

**REPLACING GPS BOARD****REMOVE OLD BOARD:**

Turn off all breakers

Power down GPS with power button

Unplug all connectors from enclosure wall and remove red/black wires from battery bank

Remove SIM cards from dial-up modems(s) and keep in safe place

Remove board from enclosure

**INSTALL NEW BOARD:**

Record UID for GPS Receiver - Primary Iridium modem - Secondary Iridium modem

Record timer switch settings (typical 1000m / 1000m for dual, 1000m / 10m for single)

Verify all breakers off (green showing)

Verify GPS power plug(s) disconnected

Place new board into enclosure

Place regulator temp sensors on batteries

Connect all cables to enclosure wall Power, Met, GPS antenna, Iridium antenna(s)

Connect heat pads to terminal blocks

Connect red/black wires to battery bank

Check and record voltages (see MEASURING VOLTAGES section)

Turn on all breakers (red showing)

Check regulators:	Solar charge LED:	green, or red with green flash
	Solar LVD LED:	green (magnet to reset if red)
	Wind charge LED:	green, or red with green flash
	Battery voltage:	voltage increasing?

Plug in GPS power cable(s)

Verify GPS front panel operating normally

IF Xeos modem: Perform Xeos checks (see IRIDIUM CHECKS section)

IF single dial-up modem: Install SIM into modem

IF dual dial-up modems: Load breaker OFF

Install active SIM into secondary modem

Load breaker ON

Place test call to secondary modem (see IRIDIUM CHECKS section)

Load breaker OFF

Move active SIM to primary modem

Install backup SIM inside secondary modem

Load breaker ON

Photograph GPS board

Place foam cap over electronics

Slide board into anti-static bag, attach alligator clip leads from bag to system ground

Verify ground wires connected from enclosure ground plate to battery negative

Photograph inside of enclosure AND connectors on enclosure wall

Verify all breakers still ON

Close, latch, and strap all enclosures

Place test call to primary modem (see IRIDIUM CHECKS section)

## **REPLACING A GPS RECEIVER**

Power down old receiver with power button

Remove all connectors from rear panel of receiver and remove receiver from board

Install new receiver and reconnect all connectors to rear panel

### **TRIMBLE NETRS**

Power A to dongle  
Ethernet to dongle (for Xeos or radio only)  
Power B lock this connector  
Serial 2 primary dial-up Iridium  
Serial 3 Met station if secondary Iridium used  
Serial 4 secondary Iridium, otherwise Met  
Antenna cable to type N connector on enclosure wall

### **TRIMBLE NETR9**

Power 2 7-pin LEMO (be careful)  
Ethernet (for Xeos or radio only)  
USB with 4GB external drive  
Serial 2 Met station  
Antenna cable to type N connector on enclosure wall

Verify GPS operation from front panel

### **TRIMBLE NETRS**

Satellite: red 1Hz  
Data: yellow 1Hz  
Power A: solid green  
Power B: solid yellow

### **TRIMBLE NETR9**

Lower Left: Logging / USB  
Upper Left: SV X (X>5)  
Upper Right: Battery icon

Record UID of new receiver

## **REPLACING A DIAL-UP IRIDIUM MODEM**

Turn off load breaker (yellow wires)

Remove Iridium modem and its power / serial cable

Move SIM card to new modem

Install new modem and power / serial cable

Serial cable To NetRS serial 2 (primary) or serial 4 (secondary)  
Iridium positive lead To timer switch pin 1  
Iridium negative lead To timer switch pin 3  
Coaxial antenna cable To type TNC connector on enclosure wall

Turn on load breaker

Record UID of new Iridium modem

## **REPLACING AN IRIDIUM ANTENNA**

Unplug the old cable from the enclosure and remove all cable ties from frame

Remove old antenna and cable

Install new antenna and cable. Hand tighten the TNC connector then use pliers to tighten further.

Route cable back to enclosure and plug in. NO SHARP BENDS OR KINKS IN THIS CABLE

Anchor cable with a tie every ~18", taking care to avoid sharp edges

## **REPLACING A WEATHER STATION**

Unplug the old cable from the enclosure and remove all cable ties from frame

Remove weather station by unscrewing small set screw inside base of weather station

Install new weather station on frame

Orient the new weather station so its "north" arrow on bottom points toward true north

Route cable back to enclosure and plug in

Anchor cable with a tie every ~18", taking care to avoid sharp edges

Record UID of new weather station

Record height of weather station above/below (+/-) GPS antenna

## REPLACING A SOLAR PANEL

Unplug the old cable from the enclosure and remove all cable ties from frame  
Unscrew 4 saddle clamps from frame and remove panel  
Install new panel using 4 saddle clamps  
Route cable back to enclosure and plug in  
Anchor cable with a tie every ~18", taking care to avoid sharp edges

## REPLACING A WIND TURBINE

Unplug the old cable from the enclosure and remove all cable ties from frame.  
Remove wind turbine from frame.  
Install new turbine on frame.  
Route cable back to enclosure and plug in.  
Anchor cable with a tie every ~18", taking care to avoid sharp edges.

