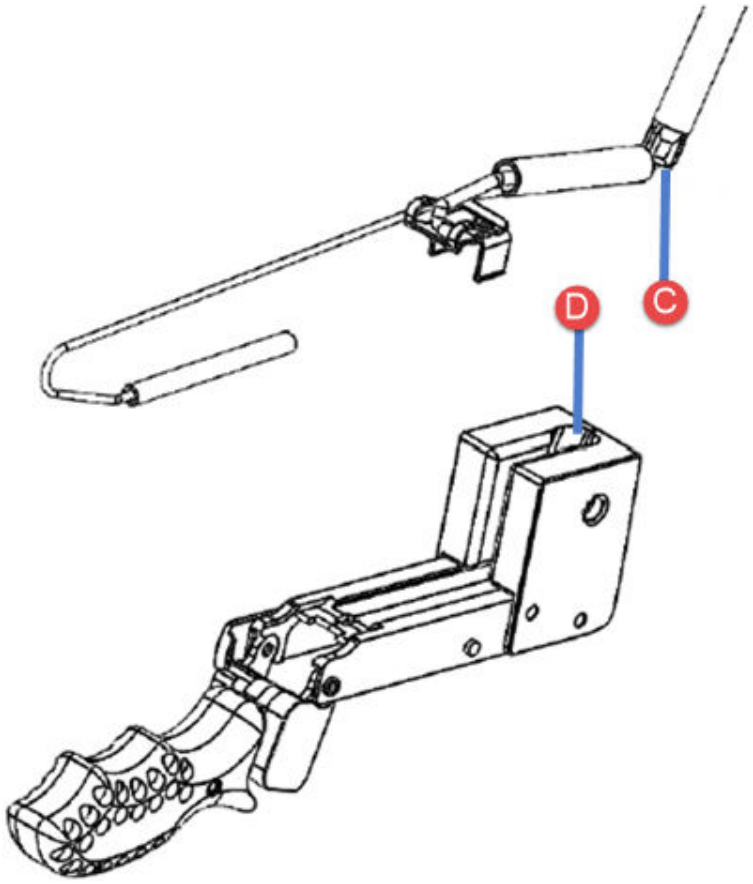
After you determine the grounding location, you can install the Remote Meter Point directly between the grounding location and the Shaft Grounding Assembly. Structural steel and station ground are examples of unacceptable grounding locations.

5.6. Installing the Rope Grounding Kit

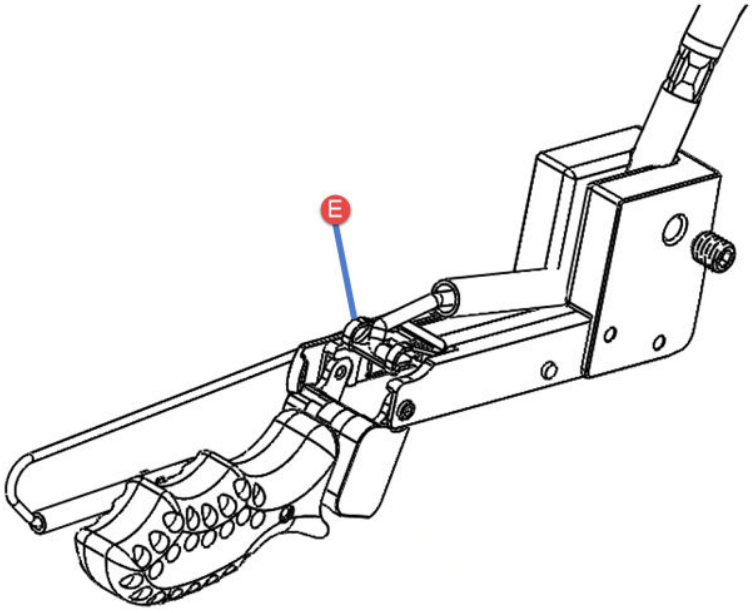
1. Open the rope holder by pulling the handle (A) back, and remove the set screw (B) using a 1/4 in hex key wrench.



