



# NRG Bat Deterrent System

## Installation Instructions | Siemens D3



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### INTRODUCTION

The NRG Bat Deterrent System was designed to help prevent bat fatalities around wind turbines. These instructions outline how to install the system on the Siemens D3 turbine platform.

### Turbine OEM Warranty Statement

The installation and integration of the bat deterrent system will require physical modifications to the wind turbine that may compromise the original equipment manufacturers (“OEM”) warranty. NRG does not represent nor warrant that any such modifications have been approved by the OEM, and it is the Purchaser’s sole responsibility to obtain authorization from the OEM for any modifications made to install the NRG Bat Deterrent System.

### Important Considerations



The Bat Deterrent Units emit ultrasound at a frequency range of 20-50 kHz and at noise levels between 120-138 db SPL (at 1m).

When the system is correctly installed, those noise levels will never be present inside of the nacelle.

When accessing the roof of the nacelle, it is recommended that the Bat Deterrent System is de-energized.



This procedure requires **permanent** modification to the nacelle using power tools. Proper training may be required in accordance with site safety protocols.



This procedure should be completed in accordance with your site safety protocols. NRG is not responsible for establishing nor defining applicable safety protocols required for the installation of the Bat Deterrent System.



## TOOLS & MATERIALS

Item	Use
<b>Tools</b>	
<b>Cordless drill</b>	Bracket mounting holes
<b>Cordless impact driver</b>	Hardware
<b>Cordless jigsaw</b>	Bottom bracket cutouts
<b>Cordless vacuum</b>	Mitigating fiberglass dust & debris
<b>1/4" chuck-to-socket adapter (match to sockets)</b>	Attaching socket to impact driver/drill
<b>1/2" Ratcheting combination wrenches (2)</b>	Bracket mounting bolts & nuts
<b>1/2" Impact deep socket</b>	Fastening brackets with impact driver
<b>7/16" deep socket</b>	DU mounting nuts
<b>7/16" combination wrench (non-ratcheting)</b>	DU mounting nuts
<b>9/16" combination wrench</b>	Grounding I-beam clamps
<b>16mm combination wrench or socket</b>	Connecting grounding strap to rotor side wall bolt
<b>3/16" Hex key</b>	Bottom bracket plate mounts
<b>2.5mm Hex key</b>	Cable gland bolts
<b>2.5mm Hex key driver bit (1/4" chuck)</b>	Cable gland bolts (speeds up the process considerably)
<b>1/4" Nut driver bit (1/4" chuck)</b>	DUC/Power supply bracket
<b>5/16" Nut driver bit (1/4" chuck)</b>	DUC/Power supply bracket
<b>Torque wrench (10-150 in-lbs, 1-15 Nm)</b>	Torquing hardware
<b>Diagonal cutters</b>	Trim cable tie ends
<b>Small flathead screwdriver/Tweaker</b>	Connecting power supply to DUC
<b>Tool lanyards</b>	Mitigate drop hazard present during installation
<b>Permanent Marker</b>	Marking for drill holes and cutouts
<b>Consumables</b>	
<b>1/2" drill bit</b>	Top bracket mounting holes (replace every 3-5 installations)
<b>Jigsaw blades (fiberglass or multi-material)</b>	(minimum 2 per installation)
<b>Dust masks</b>	Fiberglass drilling & cutting
<b>Cable ties   18" length</b>	100ct 8" cable ties provided for each system, but extras are good to have
<b>Rags &amp; degreaser</b>	Clean under main bearing for bottom brackets, if needed
<b>Materials</b>	
<b>No-ox grease</b>	Top bracket grounding connections
<b>Caulk sealant</b>	Not required. Use if a bracket does not seal the nacelle completely.
<b>Blue Loctite</b>	DU mounting studs on brackets



## PREPARATION

### Inventory

The Bat Deterrent System is sold as a turbine-specific kit. The complete BOM list for the D3 installation kit is listed below. Use this checklist when packing the kit into haul bags before each installation; nobody enjoys a bonus climb.

Part Number	Component Description	Qty							
11273	Deterrent Unit (DU)	6							
10393	DU Cable   10m	6							
14542	DU Bracket   Wide 52 Degree	4							
14546	D3 Nacelle Mount Assembly	2							
14832	Deterrent Unit Controller (DUC)	1							
12914	Power Supply   18V	1							
14007	Magnetic Bracket   DUC & Power Supply	1							
14263	Ethernet Cable   20' Cat 6	1							
14014	Cable Ties   8" 100ct bag	1							
14019	Grounding Cable   40"	2							
12901	Grounding Cable   18"	4							

### Receiving

When larger quantities of the Bat Deterrent System are purchased, the shipment may take up a considerable amount of space. Ensure that your O&M facility has adequate space available to receive and house the equipment safely and out of the elements until all systems have been successfully installed.

