



## INTRODUCTION

Instructions for replacing original Nippon Electric Inc (NEI) wind vane and NRG IceFree3 anemometer on Mitsubishi MHI 1000 turbines with Hybrid XT Sensors (XTs) are provided below. Users should be familiar with the operation of the Hybrid XT vane and anemometer prior to performing this retrofit.

NRG mounting assemblies adapt the existing NEI sensor flange mount and IceFree3 mount to the NRG XT mount with captive connectors and cable.

The NRG sensor cables connect to a terminal strip to be placed in the existing junction box, which provides a more convenient place to land all sensor and PLC connections.

The XT sensor power and signal wiring uses the existing NEI/IceFree3 sensor cabling to the control cabinet. The controller connections are modified to connect the XTs signal directly to the controller.

Product manuals and instructions for retrofits on other turbines can be obtained by contacting NRG Systems at [info@nrgsystems.com](mailto:info@nrgsystems.com).

### NOTICE

#### **Always power the heater on your Hybrid XT sensor!**

Failure to maintain constant heating may lead to corrosion or inferior sensor performance. Constant heating prevents condensation from forming on the bearings, enabling the sensor to achieve a 10 year service cycle.

**If the sensor is used without the heater, the warranty will be void.**



### WARNING

This procedure requires:

- *Access to nominal 220V AC mains power*
- *Access to sensor mast*

*This procedure should only be performed by qualified personnel, in accordance with onsite safety protocols.*



### WARNING

Sensor surfaces (particularly the head and the upper body) can become quite hot and may burn you; especially in warm ambient conditions. *Use caution when the heater power is on.*



## TOOLS REQUIRED

Item	Use
<b>Tools</b>	
<b>Ratchet</b>	Attaching to sockets
<b>10mm socket</b>	HXT mounting bolt
<b>13mm socket</b>	
<b>17mm socket</b>	
<b>13mm wrench</b>	
<b>17mm wrench</b>	
<b>Wire strippers (14-22 AWG compatible)</b>	Installing wire terminals
<b>Wire crimpers</b>	Installing wire terminals
<b>Ferrule crimping tool</b>	Installing ferrules from supplied wiring kit
<b>Mallet</b>	Installing mast adapter
<b>Small flathead/Tweaker</b>	Wire connections to terminal blocks

## KIT CONTENTS

### 9372 Hybrid XT Anemometer Retrofit Kit | Mitsubishi | IceFree

- 3769 | Hybrid Turbine Control Sensor onto IceFree Stub
- 9234 | HXT cable assembly with mounting bolt & nut
- 7901 | Hybrid XT Anemometer, Push-Pull Output
- 10125 | TVS for vane signal
- 10352 | Hybrid XT Wiring Kit | Mitsubishi Cold Weather Retrofit
  - Terminal strip
  - Wire for jumpers in control box
    - > Sensor power and ground
    - > Heater power and return
    - > Wire for bypassing vane 4-20 mA converter
  - Wire nuts for capping bypassed wires
  - Cable ties

### 9371 Hybrid XT Vane Retrofit Kit | Mitsubishi | NEI

- 12488 | Mounting adaptor for Mitsubishi
- 9234 | HXT cable assembly with mounting bolt & nut
- 9362 | Hybrid XT Vane, 4-20mA Output, Counter Clockwise
- 10199 | Mitsubishi Hybrid Retrofit Wiring Supplies



## PROCEDURE

### Sensor Installation

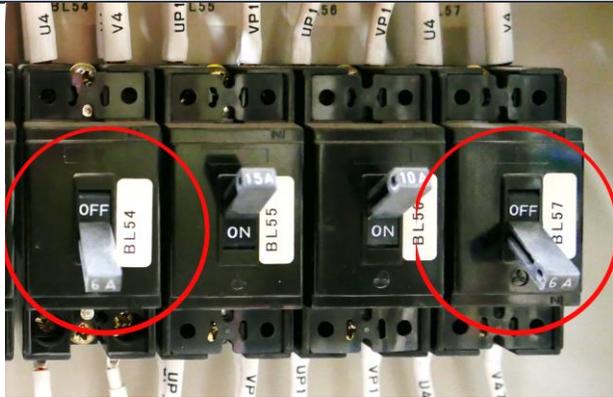
#### 1 Turn off & LOTO breakers.

BL-54 – anemometer heater power 24 V AC

BL-57 – Nippon vane heater power 100 V AC

*\*\*NOTE: the Hybrid XT Vane requires 24 V AC/DC; in this retrofit the anemometer heater power will be jumpered to the vane heater power*

CP-2 – sensor electronics power 24 V DC



#### 2 Remove NEI and IceFree3 sensors and cables.

Open the wind sensor junction box

Disconnect the cables to the two wind sensors from the junction box.

