NRG LOGR | MET
USER'S MANUAL

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SECTION 1 | INTRODUCTION

About This Manual

This manual is designed to guide users through the setup, configuration, operation, and maintenance of the LOGR|Met data logger. Whether a first-time installer or an experienced technician, this manual provides the essential information needed to ensure safe and effective use of the product.

We recommend reading through the **Essential Safety Information** and **Precautions** sections before beginning installation or operation. For additional support, refer to the **Getting Help** section.

Typographic Conventions

This font style is used for the general body of this manual.

Instructions in **bold** type direct an action to perform on an operation screen.

This style is used to warn users of a potential danger, either to themselves or to the equipment/data.

***Note**: This style is used to indicate a tip or an important note.*

	***This symbol indicates information that is critical to understanding the operation of the equipment and/or actions that could damage the equipment without endangering the user.***
	***This symbol indicates a hazard to the user, the equipment, or both that could result in significant injury or damage.***
	***This symbol indicates an electrical hazard to the user.***
	***This symbol indicates a hot surface hazard to the user, the equipment, or both.***
	***This symbol indicates an ESD hazard to sensitive equipment.***

Essential Safety Information

Safety Considerations / Warnings

WARNING: 	**Observe Safety Precautions:** Failure to observe precautions may result in bodily injury and/or damage to the product or connected equipment.
WARNING: 	**Inspect Before Use:** Always inspect the equipment for damage or defects, including wiring, before use. Do not operate the product if it is damaged or defective.
WARNING: 	**Qualified Personnel Only:** Installation and service must be performed by trained and qualified personnel only.
WARNING: 	**Do Not Open the Enclosure:** There are no user-serviceable parts inside the product enclosure. Do not open it. Opening the enclosure may damage the product and/or connected equipment and risks bodily injury.
WARNING: 	**Follow Standard Safety Rules:** In addition to the precautions listed here, follow all applicable standard safety procedures for photovoltaic (PV) array installation.
WARNING:  	**Protective Earth Terminal:** The terminal labeled with the protective earth symbol must be connected to a suitable earth ground. This provides protection from electrical hazards and establishes a functional earth connection to help guard against overvoltage and electrostatic discharge.
WARNING: 	**DC Input Port:** Port is rated for 12 to 28 V ⎓ 15 A. Do not apply AC power to this port—doing so may cause electric shock and damage the product. Do not exceed the 28 V ⎓ maximum rating. LOGR | Met may draw up to 15 A of current to power itself, the connected devices, and to charge the external battery.
WARNING: 	**PV Input Port:** Port intended for connection to a compatible solar panel to charge the external battery. Some panels may produce hazardous voltages. Do not connect panels that exceed the faceplate rating. Always de-energize the panel before handling. Use caution to avoid electric arcs, burns, or shock. When making connections, use extra care to avoid exposed wire or stray strands.
WARNING: 	**BATTERY Port:** Port is for connection to an external 12 V lead-acid battery only. The LOGR | Met may charge or discharge the battery at up to 15 A. Turn off all system circuit breakers before connecting or handling battery wiring. Use care to avoid exposed wire or stray strands.
	LOGR|Met contains an internal coin cell battery. Do not store or operate the unit at temperatures above 85°C. Do not immerse in water or dispose of in fire, as coin cells may leak or explode. When disassembling LOGR | Met for disposal, wear appropriate personal protective equipment (PPE). In the event of electrolyte leakage, absorb with

	cloth and treat the cloth as flammable waste. Perchlorate Material – special handling may apply.

Maximum Ratings

Port	Description	Maximum Rating
MODEM	D Out is the signal output to an external modem. R In is an input, receiving a signal from an external modem.	D Out to GND ±7.5 V ⎓ R In to GND ±7.5 V ⎓
MODBUS RTU	Remote terminal unit communication port can connect to SCADA.	D+ to GND 12 V ⎓ D- to GND -7 V ⎓
A1 to A8	Analog Port. EXC terminal provides excitation power to the attached sensor. SIG+ and SIG are analog inputs.	EXC to GND 12.5 V ⎓ 56 mA SIG+ to GND ±14 V ⎓ SIG to GND ±14 V ⎓
C9 to C18	Counter Port. EXC provids excitation power to the attached sensor. SIG is a counter input (analog, digital or open-collector).	EXC to GND 13.1 V ⎓ 56 mA SIG to GND 18 V ⎓
OP1 and OP2	Control Output Ports. OP1 and OP2 provide switchable power to connected equipment.	12 V to GND 13.1 V ⎓ 2.1 A
OP3	Control Output Port. OP3 provides power to connected equipment.	5 V to GND 5.2 V ⎓ 2.1 A
COM A to D	Serial Sensor Ports. EXC provides excitation power to the attached equipment. D+ and D- are RS-485 compliant data terminals.	EXC to GND 13.1 V ⎓ 1.0 A D+ to GND -7 V to +12 V ⎓ D- to GND -7 V to +12 V ⎓
RS232	Serial Communication Port. 12 V provides power to the attached equipment. D Out is an RS-232 compliant signal output. R In is an RS-232 compliant signal input.	12 V to GND 13.1 V ⎓ 1.0 A D Out to GND ±15 V ⎓ R In to GND ±15 V ⎓
SDI-12	Serial Communication Port. 12 V provides power to the attached equipment. DATA terminal is an SDI-12 compliant signal input and output.	12 V to GND 13.1 V ⎓ 1.0 A DATA to GND 5.5 V ⎓

Wire Sizes, Strip Lengths and Torques

DC, PV, and BATTERY ports	Wire Size: 30 AWG to 12 AWG (0.2 mm^2 to 2.5 mm^2) Strip Length: 7 to 8 mm (0.28 to 0.31 inch) Torque: 0.5 N·m (4.4 inch-pounds) Tool: Use slotted screwdriver (blade thickness x width) 0.6 mm x 3.5 mm (0.024 x 0.14 inch)
MODEM, MODBUS RTU, A1 to A8, C9 to C18, OP1 to OP3, COM A to COM D, RS232, and SDI-12 ports	Wire Size: 28 AWG to 14 AWG (0.2 mm^2 to 1.5 mm^2) Strip length: 6 to 7 mm (0.24 to 0.28 inch) Torque: 0.2 N·m (1.8 inch-pounds)

	Tool: Use slotted screwdriver (blade thickness x width) 0.4 mm x 2.5 mm (0.016 x 0.10 inch)

Getting Help

NRG Systems offers a variety of support options to help you get the most from your NRG product. If you have questions about your NRG product, first look at the product documentation on the NRG website. (NRG Systems LOGR|Met Data Logger).

If you cannot find the answer, contact your salesperson or NRG Systems Technical Services for assistance using the information below. Customer support is available from 8:30 AM to 5:00 PM ET, Monday through Friday.

Telephone: +1 802-482-2255 ext. 3
Email: *support@nrgsystems.com*

When you call or email, please have the appropriate product documentation and the following information:

- Customer name
- Equipment purchaser
- Item number or description
- Serial number(s)
- Approximate date of purchase
- Equipment installation location, including terrain and climatic conditions
- Detailed description of the problem
- Events leading up to the problem
- Details regarding troubleshooting attempts to solve the problem

You may be asked to provide data files or logs to help us investigate an issue. All information and data provided are kept strictly confidential.

NRG Systems maintains an extensive website which includes an in-depth customer support documentation area. If you need assistance at times outside of regular business hours, we suggest visiting our website, nrgsystems.com.

All instruments, sensors, software, and towers manufactured by NRG Systems are designed to be reliable and easy to use. We welcome your comments and appreciate your help in making our products the best available.

Product Overview

Designed specifically for the renewable energy industry, the NRG LOGR|Met data logger (NRG item # 9458, 9459, and 9460) is a versatile, high-utility data logger suitable for all wind and solar resource assessment and resource monitoring applications worldwide.

The LOGR|Met offers expanded capability over the NRG SymphoniePRO and LOGR|Solar data loggers.

LOGR|Met contains a built-in charge controller and is powered by 12 to 28 VDC. This compact logger is DIN rail-mountable and compatible with a wide range of industry-standard (Modbus RTU, counter, and analog) sensors.

Configuration can be performed via local Wi-Fi or wired ethernet network connection by using the internal web browser user interface (UI). This allows the user to manage channel configurations, update firmware, and check basic logger functionality. No proprietary configuration software is required, and a Modbus client utility is provided to test final configurations.

Data is acquired once per second and averaged into user-selectable 1-, 5-, or 10-minute intervals; intervals are time-stamped with the beginning time of each interval. A comprehensive list of **Error! Reference source not found.** provides users with easy access via Modbus TCP or RTU.

Data is stored locally on a removable (8GB) microSD card, formatted with the FAT32 file system. This data can be transferred via SFTP (Secure File Transfer Protocol) and SMTP (Simple Mail Transfer Protocol) protocols.

***Note**: Always power off the LOGR|Met before inserting or removing the microSD card. Failure to do so may result in data corruption or loss.*

Optional built in LTE modems are available in the 9459 and 9460 models, featuring integrated GPS and enabling cellular communication for remote configuration and data transfer.

The **Analog Sensors** section supports up to 8 differential or 16 single-ended measurements, or a combination of both. It provides 5 V and 12 V excitation outputs (available as either pulsed or constant sources), as well as current source excitation for sensors such as RTDs and thermistors. Additionally, the system includes built-in surge and electrostatic discharge (ESD) protection to help safeguard connected sensors and maintain reliable operation in the field.

The Serial Sensors (Modbus RTU) section can support up to 24 Modbus RTU sensors, with a maximum of 96 total measurands. These sensors can be distributed across the logger's 4 COM ports, each of which can be individually configured with different communication parameters.

The Counter Sensors section supports up to 10 devices that generate pulse-based outputs. These channels are commonly used with sensors such as flow meters, tipping bucket rain gauges, anemometers, and other instruments that produce discrete electrical pulses.

The **Error! Reference source not found.** section contains 3 switched output signals suitable for driving external pyranometer heaters, relays, external modems, and other devices that fall within the output power constraints.

Labeled terminal ports with removeable connectors facilitate error-free installations and maintenance. Blank labels are provided, enabling the user to create custom tags for terminal ports. Use of a fine-point permanent marker is recommended when writing on blank labels.

For quality traceability, a factory acceptance test report is available for each individual logger.

The logger conforms to IEC 61724-1 when utilizing the external NRG Pulsed Soiling .

The logger conforms to IEC 61400-12 for wind energy applications.

Precautions

Failure to adequately ground the system puts the logger and sensors at risk for electrostatic damage (ESD). The included grounding cable should be affixed to Earth ground to provide a discharge path from the logger to earth.

Care should be taken to avoid ground loops in the system when planning installation.

When operating in higher ambient temperatures, the outer surface of the logger may become hot to the touch.

Users should test or measure the temperature of the logger before touching or handling it after extended periods of use in warmer climates.

Environmental Considerations

- Sensor cables become less flexible and are more easily damaged at low temperatures. Make sure that all cables are securely fastened so they do not flap in the wind.
- If the equipment will be exposed to high salinity, use protective grease or other dielectric agent on terminals and ground connections.

Quick Start Guide

Follow these steps to setup, configure, and begin receiving data from a LOGR|Met system:

Setup and Login

1. Unbox the LOGR|Met system and confirm that all product components have been received (see This section outlines the key components, interfaces, and labeling conventions of the LOGR|Met system. It is intended to help users become familiar with the system's hardware layout and capabilities prior to installation and configuration.

2. Unpacking LOGR|Met for details).
3. Make physical connections:
   a. Insert the provided industrial-rated **microSD Card**, pre-formatted with FAT32.

Ensure the LOGR|Met is powered off before inserting or removing the microSD card to avoid corruption.

If the provided microSD is lost, do not replace with consumer-grade SD cards, which may be unreliable or not rated for temperature extremes.

   b. Attach the provided **Wi-Fi** antenna (NRG #20246) (see Wi-Fi for details).
   c. Connect a **12 to 28 VDC** power supply to the power terminals (see Power Source and Power Systems for details)

For cellular models only:

***Note**: Ensure the logger is powered off prior to installing SIM and antennas.*

Attach the provided **GPS** antenna (NRG #20358) (see For improved LTE performance, connect a second LTE antenna to the SMA port labeled **DIV**. Space the two antennas approximately 3 inches apart, or use a single dual-connector diversity antenna.

   d. GPS for details)

Attach the provided **Cellular (CELL),** and if applicable the **Diversity (DIV),** antenna(s) (NRG #17030) (see Attach the provided compact Wi-Fi antenna (Item #20246) to the SMA port labeled **Wi-Fi**.

Cellular and Insert a standard LTE CAT 4 SIM card into the SIM slot, then connect the LTE antenna (Item #17030) to the SMA port labeled **CELL**.

   e. Cellular Diversity for details)
   f. Insert a standard-sized (25mm x 15mm) cellular service **SIM Card** compatible with LTE CAT 4. LOGR|Met supports any carrier that supports this standard (see Modem section for cellular specifications).
4. Establish a connection and access the graphical user interface (GUI):
   a. To Connect Via Ethernet (see Connecting via Ethernet for details):
      i. Connect an Ethernet cable from a computing device to the LOGR|Met ETH1 port.
      ii. Open a web browser on the connected computing device, and navigate to the default IP address: https://192.168.1.110
      ***Note**: The default configuration uses subnet mask 255.255.255.0. The connected device will require a compatible static network configuration. Ensure the https:// prefix is included in the URL.*

To Connect Via Wi-Fi (see Connecting via Ethernet

LOGR|Met can be connected directly to a local computer or network switch using an Ethernet cable. This connection Method provides a stable and fast interface for device configuration, data access, or

integration into a SCADA network. Each Ethernet port (ETH1 or ETH2) is independently addressable and must be configured separately.

To connect via Ethernet:

1. Connect a computing device to the ETH1 port with a standard CAT 5 or CAT 6 Ethernet cable.
2. Open a web browser on the connected computing device and navigate to the default IP address: https://192.168.1.110/
   ***Note**: The default configuration uses subnet mask 255.255.255.0. The connected device will require a compatible static network configuration. Ensure the https:// prefix is included in the URL.*

If the device is unable to reach the LOGR|Met default IP address, check that the device is on a compatible IP and subnet mask below. Change network adapter settings as needed; this will likely require administrator credentials for the PC device.

b. Connecting via Wi-Fi for details):
   i. Press and hold the **Wake Button** (☼) until the logger beeps and the blue LED blinks.
   ii. On a Wi-Fi-enabled device (e.g., PC, tablet, etc.), connect to the LOGR|Met access point (e.g., NRG-LOGR-945800003) using the default Wi-Fi password printed on the label located on top of the LOGR|Met unit.
   iii. Open a web browser on the connected Wi-Fi enabled device, and navigate to the default IP address: https://192.168.0.1/
   ***Note**: Ensure the https:// prefix is included in the URL.*

5. Upon accessing the LOGR|Met web interface, a certificate security warning may be encountered. Proceed by selecting the option to continue to the site or accept the risk, depending on the browser being used.
6. When prompted, enter the default username and password printed on the label located on top of the LOGR|Met unit.
7. Once connected, it is highly recommended to change the default password. To do so, navigate to the **Logger** menu at the top of the screen and select **Change Password** from the dropdown options (see Browser Warnings for Self-Signed Certificates

When accessing the web interface of LOGR|Met over HTTPS, the browser may display a security warning. This is expected behavior for systems utilizing a self-signed certificate which is not issued by a publicly trusted Certificate Authority (CA). In the case of LOGR|Met, certificates are generated and signed by the device itself. This ensures encrypted communication between the browser and the device. However, because the certificate is not from a trusted CA, browsers cannot automatically verify its authenticity.

Self-signed certificates are commonly used in embedded systems, development environments, and private networks where secure communication is needed without the cost or complexity of third-party certificates.

This device is commonly accessed over a private or isolated network. In such environments, access to public Certificate Authorities may not be available or practical, and using a self-signed certificate is a secure and appropriate solution.

Despite these warnings, it is safe to proceed when connecting to your device, as you are communicating directly with trusted hardware on your network. The Method of proceeding is browser dependent:

Google Chrome:

1. Warning: “Your connection is not private”
2. Click “Advanced”
3. Click “Proceed to [your device’s IP] (unsafe)”

Mozilla Firefox:

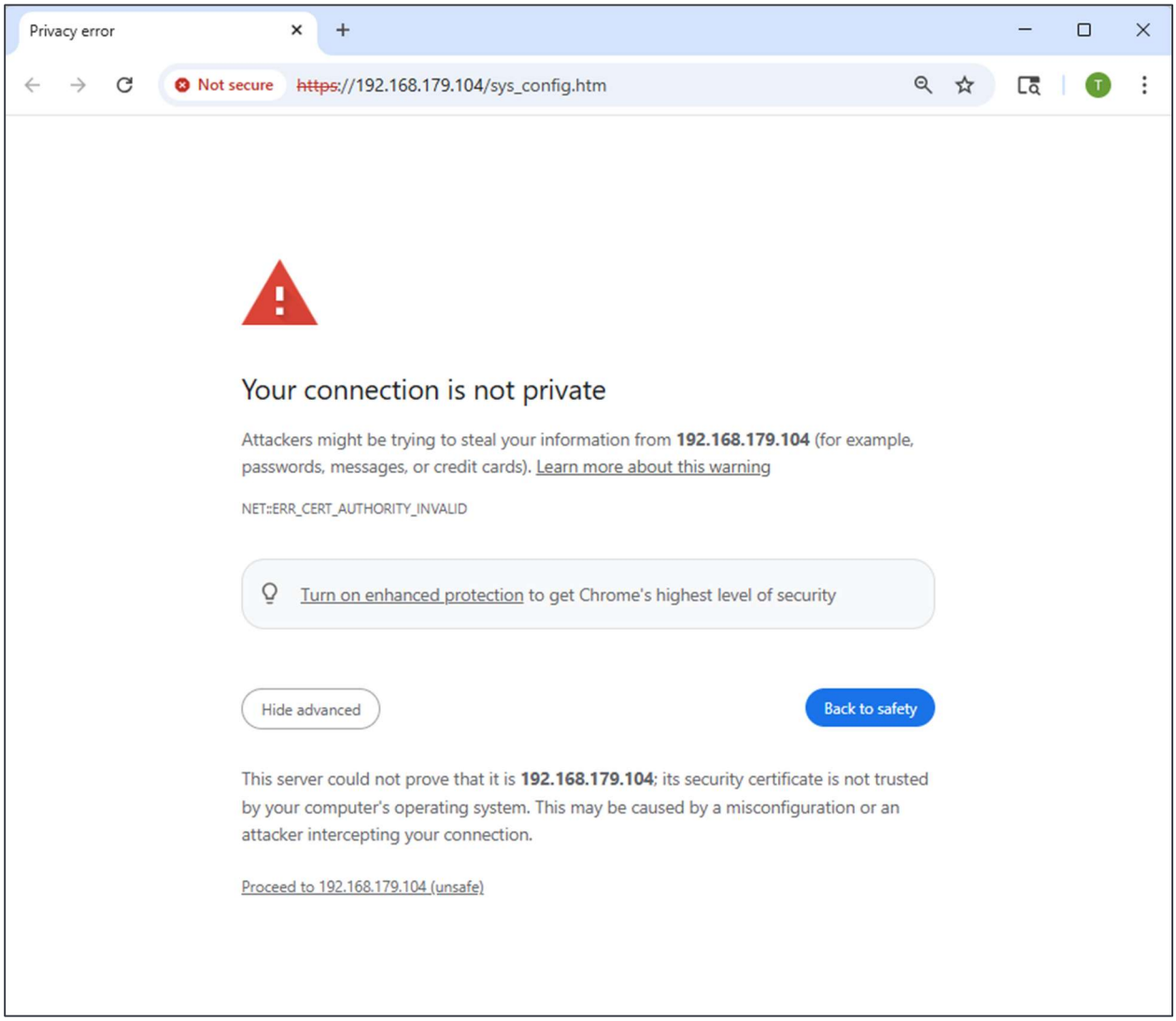
1. Warning: “Warning: Potential Security Risk Ahead.”
2. Click “Advanced…”
3. Click “Accept the Risk and Continue”

Microsoft Edge:

1. Warning: “Your connection isn’t private.”
2. Click “Advanced”
3. Click “Continue to [your device’s IP] (unsafe)”

Safari (macOS):

1. Warning: “The Connection Is Not Private”
2. Click “Show Details”
3. Click “visit this website” [Enter your Mac password if prompted]



8. Changing Web GUI Password for details).

Update the LOGR|Met to the latest firmware revision by navigating to the Logger menu at the top of the screen and selecting Firmware from the dropdown options (see

Browser Warnings for Self-Signed Certificates

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Despite these warnings, it is safe to proceed when connecting to your device, as you are communicating directly with trusted hardware on your network. The Method of proceeding is browser dependent:

Google Chrome:

4. Warning: “Your connection is not private”
5. Click “Advanced”
6. Click “Proceed to [your device’s IP] (unsafe)”

Mozilla Firefox:

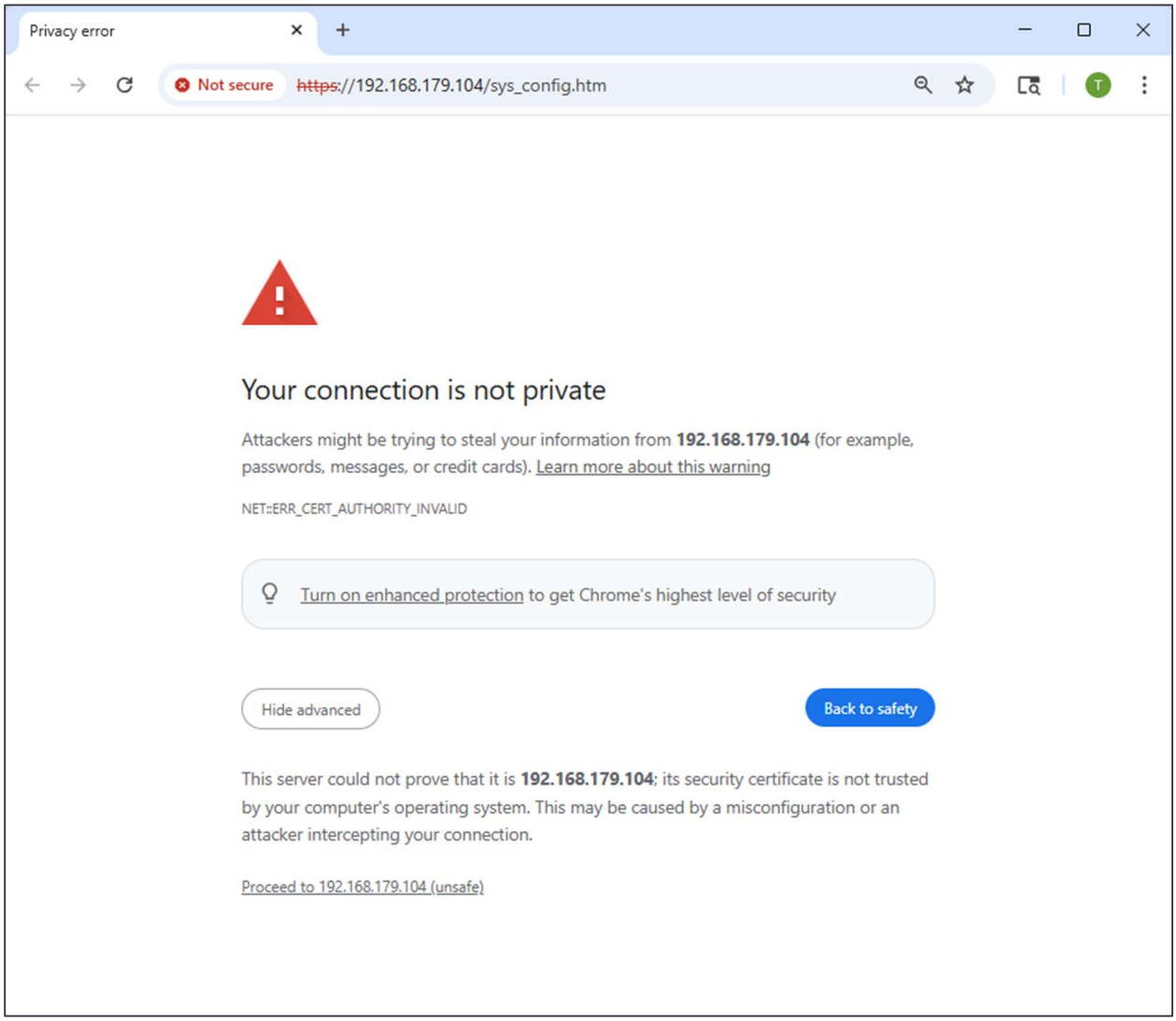
4. Warning: “Warning: Potential Security Risk Ahead.”
5. Click “Advanced…”
6. Click “Accept the Risk and Continue”

Microsoft Edge:

4. Warning: “Your connection isn’t private.”
5. Click “Advanced”
6. Click “Continue to [your device’s IP] (unsafe)”

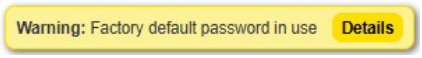
Safari (macOS):

4. Warning: “The Connection Is Not Private”
5. Click “Show Details”
6. Click “visit this website” [Enter your Mac password if prompted]



Changing Web GUI Password

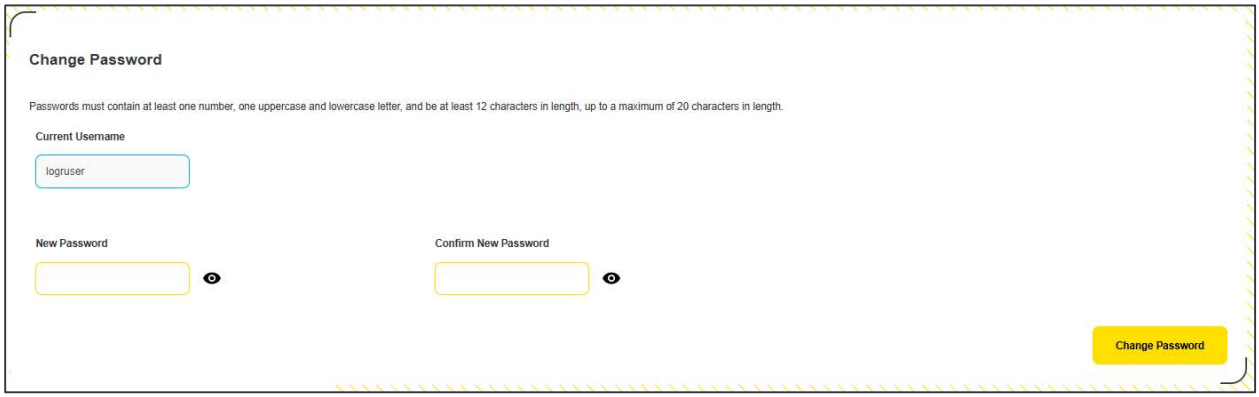
For increased security, it is strongly recommended to change the factory default password immediately after initial setup. As a reminder, a persistent warning is displayed at the top of the browser interface when a factory default password is detected.