As with any freight shipment, upon receipt you must inspect and inventory the equipment. Multiply the part quantities in the table above by the number of kits ordered to get the total number of each part.

In the event that any items are damaged or missing, contact NRG Systems Technical Support and provide the invoice number, part number(s) and any relevant information related to the problem. Contact information is found on our website and at the bottom of each page of this document.



## Deterrent Unit Controller (DUC) & Power Supply Bracket

The DUC and system power supply are mounted to a single magnetic bracket. Attaching the DUC and power supply to this bracket prior to beginning the installation makes the process considerably easier. The best practice is to assemble all brackets before beginning installations.

### Assembly

#### 1 Set up the following items:

- Power supply
- DUC
- Bracket
- Tweaker/Small flathead screwdriver
- 1/4" driver
- 5/16" (8mm) driver

**Note:** Use a cordless drill or impact driver with 1/4" and 5/16" nut driver bits to speed the process up considerably.



#### 2 1/4" Hex driver

or

#### Impact driver with 1/4" hex bit

Flip the bracket so that the magnets are facing upwards.

Remove both screws on one side.

Loosen both screws on the other side.





- 3 1/4" Hex driver**  
or  
**Impact driver with 1/4" hex bit**  
Slide one side of the power supply under the loosened screws.

Reattach both screws on the opposite side.

Tighten all (4) screws to secure the power supply to the underside of the bracket.



- 4 5/16" (8mm) Hex driver**  
or  
**Impact driver with 5/16" (8mm) hex bit**

Flip the bracket right-side up again (magnets facing down).

Remove all (4) DUC-mounting screws.



- 5 5/16" (8mm) Hex driver**  
or  
**Impact driver with 5/16" (8mm) hex bit**

Line up the mounting holes on the DUC to the bracket mounting holes.

Reattach the (4) screws.

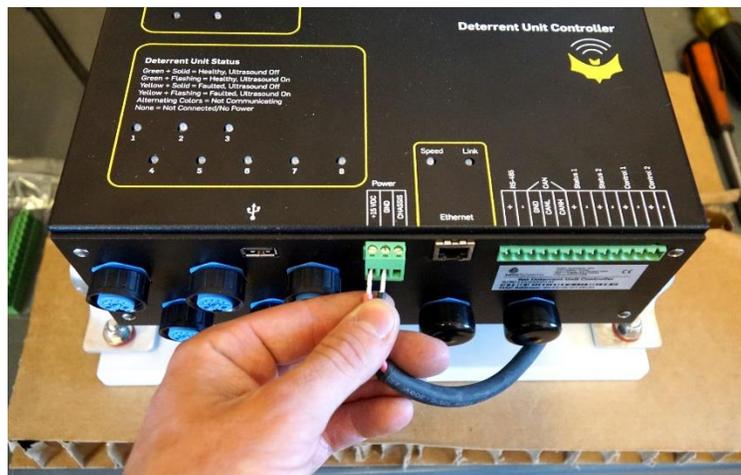




- Take the short 2C output cable from the power supply and thread it through the center opening in the bracket, underneath the front side of the DUC.



- Attach the small orange terminal plug to the DUC at the power input terminals.  
  
Attach the larger terminal plug to the comms terminals.  
  
The plugs are shipped inside the DUC box.



- Connect the DC output wires to the appropriate terminals in the small power plug.  
  
Use the tweaker to tighten the cages around each wire.  
  
DO NOT overtighten.





- 9 Bracket assembly is complete.  
Repeat for the rest of the systems until all DUCs and power supply units have been assembled.



## Hoisting

The entire kit for a single D3 installation will fit into 1-2 large haul bags.

Remove the DUs from their individual corrugated boxes, but make sure to leave the black plastic covers on the DUs in order to protect the subarrays until they are mounted to the brackets.

Physical damage resulting from bringing the system components uptower is not covered by warranty.



### Uptower Preparation

Once the tooling and Bat Deterrent System components are uptower, stage everything on the sides of the nacelle, in the general locations where they will be used or mounted.

Label each DU cable on both ends with numbers 1-6. The numbers correspond to each DU, and are important for identifying which cable to connect to each DU and to the proper DUC channel. Use a permanent marker to place hash marks on the blue parts of the end plugs.