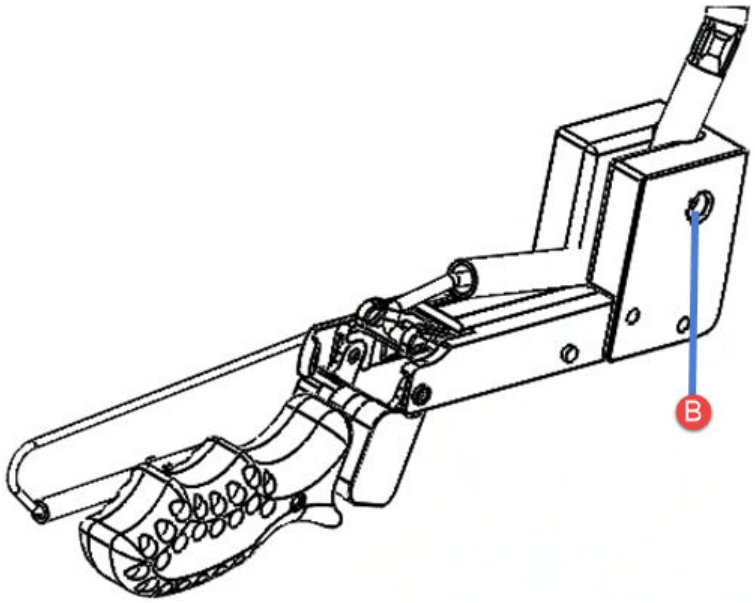
2. Insert the rope (C) into the rope slot (D).



3. Insert the rope terminal E onto the terminal mount rib.



4. Secure the rope in position by tightening the set screw B to 72-96 In-lbs (8-11 N-m).



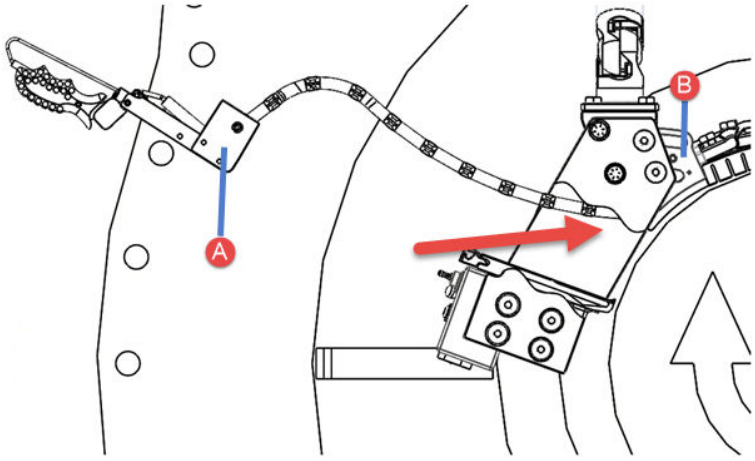
5.7. Installing the Rope Holders

Complete the steps in these sections to install the rope holders:

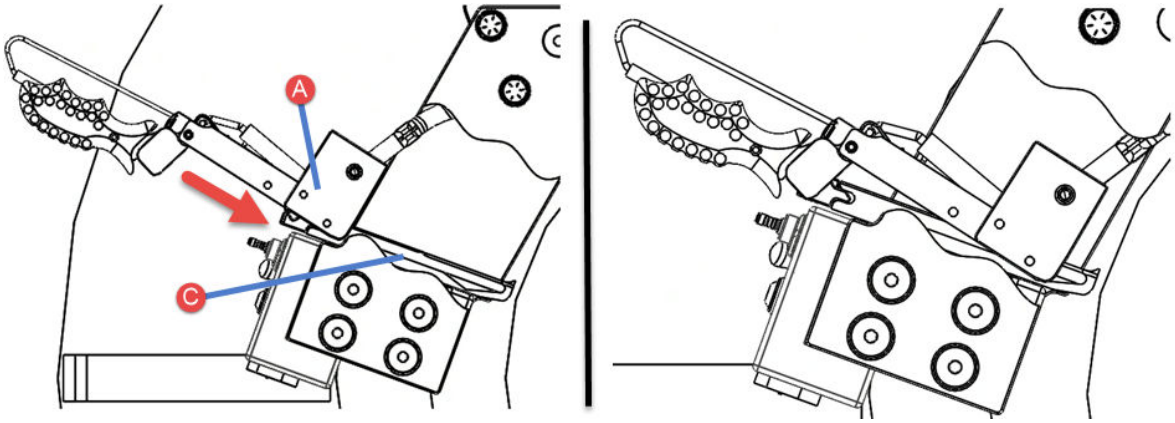
1. Install the Rope Holders (page 26)
2. Verify the Rope Holder Installation (page 28)