*Make note of which cables are going to the vane, and which to the anemometer. The new HXT sensor wires will be connected to these cables inside the junction box later.*

Remove the existing wind sensors from the sensor masts





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**3 Install HXT mounting adapters.**

Vane Mount #12488 | Anemometer Mount #3769

Note the proper mounting adapter for each sensor.

VANE | #12488 (with flange)

ANO | #3769 (for IceFree3 stub)

Install the XT mount converters to the sensor flanges, using the same process as for replacing an NEI and IceFree3 sensors.

- Apply sealant to the flanges as normal for a sensor replacements
- Reconnect the vane grounding lug as before



*Note: Images to the right already have the cables installed.*

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**4 Trim, label and install new cables.**

Cut each HXT cable to approx. 12 feet long.

Prep the shield braid at the connector with a #10 ring terminal.

**For each sensor cable:**

Remove the bolt, washer, and flag nut from the HXT cable, thread the cable down through the adapter & sensor mast.

*Note: Orient the connector with its notch, and the "Toward Rotor" label turned toward the rotor (see image to the left).*



Install the bolt and washer from the front side, and put the flag nut in place on the back side, finger-tight.



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### 5 Install HXT sensors

Install the sensors onto their respective masts.

- Slide the sensor onto the top of the adapter/cable plug assembly.
  - Ensure proper orientation:
    - Bolt & washer on the back
    - Flag nut on the front
- Sensors have a label denoting “TOWARD ROTOR”

Tighten mounting bolt with 10mm wrench.

**Torque specification: 27 in-lbs**

VANE: #9362 | 4-20 mA CCW

ANEMOMETER: #7901 | Push-Pull

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### 6 Run HXT sensor cables to wind sensor junction box.

Secure and stow cables as necessary from sensors to junction box.

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## Sensor Wiring

### HXT Sensors to Wind Sensor Junction Box

- 1 Thread the new cables through the openings in the wind sensor junction box.

**Note: The yellow wires are not used for either sensor and can remain disconnected.**

- 2 Strip the cable jackets and attach ferrules to each wire except the yellow wires.
  - Remove approximately 6 in (150 mm) of cable jacketing.
  - Discard the shield braiding; the sensor and cable are bonded at the sensor mast.
  - Strip each wire jacket back 0.25 in (6 mm).
  - Slide the ferrule over the bare wire end and crimp.

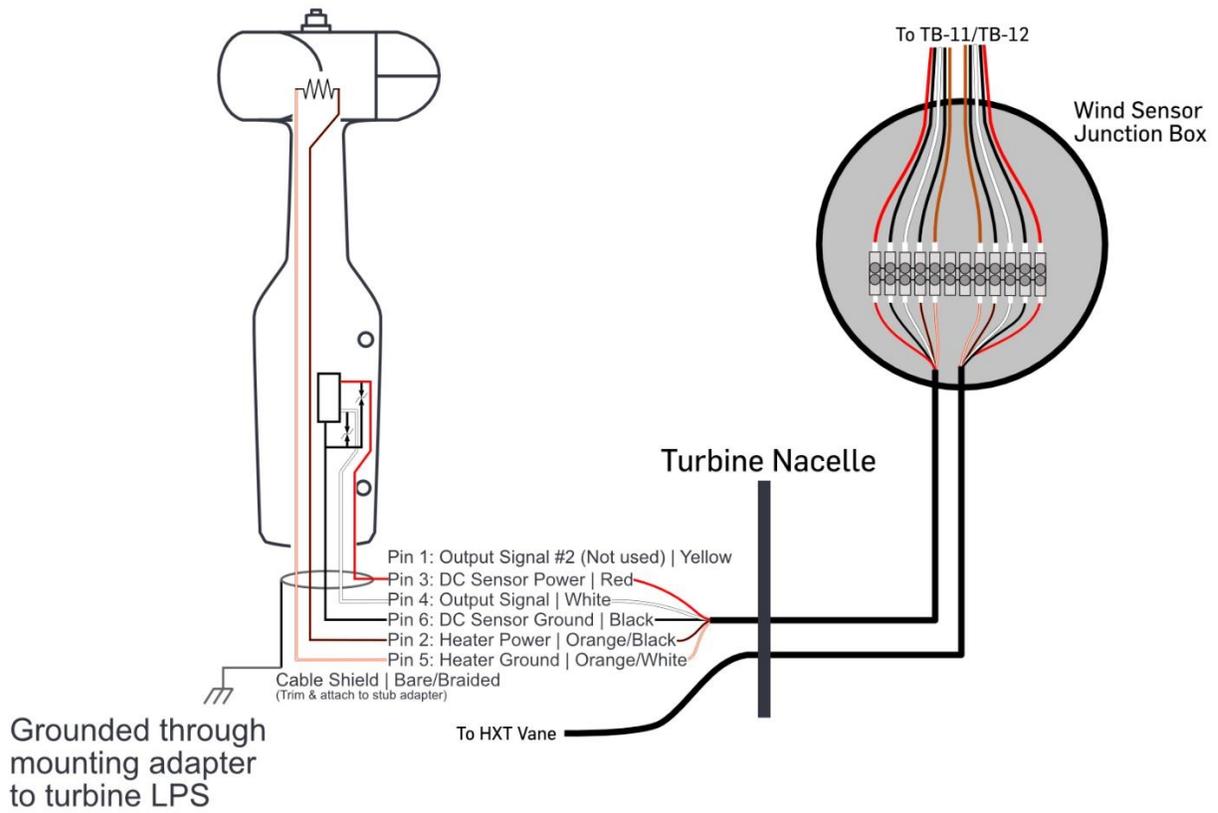
Repeat this with the existing sensor wires that go from the junction box to TB-11 & TB-12.