## DETERRENT UNIT INSTALLATION

The Bat Deterrent system for the D3 turbine platform uses six Deterrent Units (DUs), which are installed onto brackets in two identical, mirrored configurations. This section will discuss the procedure for attaching three DUs to one side of the D3 nacelle. The procedure will need to be completed a second time (or simultaneously) on the opposite side of the nacelle.

The brackets are attached to the nacelle by “sandwiching” the fiberglass between top and bottom pieces of the bracket assembly. Drilling and cutting of the fiberglass is required to complete the installation.

### Measuring & Marking Nacelle

- 1 Trace the locations of the DU bracket holes and cutout onto each side of the nacelle.
  - The Deterrent Units will be mounted immediately behind the steel ring that the rotor mounts to.
  - Use the D3 Hole Template (NRG #15101) to help determine the location of the holes.
  - If using the template as a guide, mark out the locations as follows:
    - 9.5” back from rotor-side wall to edge of template
    - 24” down from nacelle flange to top of template





In total, the result should include:

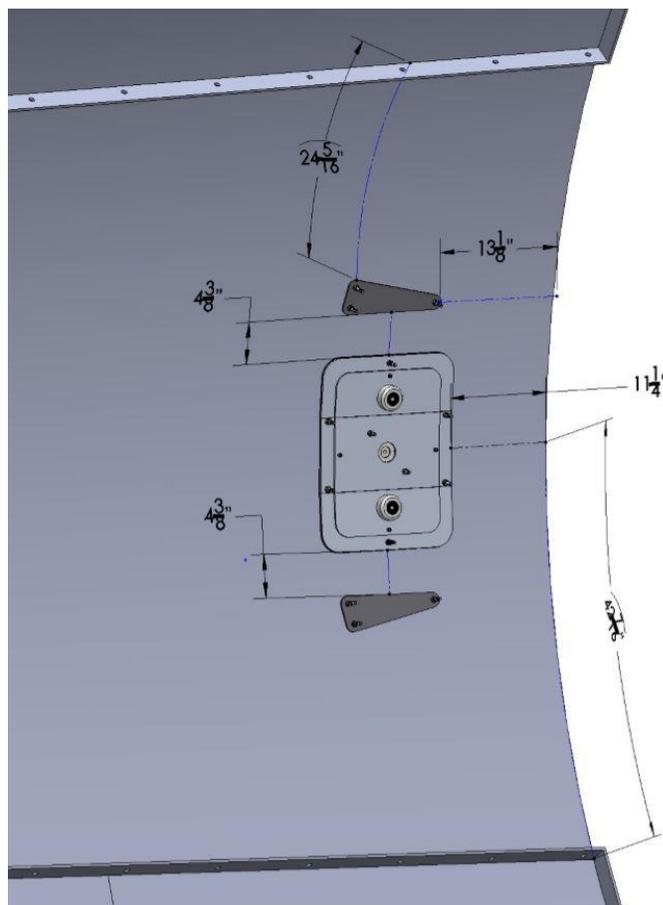
- (3) 1/2" holes | Upper Bracket
- (6) 1/2" holes | Inner flange
- (3) 1/2" holes | Lower Bracket

*Note: Exact longitudinal measurements may vary slightly. In cases where they do not seem to match the diagram exactly, simply ensure that the cutout is as close to the middle of the nacelle as you can.*



If not using the template, use the inner flange plate from Assembly #14546 & the triangular sandwich bracket from Assembly #14542 as templates.

The placement measurements are detailed in the image below.





## Drilling & Cutting Nacelle

---

- 1 Drill out the marked holes for the upper & lower brackets.
  - Each bracket uses (3) mounting holes.
  - Use a vacuum to mitigate dust exposure while operating the drill.



- 2 Drill out the holes for the center bracket assembly.
  - (6) Mounting holes
  - (2) Tie-off holes in the center of the cutout area, spaced approximately 1" center-to-center.
  - (2) Jigsaw start/end holes, in opposite corners of the cutout area, against the traced line.
  - Use a vacuum to mitigate dust exposure while operating the drill.





- 3 Tie-off the traced cutout area prior to beginning the cut.
  - Wrap a cable tie around a small-diameter, round object (drill bit, for example) to introduce a curve into the end.
  - Feed the cable tie end out one of the holes and into the other. Loosely secure to itself.
  - Attach the tool lanyard to the cable tie and to a secure location nearby.