5.7.1. Install the Rope Holders

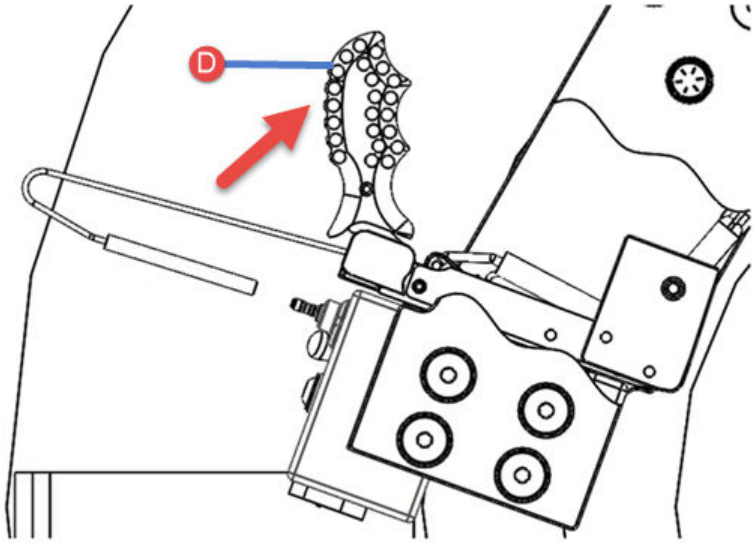
1. Start installing the rope holder A into the grounding system by inserting the copper rope into the rope guide B.



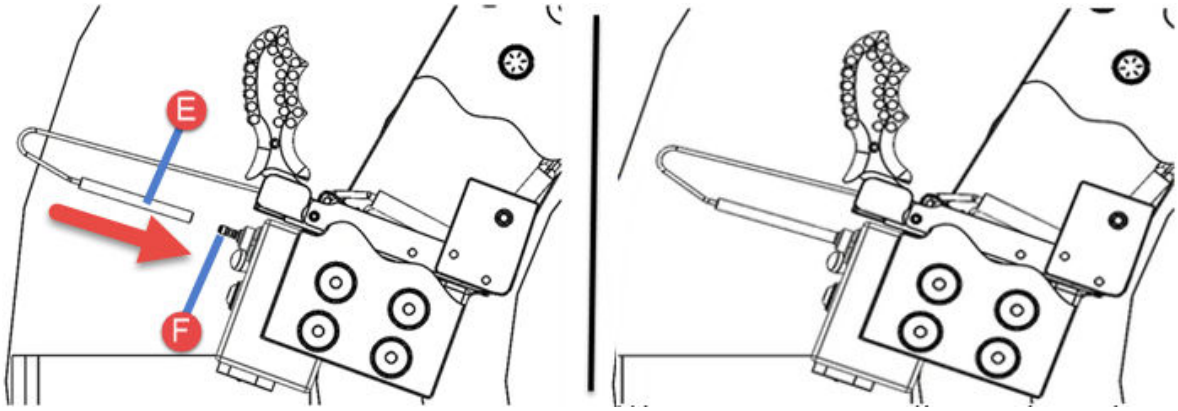
2. Once the copper rope has been inserted into the rope guide, align the holder (A) with the grooves on the sides of the mount (C) and slide the holder into the mount.



3. Rotate and lock the handle (D) into place while applying pressure toward the shaft. The position of the rope holder mount is set at the factory. Verify that the rope holder is approximately 1/8 in from the surface of the shaft.