Selecting **Details** provides further information on the importance of updating the password and provides a link to the **Change Password** page.

To change the factory default password:

1. Navigate to the **Logger** menu at the top of the page and select **Change Password** from the dropdown options.



2. Enter a password in the **New Password** field that meets the following requirements:
    - Contains at least one number
    - Contains at least one uppercase letter
    - Contains at least one lowercase letter
    - Is at least 12 characters in length
    - Is no longer than 20 characters in length

    Note: If the password does not meet the requirements the following prompt will appear: "New password must comply with the password policy described above."
3. Confirm the new password in the **Confirm New Password** field.
    Note: If the passwords do not match the following prompt will appear: "Passwords must match."
4. To confirm the new password, click the yellow **Change Password** button in the bottom right corner.
5. Once the password is changed, the logger will prompt for login with the new credentials.

If the password is lost, please contact NRG Systems Technical Services at support@nrgsystems.com for assistance.

9. Firmware Updates for details).

Configuration

Time & Location Configuration

1. Navigate to the **Logger** menu at the top of the screen and select **System Configuration** from the dropdown options to configure the following settings:
    a. **Site Properties**: Enter the desired values for site name, project name, location, latitude, longitude, and elevation (see Site Properties for details).
    b. **Logging Options**: Check the **Record 1-second Data** checkbox, if high-frequency logging is required (see Logging Options for details).
    ***Note**: This option is typically used for Solar Resource Monitoring (SRM) applications.*
    c. **Statistical Interval**: Select the desired interval from the dropdown menu: 1, 5, or 10 minutes (see Statistical Interval Selection for details).

d. **Time Zone**: Select the appropriate time zone based on the location's offset from UTC (see Date and Time for details).
e. **Power Configuration**: Select the intended power setup for the installation (see Power Configuration for details).

2. Navigate to the **Logger** menu at the top of the screen and select **Time Synchronization** from the dropdown options to configure the NTP time server.

Select **Enabled** under Mode and enter the **IP Address** or **URL** of a preferred local NTP server (see

Time Synchronization

3. NTP for details).
4. Verify **SNTP Time Adjusted** is displayed under *NTP Server Status*.

Communications Configuration

Depending on the LOGR|Met model, available infrastructure, and intended use case, one or more communication Methods must be configured to enable data transfer, remote access, and/or system monitoring.

***Note**: For detailed setup instructions, refer to the corresponding sections of this manual.*

1. Navigate to the **Logger** menu at the top of the screen and select **Local Network Settings** from the dropdown options to configure the following settings:
   a. **Ethernet** (ETH1 and ETH2)
      i. **Enable** desired Ethernet interface(s).
      ii. Select **DHCP** or specify the desired static **IP address.**
      iii. If using an external modem, check the **Connected to External Modem** checkbox and select the desired OP port to power the modem.
   b. **System Gateway** (for all outbound connections and remote access)
      i. Specify the desired **Gateway address,** primary, and secondary **DNS Addresses**. ***Note**: Gateway address must be on the same subnet as at least one of the Ethernet interfaces.*
   c. Modbus RTU
      i. Configure the **Client Address**, **Baud Rate**, **Data Bits**, **Parity**, and **Stop Bits.** ***Note:** These settings must be compatible with the connected RTU client.*
2. Navigate to the **Logger** menu at the top of the screen and select **Communications** from the dropdown options to configure the following settings:
   ***Note**: Gateway address must be configured to establish the outbound connections below.*
   a. **NRG Cloud** sync
      i. Select **Enable**.
      ii. Select the desired **Sync Frequency** and **Start Time** at which the logger will sync data.
   b. **Diagnostic Check-in** (automatically enabled if cloud sync is enabled)
      i. Select **Enable**.

***Note**: Check-in is automatically enabled if cloud sync is enabled.*

c. **Logger Listening** (for external modem access)
   i. Select **Enable** to allow remote access though the configured gateway.
   ii. Select the desired **Frequency**, **Start Time**, and duration to **Listen For** inbound connections from the dropdown options.
   iii. Select the Ethernet port to **Listen With** from the dropdown options.
   ***Note**: This will be the port configured for use with, and connected to, the modem.*
d. **SFTP** (Secure File Transfer Protocol)
   i. Enter the **Server**, **Port**, **Username**, **Password**, and remote **Data Path**.
e. **SMTP** (Simple Mail Transfer Protocol)
   i. Enter the **Server**, **Port**, **Username**, and **Password**.
   ii. Select the desired **TLS** (transport layer security).
   iii. Enter the desired **Sender's Email** and **Name**, **Recipient's Email** and **Name**, **CC Email** addresses, and **Subject Line** for the scheduled emails.
f. **File Transfer Schedule**
   i. Select **Enable** to schedule automated data transfers.
   ii. Select the desired **Transfer Method** configured above.
   iii. Select the **Frequency**, **Start Time**, and Ethernet port used to **Transfer With**.
   iv. Select the desired **File Types** to be transferred.

Channel Configuration

Navigate to the **Sensors** menu at the top of the page and select the corresponding channel or control from the dropdown options to configure the following settings:

1. **Analog Channels**
   a. Click **Configure** next to the desired analog port.
   b. Select the desired **Sensor Type** from the dropdown options.
   c. Edit **Channel Description**, **Serial Number**, **Height**, **Elevation Angle**, and **Azimuth Angle** as needed.
   d. Verify the appropriate **Slope**, **Offset**, and **Units** were populated for the selected sensor. Modify as needed.
   e. If the sensor type selected is a wind vane, select the desired **Gust Source Channel** to pair with an anemometer. To select, the sensor must first be configured on a counter channel (see below).
   ***Note**: Wind gust is the highest 3-sec average wind run per averaging interval and is used for structural loading calculations. Pairing a direction channel to a wind speed channel allows the user to determine the direction from which a gust originates.*
   f. Click **Done** and repeat until all desired analog channels are configured.
   g. Click **Save Changes** to confirm.
2. **Counter Channels**
   a. Click **Configure** next to the desired counter channel.

b. Select the desired **Sensor Type** from the dropdown options.
c. Enter **Channel Description**, **Serial Number**, **Height**, and **Elevation Angle**, **Azimuth Angle** as needed.
d. Verify the appropriate **Slope**, **Offset**, **Units**, **Signal Type**, and **Pull Up** were populated for the selected sensor. Modify as needed.
e. Click **Done** and repeat until all desired counter channels are configured.
f. Click **Save Changes** to confirm.

3. **Serial Ports**
   a. Set **Baud Rate**, **Stop Bits**, **Data Bits**, and **Parity** per COM port.
   ***Note**: Default values are 19200 baud, 1 stop bit, 8 data bits, even parity.*
   b. Click **Save** to confirm.
4. **Serial Sensors**
   a. Select the desired **Port** and **Sensor Type** from the dropdown options.
   b. Enter **Sensor Description**, **Client Address** (Modbus ID), and **Serial Number** as needed.
   c. For internally heated pyranometers, select a **Control Scheme** if desired. To select, the control scheme must first be configured (see below).
   d. Repeat until all desired sensors are configured, then click **Save Changes** to confirm.
5. **Serial Channels**
   a. Select the desired **Sensor** from the dropdown options of configured sensors.
   b. Select the desired **Measurand** from the dropdown options available for the selected sensor.
   c. Verify the appropriate **Slope** and **Offset** were populated for the selected measurand.
   d. If the sensor type selected is a wind vane, select the desired **Gust Source Channel** to pair with an anemometer. To select, the desired serial channel must first be configured and saved for it to be populated in the dropdown options.
   e. Repeat for all configured sensors and all desired measurands from each.
   ***Note**: It is best practice to add all desired measurands from each sensor sequentially.*
   f. Click **Save Changes** to confirm.
6. **Serial Sensor Control**
   a. Click **Edit Scheme** next to the desired control scheme.
   b. Check the **Enabled** checkbox at the top of the window.
   c. Enter the desired **Scheme Name**.
   d. Check the **Enabled** checkbox(es) next to the desired control conditions(s), threshold and/or time-based.
   e. For the threshold condition, select the desired **Input Channel**, **Mathematical Operator**, and enter the desired **Threshold** value.
   f. For the time-based condition, select the desired **Start Time** and **End Time** by clicking the clock icon and selecting times from the dropdown options, or typing the desired values.
   g. If desired, uncheck the Fan Always On checkbox.

***Note**: It is recommended by Hukseflux to leave their sensor fans running constantly to reduce error. This option is provided mainly for power conservation in resource assessment campaigns.*

h. Click **Done** and repeat until all desired control schemes are configured.
i. Click **Save Changes** to confirm.

7. **Calculated Channels**
   a. Click **Configure** next to the desired calculated channel.
   b. Select the desired **Calculation Type** from the dropdown options.
   c. If required, select the desired **Channel Input(s)** from the dropdown options of configured sensor(s).
   ***Note**: The logger does not prevent the selection of nonsensical inputs. The user must understand which input selections are appropriate for the desired calculation.*
   j. Click **Done** and repeat until all desired channels are configured.
   k. Click **Save Changes** to confirm.
8. **Output Controls**
   a. Check the **Enabled** checkbox under the desired output channel.
   ***Note**: To prevent potential control conflicts, OP channels configured for use with external modem control cannot be enabled and configured for use from these menus.*
   b. Enter the desired **Name** for the output channel.
   c. Check the **Enable** checkbox(es) next to the desired control condition(s), threshold and/or time-based.
   d. For the threshold condition, select the desired **Input Channel**, **Mathematical Operator**, and enter the desired **Threshold** value.
   e. For the time-based condition, select the desired **Start Time** and **End Time** by clicking the clock icon and selecting times from the dropdown options.
   f. Repeat for remaining output channels, as desired.
   g. Click **Save** to confirm.
9. **Soiling**
   ***Note**: Soiling ratio computations require additional hardware (NRG Pulsed Soiling Module).*
   a. Check the **Enabled** checkbox under **Compute Soiling Ratio**.
   b. Enter the **Standard Test Conditions (STC)** provided on the PV module datasheet.
   c. Enter the desired **Calculation Filter** settings. These settings dictate the data points the logger will include in soiling calculations.
   ***Note**: Default filter values (500 W/m², ±2 hours around solar noon) are recommended for consistency with IEC guidance but can be adjusted to suit specific site or project requirements.*
   d. Under the **Calculation Parameters** section, enter the values provided on the PV module datasheet for **Isc at STC** (A), **Voc at STC** (V), **Isc Temperature Coefficient** (%/°C), and **Voc Temperature Coefficient** (%/°C)
   ***Note**: Default values align with the PV modules provided in the NRG 30W soiling kits (19047 and #19048). If using other modules, these values will likely need to be changed.*
   e. Edit channel **Descriptions** as necessary

f. Use the dropdown menus to select the appropriate pre-configured input channels for PSM Isc, PSM Voc (optional), and PV temperature inputs for clean and soiled panels.
g. Click **Save** to confirm.

SECTION 2 | SYSTEM OVERVIEW

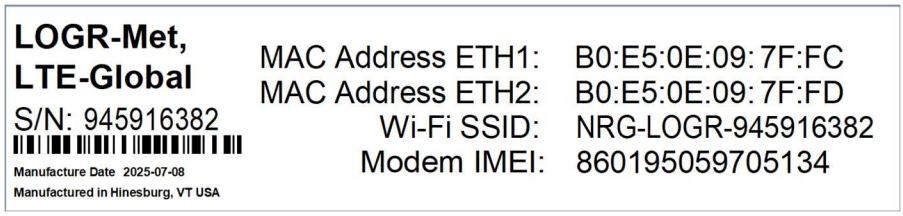
This section outlines the key components, interfaces, and labeling conventions of the LOGR|Met system. It is intended to help users become familiar with the system's hardware layout and capabilities prior to installation and configuration.

Unpacking LOGR|Met

Upon receiving a LOGR|Met system, carefully unpack all components and verify that the shipment is complete. Use the packing list included to confirm that all items are present and undamaged. If any components are missing, incorrect, or appear damaged, contact NRG Systems immediately for assistance before proceeding with installation.

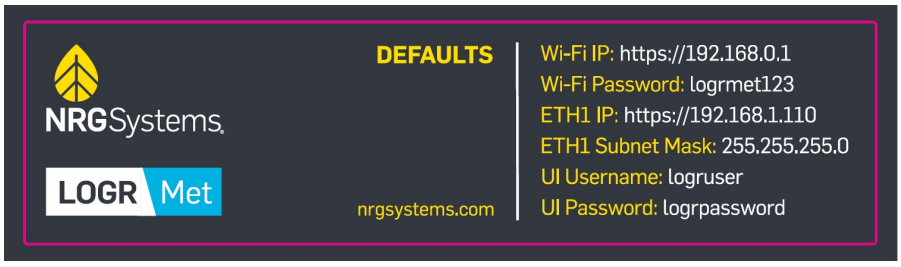
Labeling Overview

Each LOGR|Met system includes two labels affixed to the top of the enclosure and one to the side. On top of each system is an **Identification Label** containing the model and serial number of the unit, MAC addresses associated with each of the ethernet ports, Wi-Fi SSID, and the Modem IMEI (for versions containing a modem).



Also, on top of each system is a **Connections Label** containing the default Wi-Fi IP and password, ETH1 IP and subnet mask, and user interface username and password.

***Note**: The ETH2 default IP is https://192.168.1.111 and subnet mask is 255.255.255.0.*



On the side of each system is a **Max Ratings Label** containing regulatory compliance symbols and ratings previously listed in the Maximum Ratings section of this manual.

Interface Overview

Analog Channel Ports	Eight (8) analog ports can support: • Up to sixteen (16) single-ended sensors, or • Up to eight (8) differential sensors Each port provides a configurable excitation voltage, selectable between 5 V or 12 V, and can be set to pulsed or constant mode depending on sensor requirements.
Serial Channel Ports	Four (4) serial ports labeled A, B, C, and D. Each port supports individually configurable communication settings and provides 12 V excitation. • Supports up to twenty-four (24) Modbus RTU (RS-485) sensors • Offers a total of forty-eight (48) serial channels (12 per port) for measurand configuration

Counter Channel Ports	Ten (10) counter ports can process signals from sensors that produce pulse-based outputs, such as flow meters, rain gauges, anemometers, and other devices. Each port provides 12 V excitation in addition to signal inputs.
RS-232 Port	A port is included to support future use with RS-232 sensors. This feature is not yet enabled in the current firmware but is planned for future updates.
SDI-12 Port	A port is included to support future use with SDI-12 sensors. This feature is not yet enabled in the current firmware but is planned for future updates.
Switched Output Ports	Three (3) switched output ports, OP1, OP2, and OP3, are used to control external accessories such as pyranometer heaters, relays, or an external modem. • OP1 and OP2: 12 V output • OP3: 5 V output • Each port can supply up to 2.1 amps at its rated voltage

LED Status Indicator Lights	Three LED indicators provide real-time system feedback:
	• Green (Power): Steady light indicates normal operation
	• Red (Fault): Blinking indicates an error or firmware update in progress
	• Blue (Wi-Fi):
	  • Blinking = Access Point active, no client connected
	  • Solid = Client connected

Power Input (DC, PV, and/or Battery)	LOGR|Met requires a 12 to 28 VDC power supply. This can be provided by batteries, solar (PV), or DC input source.
Modbus RTU Port	This port allows the logger to connect directly to a computer or to another logger for data sharing or networked operation.
Ethernet Ports	Two ethernet ports feature a green LED that flashes to indicate active data transfer. The ports are not bridged and are individually configurable.
Modem Port	For future …
Ground Stud	A #10 grounding stud is provided and should be connected to earth ground using the provided grounding cable or an equivalent.

Reset Button	A recessed reset button is provided to restore the Ethernet network configuration (IP addresses, subnet mask, gateway, and DNS settings) to factory defaults. Insert a paperclip, or similar tool, to press and hold the button. A confirmation beep from the logger indicates that the reset has been successfully initiated.
SD Card Slot	A microSD card slot is used for local data storage. It is recommended to use the NRG-supplied 8GB SD card to ensure compatibility and performance.
SIM Card Slot	A SIM card slot is provided to enable LTE connectivity in cellular-enabled models. (Available on models 9459 and 9460.)
Wi-Fi Antenna Port	An SMA port is used to connect a Wi-Fi antenna to enable wireless access to the logger's built-in access point.
GPS Antenna Port	An SMA port is used to connect a GPS antenna for time synchronization and location services. (Available on future versions of models 9459 and 9460.)
Cellular Antenna Port	An SMA port is used to connect the primary antenna for LTE communication in cellular-enabled models. (Available on future versions of models 9459 and 9460.)
Diversity Antenna Port	An SMA port is used to connect a secondary (diversity) antenna to improve LTE signal quality and reliability. (Available on future versions of models 9459 and 9460.)

Power Source

LOGR|Met requires a DC power supply of **10 to 28 VDC** and typically consumes 125mA of current at 16 V (2W) when unloaded. Nominal supply voltage is 16 V. Power input can be provided by batteries (10 to 15 VDC), solar (PV), DC input source, or any combination of these.

SECTION 3 | PRE-INSTALLATION PREPARATION

While LOGR|Met is easy to set up, it is prudent to become familiar with the system before going to the installation site. The following sections provide an overview of the software used to prepare a LOGR|Met system for field installation. Relevant operational details are provided to help optimize the system and its communications for a specific site and project.

Once LOGR|Met is powered, it performs a starting sequence and will emit a beep when ready for configuration.

Connecting via Ethernet

LOGR|Met can be connected directly to a local computer or network switch using an Ethernet cable. This connection Method provides a stable and fast interface for device configuration, data access, or integration into a SCADA network. Each Ethernet port (ETH1 or ETH2) is independently addressable and must be configured separately.

To connect via Ethernet:

3. Connect a computing device to the ETH1 port with a standard CAT 5 or CAT 6 Ethernet cable.
4. Open a web browser on the connected computing device and navigate to the default IP address: https://192.168.1.110/
   ***Note**: The default configuration uses subnet mask 255.255.255.0. The connected device will require a compatible static network configuration. Ensure the https:// prefix is included in the URL.*

If the device is unable to reach the LOGR|Met default IP address, check that the device is on a compatible IP and subnet mask below. Change network adapter settings as needed; this will likely require administrator credentials for the PC device.

Connecting via Wi-Fi

LOGR|Met includes a built-in Wi-Fi access point for wireless connection during setup or troubleshooting. This Method is useful when Ethernet access is not available or when configuring the logger in the field. Wi-Fi is intended for short-range, local use and does not provide access to external networks.

To connect via Wi-Fi:

1. Press and hold the Wake Button (☼) until the logger beeps and the blue LED blinks.
2. On a Wi-Fi-enabled device (e.g., PC, tablet, etc.), open the Wi-Fi settings and connect to the LOGR|Met Access Point. The SSID will follow the format: NRG-LOGR-<serial number> (e.g., NRG-LOGR-945800003)
3. When prompted, enter the Wi-Fi password printed on the label located on top of the LOGR|Met unit.
4. Once connected, the blue, blinking LED will turn solid, indicating a successful connection.
5. Open a web browser on the connected computing device and navigate to the default IP address: https://192.168.0.1/
   ***Note**: Ensure the https:// prefix is included in the URL.*

Password: logrMet123

Browser Warnings for Self-Signed Certificates

When accessing the web interface of LOGR|Met over HTTPS, the browser may display a security warning. This is expected behavior for systems utilizing a self-signed certificate which is not issued by a publicly trusted Certificate Authority (CA). In the case of LOGR|Met, certificates are generated and signed by the device itself. This ensures encrypted communication between the browser and the device. However, because the certificate is not from a trusted CA, browsers cannot automatically verify its authenticity.

Self-signed certificates are commonly used in embedded systems, development environments, and private networks where secure communication is needed without the cost or complexity of third-party certificates.

This device is commonly accessed over a private or isolated network. In such environments, access to public Certificate Authorities may not be available or practical, and using a self-signed certificate is a secure and appropriate solution.

Despite these warnings, it is safe to proceed when connecting to your device, as you are communicating directly with trusted hardware on your network. The Method of proceeding is browser dependent:

Google Chrome:

7. Warning: “Your connection is not private”
8. Click “Advanced”
9. Click “Proceed to [your device’s IP] (unsafe)”

Mozilla Firefox:

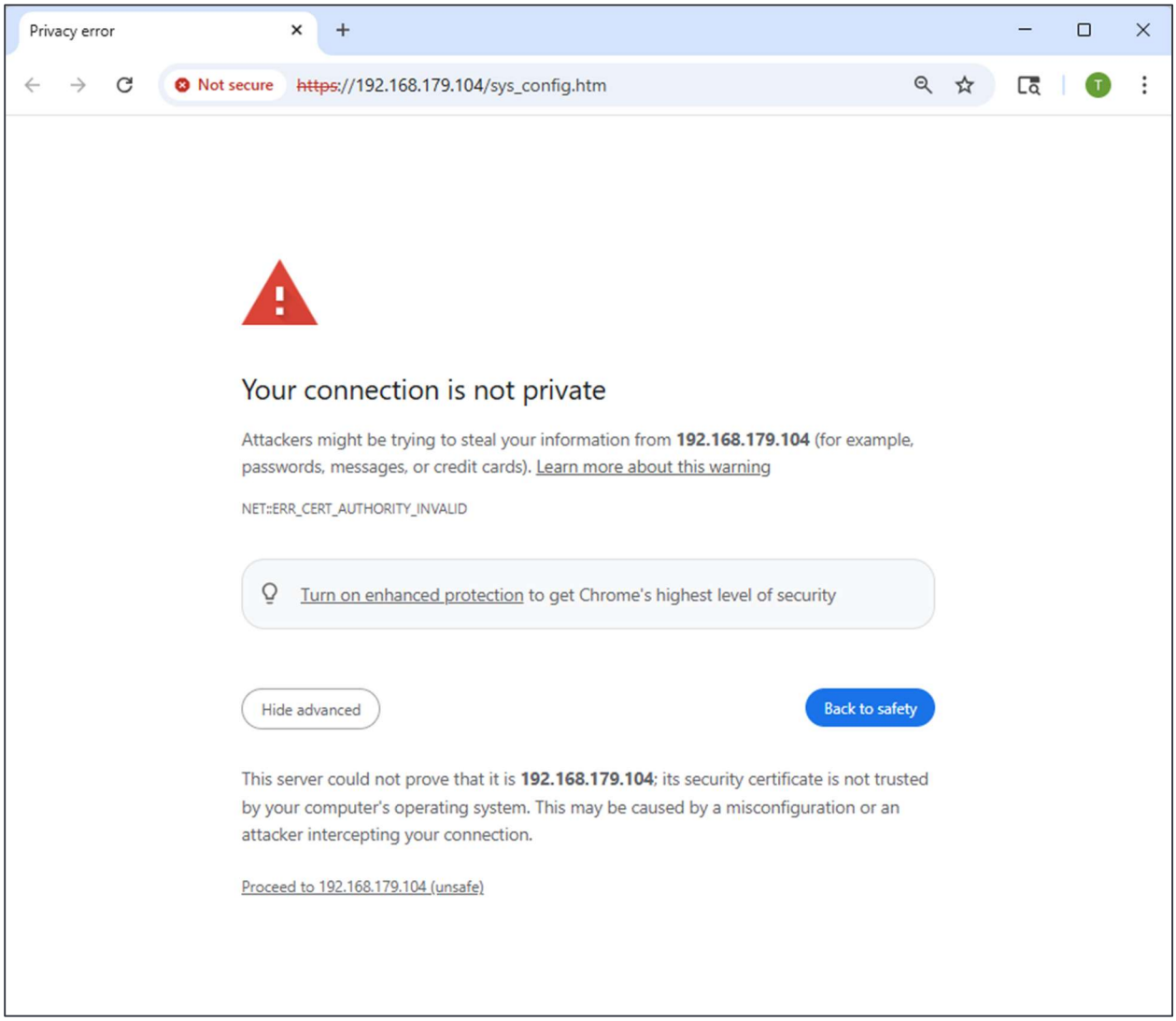
7. Warning: “Warning: Potential Security Risk Ahead.”
8. Click “Advanced…”
9. Click “Accept the Risk and Continue”

Microsoft Edge:

7. Warning: “Your connection isn’t private.”
8. Click “Advanced”
9. Click “Continue to [your device’s IP] (unsafe)”

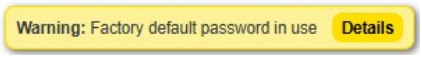
Safari (macOS):

7. Warning: “The Connection Is Not Private”
8. Click “Show Details”
9. Click “visit this website” [Enter your Mac password if prompted]



Changing Web GUI Password

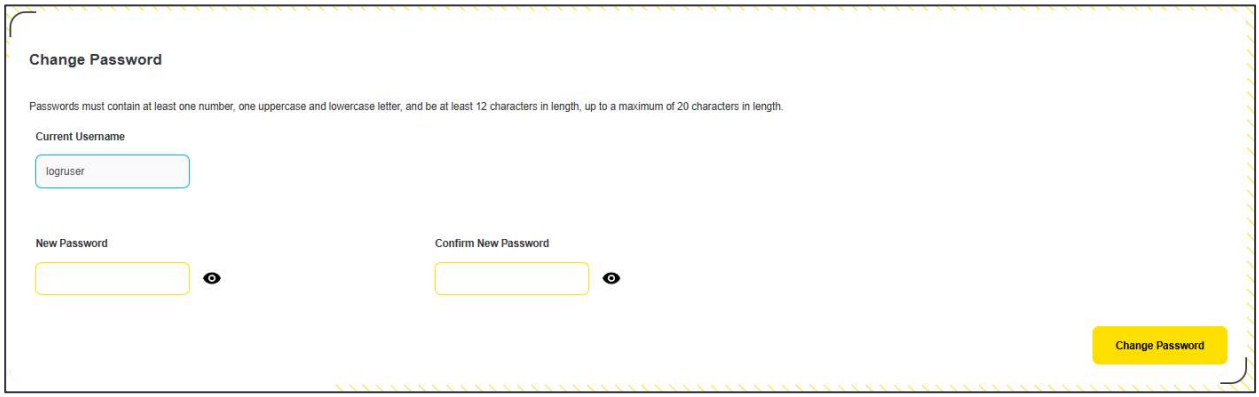
For increased security, it is strongly recommended to change the factory default password immediately after initial setup. As a reminder, a persistent warning is displayed at the top of the browser interface when a factory default password is detected.



Selecting **Details** provides further information on the importance of updating the password and provides a link to the **Change Password** page.

To change the factory default password:

6. Navigate to the **Logger** menu at the top of the page and select **Change Password** from the dropdown options.



7. Enter a password in the **New Password** field that meets the following requirements:
    - Contains at least one number
    - Contains at least one uppercase letter
    - Contains at least one lowercase letter
    - Is at least 12 characters in length
    - Is no longer than 20 characters in length

    Note: If the password does not meet the requirements the following prompt will appear: "New password must comply with the password policy described above."
8. Confirm the new password in the **Confirm New Password** field.
    Note: If the passwords do not match the following prompt will appear: "Passwords must match."
9. To confirm the new password, click the yellow **Change Password** button in the bottom right corner.
10. Once the password is changed, the logger will prompt for login with the new credentials.