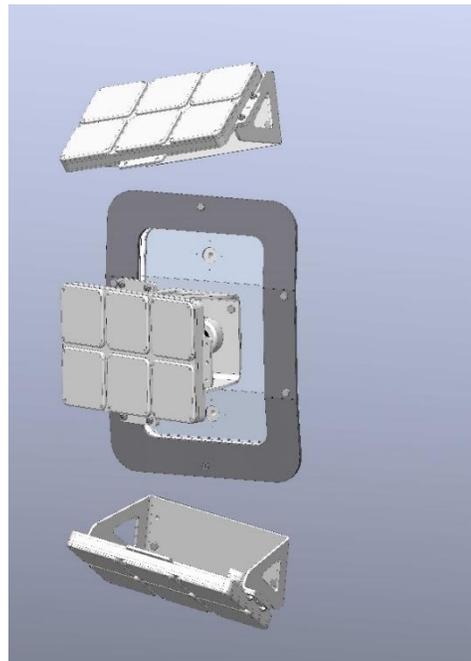


- 4 Use a jigsaw to cut along the traced line and remove the tied-off fiberglass piece.
  - Tie-off the jigsaw with a tool lanyard.
  - Begin at a corner of the traced cutout where a hole was drilled.
  - Follow the traced line with the jigsaw to cut out the space for the DU bracket. Make 2 cuts with a 90-degree turn in the middle of each.
  - Use the vacuum to mitigate dust and debris from the jigsaw.
  - Remove the cutout from the hole after it drops free of the nacelle wall.





**Installing the DUs**



The completed installation of DUs on the left side of the turbine. The rotor is towards the left side in this image, such that the DUs are facing towards the blades.

**Torque Specifications**

NRG PN	FASTENER	CONNECTION	TORQUE (IN-LBS)	TORQUE (N-M)
12823	Buttonhead screw   #6-32   Stainless	Cable gland outer shell	10	1.1
12198	Lock nut   1/4"-20   Stainless	DU to Mounting Brackets	50	5.6
14074	Machine head screw   1/4"-28 threaded   Stainless	Access hole coverplate to inner flange	50	5.6
11414	Hex head screw   5/16"-18 threaded   1.5" length   Stainless	Attaching 15-degree DU bracket to access hole coverplate	132	14.9
12820	Hex head screw   5/16"-18 threaded   2.5" length   Stainless	Attaching inner & outer flange plates to nacelle wall	132	14.9



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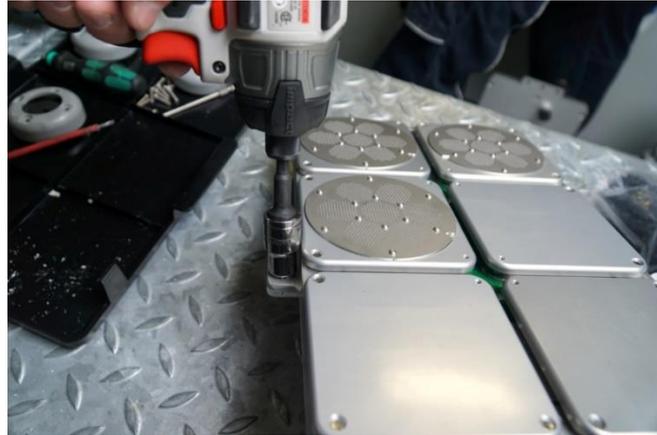
**Attach DUs to Brackets**

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- 1 Remove the locknuts from the bracket with a 7/16" wrench or impact driver with a 7/16" bit.

Apply Blue Loctite to the threaded studs on the brackets.

Attach a DU to the bracket using the locknuts and tighten using the 7/16" wrench or impact driver.



- The 52.5-degree brackets (top & bottom) use the mounting holes at the ends of the DUs.
- The 15-degree bracket (middle) uses the mounting holes on the middle sides of the DU.

- 
- 2 Use a torque wrench and 7/16" deep socket to torque to recommended specification (50 in-lbs)
- 

**NOTICE**

The DU bracket studs & mounting nuts are stainless steel. To prevent the threads from galling, use care when fastening and do not overtighten.

---

- 3 Repeat with the other brackets.
-



### ***Mounting Flange Plates***

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- 1 Use a tool lanyard to tie off the outer flange plate.
  - Girth-hitch the lanyard around the top or bottom of the flange plate.

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- 2 Feed the tool lanyard through the center of the inner flange plate, then attach it to a suitable tie-off point near the hole in the nacelle wall.

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- 3 With both flange plates tied off, feed the outer flange plate out of the hole and into position against the nacelle, with the bolt holes lined up.