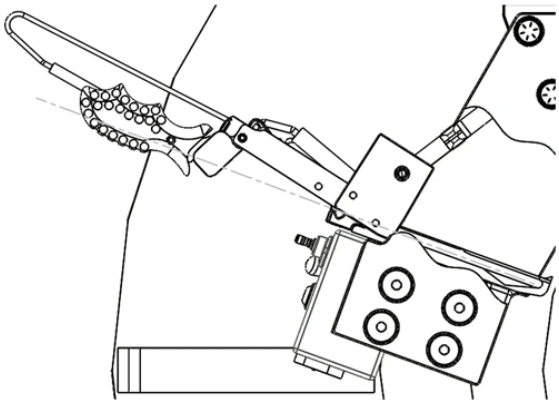
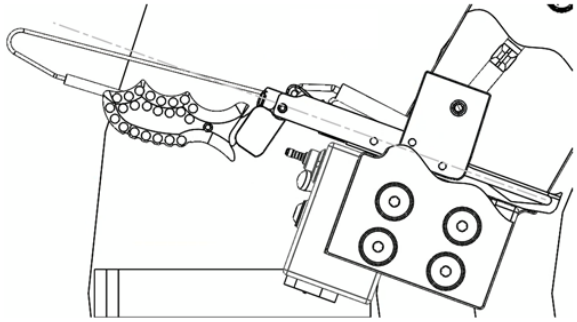
4. Attach the female connector (E) at the end of the grounding rope signal wire to the corresponding male banana jack (F).



5.7.2. Verify the Rope Holder Installation

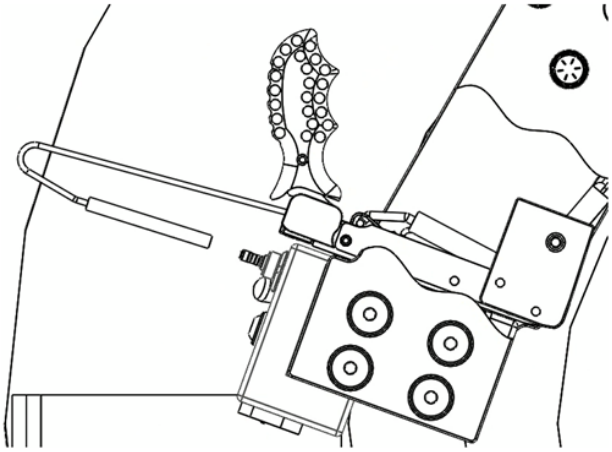
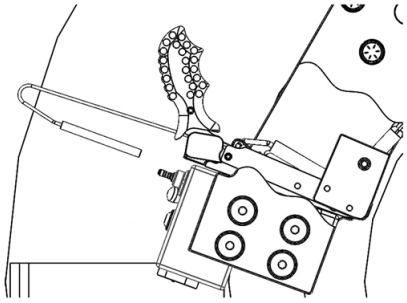
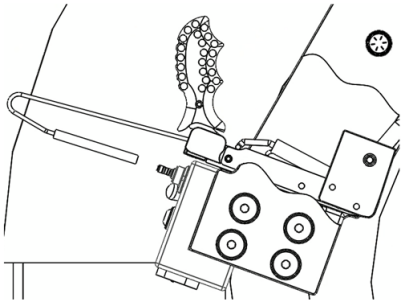
This table shows a correctly and an incorrectly installed rope holder:

Table 1. Correct/Incorrect Rope Holder Installation

Correct	Incorrect
	

This table shows a correctly and an incorrectly mounted rope holder:

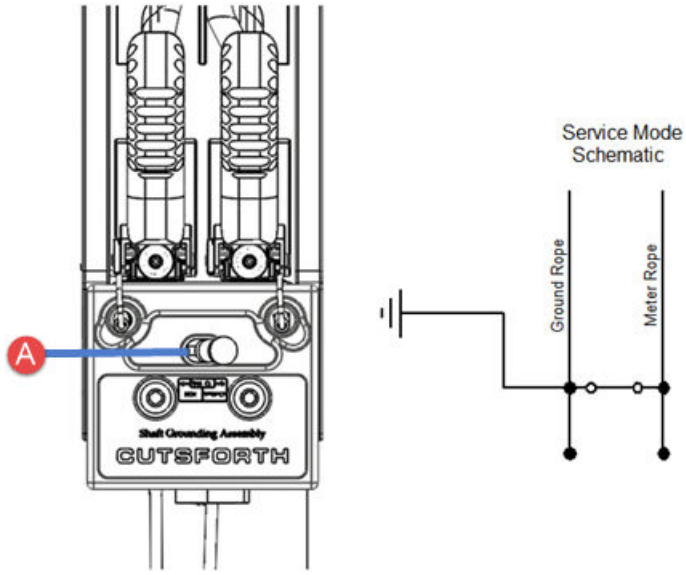
Table 2. Correct/Incorrect Mounted Rope Holders

Correct	Incorrect
In this example, the terminal and holder are properly engaged: 	In this example, the rope holder is not fully engaged:  In this example, the terminal is disengaged: 