## IRIDIUM CHECKS

### TEST CALL TO NETRS THROUGH DIAL-UP MODEM

Connect Iridium handset to laptop serial port. Power the handset and extend antenna vertically.  
Make sure you have good sky view for the antenna  
Open previously configured Iridium dial-up Network Connection.  
Enter Iridium phone number and click Dial. May take several tries. If persistent failures:

- Phone number correct?
- Active SIM card installed on remote modem?
- Remote Iridium modem on?
- Remote modem antenna cable and connectors OK?
- Breakers on?

After "Registering Computer On Network" box disappears, connection has been made to GPS  
In any browser, enter following commands (xx = unique for each remote station)

Note: your computer will be 192.168.xx.1. See this IP under Dial-Up in the Network Connections window.

*http://192.168.xx.2/prog/show?systemname*  
*http://192.168.xx.2/prog/show?serialnumber*  
*http://192.168.xx.2/prog/show?firmwareversion*  
*http://192.168.xx.2/prog/show?voltage&input=1*  
*http://192.168.xx.2/prog/show?voltage&input=2*  
*http://192.168.xx.2/prog/show?loggingstatus*  
*http://192.168.xx.2/prog/show?trackingstatus*

Verify you have connected to the right site  
Record on checklist  
Running 1.3-2 (or 1.3-1 or 1.3-0). Record on checklist.  
Voltage 1 is >13V and charging  
Voltage 2 is >13V and charging  
Verify NetRS is logging 60-minute datafile  
**Must have nonzero L1snr and L2snr values**

### CHECKS WITH XEOS MODEM

Upon power up, Power LED flashes then solid yellow <10 seconds  
Press DAS Test button. DAS OK LED flashes then solid yellow. Verifies Ethernet connection to GPS. <20 seconds.  
Press SAT Test button. SAT OK LED flashes then solid yellow Verifies Iridium link (up to 90 sec). May take 2-3 tries.  
Note: Xeos goes to sleep after 15 minutes. If asleep, cycle load breaker to wake up.

## **MEASURING VOLTAGES**

### **TURN ALL BREAKERS OFF**

#### **BATTERY VOLTAGES** (with breakers OFF)

Verify voltmeter is set to measure DC voltage (NOT DC current).

If no individual breakers for auxiliary battery banks:

Unplug all external battery cables from outside of enclosure

Measure main bank voltage from port 2 on battery breaker to black terminal blocks

Measure auxiliary bank voltages at external battery cable (pin B positive)

Reconnect external battery cables to enclosure

If individual breakers for auxiliary battery banks:

Measure main bank voltage from port 2 on main battery breaker to black terminal blocks

Measure auxiliary bank voltages from port 2 on auxiliary battery breakers to black terminal blocks

All battery voltages should be steady  $\geq 13V$  if system charging on arrival.

All battery voltages should be steady  $< 13V$  if system not charging on arrival.

#### **SOLAR PANEL VOLTAGES** (with breakers OFF)

Unplug all but one panel from outside of box.

Measure solar panel voltage from port 2 on solar breaker (orange wires) to black terminal blocks.

Should be  $> 20V$

Unplug first panel. Connect second panel into different plug.

Measure voltage again.

Repeat for panels 3 and 4 if necessary.

Reconnect all panels to enclosure.

#### **WIND TURBINE VOLTAGES** (with breakers OFF)

Unplug all but one turbine from outside of box.

Measure wind turbine voltage from port 2 on wind breaker (blue wires) to black terminal blocks.

Should be  $> 15V$  when spun by hand

Unplug first turbine. Connect second turbine into different plug.

Measure voltage again.

Reconnect both turbines to enclosure.

#### **HEAT PAD RESISTANCE** (with breakers OFF)

Set voltmeter to resistance.

Measure purple to black blocks.

Should be  $\sim 7\text{ohms}$  when cold.

### **TURN ALL BREAKERS ON**

#### **LOAD VOLTAGE** (with breakers ON)

Measure load voltage from yellow terminal blocks to black terminal blocks.

Should equal battery voltage.