- 3 Connect the HXT sensor wires and the existing sensor wires to the new terminal block supplied in the wiring kit. The terminal block has 12 junctions, so 2 will remain unused.

This connection happens inside the wind sensor junction box.

The connections made at the terminal block are listed in the table below, outlined by the thick border, and shown in the figure below.

Sensor	HXT Sensor wire		Turbine Cabinet wire		Terminal block	Wire number
<b>Anemometer</b>	Red	Power	Red	Power	TB-12	50
	White	Signal	White	Signal		51
	Black	Ground	Black	Ground		49
	Orange/white	Heater +	Copper/clear	Heater +	TB-11	40
	Orange/black	Heater -	Black	Heater -		39
<b>Vane</b>	Red	Power	Red	Power	TB-12	33
	White	Signal	White	Signal		34
	Black	Ground	Black	Ground		35
	Orange/white	Heater +	Copper/clear	Heater +	TB-11	46
	Orange/black	Heater -	Black	Heater -		45



**Note:** The anemometer is shown in the diagram, but the wiring connections happen in the same junction box for both sensors.



## Top Box Wiring

### 1 Remove old vane signal wiring from TB-12.

- Cap each wire with a wire nut (supplied with wiring kit #10199).  
106D/1 from TB-12 pin 33  
106D/2 from TB-12 pin 34  
106D/3 from TB-12 pin 35
- Disconnect the NA/01+ from CNTB-13. Cap with wire nut and tuck out of the way.

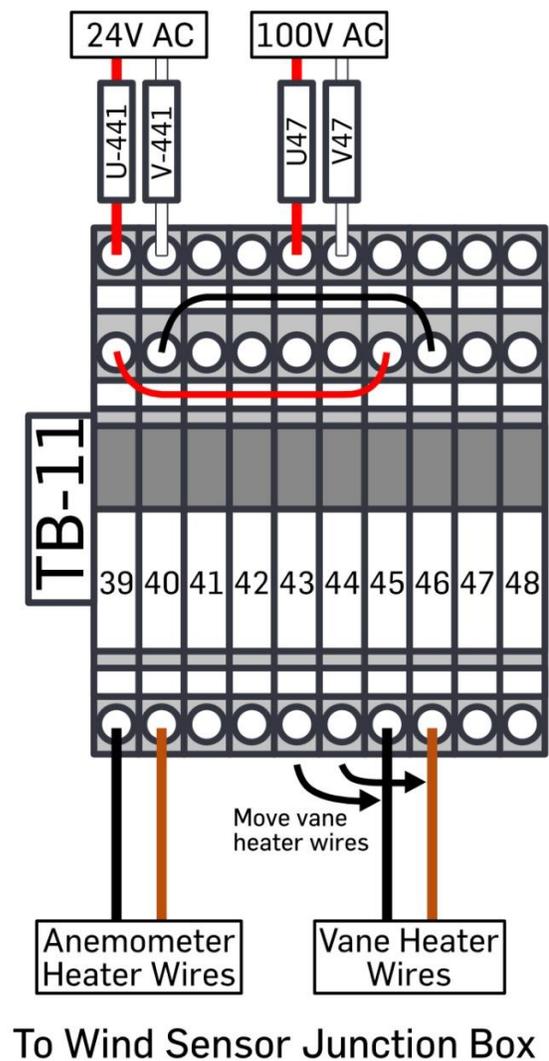
### 2 Change vane heater power to 24 VAC.

- Move vane wire from Pin 43 to Pin 45.
- Move vane wire from Pin 46 to Pin 46.

*Note: If pins 45 & 46 are occupied, then find another pair of open pins nearby.*

- Jumper Pin 39 (U-441) to Pin 45 using the included red 16 AWG wire.
- Jumper Pin 40 (V-441) to Pin 46 using the included black 16 AWG wire.