If the password is lost, please contact NRG Systems Technical Services at support@nrgsystems.com for assistance.

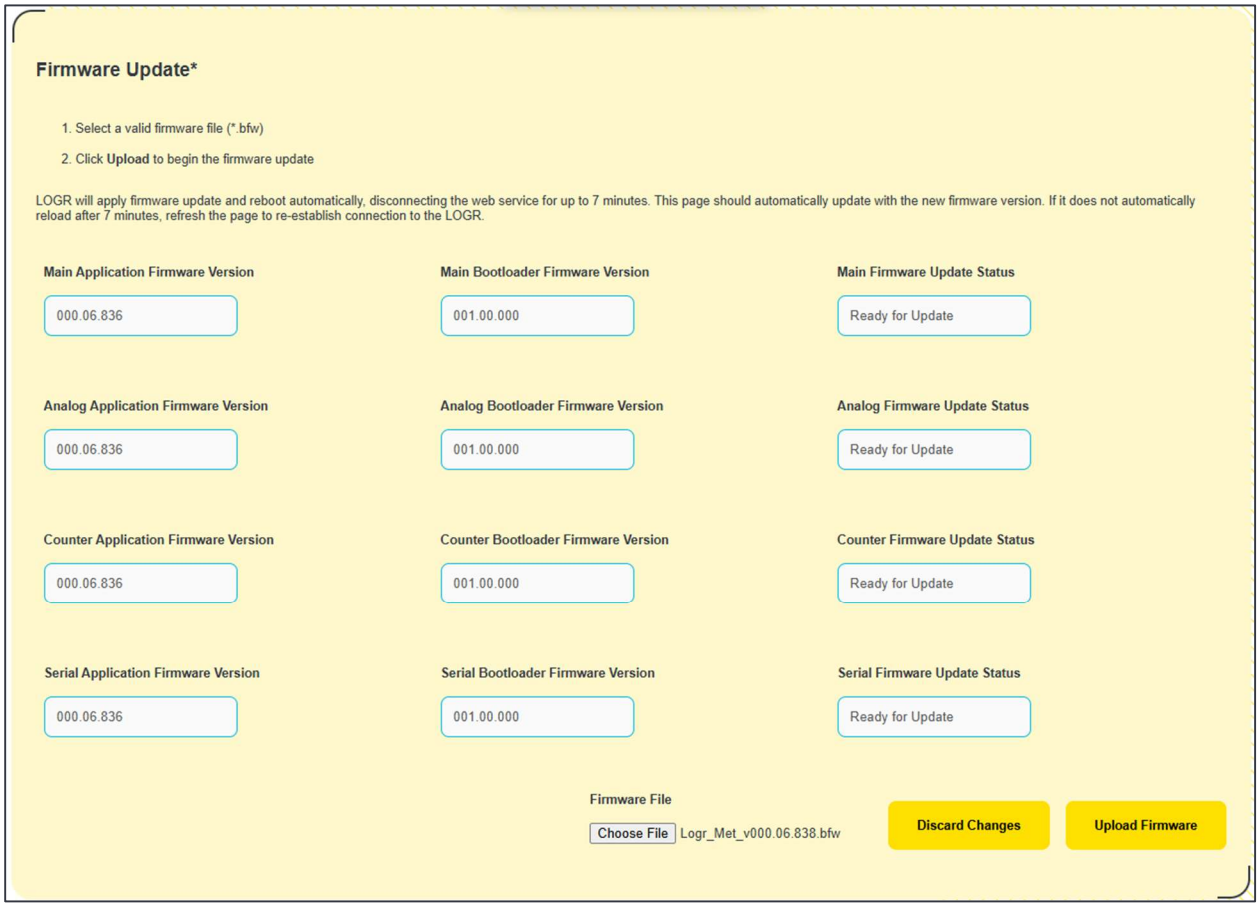
Firmware Updates

The newest version of LOGR|Met firmware is always available on the NRG Systems website at the following link: NRG Systems LOGR|Met Data Logger Firmware.

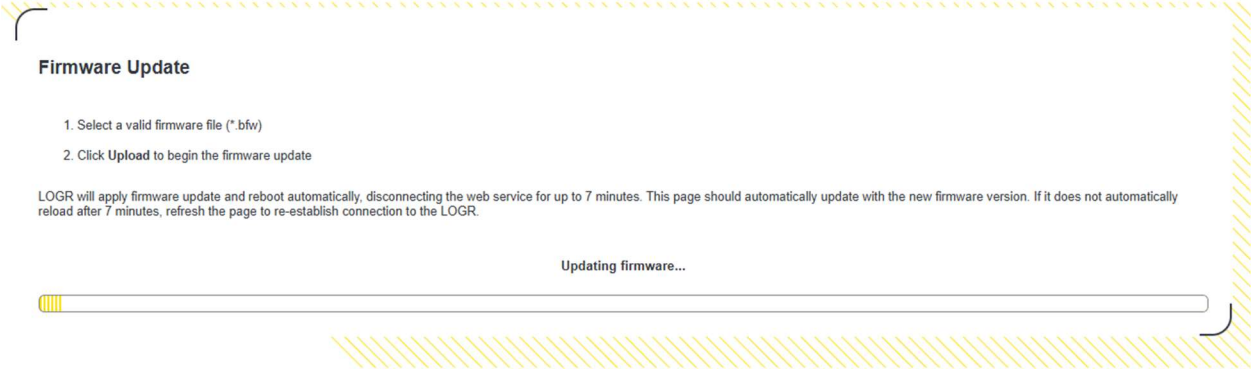
To update firmware:

Use the following instructions to update or view firmware version details.

1. Navigate to the **Logger** menu at the top of the page and select **Firmware** from the dropdown menu. This page details **Application Firmware Version**, **Bootloader Firmware Version,** and the firmware **Status** for all processors within the system.
2. If not already done so, download and save locally the most recent firmware version (website link above).
3. On the web UI, click the **Choose File** button, navigate to, and open a valid .bfw firmware file. Click the yellow **Upload Firmware** button.



4. The LOGR|Met will beep to confirm the firmware update procedure has begun, redirecting to a progress indication page. This process may take several minutes, during which data portions of the web server will be unavailable. The LOGR|Met will reboot when the action completes, and the UI will redirect to the **Sensor Outputs** home page. The updated firmware can then be confirmed by navigating back to the **Firmware** page under the **Logger** menu.

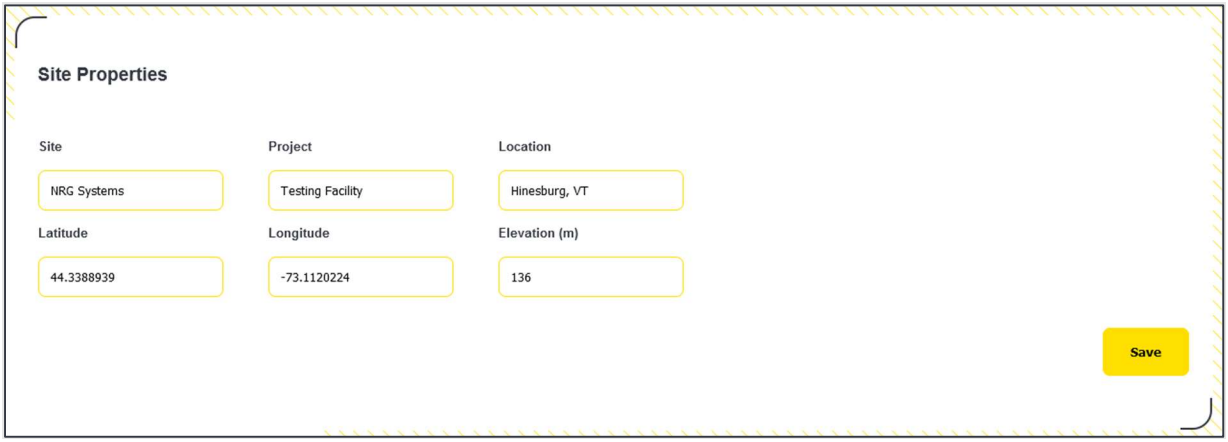


System Configuration

Navigate to the **Logger** menu at the top of the page and select **System Configuration** from the dropdown options. Each of the following sections can be configured and saved individually. Newly configured sections will be highlighted in yellow, and an "**Unsaved Changes**" warning will be displayed at the top of the page. To save configuration changes, click the yellow **Save** button in the bottom right corner of each highlighted section.

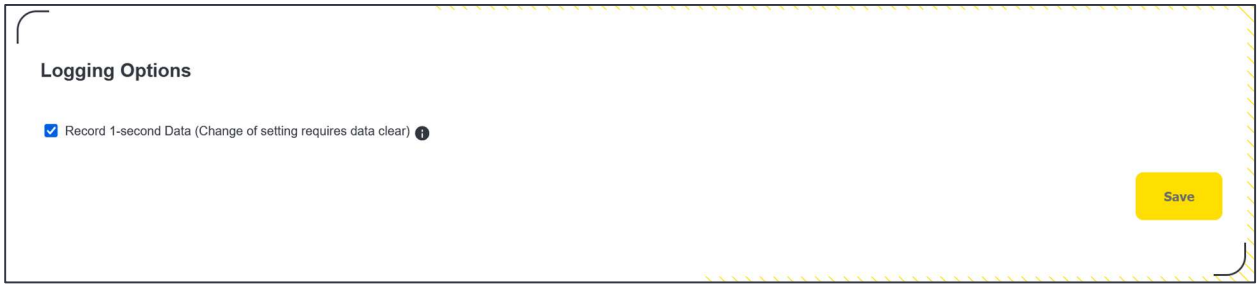
Site Properties

Site	This field contains the name for the site. A site description of up to 32 characters can be entered. This is used to provide a brief description of the site or the site number, such as "Site 1234." Frequently, the last four digits of the logger serial number are used as a site number.
Project	This field contains the project name for the site. A project description of up to 20 characters can be entered. Project is usually a broader term that can describe a group of multiple sites. This is used to provide a brief description of the overall project, such as "Windy Solar Farms."
Location	This field contains the location name for the site. A location description of up to 32 characters can be entered. This is used to provide a brief description of the site, such as "Block B Tower" and may include the site number if there are multiple in the same area.
Latitude	Enter latitude in decimal degrees (rather than in degrees, minutes, seconds). Entry should be formatted like "44.3286110." Use positive (+) numbers for northern latitudes; use negative (-) numbers for southern latitudes.
Longitude	Enter longitude in decimal degrees (rather than in degrees, minutes, seconds). Entry should be formatted like "-73.1100000." Use positive (+) numbers for eastern longitudes; use negative (-) numbers for western longitudes.
Elevation (m)	Enter the elevation of the installation location in meters.



Logging Options

By checking the **Record 1-second Data** box, the logger will store 1-second data files. These files are larger and limit storage to 90 days. If the box is left unchecked (default), the logger stores only averaged data based on the selected statistical interval, allowing for up to 365 days of data storage.



Data Storage

To retrieve real-time data via Modbus TCP, the logger should be connected to a SCADA network. The Modbus registers are pre-defined, allowing repeatable and streamlined data acquisition configuration. There is a backup of data contained on a non-removeable 8 GB internal microSD card within the LOGR.

If a connection with the logger is lost, the internal microSD card will store files (data, diagnostics, and event logs) for up to 90 days of 1-second data collection. Disabling 1-second data recording reformats the internal microSD card to allow for 365 days of 1-, 5-, 10-minute averaged data. Note that all data should be retrieved and saved before reformatting the internal memory for a different file type, either 1-second or averaged.

To change the data logging format, navigate to the **Logger** menu and select **System Configuration**. Scroll down to **Logging Options** to enable or disable 1-second data recording. Click the yellow **Save** button to continue with changes.

Statistical Interval Selection

The **Statistical Interval** determines how frequently the logger calculates and stores averaged data from connected sensors. This setting affects the resolution of the data but does not impact the total storage duration. The following options are available from the dropdown menu:

- **10 minutes** (default): Ideal for Wind Resource Assessment (WRA), where long-term trends are more important than high-frequency detail.
- **1 minute**: Recommended for both Solar Resource Assessment (SRA) and Site Resource Monitoring (SRM), where finer resolution is needed to capture rapid changes in irradiance or system performance.
- **5 minutes**: A middle-ground option for applications that require moderate resolution.

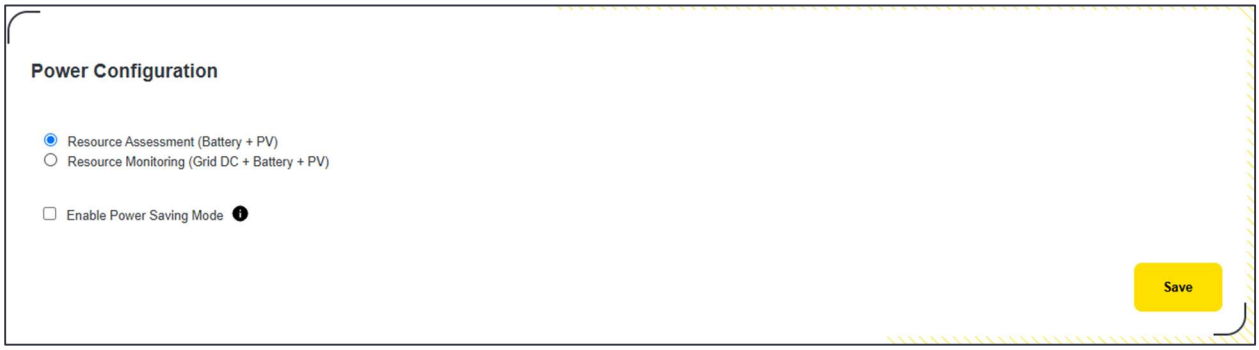
Date and Time

Device Time (Local Logger)	The logger clock's current time is displayed. Verify that this is the current time in the local time zone in standard time (not "daylight-saving" time).
Reference Time (UTC)	Reference Time is the PC clock's current time, displayed in UTC. Pressing the Set Time button will update the logger's clock to the reference time.
Time Zone	Select the LOGR's local time zone from the dropdown options. ***Note**: Use logger local standard time (not daylight-saving time). The logger clock will not adjust for daylight saving time.*

Power Configuration

The **Power Configuration** selection (Resource Assessment or Resource Monitoring) provides the LOGR|Met system with proper context regarding the monitoring of power inputs. Select the appropriate configuration according to the presence or absence of grid-tied DC input presence at the site.

Power Saving Mode is enabled to take advantage of automatically lowering power consumption when the LOGR|Met switches to a backup power source. This is achieved by monitoring the mains voltage channel and turning serial sensor heater loads (e.g., Hukseflux SR30) off to conserve power.



Local Network Settings

Ethernet Settings (ETH1 and ETH2)

Ethernet Port Configuration

LOGR|Met includes two independent Ethernet interfaces—**ETH1** and **ETH2**—that can be used for network communication, including data uploads, remote access, and integration with SCADA systems. These interfaces are not bridged and must be configured individually. Each Ethernet port can be configured using either:

- **DHCP (Dynamic Host Configuration Protocol)**: Automatically obtains IP address, subnet mask, and DNS settings from a DHCP server. The LOGR|Met must be on a network which is running a DHCP server for this type of configuration to succeed.
- **Static IP**: User-specified IP address, subnet mask settings. This is the default configuration.

Common Settings

LOGR|Met makes use of networking settings that are shared between its Ethernet ports.

- **Gateway address** – the system supports a single gateway address, which must be on the same subnet as at least one of the Ethernet interfaces. This gateway is used for all outbound communications, including connections to NRG Cloud, SFTP, and SMTP servers. Ensuring the correct gateway configuration is critical for successful external communication. DHCP and use of an internal cellular modem will override any manually specified Gateway address.

- **DNS Address (Primary) –** the Domain Name Server (DNS) the system will use first when translating a domain name (like example.com) into an IP address. Use 0.0.0.0 if no DNS is not to be utilized.
- **DNS Address (Secondary)** – a backup DNS used by the system when DNS Primary cannot be reached.

External Modem Support

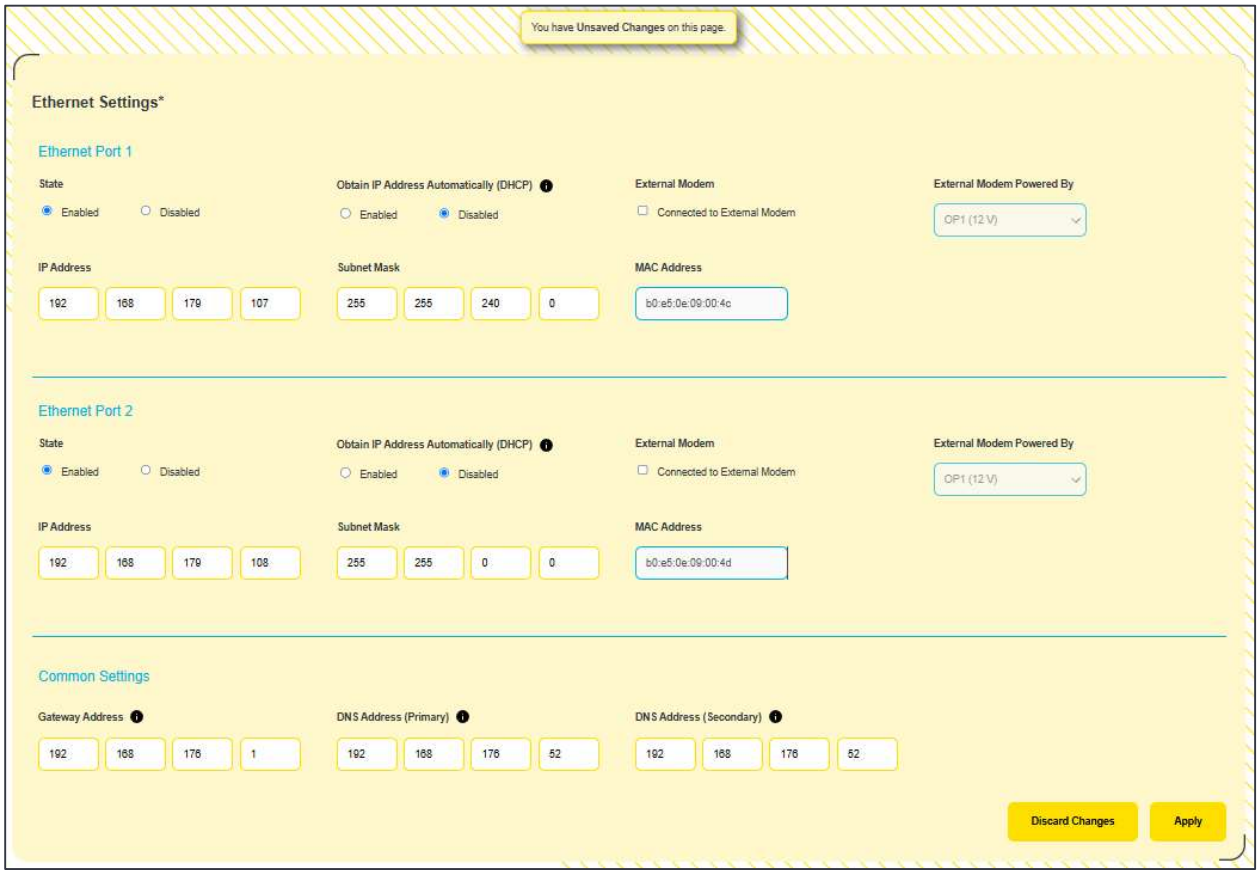
An external modem can be connected to an Ethernet interface from which the LOGR|Met system can control and monitor the power. To enable this, check the **Connected to External Modem** box for the desired Ethernet port, then select which **Switched Output Port (OP1, OP2, or OP3)** will be used to power the modem. The logger will then manage modem power and connectivity automatically during communication events. To use the external modem for remote access to the logger, see the Logger Listening section of this manual for details.

The external modem feature requires the use of the BATTERY input for power. The system will test the voltage and ensure proper battery health before continuing use of the external modem. If voltage is measured below 12V on this input port, the external modem will be powered down to conserve power and communication Methods will be attempted at their next scheduled opportunity.

To configure Ethernet and system gateway settings:

1. Navigate to the **Logger** menu at the top of the page and select **Local Network Settings** from the dropdown options.
2. Select the desired **State**, *Enabled* or *Disabled*, for the port(s) being configured.
3. Select the desired **DHCP** setting, *Enabled* or *Disabled*, for the port(s) being configured.
4. If DHCP setting is disabled, enter the desired IP Address, Subnet Mask, and DNS Address for the port(s) being configured.
5. If an external modem is connected, check the **Connected to External Modem** checkbox for the port being used. Once checked, an **External Modem Powered By** dropdown menu will appear. Choose the desired **Output Control Port** (OP1, OP2, or OP3) will be used to power the external modem.
6. Enter the desired **System Gateway Address**.
   Note: This address must be compatible with the Ethernet port being used with the modem.

The new configuration is displayed as "**Unsaved Changes**" and will be highlighted in yellow.



7. To confirm the newly configured network settings, click the yellow Apply button in the bottom right corner.
8. The logger will prompt for verification of the proposed settings. Review the configuration carefully, then click the yellow **Confirm Changes** button in the bottom right corner. The logger takes about 10 seconds to confirm the settings change and will emit a beep when complete.

   ***Note**: Confirming these changes will disconnect the browser session if the IP address of the currently connected port is modified. In this case, the browser will automatically redirect to the new IP address. If connected via Wi-Fi or an Ethernet port whose IP address has not changed, the current browser connection will remain active. If an error occurs, or the browser does not redirect, open a new tab in the web browser and enter the new IP address in the address bar.*

*If a link is still not made, the logger can be reset to the default IP address by pushing and holding the recessed **RESET** button on the logger face until a beep is heard.*

Once networking configuration has been set up, the logger can be integrated into a network environment to perform additional advanced functions, including:

- Real-time data communication via **Modbus TCP** to a SCADA network (Port 502).
- Scheduled or on-demand data file transfers to an **SFTP server**.
- Scheduled or on-demand data file transfers to an **SMTP server**.
- Data synchronization with **NRG Cloud**.
- Accurate time synchronization via communication with an **SNTP time server**.

Real-time data is also viewable directly from the webserver's **Sensor Outputs** homepage.

For any single LOGR|Met unit, only ONE user is recommended to be logged into the webserver at any given time. If two browsers are open and connected to the same IP address, there is a first-come first-served behavior, which may lead to confusing behavior regarding the configuration of the logger.

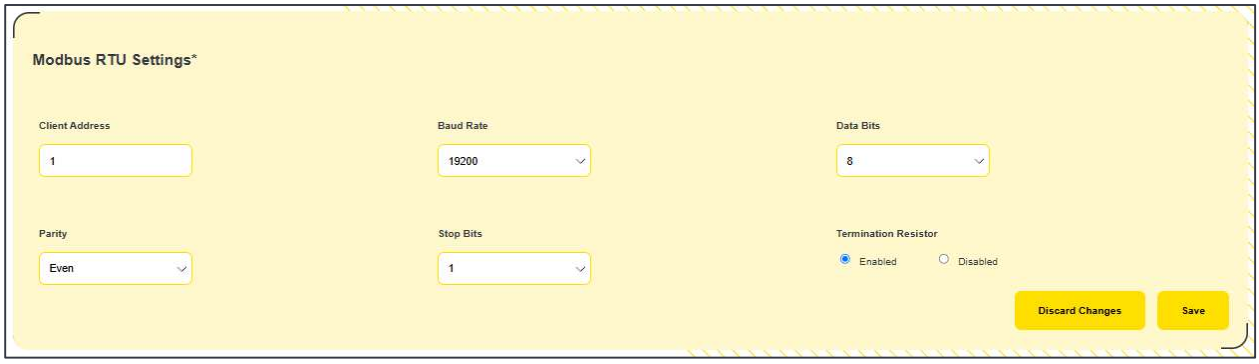
Modbus RTU

LOGR|Met includes a **Modbus RTU** interface, which allows the logger to respond to requests from a Modbus client, such as a SCADA system. This interface mirrors the Modbus TCP server functionality available on the Ethernet ports, enabling real-time data access over serial communication (RS-485). The SCADA system can query the logger's Modbus registers as defined in the SCADA map.

To configure Modbus RTU port:

1. Navigate to the **Logger** menu at the top of the page and select **Local Network Settings** from the dropdown options.
2. Scroll down to the **Modbus RTU Settings** section.
3. Edit the **Client Address**, **Baud Rate**, **Data Bits**, **Parity**, and **Stop Bits** as necessary.
4. Choose if the **Termination Resistor** is *Enabled* or *Disabled.*

The new configuration is displayed as "**Unsaved Changes**" and will be highlighted in yellow.



5. To confirm the newly configured settings, click the yellow **Save** button in the bottom right corner.

***Note**: When these values are saved the logger will reboot.*

Time Synchronization

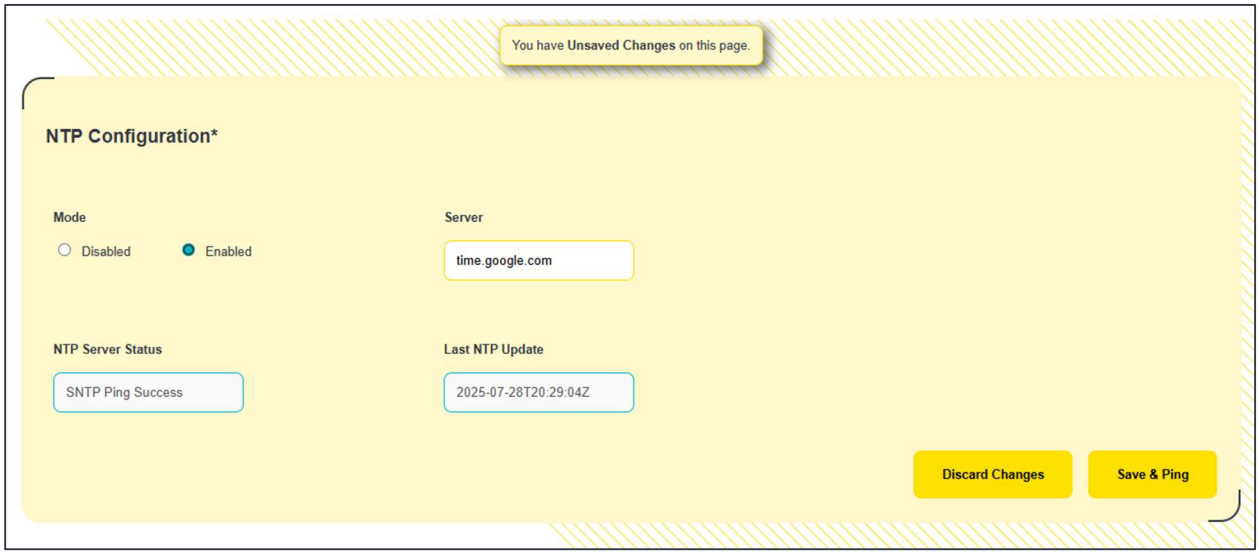
NTP Configuration

For improved time accuracy, an NTP server can be configured for daily time updates. The server status and most recent check-in date and time are presented on this page. LOGR|Met has an embedded coin cell battery installed to maintain operation of the real-time clock through power disruptions.