At the same time, place the inner flange plate against the inside of the nacelle wall, also lined up with the bolt holes.

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- 4 Feed two bolts (#12820 | 5/16"-18 threaded, 2.5" length) through the top & bottom holes in the flange plates and the nacelle, opposite the location of the tie-off. Orient the threads outwards.

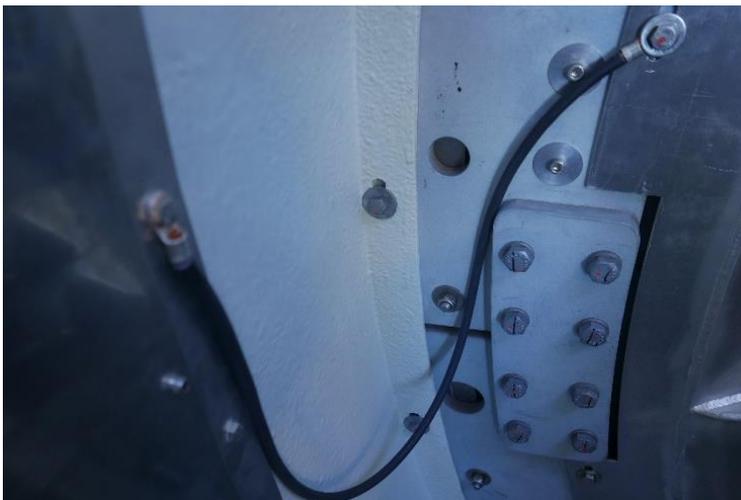
Loosely thread nuts onto the end of the bolts to secure the plates in place and in the proper orientation.

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- 5 Remove the tool lanyard from the outer flange plate.

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- 6 Ground the system to the turbine rotor wall.
  - Feed a bolt through a lug of the longer grounding cable (#14019 | 40" length), then through upper hole on the side closest to the rotor wall.
  
  - Attach the other end of the grounding cable to the rotor wall at the bolt indicated in the image below. Use a 16mm socket to remove & re-attach this bolt.





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- 
- 7 Ground the upper & lower DU brackets.
    - Attach the shorter grounding cables (#12901 | 18" length) to the bolts on the flange side furthest away from the rotor wall.
    - Feed these bolts through the upper & lower holes on the flange.
    - Loosely attach nuts to the bolts outside of the nacelle & outer flange to secure.
- 
- 8 Feed the final (sixth) bolt through the lower hole on the rotor wall-side of the flange & hand-thread a nut onto it.
- 
- 9 Secure all six bolts with 1/2" wrench and 1/2" socket/impact driver or ratchet.  
Torque to specification with a torque wrench and 1/2" socket (132 in-lbs).





### **Mounting 52.5-degree Brackets & DUs**

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- 1 Tie off the #14542 bracket assembly (with DU attached).

**Technician 1:** Place the bracket assembly against the outside of the nacelle, lined up with the three mounting holes.

**Technician 2:** Feed a mounting bolt through the single hole in the sandwich plate, nacelle, & the lower hole of the DU bracket.

Thread (1) nut onto the mounting closest to the rotor wall & hand-tighten.

Repeat this with a second bolt and the lower of the two holes that are further away from the rotor wall.





### Bat Deterrent Installation | Siemens D3

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- 2 Attach the other end of the closest grounding strap to the remaining bolt, then feed the bolt through the final mounting hole & secure by hand-threading on the final nut.

Snug the bracket to the nacelle by tightening the hardware.



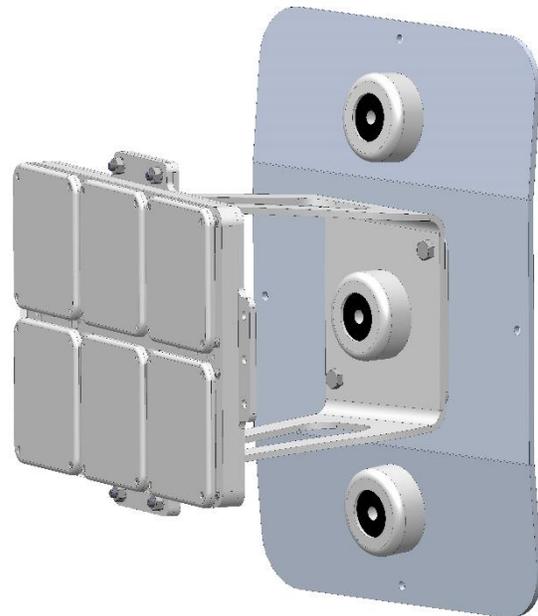
- 3 Repeat the previous steps with the second DU/bracket assembly.
- 

- 4 Torque all six bolts to specification with a torque wrench and 1/2" socket (132 in-lbs).
-



**Mounting 15-degree Bracket**

- 1 Mount the 15-degree bracket (with DU attached) to the cover plate using the provided pair of bolts (#11414 | 5/16"-18 threaded, 1.5" length) & locknuts.