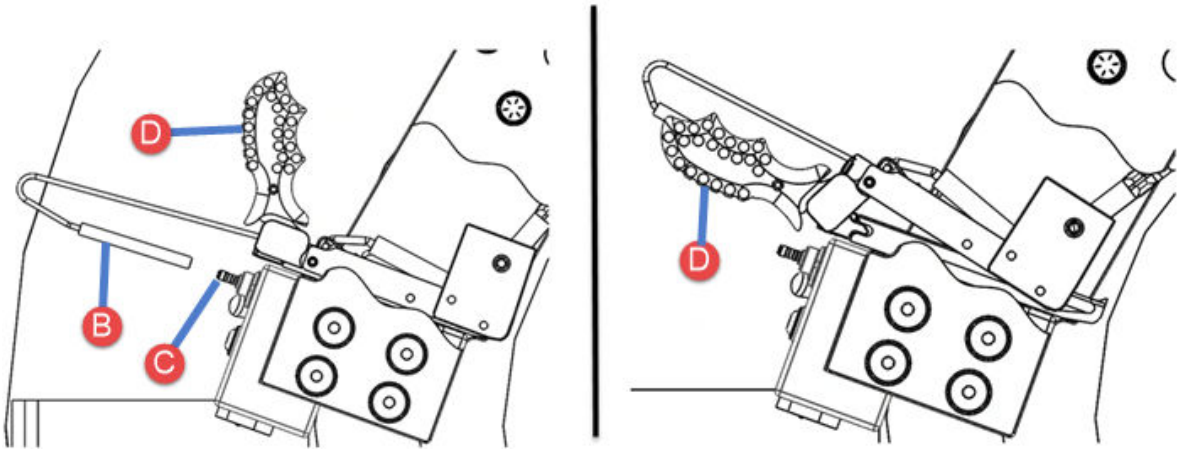
6. Replacing the Rope Grounding Kit

6.1. Removing the Rope Holder

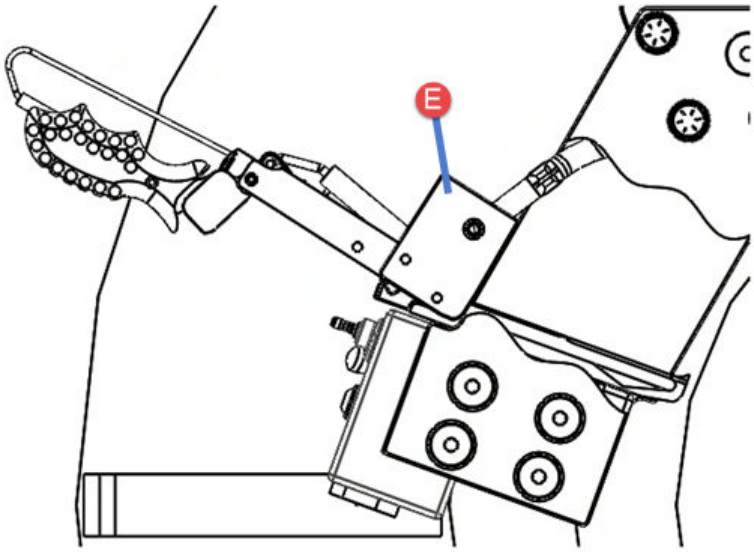
1. If unit is online, flip the switch (A) to "Dual Ground" or "Service" mode. If you are changing ropes online, always have one rope installed in the grounding system to ensure the shaft is grounded throughout the rope change.



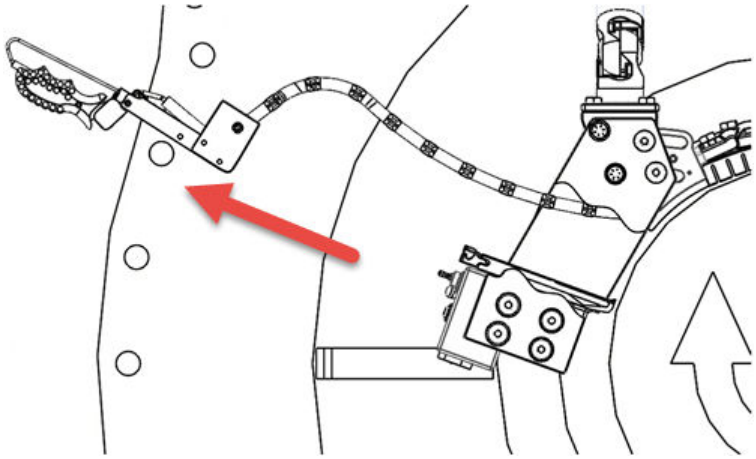
2. Disconnect the signal wire (B) from the junction box adapter faceplate (C). Then, while maintaining control of the holder, apply pressure to the handle (D) away from the shaft and rotate it to its retracted position.