To configure NTP server:

1. Navigate to the **Logger** menu at the top of the page and select **Time Synchronization** from the dropdown options.
2. Select **Enabled** under Mode in the configuration window.
   ***Note**: The logger defaults to **Disabled** (no NTP checks).*
3. Enter the IP Address or URL of a preferred local NTP server (e.g., time.google.com).

The new configuration is displayed as "**Unsaved Changes**" and will be highlighted in yellow.



4. To confirm the NPT configuration, click the yellow **Save & Ping** button in the bottom right corner. This will also check the server and automatically update the *Last NTP Update* date/time.
5. Verify the *NTP Server Status* displays **SNTP Time Adjusted** and *Last NTP Update* time is updated. This may take a few minutes. While attempting to contact the server, the status may display or *Waiting to Reconnect*, *Attempting Reconnect*, or *Pinging SNTP Server*.

6. If the *NTP Server Status* displays *SNTP init failed* or *SNTP Ping Error*, check the server URL, network settings, or IP to verify the address is correct and the time server is reachable.

Channel Configuration and Data Collection

Channel Numbers

Below is a summary of available measurement channels on LOGR|Met (item 9458, 9459, 9460):

Channel Type	Channel Count (Capacity)	Channel Number Range
Analog Sensors*	16	1 to 16
Serial Sensors (Modbus RTU)	48	101 to 148
Soiling	5	201 to 205

	20	301 to 320

Output Control

The LOGR|Met provides three configurable switched output ports (OP1, OP2, and OP3) to control external devices such as pyranometer heaters, relays, or modems. These outputs can be enabled and configured individually to respond to sensor measurements or scheduled timing conditions.

Users can choose from two types of control logic:

- **Threshold-Based Control**: The heater is activated when a selected sensor's value crosses a user-defined threshold.
- **Time-Based Control**: The heater operates within a user-defined time window.

Both control types can be enabled simultaneously. In this case, the output will activate if **either** condition is met.

- **OP1** and **OP2:** Provide 12 V output, each capable of supplying up to 2.1 A.
- **OP3:** Provides 5 V output, capable of supplying up to 2.1 A.

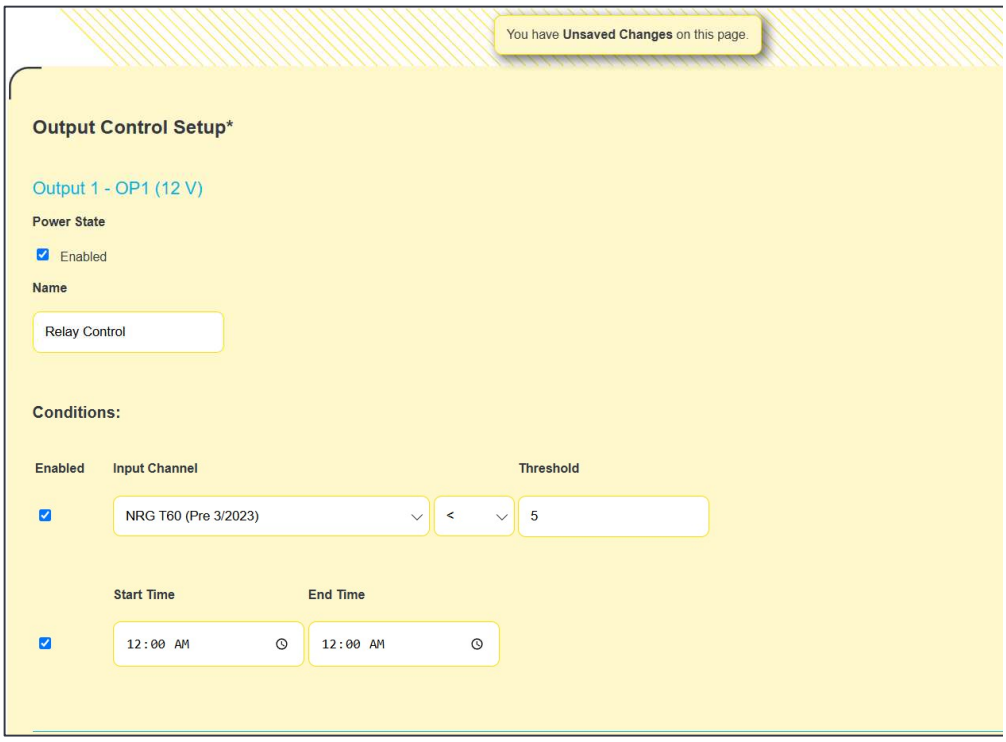
***Note**: To prevent potential control conflicts, OP channels configured for use with external modem control cannot be enabled and configured for use from these menus.*

Output Control Configuration

To configure output control channels:

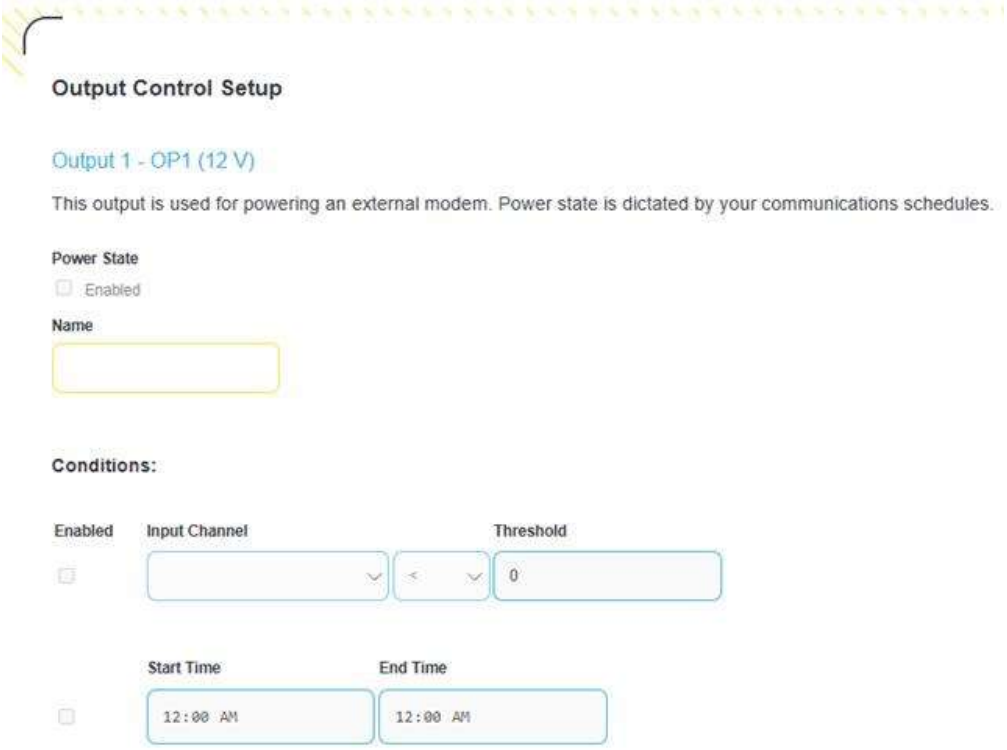
1. Navigate to the **Sensors** menu at the top of the page and select **Output Control** from the dropdown options.
2. Check the **Enabled** checkbox under the **Power State** section of the desired output.
3. Enter a descriptive **Name** for the control scheme.
4. If threshold-based control is desired:
    a. Check the corresponding **Enabled** checkbox.
    b. Use the dropdown menus to select the desired pre-configured sensor from the **Input Channel** dropdown options.
    c. Select the desired mathematical operator.
    d. Set the desired threshold value.
5. If specific timing conditions are desired:
    1. Check the corresponding **Enabled** checkbox.
    2. Set the desired **Start Time** and **End Time** for the action.
6. Repeat with any additional output controls as desired.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



7. To confirm the newly configured channels, scroll to the bottom of the page and click the yellow **Save** button in the bottom right corner.

Note that if an Output Control Setup is utilized for an external modem configuration, it utilizes a single output control (OP1) and the configuration will overwrite any values formerly programmed in that Output Control Setup and it can no longer be utilized for alternate control schemes.



Calculated Channels		
Counter Sensors	10	401 to 410

**Each removeable terminal block in the Analog section can accommodate up to two single-ended measurement sensors or one differential sensor, but not both.*

Analog Sensors

LOGR|Met provides **eight ports** for a total of **sixteen analog channel options**. These are used for measuring parameters including solar radiation, PV temperature, ambient temperature, barometric pressure, relative humidity, wind direction, and more. The LOGR|Met analog sensor ports have **5 and 12 V excitation** with a limit of **50 mA per port**. Each excitation can also be configured for constant or pulsed power mode.

Each port can be configured to support two single-ended sensors, each on a separate channel, or one differential sensor. LOGR|Met has a variety of default sensors available, but generic sensors are also supported by selecting the correct voltage level for the specified sensor. Note that the scale of (-75 to +75) mV is for use with differential sensors only. All other measurement levels can be used for either

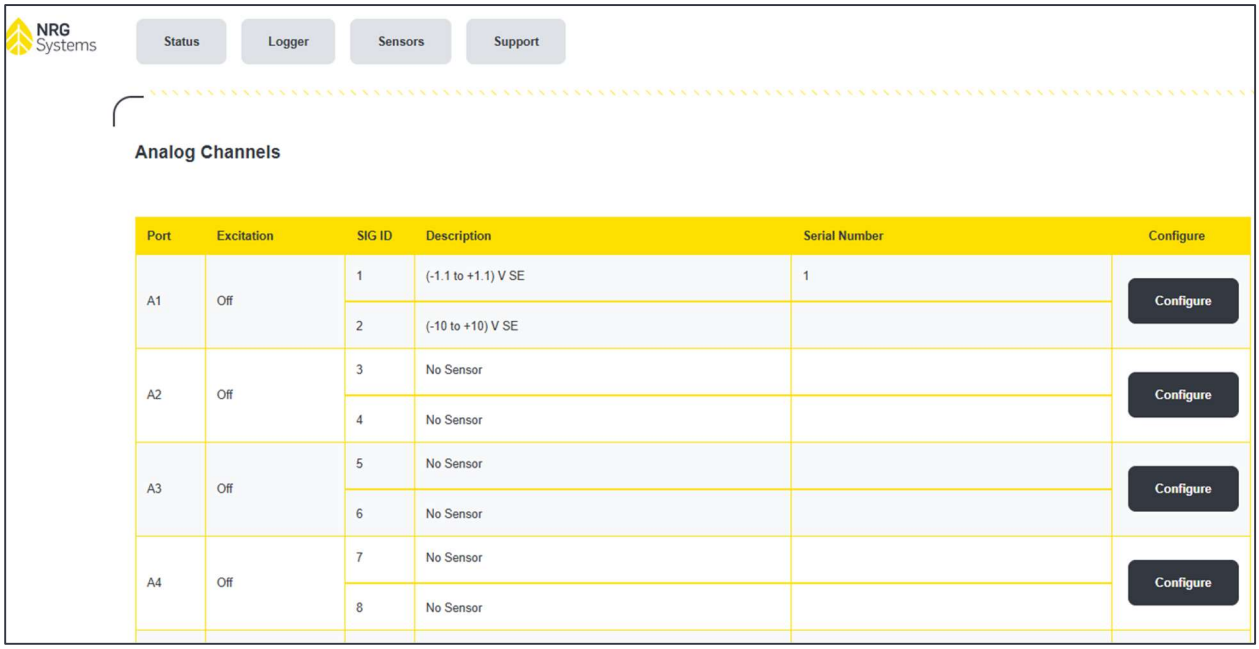
single-ended or differential sensors. For complete analog sensor wiring instructions, see the Required Tools and Sensor Connections sections.

Both 1-second and statistical (average, max, min, and standard deviation) data are available via Modbus registers. The home page of the webserver provides a quick view of live data to ensure sensors are performing and are connected properly at set up time.

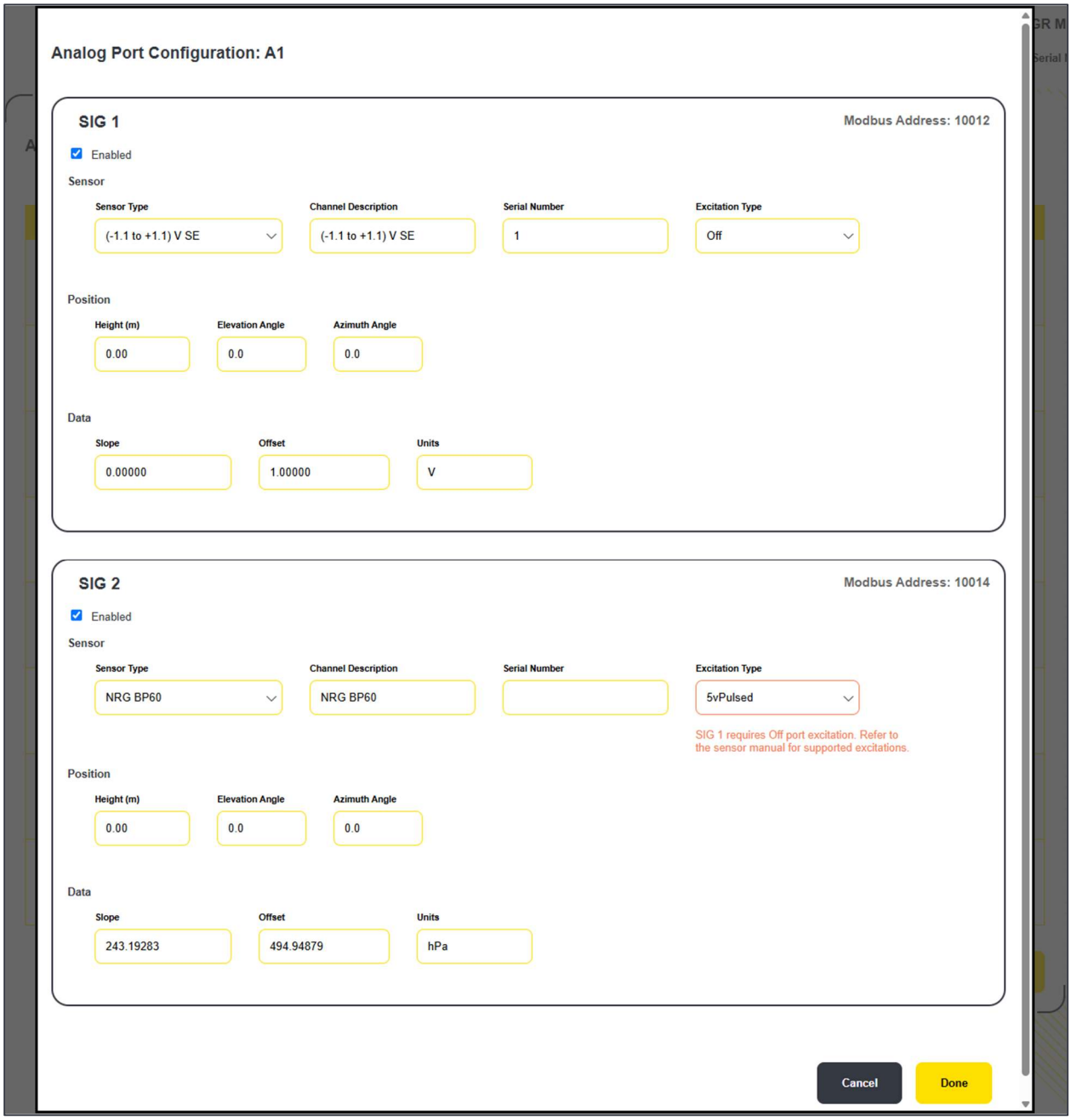
Analog Channel Configuration

To configure analog channels:

1. Navigate to the **Sensors** menu at the top of the page and select **Analog Channels** from the dropdown options.
2. Select **Configure** next to the desired channel.



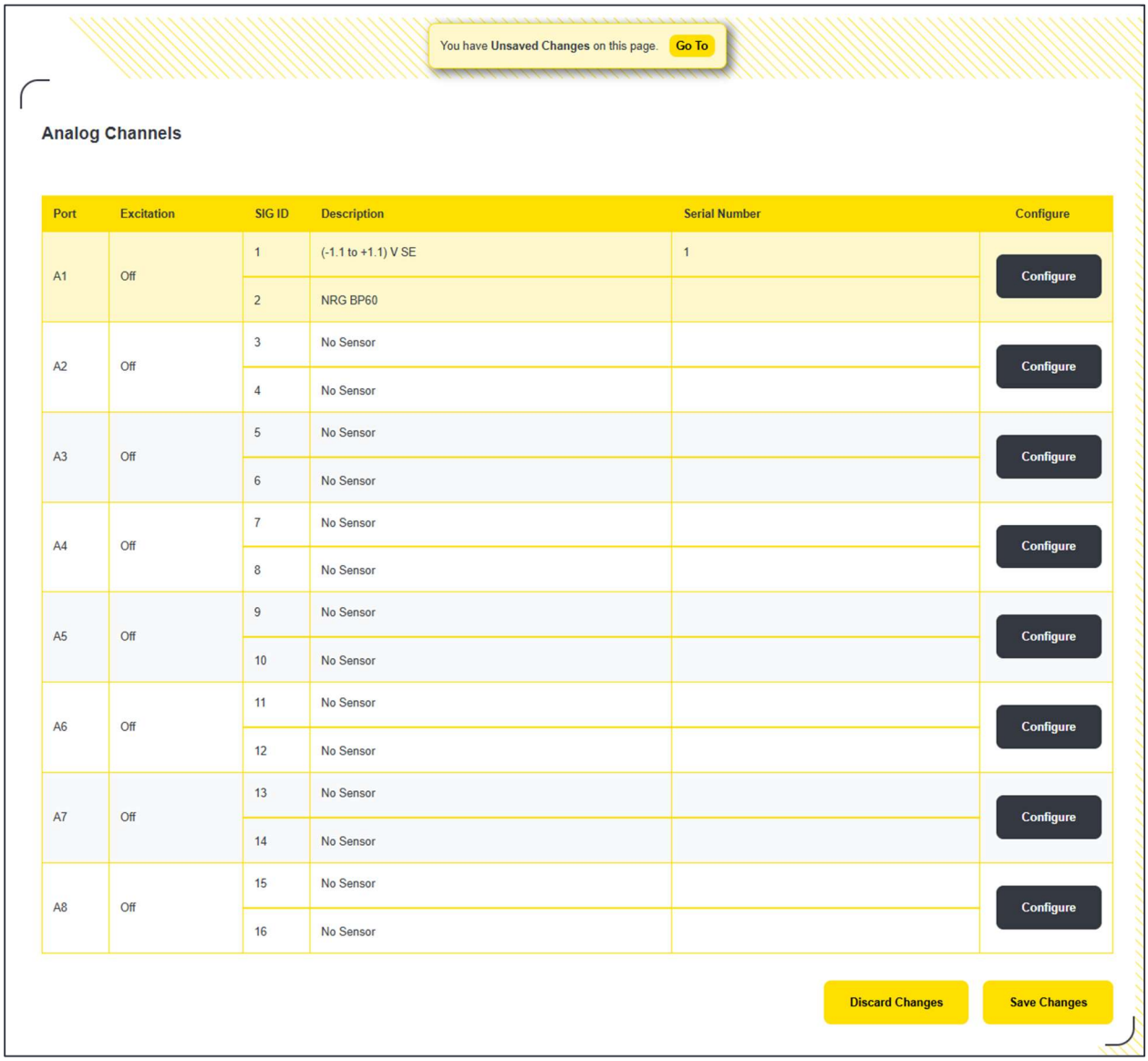
Selecting the **Configure** button in a row will present the **Analog Port Configuration** dialog for the corresponding analog port.



3. Using the **Sensor Type** dropdown, select the desired sensor(s) to be programmed onto the channel(s) corresponding to the port.
   ***Note**: If a conflict is presented regarding excitation between sensors on a shared port, a warning is presented. Additionally, if a sensor is selected which uses differential signaling, the channel listing will automatically be limited to a single channel.*
4. Edit the **Channel Description** as necessary.
5. Enter the sensor **Serial Number** provided by the manufacturer. The field can include numerical and alphabetical characters if necessary.

6. Enter the sensor **Height** in meters.
7. Enter the **Elevation Angle** and **Azimuth Angle,** if applicable, where:
   - Azimuth Angle represents the compass direction (0°–360°) that the sensor's reference point (e.g., North Mark on a wind vane) faces, measured clockwise from true north.
   - Elevation Angle:
     The vertical tilt of the sensor relative to horizontal, in degrees. Positive tilts upward; zero is level.
8. Edit the **Slope**, **Offset**, and **Units** fields if the sensor values differ from the default values. This is typically only changed with calibrated sensors or when entering the desired units for a sensor using one of the generic voltage output selections from the Sensor Type dropdown.
9. Channels configured with a wind direction sensor (wind vane) will enable a **Gust Source Channel** dropdown menu. Select the configured Counter Channel of a wind speed sensor (anemometer) to pair the data.
   ***Note**: Wind gust is the highest 3-sec average wind run per averaging interval and is used for structural loading calculations. Pairing a direction channel to a wind speed channel allows the user to determine the direction from which a gust originates.*
10. Click the yellow **Done** button in the bottom right corner when all relevant values have been entered to return to the **Analog Channels** page.
11. Repeat with any remaining analog sensor channels as needed.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



12. To confirm the newly configured channel(s), scroll to the bottom of the page and click the yellow **Save Changes** button in the bottom right corner.

Serial Sensors (Modbus RTU)

LOGR|Met supports up to 24 Modbus RTU sensors total, with a limit of 12 measurands per port for a total of 48 measurands. Both 1-second and statistical (average, max, min, and standard deviation) data are available via Modbus registers. The home page of the webserver provides a quick view of live data to ensure sensors are performing and are connected properly at set up time.

Serial Port Configuration

LOGR|Met provides flexible configuration options for serial communication through COM ports A, B, C, and D. Each port can be independently configured to match the communication requirements of connected Modbus serial sensors. This configurability allows for broad compatibility with a wide range of Modbus RTU devices, ensuring reliable communication in diverse industrial and environmental monitoring applications.

The following parameters can be set for each COM port:

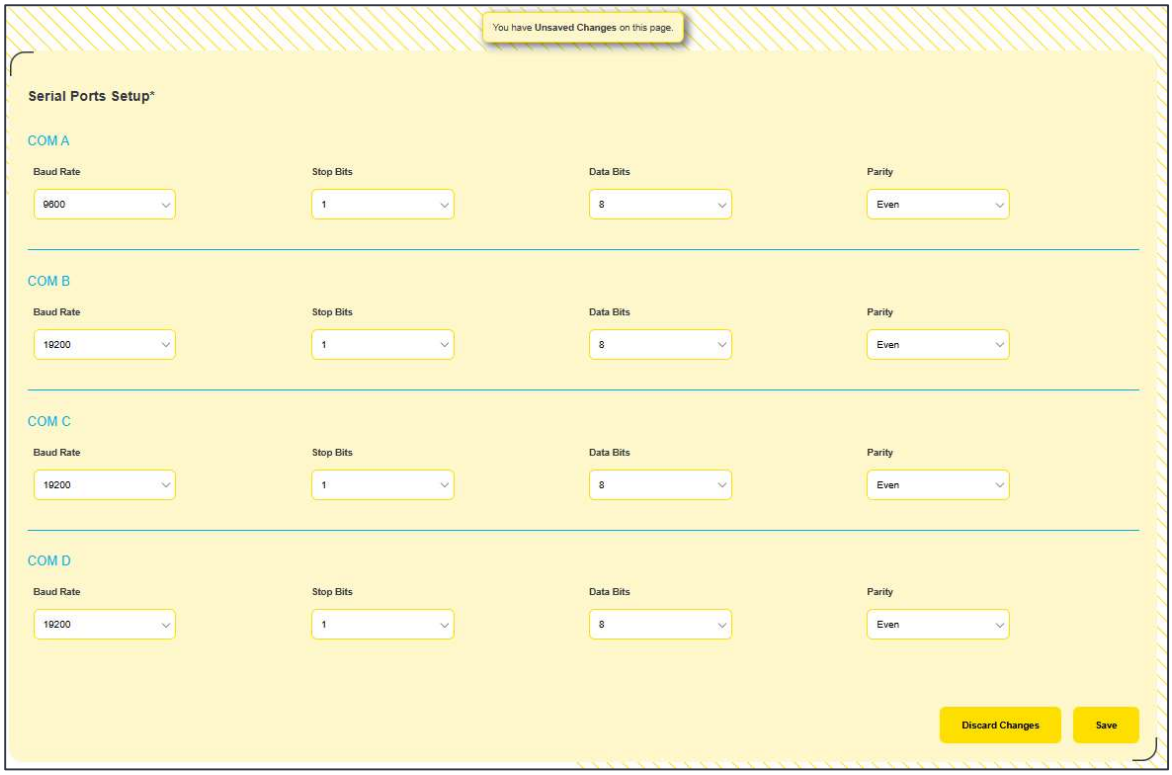
- **Baud Rate** – Defines the speed of data transmission (e.g., 9600, 19200, 38400, etc.).
- **Stop Bits** – Specifies the number of stop bits used to signal the end of a byte (0, 1, or 2).
- **Data Bits** – Sets the number of data bits in each character (8 bits is the only available option).
- **Parity** – Configures error-checking mode (None, Even, or Odd).

Note: Default values are 19200 baud rate, 1 stop bit, 8 data bits, and even parity.

To configure serial ports:

1. Navigate to the **Sensors** menu at the top of the page and select **Serial Ports** from the dropdown options.
2. Select the desired **Baud Rate**, **Stop Bits**, **Data Bits**, and **Parity** settings for each channel.

The newly configured ports are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



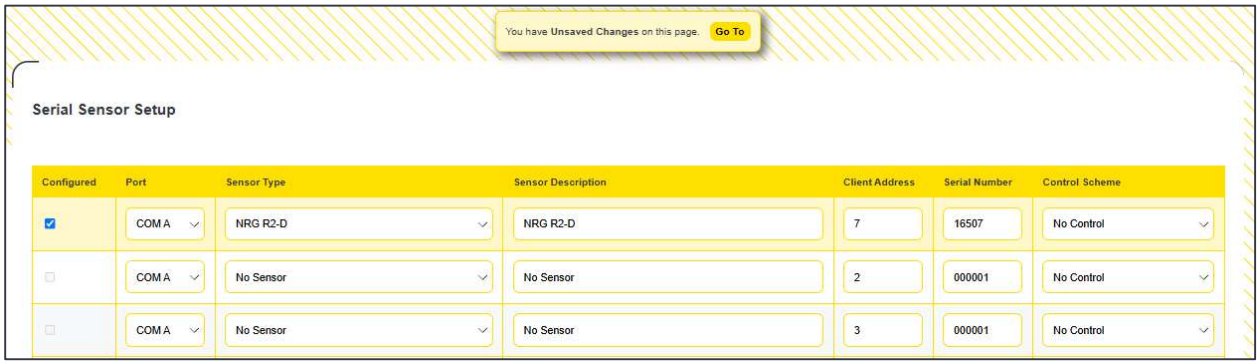
3. Click the yellow **Save** button on the bottom right corner of the page when configuration is complete.