- 2 Torque bolts to specification with a torque wrench and 1/2" socket (132 in-lbs).

**Connecting Cables**

The DU cables go from the DUs to the DUC through cable glands mounted to the cover plate before the plate is bolted into place.

- 1 Stage (3) cable rolls on each side of the igloo, about the same distance away from the rotor wall as your DU cutout.  
Unroll 10-12 feet from the female end of each roll and route them from the cable tray, behind the rotor wall framing and up to the DU cutout.

- 2 Remove the outer cover of each cable gland using the 2.5mm Allen key or bit.

- 3 Remove the center cable gaskets. Pry out with a tweaker/flathead screwdriver, if needed.

- 4 Slide the grey cable gland cap onto the cable, then feed the appropriate-numbered cable through the center of each cable gland and plug into the DU.

Left Side	DU Position	Right Side
2	Top	1
4	Center	3
6	Bottom	5



## Bat Deterrent Installation | Siemens D3

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For the middle DU, leave enough slack to relieve pressure on the cable.

For the top & bottom DUs, the final amount of slack determined once the cover plate is in place.

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- 5** Pry open gasket slot and connect gasket at gland location.  
Re-attach the middle gland cover using the 2.5mm hex key or bit. Do not overtighten.  
(Torque specification: 10 in-lbs)  
Leave the top & bottom cable gland covers off until after the plate is in place.
- 

### ***Attaching Cover Plate***

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- 1** Put the cover plate in place on the inner flange, covering the hole.
  - 2** Secure it to the inner flange using the supplied hardware and a 3/16" hex key or driver bit.  
(#14074 | Machine head screw | 1/4"-28 threaded | Stainless)  
(Torque specification: 50 in-lbs)
  - 3** Pull the excess top & bottom DU cable through the respective glands. Leave some slack for strain relief.  
Slide the rubber gasket into place & re-attach the middle gland cover using the 2.5mm hex key or bit. Do not overtighten.  
(Torque specification: 10 in-lbs)
-



## Bat Deterrent Installation | Siemens D3

### ***Grounding***

The grounding cables should have been attached when the brackets & flanges were bolted to the nacelle wall. If this was not done, remove the appropriate bolts in each bracket & the flanges to attach the grounding cables. Refer to the pictures below for proper grounding cable attachment points.





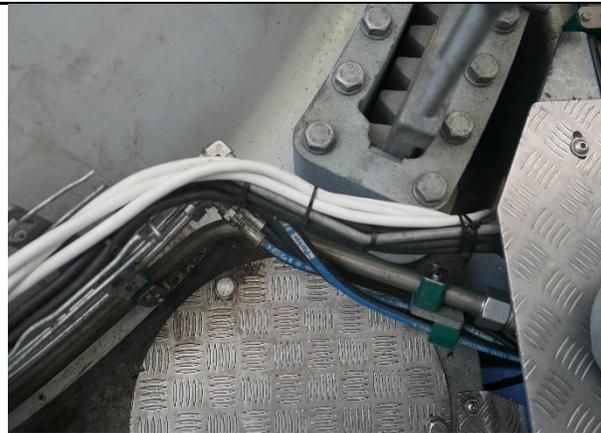
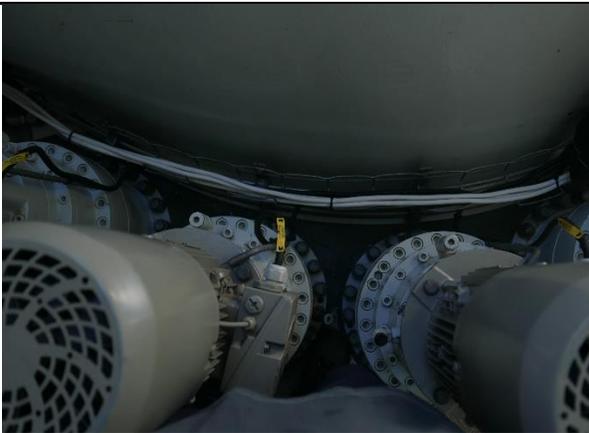
## Bat Deterrent Installation | Siemens D3

### *Routing Cables*

#### Left side of igloo

Cables route from DU's through rotor side wall, then along cable trays to the end of the igloo.