Strip all wire ends and crimp ferrules onto them to ensure reliable connection.



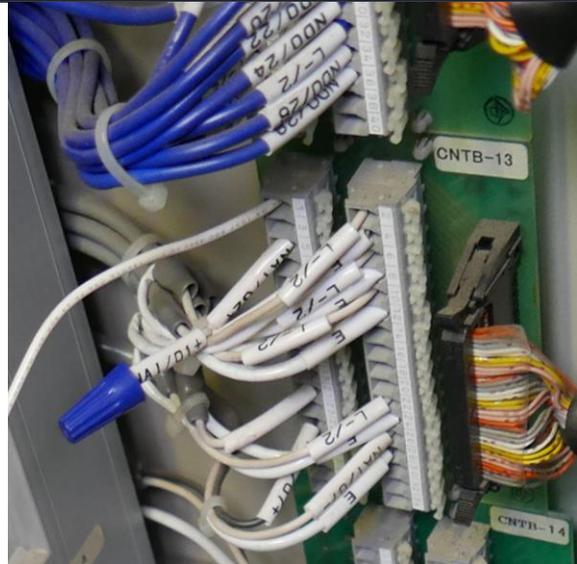


**3 Connect new sensor signal wiring.**

Use the 7' 20AWG white wire included with wiring kit #10199 to jumper between TB-12 Pin 34 and CNTB-13 Pin 1.

Strip the wire ends and crimp ferrules onto them to ensure reliable connection.

Route the wire appropriately so it is tucked out of the way.



**4 Change vane sensor power to 24V DC.**

- Move anemometer ground wire from Pin 49 to Pin 36.
- Move anemometer power wire from Pin 50 to Pin 37.

*Note: If pins 36 & 37 are occupied, then find another pair of open pins nearby.*

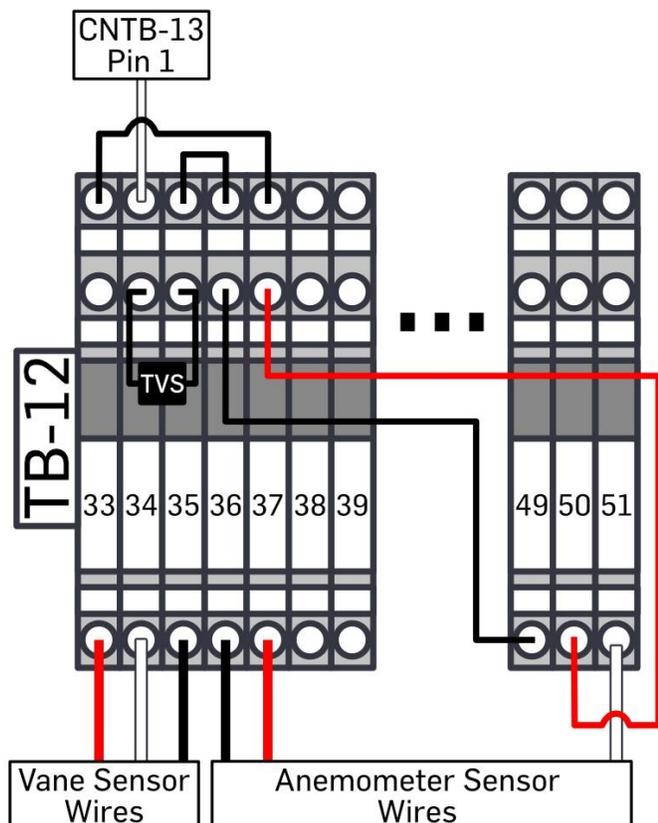
Using the supplied 20 AWG black wire:

- Jumper Pin 33 to Pin 37
- Jumper Pin 35 to Pin 36
- Jumper Pin 49 to Pin 36

Using the supplied 20 AWG red wire:

- Jumper Pin 50 to Pin 37

Strip all wire ends and crimp ferrules onto them to ensure reliable connection.





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**5 Test sensor function.**

- Remove LOTO & turn on breaker BL-54.
- Test anemometer and vane signal with Mitsubishi Handy interface.

*If the wind is very low during this procedure, spin the anemometer and vane by hand to verify that wind speed data is read by the controller.*

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**6 Clean and secure all wiring & connections.**

- Replace the cover on the Wind Sensor Junction Box.
  - Route sensor cables appropriately, if not done already.
  - Replace doors on control cabinet & reconnect door grounding straps.
  - Secure control cabinet.
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**System Startup****1 Verify startup and yaw.**

- Start turbine as usual after exiting.
- Verify that the turbine yaws into the direction of the wind.
- Verify that the wind starts and reconnects to the grid.

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**2 Verify anemometer scaling and wind speed in SCADA & Handy.**

Slope = 0.572  
Offset = 1.00