Serial Channel Configuration

To configure serial sensors:

1. Navigate to the **Sensors** menu at the top of the page and select **Serial Sensors** from the dropdown options.
2. Using the dropdown menus, select the desired Port (COM-A, COM-B, COM-C, COM-D), then the desired Sensor Type from the dropdown list of supported serial sensors. This will automatically check the Configured checkbox in the first column.
3. Edit the **Sensor Description** as necessary. The field auto-populates with the Sensor Type chosen.
4. Edit the **Client Address** to match that of the programmed sensor ID.
5. Enter the sensor **Serial Number** provided by the manufacturer. The field can include numerical and alphabetical characters if necessary.
6. If utilizing the **Control Scheme** function (example: to keep a Hukseflux SR30, SR300, or SRD100 sensor within system temperature and timing limitations), select the pre-configured scheme from the dropdown menu. For further information, see the Control Scheme Configuration section below.
7. Repeat with any remaining serial sensor channels as needed.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



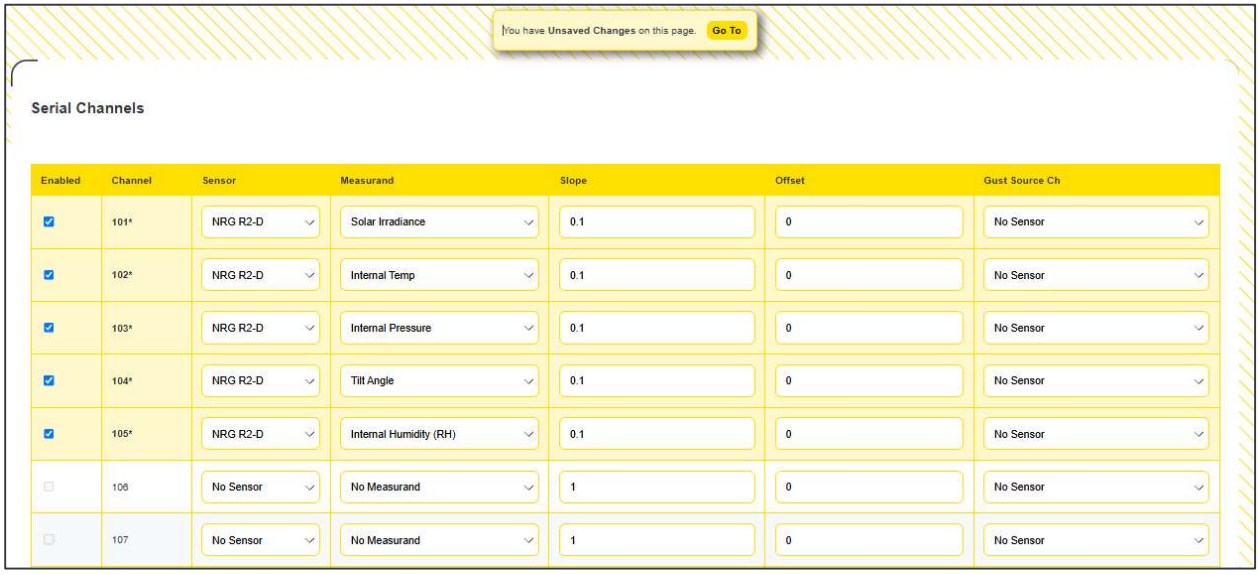
8. To confirm the newly configured channel(s), scroll to the bottom of the page and click the yellow Save Changes button in the bottom right corner.

Saving the Serial Sensor Setup page will automatically redirect to the **Serial Channels** page to specify the desired Measurands for the sensor.

To configure serial channels:

1. Using the dropdown menus, select the desired previously configured sensor from the **Sensor** dropdown menu. This will automatically check the **Enabled** checkbox in the first column for the channel.
2. Select the desired **Measurand** from the dropdown menu.
3. Edit the **Slope** and **Offset** fields if the default values need to be changed. This is typically only changed with calibrated sensors.
4. Channels configured with a wind direction sensor can utilize the **Gust Source Ch** dropdown menu to select a channel configured with a wind speed sensor to pair the data.
   Note: Wind gust is the highest 3-sec average wind run per averaging interval and is used for structural loading calculations. Pairing a direction channel to a wind speed channel allows the user to determine the direction from which a gust originates.
5. Repeat with any remaining measurands channels as needed.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



6. To confirm the newly configured channel(s), scroll to the bottom of the page and click the yellow **Save** button in the bottom right corner.

Serial Control Scheme Configuration

Control schemes can be configured to create pre-set actions for the Hukseflux SR30, SR300, and SRD100 sensors. Up to five unique schemes can be configured and assigned to different sensors, enabling tailored behavior for specific conditions - such as activating the heater during cold temperatures and/or clearing morning dew within a set time window.

Users can choose from two types of control logic:

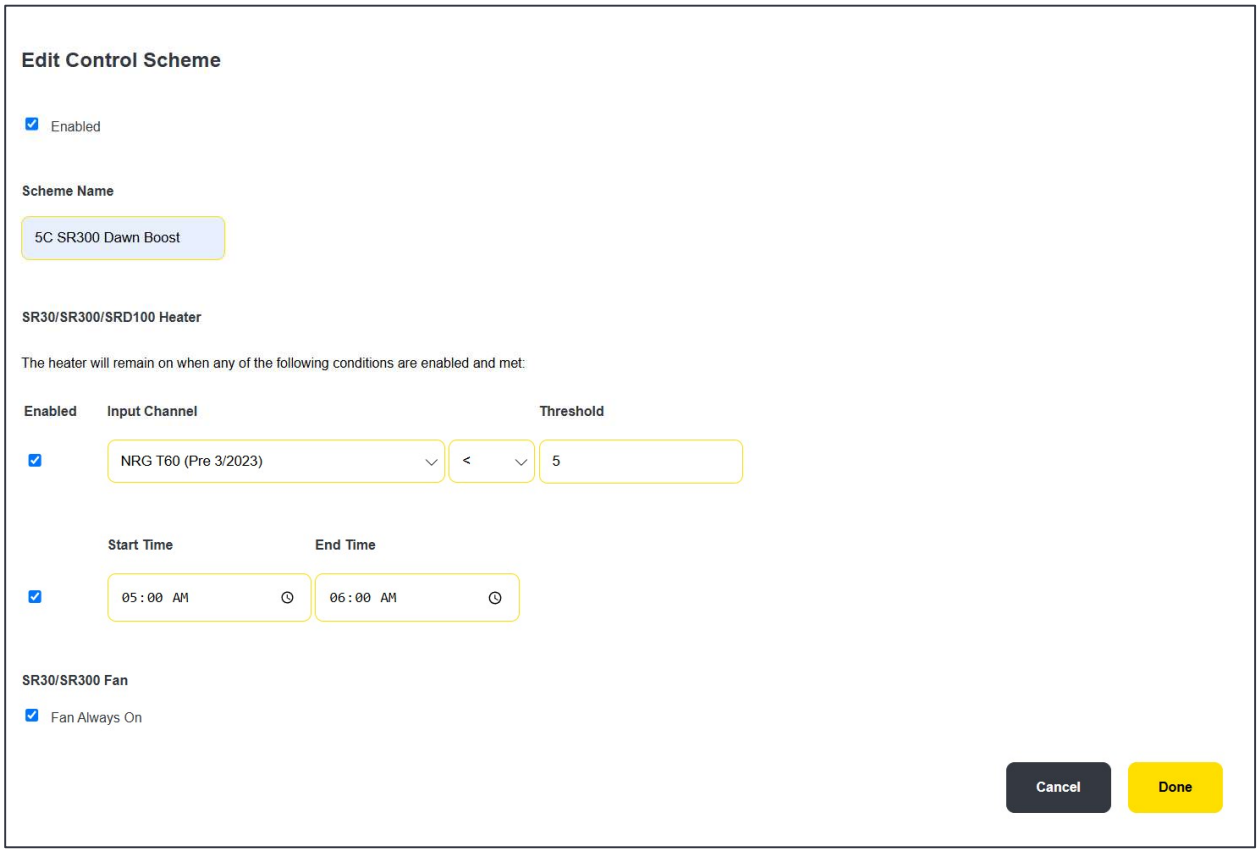
- **Threshold-Based Control**: The heater is activated when a selected sensor's value crosses a user-defined threshold.
- **Time-Based Control**: The heater operates within a user-defined time window.

Both control types can be enabled simultaneously. In this case, the heater will activate if **either** condition is Met.

To configure control schemes:

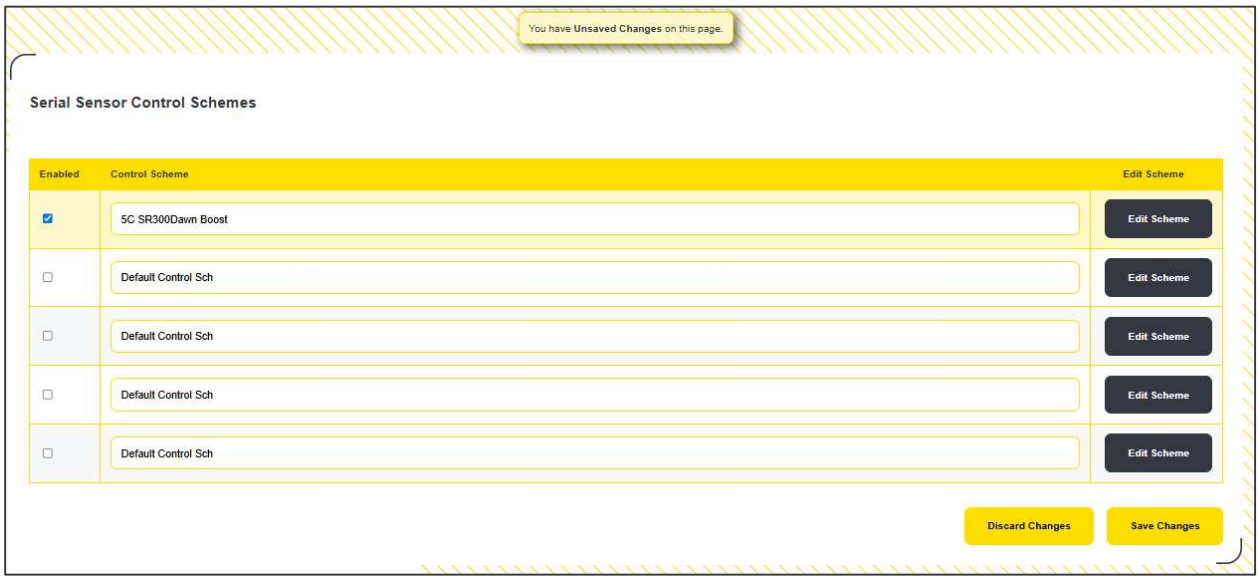
1. Navigate to the **Sensors** menu at the top of the page and select **Serial Sensor Control** from the dropdown options.
2. Select the **Edit Scheme** button to edit and enable a control scheme.

Selecting **Edit Scheme** in a row will present the **Edit Control Scheme** dialog for the corresponding control scheme.



3. Check the **Enabled** checkbox at the top of the control scheme dialog box.
4. Using the dropdown menus, select the desired pre-configured sensor from the **Input Channel** dropdown options, select the desired mathematical operator, and set the desired Heater ON threshold value (in degrees Celsius).
   ***Note**: By default, mathematical operator control is enabled. If this is not desired, uncheck the checkbox to the left.*
5. Set the desired **Start Time** and **End Time** for the action.
   ***Note**: By default, the time-based control is disabled. If this control is desired, check the checkbox to the left.*
6. By default, the **Fan Always On** checkbox is checked. If this behavior is not desirable, uncheck this box.
   ***Note**: The SR30 and SR300 fan will always run if/when the heater is enabled. The fan can only be disabled if the heater is not in use and the **Fan Always On** checkbox is unchecked.*
7. When configuration is complete, click the yellow **Done** button to return to the Serial Sensor Control Scheme page.
8. Repeat with any remaining control schemes as needed.

The newly configured control schemes are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



9. To confirm the newly configured scheme(s), click the yellow **Save Changes** button in the bottom right corner.

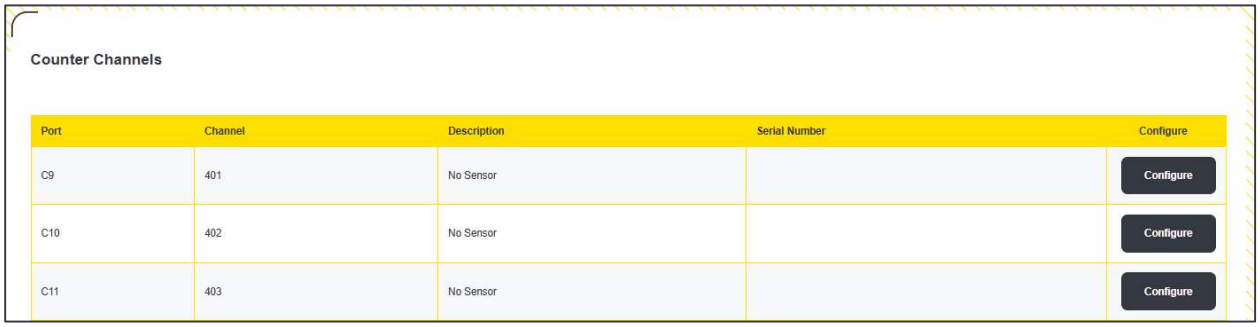
Counter Sensors

LOGR|Met supports up to 10 counter channels to record and process signals from sensors that produce pulse-based outputs, such as flow meters, rain gauges, anemometers, and other devices. Both 1-second and statistical (average, max, min, and standard deviation) data are available via Modbus registers. The home page of the webserver provides a quick view of live data to ensure sensors are performing and connected properly after set-up.

Counter Channel Configuration

To configure counter channels:

1. Navigate to the **Sensors** menu at the top of the page and select **Counter Channels** from the dropdown options.
2. Select **Configure** next to the desired channel.



Selecting the **Configure** button in a row will present the **Counter Sensor Setup** dialog for the corresponding counter channel.

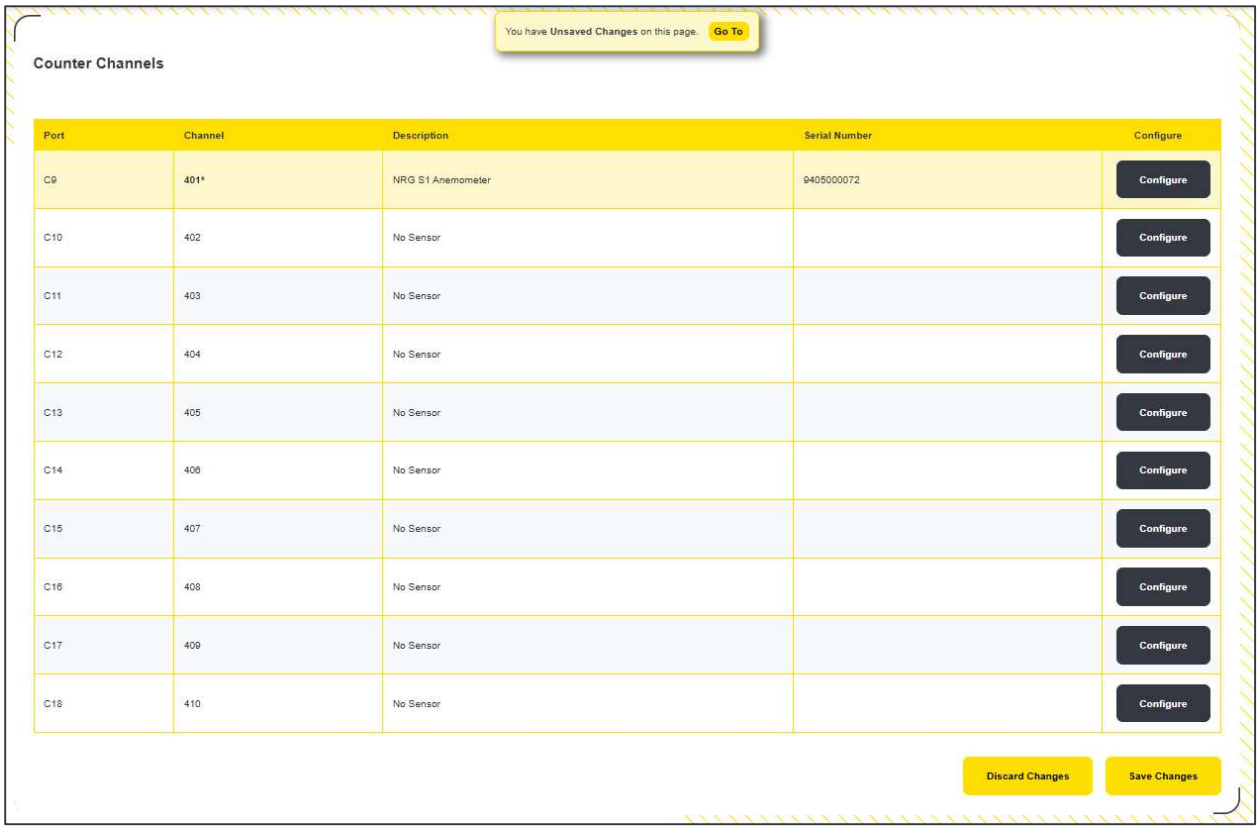
3. Using the **Sensor Type** dropdown, select the desired sensor to be programmed onto this channel.

4. Edit the **Channel Description** as necessary.
5. Edit the **Slope, Offset,** and **Units** fields if the default values need to be changed. This is typically only changed with calibrated sensors.
6. Enter the sensor **Serial Number** provided by the manufacturer. The field can include numerical and alphabetical characters if necessary.
7. Enter sensor **Height** in meters.
13. Enter the **Elevation Angle** and **Azimuth Angle,** if applicable, where:
    - Azimuth Angle represents the compass direction (0°–360°) that the sensor's reference point (e.g., North Mark on a wind vane) faces, measured clockwise from true north.

- Elevation Angle:
  The vertical tilt of the sensor relative to horizontal, in degrees. Positive tilts upward; zero is level.

8. Enable **Pull Up** and change the **Signal Type**, if necessary.
9. When all relevant values have been entered, click the yellow **Done** button in the bottom right corner to return to the **Counter Channels** page.
10. Repeat with any remaining counter sensor channels as needed.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



11. To confirm the newly configured channels, scroll to the bottom of the page and click the yellow **Save Changes** button in the bottom right corner.

RS232 Sensors

LOGR|Met is equipped with an RS232 port to support RS232 sensors. Please contact NRG.

SDI12 Sensors

LOGR|Met is equipped with an SDI12 port to support SDI12 sensors. Please contact NRG.

Output Control

The LOGR|Met provides three configurable switched output ports (OP1, OP2, and OP3) to control external devices such as pyranometer heaters, relays, or modems. These outputs can be enabled and configured individually to respond to sensor measurements or scheduled timing conditions.

Users can choose from two types of control logic:

- **Threshold-Based Control**: The heater is activated when a selected sensor's value crosses a user-defined threshold.
- **Time-Based Control**: The heater operates within a user-defined time window.

Both control types can be enabled simultaneously. In this case, the output will activate if **either** condition is met.

- **OP1** and **OP2:** Provide 12 V output, each capable of supplying up to 2.1 A.
- **OP3:** Provides 5 V output, capable of supplying up to 2.1 A.

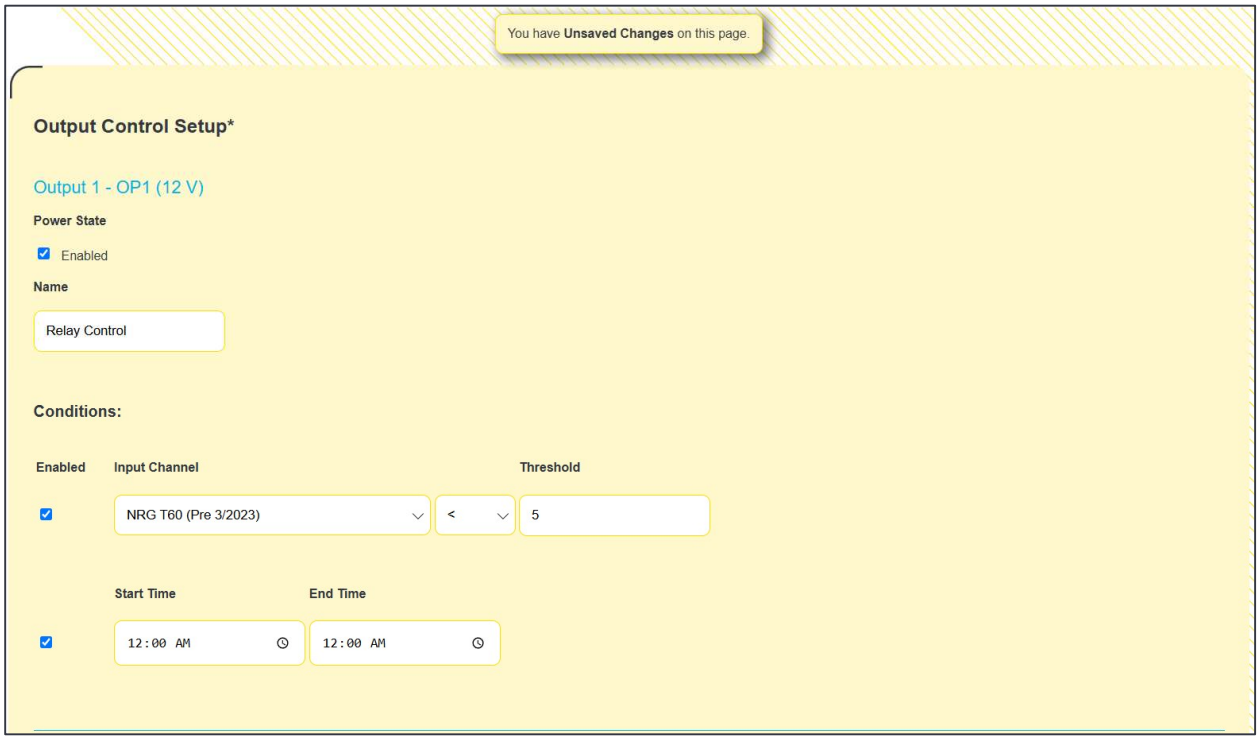
***Note**: To prevent potential control conflicts, OP channels configured for use with external modem control cannot be enabled and configured for use from these menus.*

Output Control Configuration

To configure output control channels:

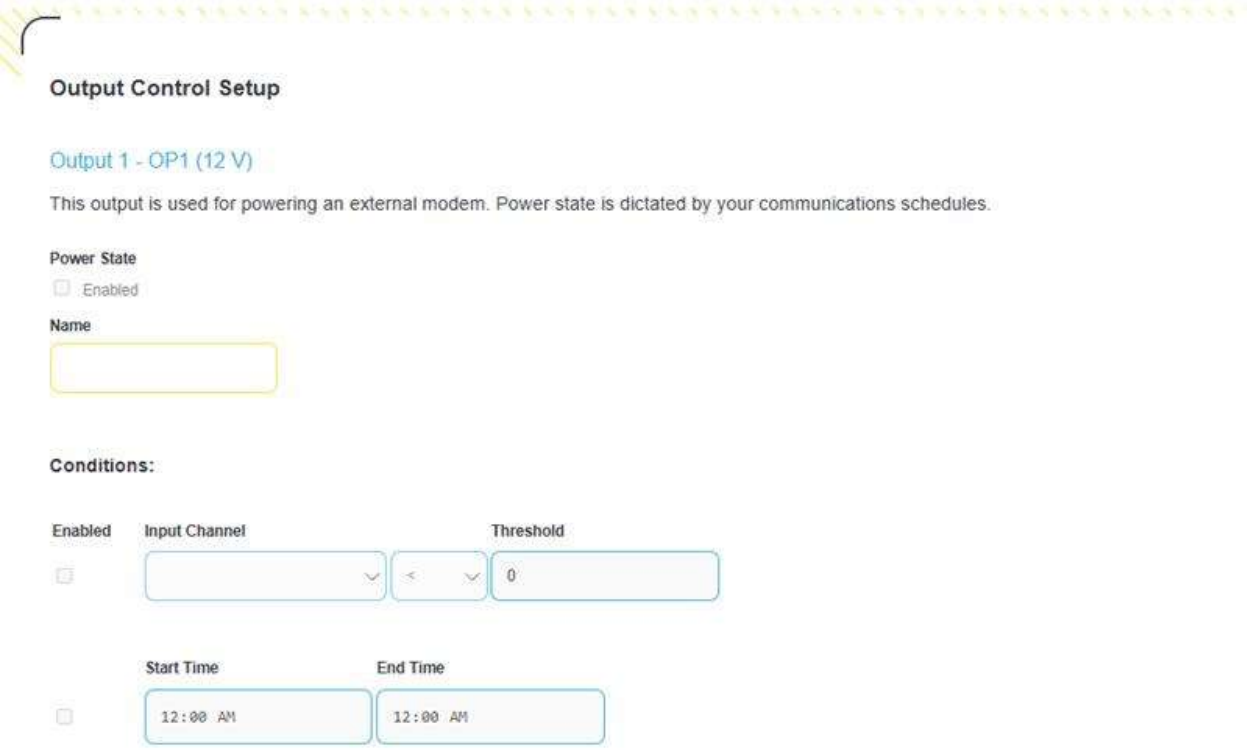
8. Navigate to the **Sensors** menu at the top of the page and select **Output Control** from the dropdown options.
9. Check the **Enabled** checkbox under the **Power State** section of the desired output.
10. Enter a descriptive **Name** for the control scheme.
11. If threshold-based control is desired:
    e. Check the corresponding **Enabled** checkbox.
    f. Use the dropdown menus to select the desired pre-configured sensor from the **Input Channel** dropdown options.
    g. Select the desired mathematical operator.
    h. Set the desired threshold value.
12. If specific timing conditions are desired:
    3. Check the corresponding **Enabled** checkbox.
    4. Set the desired **Start Time** and **End Time** for the action.
13. Repeat with any additional output controls as desired.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



14. To confirm the newly configured channels, scroll to the bottom of the page and click the yellow **Save** button in the bottom right corner.

Note that if an Output Control Setup is utilized for an external modem configuration, it utilizes a single output control (OP1) and the configuration will overwrite any values formerly programmed in that Output Control Setup and it can no longer be utilized for alternate control schemes.