Cables then turn and go under the floor and route along cable trays to the base of the top box.





### Right side of Igloo

Cables route from DU's through rotor side wall, then along cable trays to the end of the igloo

2 small sections of the floor need to be removed to route cables under the top box





## DETERRENT UNIT CONTROLLER (DUC) INSTALLATION

The DUC acts as an intermediary between the turbine and the DUs, providing power and communications to the DUs through the cables.

The DUC and power supply should have already been attached to the magnetic bracket (see ***Deterrent Unit Controller (DUC) & Power Supply Bracket***). This bracket will reliably attach to any steel surface, but some locations are better than others for mounting.

### ***Installation Considerations***

#### **NOTICE**

The DUC is not designed to the same protection standards as the DU, and is not intended to be installed in an exterior location or harsh environment. Installing the DUC in a wet or dusty location may impact the performance of the system and any resulting damage will not be covered by warranty.

### ***DUC Mounting Location | Behind the Top Box***

#### ***Mounting***

***Caution:*** Be mindful of the pinch points created by the magnets.

DUC should be mounted on the back side of the top box towards the rotor.

Cables are routed from under the top box up to the DUC for the connection.





## Bat Deterrent Installation | Siemens D3

### Wiring

*The best practice is to complete the wiring procedure at the end of the installation process, after all DUs have been mounted and cables run back to the DUC.*

Breaker is installed to 909F3



Wiring is completed at 909 X 16



Note that newer versions of the D3 nacelle may have different breaker and wiring locations.



## Bat Deterrent Installation | Siemens D3

### DUC Communication Cable

Each system includes a 20' Cat6 Ethernet cable (NRG part #14263) for communication and data transfer.

This cable connects to the DUC through the RJ45 port.

### *Connecting the Ethernet Cable*

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Cable connects to Port 10 of the router



Cable needs to feed through conduit and down to the bottom of the top box.





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Cable feeds down and out of the back-wall conduit.



Route cable from the conduit to the opening in the panel and feet to the bottom of the top box.



Feed Ethernet cable up along DU cables and connect to the DUC.



### **Connecting to SCADA Networks**

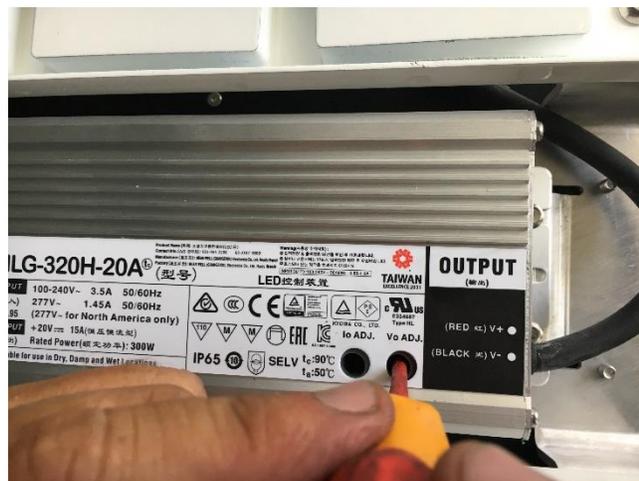
In order to monitor your Bat Deterrent Systems after installation, they will need to be connected to the SCADA network on your wind farm. The methods of how to do this may vary, and the best solution is to talk to your network experts about the best way to do this.