3. Once the holder (E) is free to slide on the mount, pull the holder away from the shaft to remove it from the mount.

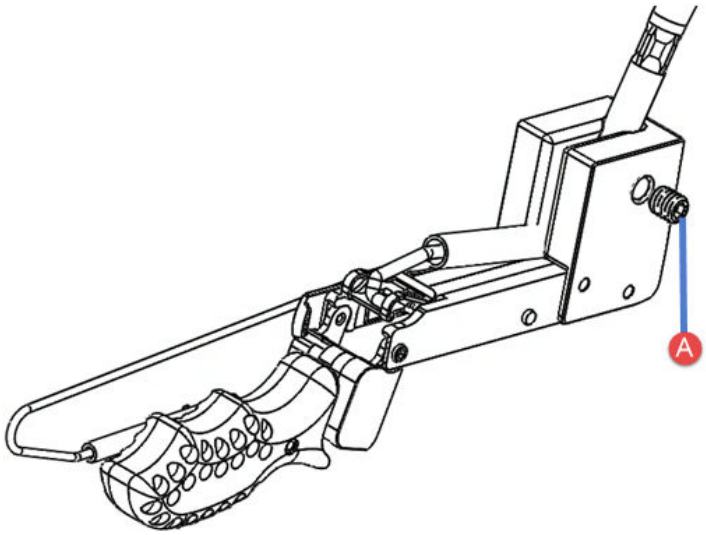


4. Continue to pull the holder and rope away from the grounding system while maintaining control of the rope until the rope is completely removed.

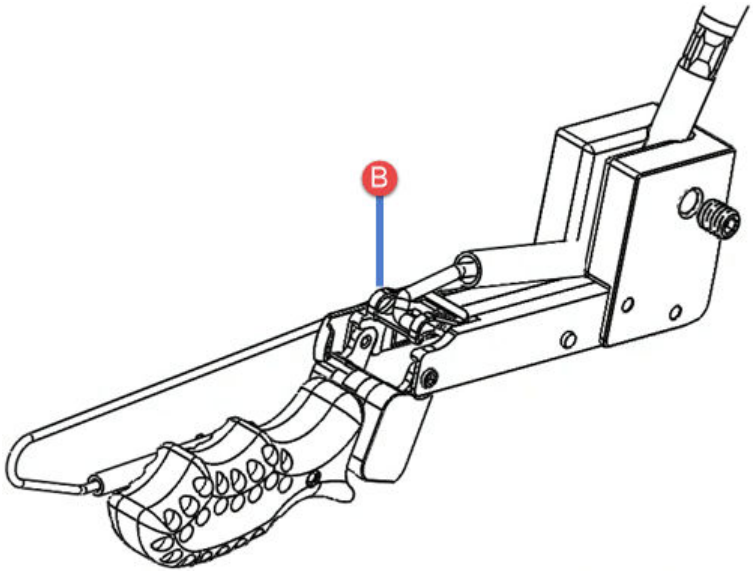


6.2. Removing a Rope

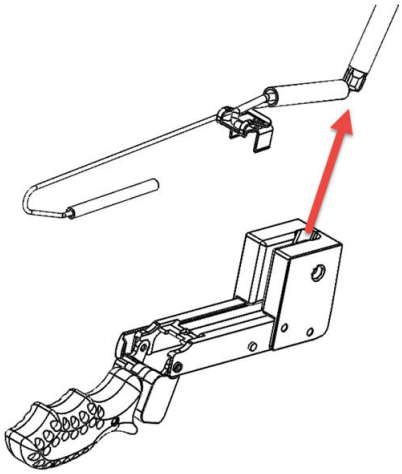
1. Use a 1/4 in hex key wrench to unscrew the set screw (A) holding the rope in position.