Calculated Channels

Calculated channels are available to compute values using data from sensor channels. For example, they can be used for irradiance comparisons and solar angle calculations to verify and troubleshoot data. A total of twenty calculated channels are available for configuration (Ch. 301-320). The home page of the webserver provides a quick view of live data to ensure channels are performing properly after set-up.

Solar Zenith Angle (SZA)	Solar Zenith Angle (SZA) is the angle measured in degrees between the zenith - an imaginary point directly overhead at a given location - and the center of the sun. SZA is commonly used for solar data quality control and as a key input for calculations such as Direct Normal Irradiance (DNI). This value is calculated using the NREL Solar Position Algorithm (SPA), which determines the sun's position based on the system's date, time, and geographic location settings. No sensor inputs are required. This calculated channel supports statistical outputs for Average and Standard Deviation, computed over the user-selected statistical interval.

Solar Azimuth Angle (SAA)	Solar Azimuth Angle (SAA) is the angle measured in degrees between true north and the horizontal projection of the sun's position, measured clockwise. It indicates the compass direction from which sunlight is coming at a specific time and location. For example, due east corresponds to an SAA of 90 degrees, while due west corresponds to an SAA of 270 degrees. SAA is commonly used for solar data quality control, such as troubleshooting unexpected shading or reflection issues, and in solar tracking systems, to align PV panels with the sun. This value is calculated using the NREL Solar Position Algorithm (SPA) which determines the sun's position based on the system's date, time, and geographic location settings. No sensor inputs are required. This calculated channel supports statistical outputs for Average and Standard Deviation, computed over the user-selected statistical interval.
Solar Elevation Angle	Solar Elevation Angle, also referred to as solar altitude, is the angle measured in degrees between the horizontal plane and the sun's position in the sky, measured upward from the horizon. It indicates how high the sun appears above the horizon at a specific time and location. For example, when the sun is directly overhead, the elevation angle is 90 degrees, while when the sun is on the horizon (e.g., at sunrise or sunset), the elevation angle is 0 degrees. Elevation angles are commonly used to evaluate sunlight availability, assess shading conditions, and optimize panel tilt throughout the day. This value is calculated using the NREL Solar Position Algorithm (SPA) which determines the sun's position based on the system's date, time, and geographic location settings. No sensor inputs are required. This calculated channel supports statistical outputs for Average and Standard Deviation, computed over the user-selected statistical interval.
Direct Normal Irradiance (DNI)	Direct Normal Irradiance (DNI) represents the amount of solar radiation measured in W/m^2 received on a plane normal to the sun. This value is calculated using the system's date, time, and geographic location settings, along with measured values of Global Horizontal Irradiance (GHI) and Diffuse Horizontal Irradiance (DHI). This calculation requires an input source for both GHI, such as a level upward facing pyranometer, and DHI, such as a diffusometer or a pyranometer with a shading device. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected statistical interval.

Albedo	Albedo is the ratio between Reflected Horizontal Irradiance (RHI) and Global Horizontal Irradiance (GHI), i.e., the ratio of reflected irradiance to incoming irradiance. A high albedo value (up to a maximum of one) indicates strong reflection, such as from snow or light-colored surfaces. A value of zero indicates complete absorption of solar radiation. This calculation requires an input source for both GHI, such as a level upward facing pyranometer, and RHI, such as a downward facing pyranometer. To minimize error, it is recommended to use sensors of the same make and model to avoid discrepancies due to spectral response variations or temperature compensation differences. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected statistical interval.
Ratio	Ratio is the proportional relationship between the values of two input channels. One channel is assigned as the numerator and the other as the denominator. The description of this channel can be customized to reflect the specific ratio being calculated. When comparing similar types of measurements, it is recommended to use sensors of the same make and model to minimize error caused by calibration differences or variations in sensor characteristics. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected statistical interval.
Daily Sum	Daily Sum calculates the total accumulated value from an input channel over the course of a single day, based on 1-second data. While the calculation will sum any input channel, it is intended for use with sensors that produce meaningful cumulative data, such as precipitation or flow measurements. The value resets to zero at midnight each day, based on the local logger time. *Note: For Lufft sensors, the Precipitation Diff measurand should be enabled and then selected from the dropdown options for use with this calculated channel.* This calculated channel supports statistical output for Sum, computed over the user-selected statistical interval.
Hourly Sum	Hourly Sum calculates the total accumulated value from an input channel over the course of a one-hour period, based on 1-second data. While the calculation will sum any input channel, it is intended for use with sensors that produce meaningful cumulative data, such as precipitation or flow measurements. The value resets at the start of each hour, based on the local logger time. This calculated channel supports statistical output for Sum, computed over the user-selected statistical interval. *Note: For Lufft sensors, the Precipitation Diff measurand should be enabled and then selected from the dropdown options for use with this calculated channel.*

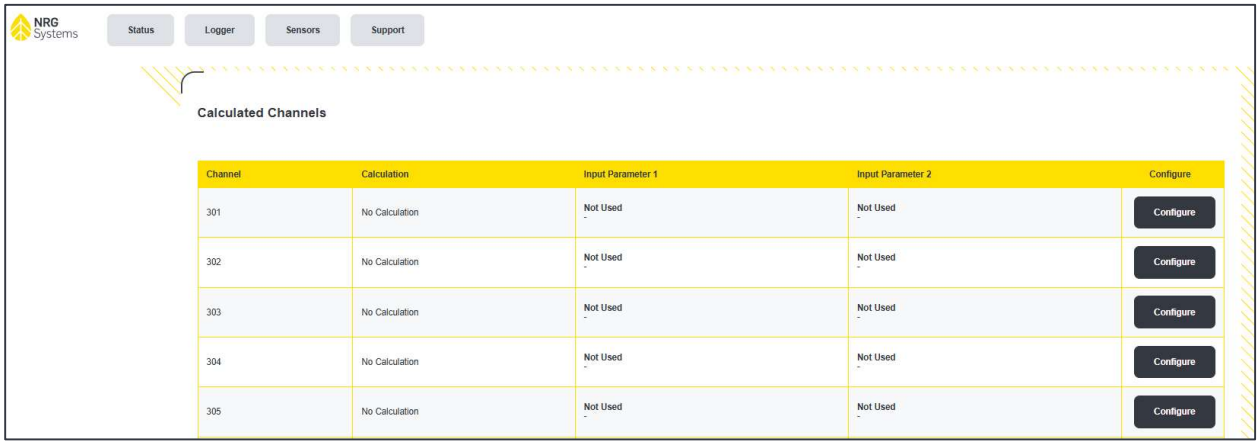
Rainfall Intensity	Rainfall Intensity extrapolates the amount of precipitation per hour if the current rate continues unchanged. It is expressed in millimeters per hour (mm/hr). It is calculated using the rain depth measured over a user selected statistical interval and scaled to an hourly rate: • For a **1-minute interval**: *Rainfall Intensity (mm/hr) = Rain Depth measured over one minute (mm) × 60 one-minute intervals in an hour* • For a **5-minute interval**: *Rainfall Intensity (mm/hr) = Rain Depth measured over five minutes (mm) × 12 five-minute intervals in an hour* • For a **10-minute interval**: *Rainfall Intensity (mm/hr) = Rain Depth measured over 10 minutes (mm) × 6 ten-minute intervals in an hour* For example, if 2 mm of rain is recorded in a statistical interval of one minute, the rainfall intensity is 120 mm/hr. This Metric is useful for identifying short-term heavy rainfall events and assessing storm severity. The calculation requires an input source for precipitation, such as a tipping bucket rain gauge. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected averaging interval. *Note: For Lufft sensors, the Precipitation Diff measurand should be enabled and then selected from the dropdown options for use with this calculated channel.*
Daily Insolation	Daily Insolation represents the total amount of solar energy received on a horizontal surface over the course of a single day, expressed in kW/ m². It is calculated by summing 1-second Global Horizontal Irradiance (GHI) measurements throughout the day, providing a cumulative measure of solar exposure. The total resets at midnight each day, based on the local logger time. This calculation requires an input source for GHI, such as a level upward facing pyranometer. This calculated channel only supports sum as a statistical output. These values are computed over the user-selected statistical interval.
Horizontal Wind Speed	Horizontal Wind Speed calculates the magnitude of the horizontal wind vector using the U (east-west) and V (north-south) wind components. This is typically done using outputs from an ultrasonic wind sensor. The calculation requires an input source for both U and V components, ideally from the same sensor to ensure accurate and synchronized measurements. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected statistical interval.

Horizontal Wind Direction	Horizontal Wind Direction calculates the direction of the horizontal wind vector in degrees from true north using the U (east-west, positive for wind from the south) and V (north-south, positive for wind from the south) wind components. The calculation requires an input source for both U and V components, ideally from the same sensor to ensure accurate and synchronized measurements. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected statistical interval.
Dew Point	Dew Point estimates the temperature at which air becomes saturated with moisture and water vapor begins to condense, expressed in degrees Celsius (°C). This Metric can be useful for forecasting fog or dew formation. This calculation requires input sources for both temperature and relative humidity. This calculated channel supports statistical outputs for Average, Minimum, Maximum, and Standard Deviation, computed over the user-selected statistical interval.

Calculated Channel Configuration

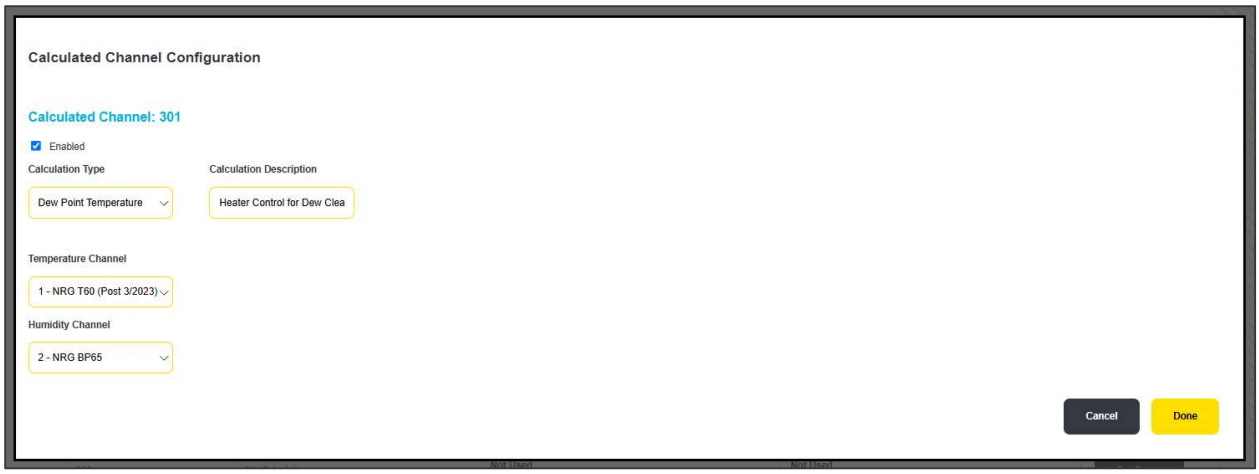
To configure calculated channels:

1. Navigate to the **Sensors** menu at the top of the page and select **Calculated Channels** from the dropdown options.
2. Select the **Configure** button on the right side of the desired **channel**.



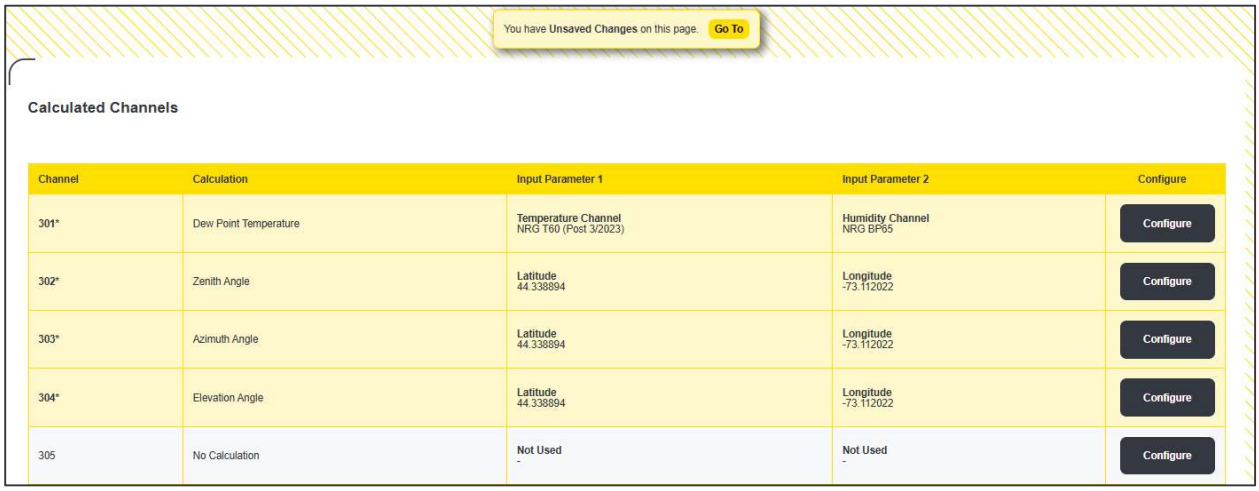
Selecting the **Configure** button in a row will present the **Calculated Channel Configuration** dialog for the corresponding calculated channel.

3. Use the **Calculation Type** dropdown menu to choose the desired calculation. Selecting a Calculation Type will automatically check the **Enabled** checkbox.
4. Edit the **Calculation Description** as necessary. The field auto-populates with the Calculation Type chosen.
5. Most channels require input from one or more sensors to complete the requested calculation. Using the provided dropdown menus, select the appropriate pre-configured sensor(s). See the channel descriptions above for more information.
6. Click the yellow **Done** button in the bottom right corner to return to the Calculated Channels page.



7. Repeat with any remaining calculated channels as needed.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



8. To confirm the newly configured channels, scroll to the bottom of the page and click the yellow **Save Changes** button in the bottom right corner.

Soiling

LOGR|Met includes built-in support for calculating PV soiling ratio when used with the NRG Pulsed Soiling Module (PSM). The PSM allows for direct connection of two PV panels, one clean and one soiled, to monitor performance degradation due to accumulated debris such as dust and pollen.

While the PSM requires no user configuration, the logger must be configured to accept four analog inputs:

- Isc (short-circuit current) from both the clean and soiled panels
- Back-of-module temperature sensors installed on each module (such as the NRG PVT1)

In addition, users must enter PV module constants provided by the manufacturer, including:

- Standard Test Conditions (STC); typically 1000 W/m^2 irradiance and 25^{o}C temperature
- Isc at STC
- Temperature coefficient for Isc

LOGR|Met performs the following soiling ratio calculations using the IEC 61724-1 Annex C Method 2:

Soiling Ratio Isc Index (SRIsc)

Instantaneous ratio of the soiled panel's Isc to the clean panel's Isc, both corrected for temperature. This value reflects the momentary impact of soiling and is computed every second. No filtering or time-of-day constraint is applied.

Effective Irradiance Clean (G)

Temperature-corrected irradiance proxy calculated from the clean panel's Isc. This value is computed every second using panel-specific STC values, temperature coefficients, and the measured back-of-module temperature. No irradiance or time filtering is applied.

Effective Irradiance Soil (G_Soil)

Temperature-corrected irradiance proxy calculated from the soiled panel's Isc. This value is computed every second using the same Method as Effective Irradiance Clean (G).

Daily Soiling Ratio

A single daily value calculated as the irradiance-weighted average of SRIsc over a user-defined window centered on solar noon. Solar noon is also automatically calculated using the logger's date and longitude. Only data points with irradiance above a user-specified threshold are included. If no qualifying data is available, the previous day's value is retained.

Number of Solar Data Points

The total count of valid 1-second data points used to calculate the Daily Soiling Ratio. A data point is considered valid if it falls within the configured solar noon window and exceeds the irradiance threshold.

Soiling Ratio Configuration

Before enabling PV soiling calculations, ensure the required PSM and temperature inputs are configured. These include:

- **Clean Isc** (short-circuit current) input from PSM
- **Soiled Isc** (short-circuit current) input from PSM
- **Clean Voc*** (open-circuit voltage — optional)
- **Soiled Voc*** (open-circuit voltage — optional)
- **Clean back-of-module temperature** (e.g., PVT1)
- **Soiled back-of-module temperature** (e.g., PVT1)

***Note:** While not required for soiling calculations, optional Voc (open-circuit voltage) channels from the PSM can also be configured for auxiliary monitoring.*

There are 3 variations of PSM inputs to choose from in the analog sensor type dropdown. These include:

- **c-Si** — for crystalline modules
- **Thin Film** — for thin film modules
- **NRG 30W** — Specifically calibrated for the 30W crystalline PV modules provided with the NRG #19047 (SRM) and #19048 (SRA) soiling kits

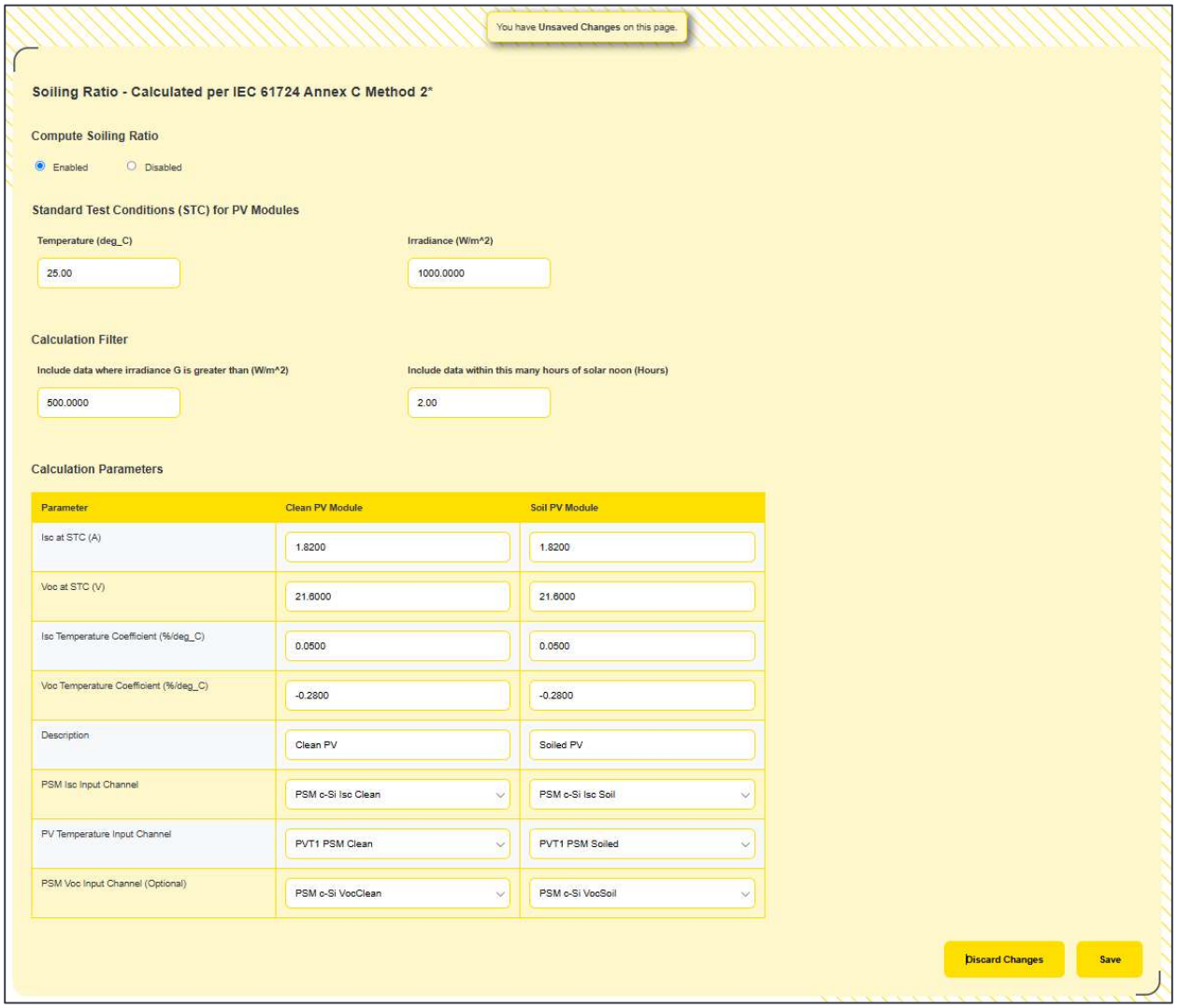
Analog Channels

Port	Excitation	SIG ID	Description
A1	12vPulsed	1	PVT1 PSM Clean
		2	
A2	12vPulsed	3	PVT1 PSM Soiled
		4	
A3	12vConst	5	PSM c-Si Isc Clean
		6	PSM c-Si Isc Soil

To configure PV soiling measurements:

1. Navigate to the **Sensors** menu at the top of the page and select **Soiling** from the dropdown options.
2. Select the **Enabled** box under **Compute Soiling Ratio**.
3. Enter the **Standard Test Conditions (STC)** provided on the PV module datasheet.
4. Enter the desired **Calculation Filter** settings. These settings dictate the data points the logger will include in soiling calculations.
   ***Note**: Default filter values (500 W/m², ±2 hours around solar noon) are recommended for consistency with IEC guidance but can be adjusted to suit specific site or project requirements.*
5. Under the **Calculation Parameters** section, enter the values provided on the PV module datasheet for **Isc at STC** (A), **Voc at STC** (V), **Isc Temperature Coefficient** (%/°C), and **Voc Temperature Coefficient** (%/°C)
   ***Note**: Default values align with the PV modules provided in the NRG 30W soiling kits (19047 and #19048). If using other modules, these values will likely need to be changed.*
6. Edit channel **Descriptions** as necessary
7. Use the dropdown menus to select the appropriate pre-configured input channels for PSM Isc, PSM Voc (optional), and PV temperature inputs for clean and soiled panels.

The newly configured channels are displayed as "**Unsaved Changes**" and will be highlighted in yellow.



8. To confirm the configuration, click the yellow **Save** button in the bottom right corner.

Panel Cleaning

For accurate soiling ratio measurements, the clean PV module must remain free of dirt, dust, or other contaminants. The **Clean Panel** button at the bottom of the **Soiling** page allows users to log the date and time of each panel cleaning event. This timestamp is stored in the system and used for reference when reviewing soiling ratio performance over time.

Note: If a physical button accessory is desired for placement at the soiling station, please contact NRG Systems Technical Support.

To record a panel cleaning event:

1. Navigate to the **Sensors** menu at the top of the page and select **Soiling** from the dropdown options.

2. Scroll down to the **Panel Cleaning** section.
3. Click the yellow **Clean Panel** button to log the current date and time as the most recent cleaning event.
4. The **Last Cleaning Time** field will update automatically.
   Note: *This log is not used in the calculation of the soiling ratio itself but serves as a helpful annotation for post-processing and data validation.*

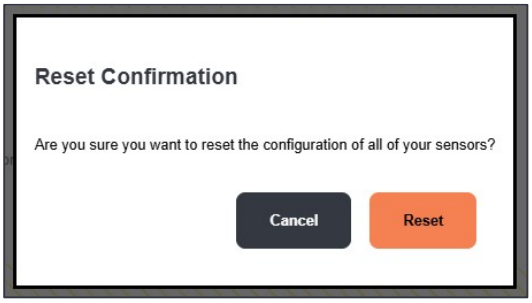
Clearing All Sensor Configurations

It is possible to clear all sensor configurations simultaneously. This action removes all values from Analog, Serial, Counter, and Calculated channels, as well as Output Controls, Serial Sensor Control Schemes, and Soiling information. However, it does **not** affect the serial port configuration settings or the last panel clearing time.

***To clear all sensor configurations*:**

1. Navigate to the **Logger** menu at the top of the page and select **Maintenance** from the dropdown options.
2. Click the yellow **Reset** button in the bottom right corner of the **Reset Sensor Config** window.

3. The logger will be prompt for a “Reset Confirmation”, verifying that this action is desired. To confirm, click the orange **Reset** button.



Note*: This action is irreversible. It is strongly recommended to export the current sensor configuration before proceeding.*

Importing and Exporting System Settings

LOGR|Met provides a means of representing the systems configuration in the form of a Javascript Object Notation (JSON) text file. Such files can be exported from an already configured system, serving as a useful means for record keeping or backup. Additionally, these same JSON files can be imported into any LOGR|Met device to perform a bulk change of system settings.

While the .json text format does provide a human readable format, it is not recommended to attempt manual editing of exported configuration files. Subtle syntax and formatting issues may result in a malformed file or may result in unexpected settings being applied to the LOGR system.

Exporting LOGR Settings

1. Navigate to the **Logger** menu at the top of the page and select **Import/Export Settings** from the dropdown options.
2. Click the yellow **Export Settings** button in the bottom right corner of the **Export LOGR Settings** section.
3. The system will generate a .json file named with the current datetime and the unit serial number. The file can be located in the local Downloads folder.

Importing LOGR Settings

1. Navigate to the **Logger** menu at the top of the page and select **Import/Export Settings** from the dropdown options.
2. Click the **Choose File** button in the Import LOGR Settings section.
3. Navigate to and select the .json file which contains the system settings to be imported to this system.
4. Click the yellow **Import Settings** button in the bottom right corner of the **Import LOGR Settings** section.

5. Settings are automatically applied to the system.
6. If issues are encountered during the import process, a pop-up dialog will present which provides indication of where settings were applied as well as where the process encountered a problem.