## APPENDIX A | TESTING POWER SUPPLY OUTPUT VOLTAGE

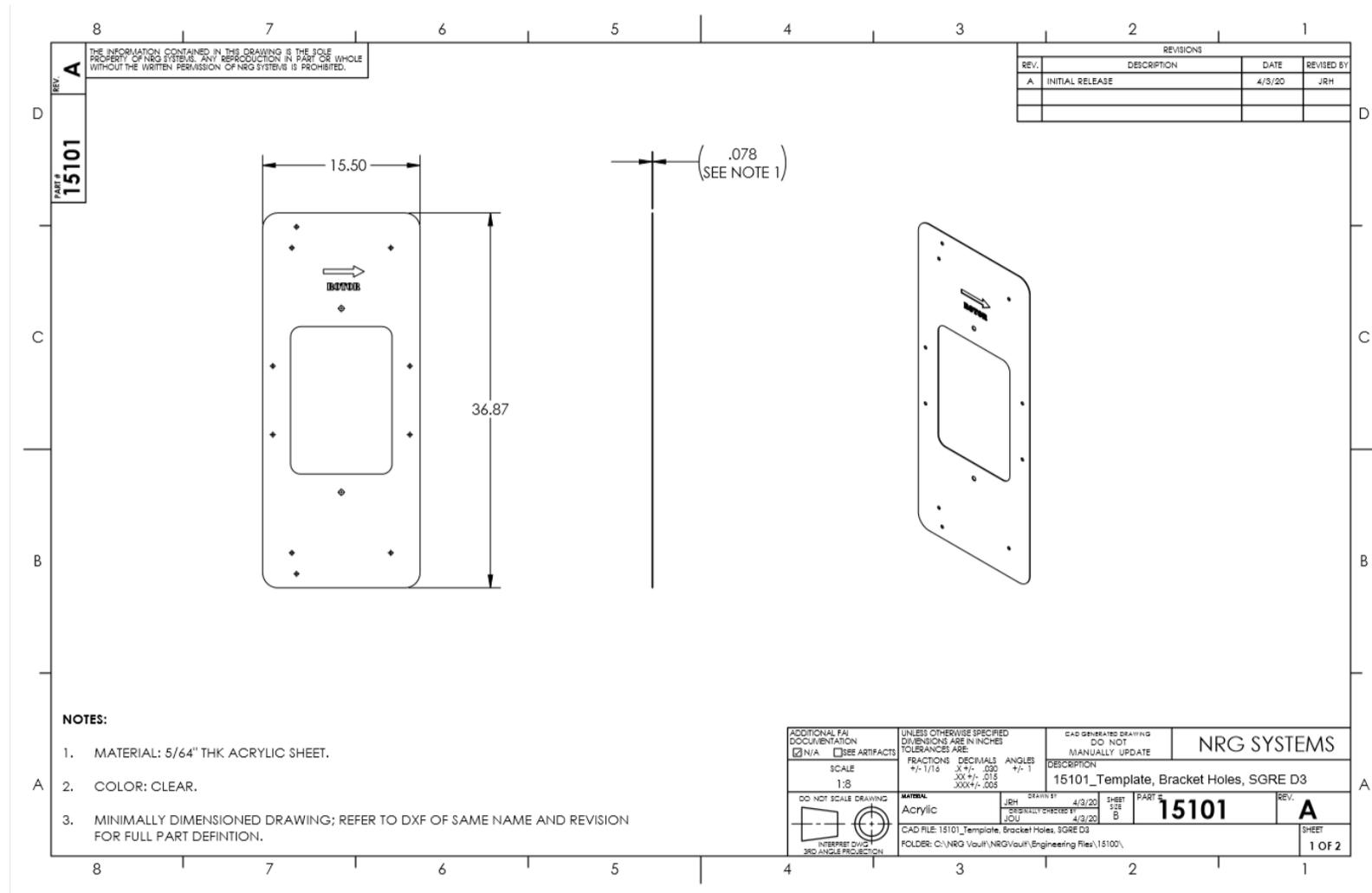
It is important to verify that the power supply is providing 18V DC to the Bat Deterrent System through the DUC power input.

1. Unplug the orange terminal plug from the DUC, if it has not been already.
2. Turn on the 10A breaker to the power supply.
3. With a voltmeter, measure the DC voltage at the green terminal plug.
4. If the voltage is not 18V, then remove the rubber plug from the **Vo ADJ.** hole in the power supply, located on the front next to the DC output wires. Use a P2 screwdriver to slowly turn the screw and adjust the voltage (Clockwise to decrease).
5. Remove the rubber plug from the **Io ADJ.** hole. Ensure that it is turned completely clockwise.
6. Replace both rubber plugs.
7. Switch off the 10A breaker. Plug the orange terminal plug into the DUC.





APPENDIX B | HOLE TEMPLATE #15101



If you would like a full-size version of the actual template size to print, please contact Tech Services at [support@nrgsystems.com](mailto:support@nrgsystems.com).



### COMMISSIONING REPORT

Print a copy of the diagram on the following page for each installation and fill in the serial numbers at each position.

The diagram is looking upwind, from the back of the nacelle, towards the rotor.

**Once installed, the DUs do not automatically identify their positions. It is important to record serial numbers for each position at the time that they are installed.**

Send .pdf copies of each Turbine installation to [support@nrgsystems.com](mailto:support@nrgsystems.com) so the system can be programmed into the software.



# Siemens D3