2. Unclip the terminal B from the terminal mount rib.

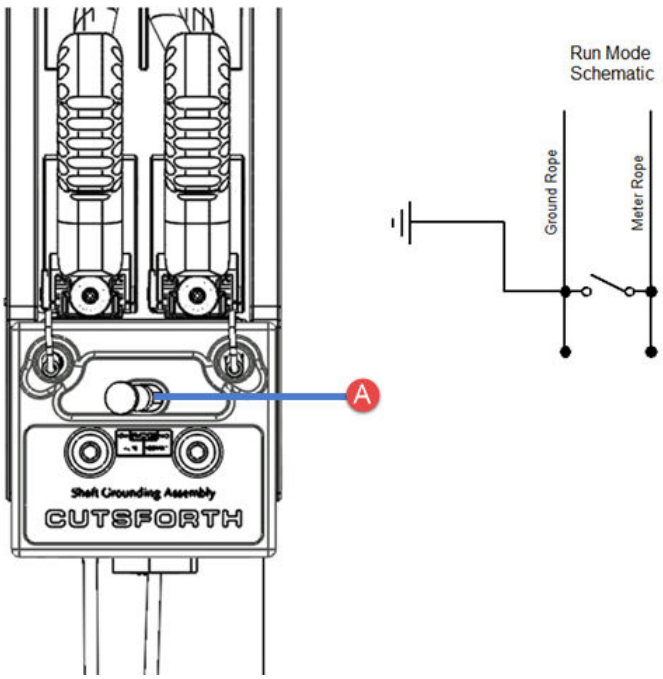


3. Slide the copper rope up and out of the rope slot.



6.3. Installing a New Rope Grounding Kit

1. Install the Rope Grounding Kit as described in Installing the Rope Grounding Kit (page 24).
2. Install the rope holders and verify the installation as described in Installing the Rope Holders (page 26).
3. Flip the switch located below the rope holders back to "Metering" or "Run" mode.



7. Inspecting the Shaft Grounding System

To ensure that the Shaft Grounding System is in proper working condition, frequently make the following inspections:

- Inspect the holder for any signs of wear or damage as well as any excessive build up of dirt or foreign material.
- Check for any cracking or breakage of components or welds.
- Confirm the “snap in” pressure when installing or removing the rope holder is relatively equal to the other rope holder.
- Verify that the meter switch works properly.
- Confirm the rope guide is not contacting the shaft. There should be a 1/16 in gap between the rope guide and the face of the shaft.
- Inspect the integrity of the rope guide and attachment arms.
- Make sure the terminal connection area on the mount is not excessively worn or pitted.

8. Glossary

attenuation	The reduction of the amplitude of a signal due to excessive cable length.
AWG	American Wire Gauge
DC	Direct Current
FEP	Fluorinated Ethylene Propylene (high-temperature cable jacket material)
ground conductor	An 8 AWG ground conductor that runs from the Shaft Grounding Assembly to the junction box, then to unit case ground.
ground current	The electrical current between the shaft and the unit case ground through the ground conductor.
ground rope	The left rope in the shaft grounding assembly, which provides the primary path to unit case ground through the 8 AWG ground conductor.
High-Frequency Drain (HFD)	A 12 AWG conductor that splits off from the main ground conductor, runs through a low-inductance resistor, and then connects to unit case ground in less than 4 ft 6 in. The HFD ensures that high frequency voltage spikes are grounded properly.
inductance	The resistance to change in the current of a circuit.
LOTO	Lock-out, tag-out
meter rope	The right rope in the shaft grounding assembly, which provides a shaft contact point at which shaft voltage readings are taken. It also provides a secondary path to unit case ground through the High-Frequency Drain.
rope refresh kit	A rope assembly that can be used as a ground rope or a meter rope.
Shaft Grounding Assembly (SGA)	A Cutsforth product designed to provide a best-in-class ground connection, as well as a shaft contact point at which shaft voltage can be measured.
shaft voltage	The voltage potential between the shaft and the unit case ground as measured by the metering rope.
signal cable	A shielded, twisted-pair cable that carries voltage signals from the Shaft Grounding Assembly to the junction box and the Assurance Monitoring System.

unit	The equipment being monitored by the Cutsforth monitoring system.
unit case ground	The lower half of the turbine case, generator case, or coupler case near the Shaft Grounding Assembly to which the shaft can be grounded.

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