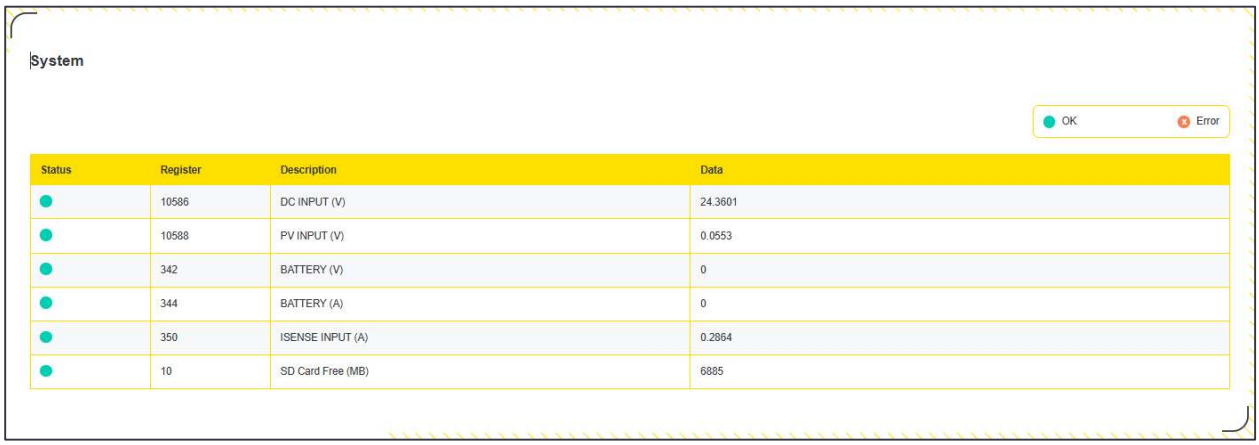
Diagnostics

LOGR|Met continuously monitors key voltages, currents, and status registers for proactive fault detection. Real-time diagnostic values can be viewed on the web interface by navigating to the **Status** menu at the top of the page and selecting **Diagnostics** from the dropdown options. On the left side of this page, the **Status** column indicates:

- *Measurement within normal limits*
- *Fault Condition (out of tolerance)*

System Diagnostics

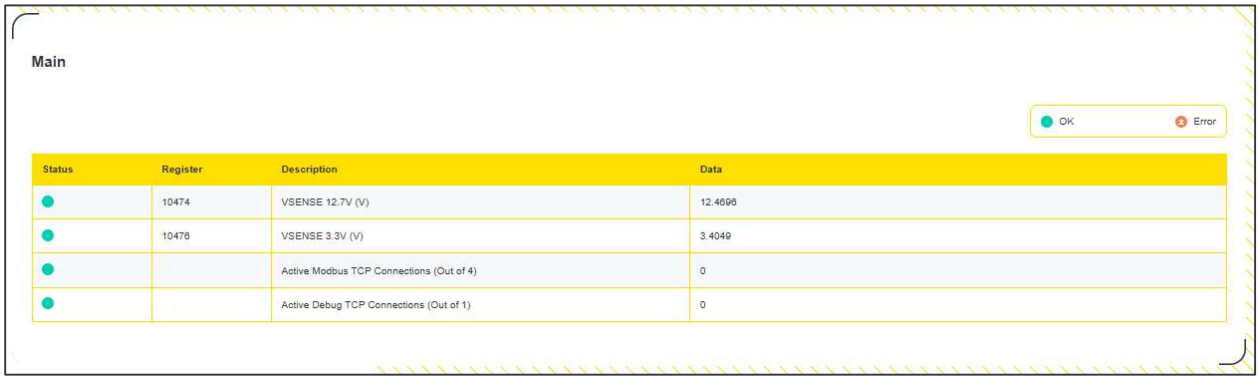
This section displays power input voltages and currents, along with the remaining storage space available on the SD card.



Status	Register	Description	Data
	10586	DC INPUT (V)	24.3601
	10588	PV INPUT (V)	0.0553
	342	BATTERY (V)	0
	344	BATTERY (A)	0
	350	ISENSE INPUT (A)	0.2864
	10	SD Card Free (MB)	6885

Main Diagnostics

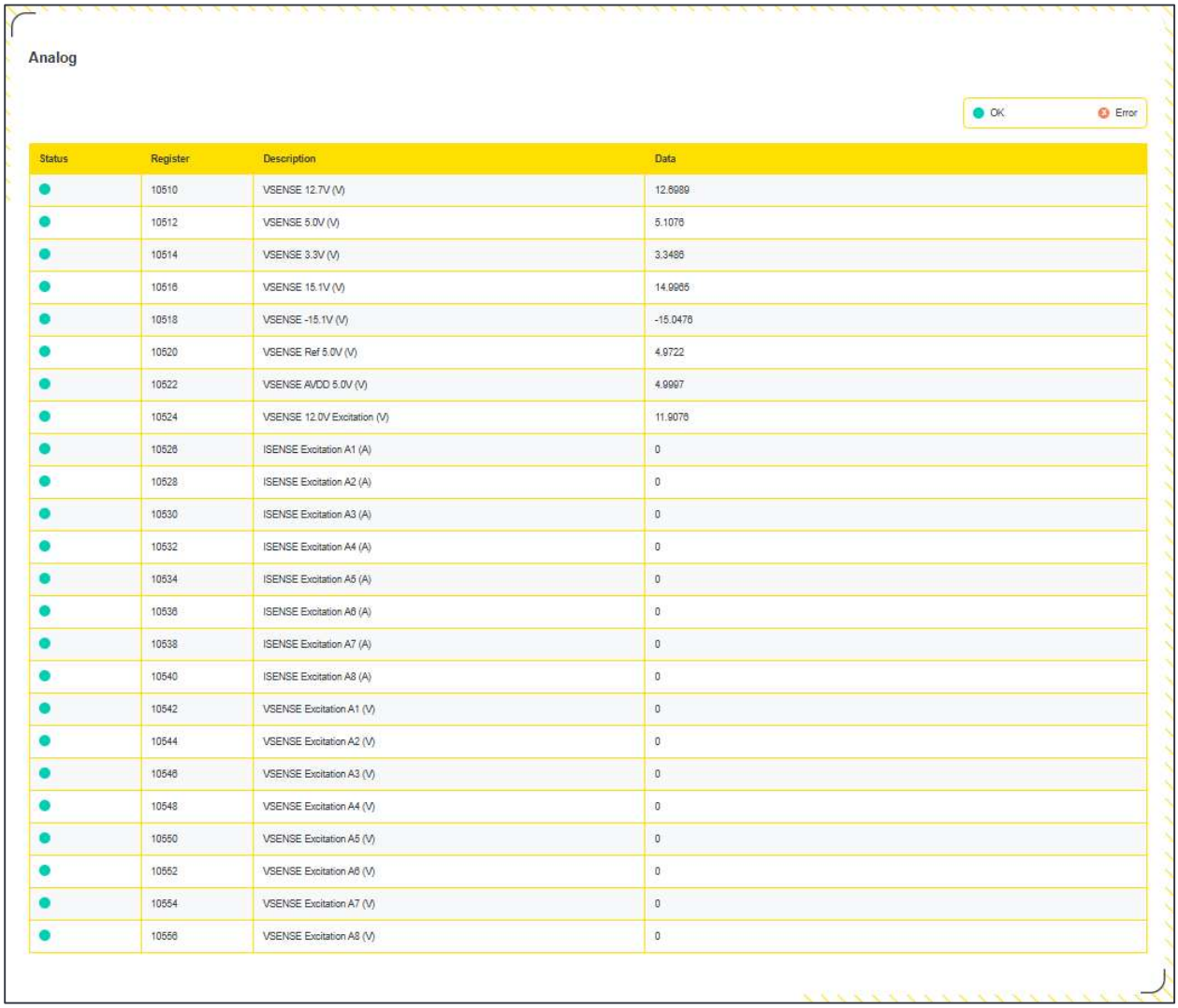
This section displays the regulated 12.7 V and 3.3 V outputs on the primary power supply board, along with counts of active TCP connections.



Status	Register	Description	Data
	10474	VSENSE 12.7V (V)	12.4696
	10476	VSENSE 3.3V (V)	3.4049
		Active Modbus TCP Connections (Out of 4)	0
		Active Debug TCP Connections (Out of 1)	0

Analog Diagnostics

This section displays voltage and current measurements for all analog input channel, along with the excitation-rail and reference-rail voltages that power them.



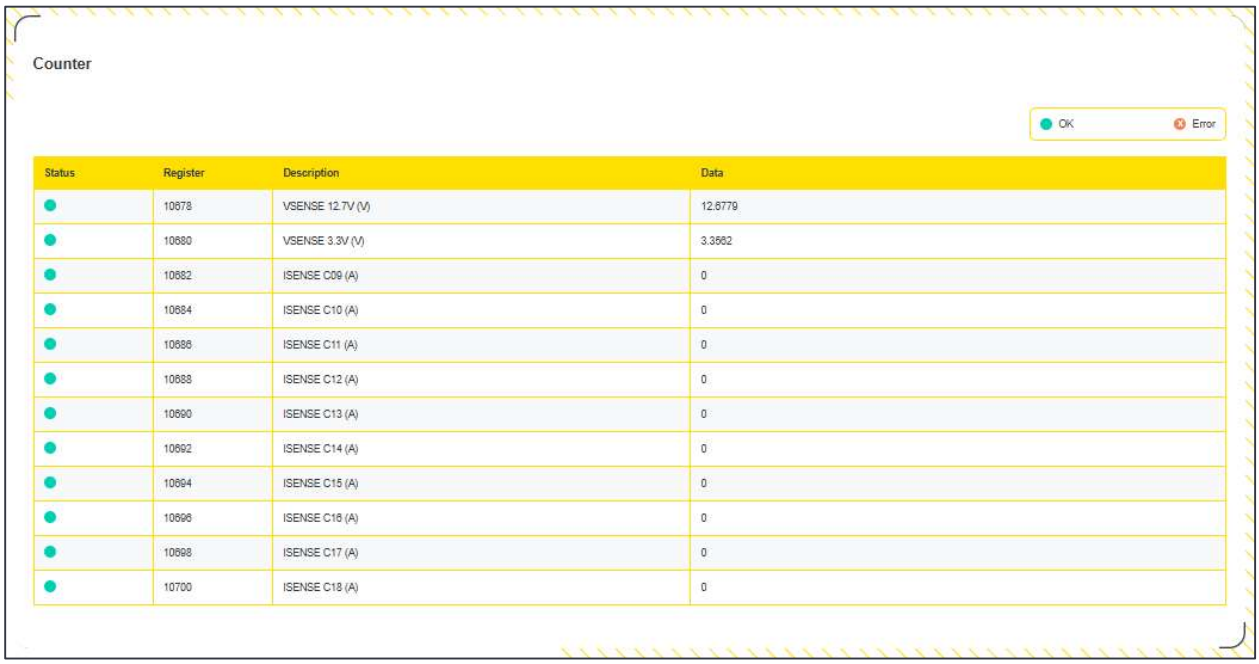
Analog

OK Error

Status	Register	Description	Data
	10510	VSENSE 12.7V (V)	12.6989
	10512	VSENSE 5.0V (V)	5.1076
	10514	VSENSE 3.3V (V)	3.3486
	10516	VSENSE 15.1V (V)	14.9965
	10518	VSENSE -15.1V (V)	-15.0476
	10520	VSENSE Ref 5.0V (V)	4.9722
	10522	VSENSE AVDD 5.0V (V)	4.9997
	10524	VSENSE 12.0V Excitation (V)	11.9076
	10526	ISENSE Excitation A1 (A)	0
	10528	ISENSE Excitation A2 (A)	0
	10530	ISENSE Excitation A3 (A)	0
	10532	ISENSE Excitation A4 (A)	0
	10534	ISENSE Excitation A5 (A)	0
	10536	ISENSE Excitation A6 (A)	0
	10538	ISENSE Excitation A7 (A)	0
	10540	ISENSE Excitation A8 (A)	0
	10542	VSENSE Excitation A1 (V)	0
	10544	VSENSE Excitation A2 (V)	0
	10546	VSENSE Excitation A3 (V)	0
	10548	VSENSE Excitation A4 (V)	0
	10550	VSENSE Excitation A5 (V)	0
	10552	VSENSE Excitation A6 (V)	0
	10554	VSENSE Excitation A7 (V)	0
	10556	VSENSE Excitation A8 (V)	0

Counter Diagnostics

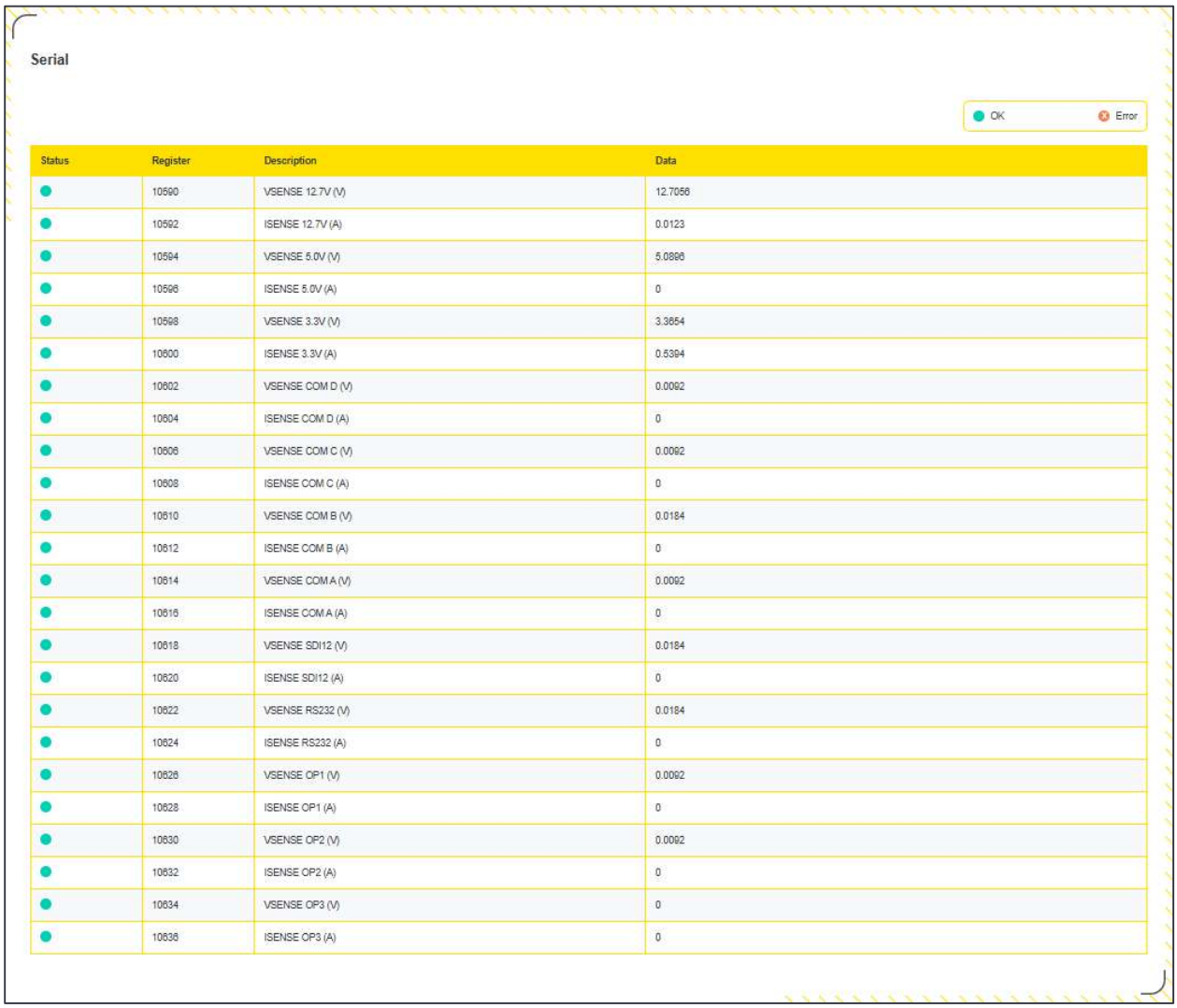
This section displays current measurements for all counter input channel, along with the excitation-rail voltages that power them.



Status	Register	Description	Data
	10678	VSENSE 12.7V (V)	12.6779
	10680	VSENSE 3.3V (V)	3.3562
	10682	ISENSE C09 (A)	0
	10684	ISENSE C10 (A)	0
	10686	ISENSE C11 (A)	0
	10688	ISENSE C12 (A)	0
	10690	ISENSE C13 (A)	0
	10692	ISENSE C14 (A)	0
	10694	ISENSE C15 (A)	0
	10696	ISENSE C16 (A)	0
	10698	ISENSE C17 (A)	0
	10700	ISENSE C18 (A)	0

Serial Diagnostics

This section displays voltage and current measurements for all serial input and OP channels, along with the excitation-rail voltages that power them.



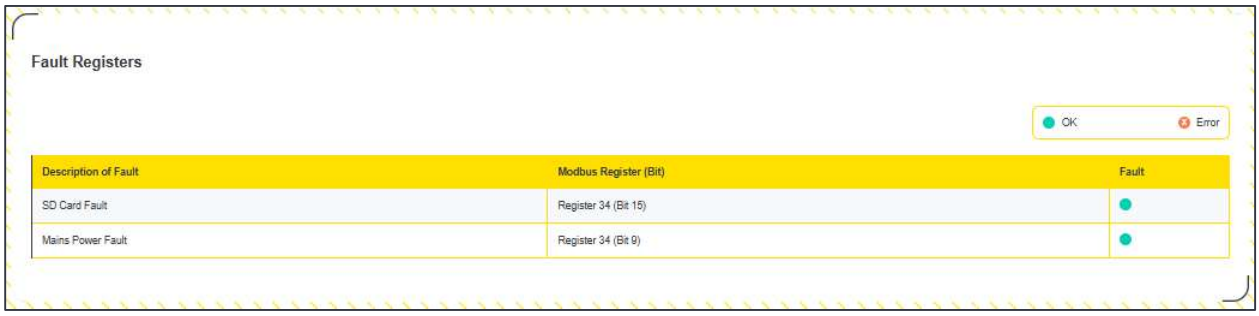
Status	Register	Description	Data
	10590	VSENSE 12.7V (V)	12.7056
	10592	ISENSE 12.7V (A)	0.0123
	10594	VSENSE 5.0V (V)	5.0896
	10596	ISENSE 5.0V (A)	0
	10598	VSENSE 3.3V (V)	3.3654
	10600	ISENSE 3.3V (A)	0.5394
	10602	VSENSE COM D (V)	0.0092
	10604	ISENSE COM D (A)	0
	10606	VSENSE COM C (V)	0.0092
	10608	ISENSE COM C (A)	0
	10610	VSENSE COM B (V)	0.0184
	10612	ISENSE COM B (A)	0
	10614	VSENSE COM A (V)	0.0092
	10616	ISENSE COM A (A)	0
	10618	VSENSE SDI12 (V)	0.0184
	10620	ISENSE SDI12 (A)	0
	10622	VSENSE RS232 (V)	0.0184
	10624	ISENSE RS232 (A)	0
	10626	VSENSE OP1 (V)	0.0092
	10628	ISENSE OP1 (A)	0
	10630	VSENSE OP2 (V)	0.0092
	10632	ISENSE OP2 (A)	0
	10634	VSENSE OP3 (V)	0
	10636	ISENSE OP3 (A)	0

Faults

This section displays fault flag status for various parameters and functions. Use this section to quickly identify failing channels or subsystems.

Fault Registers

This section displays fault flag status and the corresponding Modbus register (and bit) for the SD card and mains power faults. To view these faults, navigate to the **Status** menu at the top of the page and select **Fault Registers** from the dropdown options.



SECTION 4 | FIELD INSTALLATION

Grounding & Lightning Considerations

A properly grounded system helps protect the logger, sensors, and data.

It is the responsibility of the installer to provide proper earth grounding for the tower, logger, and sensors. All warranty coverage for NRG Systems instruments and sensors is void if the system is improperly grounded.

Meteorological sensors, loggers, and towers accumulate static charge unless they are properly grounded. High winds, low humidity, and the height of the tower above ground increase the rate of charge accumulation. Charge continues to accumulate until the developed voltage difference, sometimes thousands of volts relative to ground, causes dielectric breakdown and an electrostatic discharge (ESD). ESD can damage any scientific instrument or sensor, including NRG loggers, pyranometers, and other sensors. **Any structure that the logger is mounted to must be carefully grounded and protected against lightning.** The same careful grounding of the logger and sensors provides the best protection against lightning damage as well.

The LOGR|Met grounding terminal, labelled with chassis ground symbol to the left must be connected to a suitable earth ground.

The LOGR|Met internal over-voltage and noise suppression systems use this chassis ground as the path to return ESD, overvoltage, or noise currents to ground. ***The ground terminal should be properly connected before any other wiring is connected to the logger****.*

Suitable grounding typically consists of a driven ground rod bonded with a heavy copper conductor, or, in grid-connected installations, the facility's electrical safety ground—provided it meets local code and offers low resistance back to a driven electrode. The NRG shelter box kits that include AC grid power supply provide a grounding connection to the electrical grid safety ground.

Each sensor terminal block also includes a "SHLD" pin tied directly to chassis ground. Use these shield terminals to terminate sensor-cable shields, minimizing electrical noise and providing an additional discharge path for static or surge currents.

Surge protection devices such as the NRG SP100 are highly recommended to prevent significant damage to sensitive sensors and equipment. Consult with an NRG Systems project engineer for the recommended surge protection configuration.

Mounting

Within a shelter box, LOGR|Met mounts securely onto a standard 35mm DIN rail using the included removeable insulating clips.

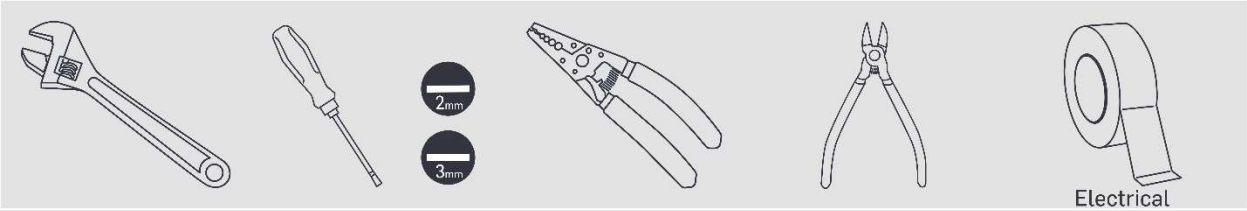
To install LOGR|Met onto the DIN rail:

1. Angle the logger so that the bottom of the black attachment clips on the back of the unit hook onto the bottom edge of the DIN rail.
2. Push the unit upward to compress the spring-loaded clips.
3. Push the top of the unit towards the panel unit the top of the clip is able to catch the DIN rail.
4. Release the unit and ensure it is firmly seated and secure on the rail.

LOGR|Met was designed to be installed in an enclosure rated for environmental protection of IP66 or better.

Do not install LOGR|Met in unprotected outdoor locations.

Required Tools



- Flathead screwdrivers, 2mm and 3mm
- Hex driver, 8mm
- Wire cutter and strippers
- Electrical tape
- Adjustable wrench
- Permanent marker
- Paper clip (for reset button)
- Digital multimeter

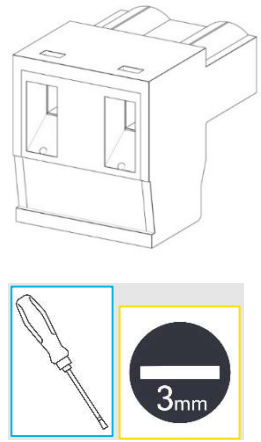
Connecting Power

The LOGR|Met has an internal MPPT charge controller that will charge the battery connected to the "Battery" input when DC and or PV power are available. To charge from the DC input, this supply must provide voltage greater than the battery voltage. For full charging, this requires DC supplies of 15V or more. The charge controller will limit the voltage and current to charge the battery fully and safely. See Powering the LOGR|Met for more details.

Before making any power connections, ensure all system circuit breakers are open and the LOGR|Met is powered off. Failure to de-energize circuits may result in electric shock, equipment damage, or data loss.

Power Connectors

LOGR|Met uses a dedicated three-port power block for DC, PV and Battery inputs. These terminals accept larger wire gauges and are not cross-compatible with sensor port terminal blocks.



These inputs will accept wire sizes from 12 AWG to 30 AWG, stripped approximately 7 to 8 mm (0.28 to 0.31 inch). See Wire Sizes, Strip Lengths and Torques for details.

Connecting DC Power

1. Select a regulated supply from 12 to 28 VDC (rated ≤ 15 A). **Do not** exceed 28 V or apply AC power to this port.
2. Strip the DC cable conductors to expose 7 to 8 mm of bare wire.
3. Insert the positive (+) conductor into the "DC +" terminal and the negative (–) conductor into "DC –" terminal.
4. Tighten each terminal screw to 0.5 N·m using a 3mm flathead screwdriver.
5. Inspect the connection to ensure no stray strands are exposed.

Connecting PV Input

1. Select a PV module/array with a maximum open-circuit voltage (V_{OC}) of 28 V.
   ***Note**: If using more than one panel, the panels will need to be wired in parallel to avoid exceeding the V_{OC} limit.*
2. Strip the PV cable to expose 7 to 8 mm of bare wire.
3. Insert the positive (+) PV lead into the "PV +" terminal and negative (–) into "PV –" terminal.
4. Tighten each terminal screw to 0.5 N·m using a 3mm flathead screwdriver.
5. Inspect the connection to ensure no stray strands are exposed.

Connecting Battery

1. Select a 12 V lead-acid battery only. This includes flooded, AGM, Gel, and spiral cell batteries.
2. Strip the battery cable to expose 7 to 8 mm of bare wire.
3. Insert the positive (+) battery lead into the "BATTERY +" and negative (–) into "BAT –."
4. Tighten each terminal screw to 0.5 N·m using a 3mm flathead screwdriver.
5. Inspect the connection to ensure no stray strands are exposed.

Installing Antennas and SIM

Proper antenna installation is essential for reliable communication and data transfer. LOGR|Met supports multiple antenna types depending on the model and communication Method. Connect each of the following antennas if supported by logger model being installed.

Before making any antenna connections or inserting the SIM card, ensure the LOGR|Met is powered off. Failure to de-energize circuits may result in equipment damage.

Wi-Fi

Attach the provided compact Wi-Fi antenna (Item #20246) to the SMA port labeled **Wi-Fi**.

Cellular

Insert a standard LTE CAT 4 SIM card into the SIM slot, then connect the LTE antenna (Item #17030) to the SMA port labeled **CELL**.

Cellular Diversity

For improved LTE performance, connect a second LTE antenna to the SMA port labeled **DIV**. Space the two antennas approximately 3 inches apart, or use a single dual-connector diversity antenna.

GPS

Mount the GPS antenna (Item #20358) with a clear view of the sky. Attach it to the SMA port labeled **GPS**.

Connecting Sensors

Routing Sensor Cables into the Shelter Box

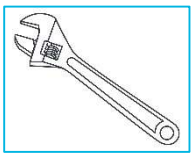
To protect the contents of the shelter box from the outside environment, install strain reliefs (rubber sealing gaskets or grommets) into the holes in the bottom of the shelter box where wires will pass into the box. The table below contains types of strain reliefs offered by NRG Systems, although other types may be sourced elsewhere.

NRG Part Number	Part Specification	Maximum Cables
12590	Break-thru/Skinned-over | .17”-.22” cable diameter | 3/4” NPT Threaded	5
16506	Break-thru/Skinned-over | .13”-.25” cable diameter | M32-5 Threaded	7
16545	Break-thru/Skinned-over | .24”-.30” cable diameter | 1” NPT Threaded	5
20222	Break-thru/Skinned-over | .17”-.22” cable diameter | 1/2” NPT Threaded	3
17742	Break-thru/Plug | .13” - .45” cable diameter | .875” Hole (fits ½” NPT)	1
12028	Pass-thru | .39” - .55” cable diameter | 1/2” NPT Threaded	1

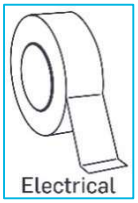
20449	Pass-thru | .12” - .17” cable diameter | 1/2” NPT Threaded	2
12870	Pass-thru | .19” – .24” cable diameter | 1/2” NPT Threaded	2
15364	Pass-thru | .18” - .22” cable diameter | 1/2” NPT Threaded	3
17145	Split Core | .21” - .334” cable diameter | 1/2” NPT Threaded	1
1638	Pass-thru | .19” - .35” cable diameter | 1/2” NPT Threaded	1

To pass a cable through a break-thru strain relief, carefully puncture the rubber grommet before passing sensor wires through the resulting hole. When using grommets or gaskets with a set number of pre-made holes, seal the unused holes with plumber’s putty or short sections of scrap cable (1-2” long).

After all wires have been installed and extra holes have been plugged, seal the strain relief by tightening the outer shell around the gasket & cables.

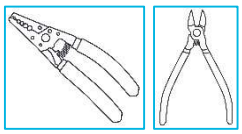


All wires coming down the tower and into the shelter box should be secured to the mast below the shelter box and then looped back up to form a drip-loop before entering the shelter box.



Connecting Sensor Wires to LOGR

Two single-ended sensors **or** one differential sensor can be connected to each analog port.

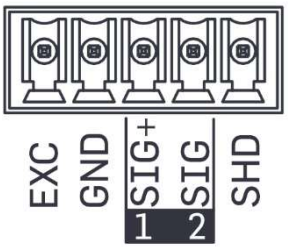


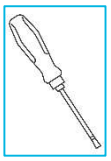
*Sensor wires should be stripped to expose only **6 to 7 mm (1/4 inch) of bare wire**. Stripping off additional insulation could allow bare wires to touch and cause an electrical short.*
If sensor wires come pre-stripped beyond 7 mm (1/4 inch), trim the exposed ends to the correct length.

Connect the individual sensor wires to the supplied terminal plugs. Note that these terminal plugs are removeable and directional. They can only be inserted with the wire cages facing downwards. The wiring positions are indicated below each channel on the logger faceplate.

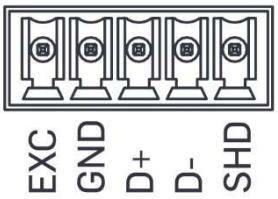
Terminal Plugs

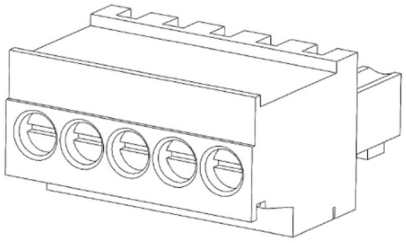
Analog Sensors



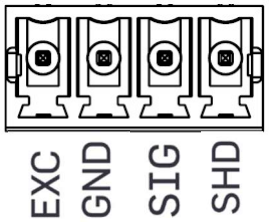


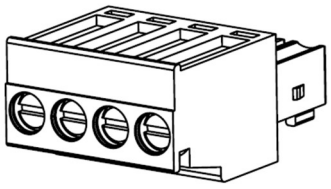
RS-485 Sensors



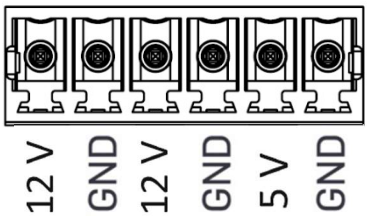


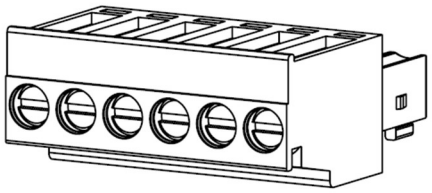
Counter Sensors





Output Terminals





Connecting Analog Sensors

There are two signal terminals to each analog sensor port: **SIG+** and **SIG** with accompanying channel numbers below the terminal identifiers (see diagram above).

When connecting a single-ended analog sensor to a port, land the signal wire in the SIG+ or SIG terminal which corresponds to the channel number configured for the sensor on the Web Interface. For example, if the (single-ended) NRG BP60 sensor is configured on channel 4, the signal wire must land in port A2, terminal SIG, channel 4.

When connecting a differential sensor, both SIG+/SIG terminals are required for use by the sensor so the even channel number of the pair cannot be utilized by another sensor. For example, if an analog pyranometer is connected to port A5, the signal wires land on both terminal SIG+ **and** SIG (channels 9 and 10). The data will be recorded to channel 9 and there will be no information for channel 10.

Connecting RS-485 Sensors

Each LOGR|Met COM port (A, B, C, D) is an RS-485 interface capable of supporting multiple serial sensors using Modbus protocol. A maximum of 24 serial sensors can be configured onto LOGR|Met and they should be spread across the available COM ports.

Depending on wire gauge, there may be physical limitations to practically connect multiple sensors to a single COM port. It is possible to add a fan-out (wire expansion) connector or daisy-chain sensors to a single RS-485 bus, enabling multi-sensor connectivity without consuming additional COM ports.

It is recommended to isolate a slower-response Modbus sensor to its own COM port if possible. There are several factors to consider when determining if a sensor is “slow” to respond and how to order multiple serial sensors within a logger configuration. These factors include cable quality and run distance, sensor mounting, surge protection quality, sensor type and model, sensor response speed, and sensor baud rate. Please consult with NRG Technical Services or Project Management to determine an ideal Modbus topology for a desired sensor configuration.

LOGR|Met provides feedback via the diagnostic (.diag) file regarding response time to collect all channel data per COM port. Additionally, view the logger Diagnostics page within the web UI for more details. These resources should be referenced if data response issues arise.

After all sensors are connected to the wiring panel:

- Confirm correct wiring by reviewing each sensor channel on the web UI.
- Coat the stripped ends of the wires or the jaws of the plugs with an anti-corrosive product (such as PreservIT P100L from Caig Laboratories or Vaseline petroleum jelly).

Labeling the end of sensor wires during installation is recommended for future configuration and troubleshooting.

Connecting Accessories to OP1-OP3

OP1-3 terminal blocks are switched DC voltage sources on the face of the logger which allow for a total of three distinct output setups. These outputs can drive accessories and relays.

- OP1 | 12V | 2100mA
- OP2 | 12V | 2100mA
- OP3 | 5V | 2100mA

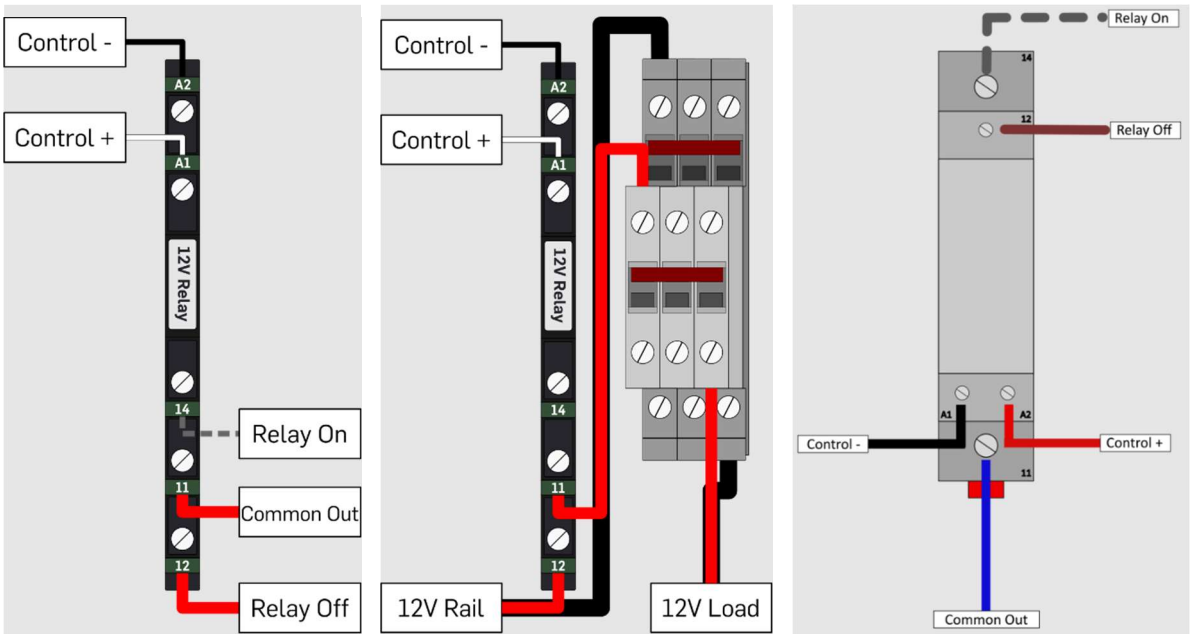
Many accessories can be driven directly from the logger without the use of relays (under 24W of consumption with 12V excitation). Alternatively, relays can be applied to LOGR|Met to support a variety of functions such as turning an externally heated ventilator on and off. Output relays can connect to the OP1-OP3 terminal blocks on the face of the logger for a total of three distinct output setups.

Accessory connections:

The most common utilization of OP terminals is to power an external modem such as the Teltonika RUT241. Alternatively, OP terminals may be used for connecting accessories such as analog ultrasonic sensors or heated pyranometers.

Common relay wiring:

Several output relay models have been evaluated and approved, such as the Murr Elektronik Miro 6.2, and the AutomationDirect 781-1C-SKT relay socket.

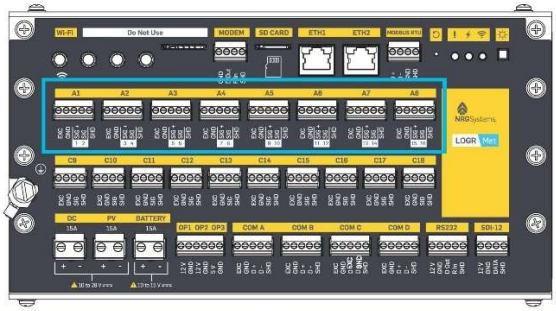


Terminal:	Call Out:	Connects to:	Use:
A1	Control +	OP Out	Relay Trigger
A2	Control -	OP GND	Relay Trigger Ground
11	Common Out	To Power Rail (heaters)	When relay is triggered, DC power flows from this terminal to the load (heaters)
12	Relay Off	From 12 V+ power supply	Feeds 12 V+ power to the relay from the power supply

14	Relay On	Not used	Not used

Sensor Wiring Map

Refer to this diagram to connect standard sensors to the logger or refer to the manufacturer's instructions for each sensor. This is not a complete list of sensors compatible with LOGR|Met.

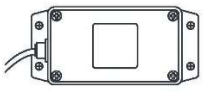


LOGR | Met - Wiring Map

Analog Channels (A1-A8)

Page 1 of 5

Atonometrics RC18



Sensor	Logger
Pnk	EXC
Blk	GND
Grn	SIG+
Brn	SIG
Bare	SHD

Delta-T SPN1

Sensor	Logger	
Pnk	EXC	
Grn	GND	
✱Wht	SIG+	GHI
✱Brn	SIG	DIF
Braid	SHD	
Red	Heater Power Supply	
Blu	Heater Ground	

EKO MS-80

Sensor	Logger
	EXC
	GND
Brn	SIG+
Wht	SIG
Bare	SHD

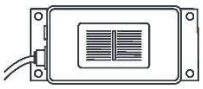
Hukseflux SR05

Sensor	Logger
Brn	EXC
Blk	GND
Blu	SIG+
	SIG
Ylw	SHD

Hukseflux SR11, SR12, and SR20

Sensor	Logger
	EXC
	GND
Wht	SIG+
Grn	SIG
Blk	SHD

IMT Reference Cell

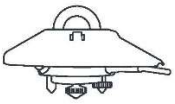


Sensor	Ext Wire	Logger
Red	Brn	EXC
Blk	Wht	GND
Orng	Grn	SIG+
Brn	Ylw	SIG
	Thick Blk	SHD

Kipp & Zonen CMP3, CMP10, CMP11

Sensor	Logger
	EXC
	GND
Wht	SIG+
Grn	SIG
Blk	SHD

Kipp & Zonen SUV5-V Radiometer



Sensor	Logger
Wht	EXC
Blk	GND
	SIG+
Grn	SIG
Bare	SHD

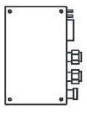
NRG 200M

Sensor	Logger
Red	EXC
Blk	GND
✱Wht	SIG+
	SIG
Shield	SHD

NRG BP65, BP60, and BP20

Sensor	Logger
Red	EXC
Blk	GND
✱Wht	SIG+
	SIG
Shield	SHD

NRG PSM1



Sensor	Logger
Red	EXC
Blk	GND
Blu	SIG+
Grn	SIG
Shd	SHD

2nd Port

Sensor	Logger
Ylw	SIG+
Brn	SIG

9-10-2025

LOGR | Met - Wiring Map
Analog Channels (A1-A8)

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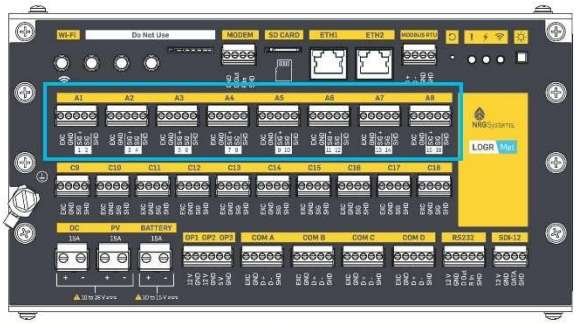
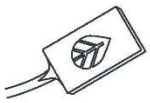
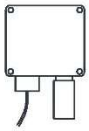
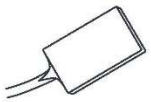


NRG PVT1	NRG R1	NRG R2 (Analog)	NRG RH5X
			
Sensor / Logger Red — EXC Blk — GND Grn — SIG+ Wht — SIG Shield — SHD	Sensor / Logger Brn — EXC Wht — GND Blu — SIG+ Ylw — SIG Shield — SHD	Sensor / Logger Brn — EXC Blk — GND Blu — SIG+ Ylw/Grn — SIG Shield — SHD	Sensor / Logger Red — EXC Blk — GND ✱ Wht — SIG+ SIG Shield — SHD

NRG T60 or 110S	PT100, PT1000 or Thermistor, 4-wire connection	RM Young Vert Prop 27106	NRG Grid Voltage Monitor
			
Sensor / Logger Red — EXC Blk — GND ✱ Wht — SIG+ SIG Shield — SHD *Note: Use on Ch. 14 for SR30 Control*	Sensor / Logger Current — EXC Common — GND Signal+ — SIG+ Signal — SIG SHD	Sensor / Logger EXC Terminal A — GND ✱ Terminal B — SIG+ SIG SHD	Logger EXC Gry — GND Wht — SIG+ SIG SHD

✱

This is a single-ended sensor. Signal wire may be connected to either SIG+ or SIG, and may share EXC, GND, and SHLD with another single-ended sensor.

See user manual for more information.

LOGR | Met - Wiring Map
Serial Channels (COM A - SDI-12)

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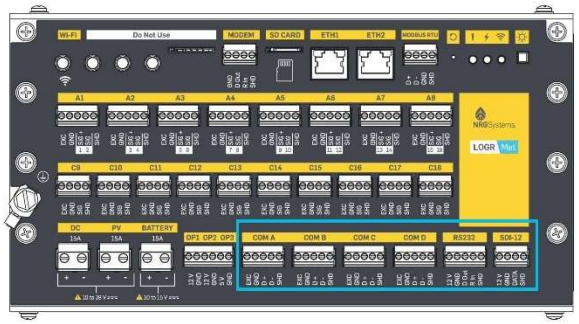
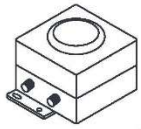
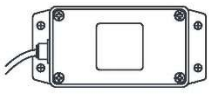


Atonometrics Mars



Sensor		Logger
Brn		EXC
Blk		GND
Gry		D+
Wht		D-
Shield		SHD

Atonometrics RC18



Sensor		Logger
Pnk		EXC
Blk		GND
Wht		D+
Pur		D-
Shield		SHD

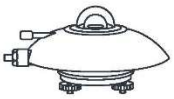
EKO MS-40M

Sensor		Logger
Brn		EXC
Wht		GND
Blu		D+
Blk		D-
Gry	& Shield	SHD

EKO MS-80S

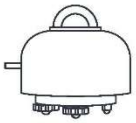
Sensor		Logger
Brn		EXC
Wht		GND
Blu		D+
Blk		D-
Ylw		SHD

Hukseflux SR20-D2



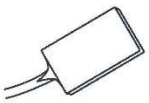
Sensor		Logger
Red		EXC
Blu		GND
Wht		D+
Grn		D-
Blk		SHD

Hukseflux SR30-D1, SR300, SRD100-D1



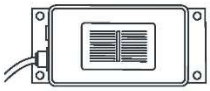
Sensor		Logger
Brn		EXC
Blk & Blu		GND
Wht		D+
Gry		D-
Ylw		SHD

IMT BoM-T



Sensor	Ext Wire	Logger
Red	Brn	EXC
Blk	Wht	GND
Brn	Ylw	D+
Orng	Grn	D-
Thick Blk		SHD

IMT Reference Cell



Sensor	Ext Wire	Logger
Red	Brn	EXC
Blk	Wht	GND
Brn	Ylw	D+
Orng	Grn	D-
Thick Blk		SHD

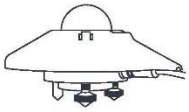
Kipp & Zonen DustIQ

Sensor		Logger
Wht		EXC
Blk		GND
Ylw		D+
Gry		D-
Blu		SHD

Kipp & Zonen SMP12

Sensor		Logger
Red		EXC
Blk&Blu&Brn		GND
Ylw		D+
Gry		D-
Shield		SHD

Kipp & Zonen SMP10



Sensor		Logger
Wht		EXC
Blk & Blu		GND
Ylw		D+
Gry		D-
Shield		SHD

Kipp & Zonen SUV-5-V

Sensor		Logger
Wht		EXC
Blk		GND
Ylw		D+
Gry		D-
Thick Blk		SHD

LOGR | Met - Wiring Map
Serial Channels (COM A - SDI-12)

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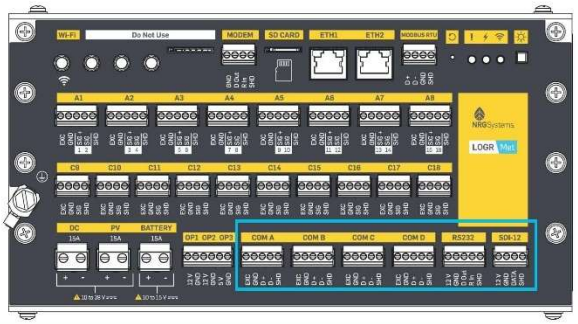
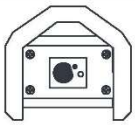
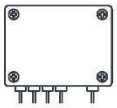


Lufft SHM31	Lufft WS100, WS200, WS300, WS500, WS600	NRG R1-D	NRG R2-D
			
Sensor — Logger Brn ---- EXC Wht ---- GND Grn ---- D+ Ylw ---- D- Gry ---- GND Shield ---- SHD	Sensor — Logger Brn ---- EXC Wht ---- GND Grn ---- D+ Ylw ---- D- Braid ---- SHD	Sensor — Logger Brn ---- EXC Wht ---- D+ Blu ---- GND Blk ---- GND Gry ---- D- Ylw ---- SHD	Sensor — Logger Brn ---- EXC Wht ---- D+ Blk & Blu ---- GND Gry ---- D- Ylw & Grn ---- SHD
RDE 300i			
			
Sensor — Logger Brn ---- EXC Blk ---- GND Gry ---- D+ Wht ---- D- Blu ---- None Shield ---- SHD			

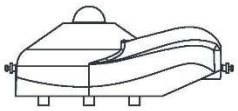
LOGR | Met - Wiring Map
Counter Channels (C9 - C18)

Page 5 of 5

EKO MV01 Fan Speed

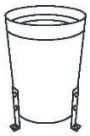
Sensor		Logger
Brn		EXC
Blk		GND
Blu		SIG
N/A		SHD

Kipp & Zonen CVF4 Fan



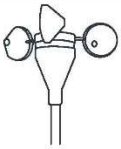
Sensor		Logger
Ylw		EXC
Gry		GND
Grn		SIG
Shd		SHD

NovaLynx 260 TBRG



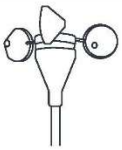
Sensor		Logger
N/A		EXC
Blk		GND
Red		SIG
Shd		SHD

NRG 40 Anemometer



Sensor		Logger
N/A		EXC
Blk		GND
Wht		SIG
Shd		SHD

NRG 40H



Sensor		Logger
Red		EXC
Blk		GND
Wht		SIG
Shd		SHD

NRG S1 Anemometer

Sensor		Logger
Red		EXC
Blk		GND
Wht		SIG
Shd		SHD

Rainwise TBRG

Sensor		Logger
N/A		EXC
Blk		GND
Red		SIG
N/A		SHD

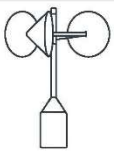
RM Young Heated Rain Gauge

Sensor		Logger
Wht		SIG
Blk		GND

Texas Elec. TR-525-W2S

Sensor		Logger
N/A		EXC
Wht		GND
Red		SIG
N/A		SHD

Thies FCA 4.3351



Sensor		Logger
Brn		EXC
Grn		GND
Wht		SIG
Shd		SHD

WindSensor P2546C-OPR

Sensor		Logger
N/A		EXC
Brn		GND
Wht		SIG
Shd		SHD

WindSensor P2546D-OPR

Sensor		Logger
N/A		EXC
Brn		GND
Wht		SIG
Shd		SHD

Logger Data Acquisition and Storage

LOGR|Met starts recording data and delivering it to the SCADA system as soon as it is powered up and configured with one or more sensors. A backup of all SCADA data is stored as memory on a microSD card installed in the logger. If this data is needed as a backup or to send to NRG Technical Services for troubleshooting, it can be pulled from the SD card, or directly exported to a connected PC via the web UI. See Data Storage section for more information.

SECTION 5 | COMMUNICATION & DATA TRANSFER

Data Files

The files stored in the internal memory are a backup which can be used to backfill a SCADA database or for troubleshooting purposes. Much of the information stored in these files is available on the SCADA registers.

Statistical Data Files (*statistical.dat)	*This file type contains time stamped logger statistical data and human readable header text providing information regarding the logger configuration and site location.*
One Second Data Files (*onesecond.dat)	*This file type contains time stamped logger one second and human readable header text providing information regarding the logger configuration and site location.*
Diagnostic Files (*.diag)	*This file type contains statistical diagnostic data (voltages and currents) for troubleshooting purposes.*
Log Files (*.log)	*This file type contains a list of unix timestamped events and errors.*

All files are human-readable and file names are formatted as: YYYYMMDD_HHMM_XXXXX_ZZZZZZ, where XXXXX is the logger serial number, and ZZZZZZ is the index of the file.

For example, the file *20210801_2300_000214_000327.** was created on August 1, 2021, at 11 PM, was logged by logger serial number 214, and has a file index number of 327. All files from that date and time have the same name and are followed by the appropriate file type extension (*_onesecond.dat, *_statistical.dat, *.log, *.diag).

File Facts

Files are created at top of each hour, or when the file is closed due to a configuration change.

Files are recorded using ISO 8601 timestamps referenced to UTC 0 (Z).

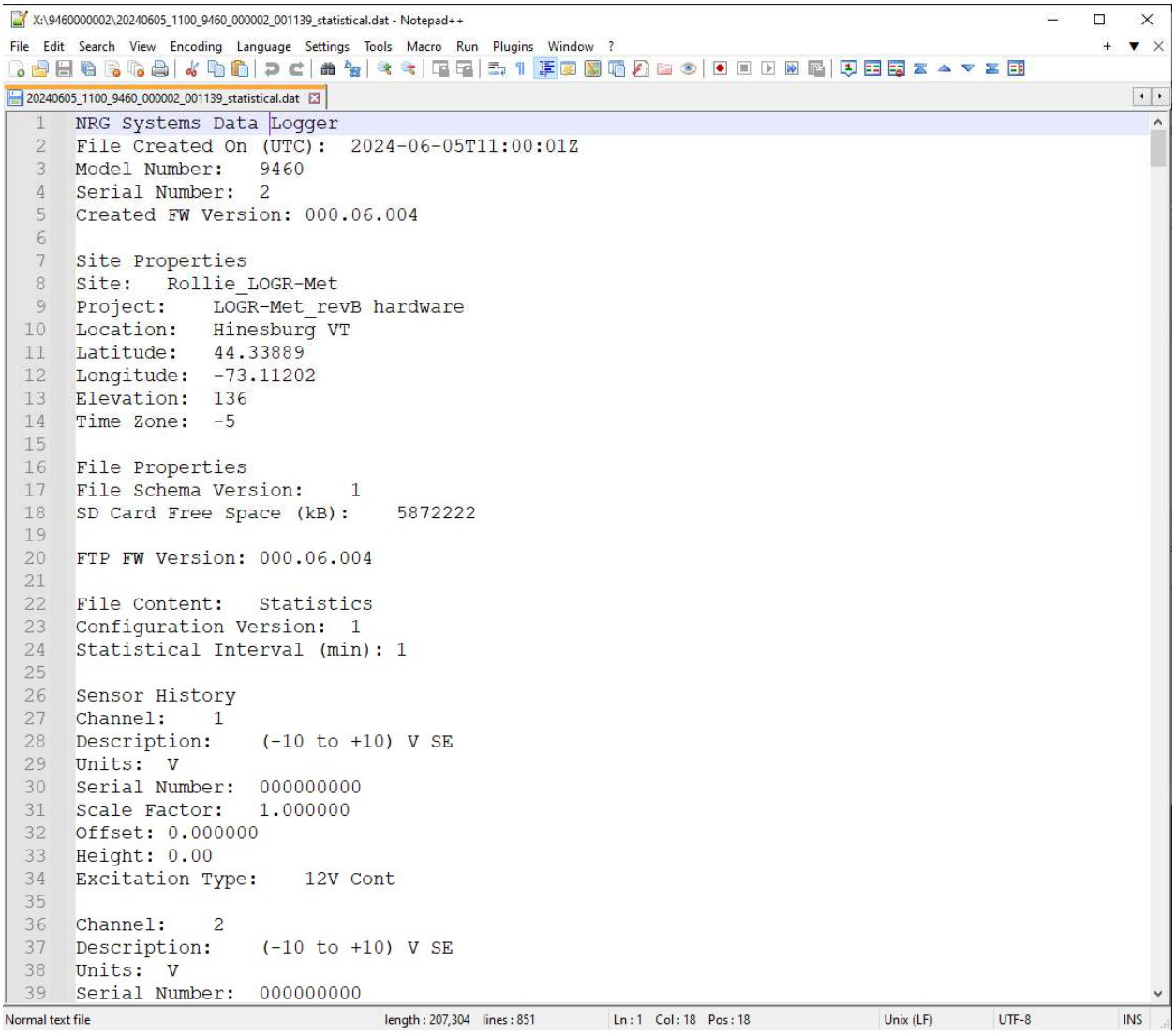
Note that SymphoniePRO loggers use logger local standard time for time stamps, which is different than LOGR|Met time stamps.

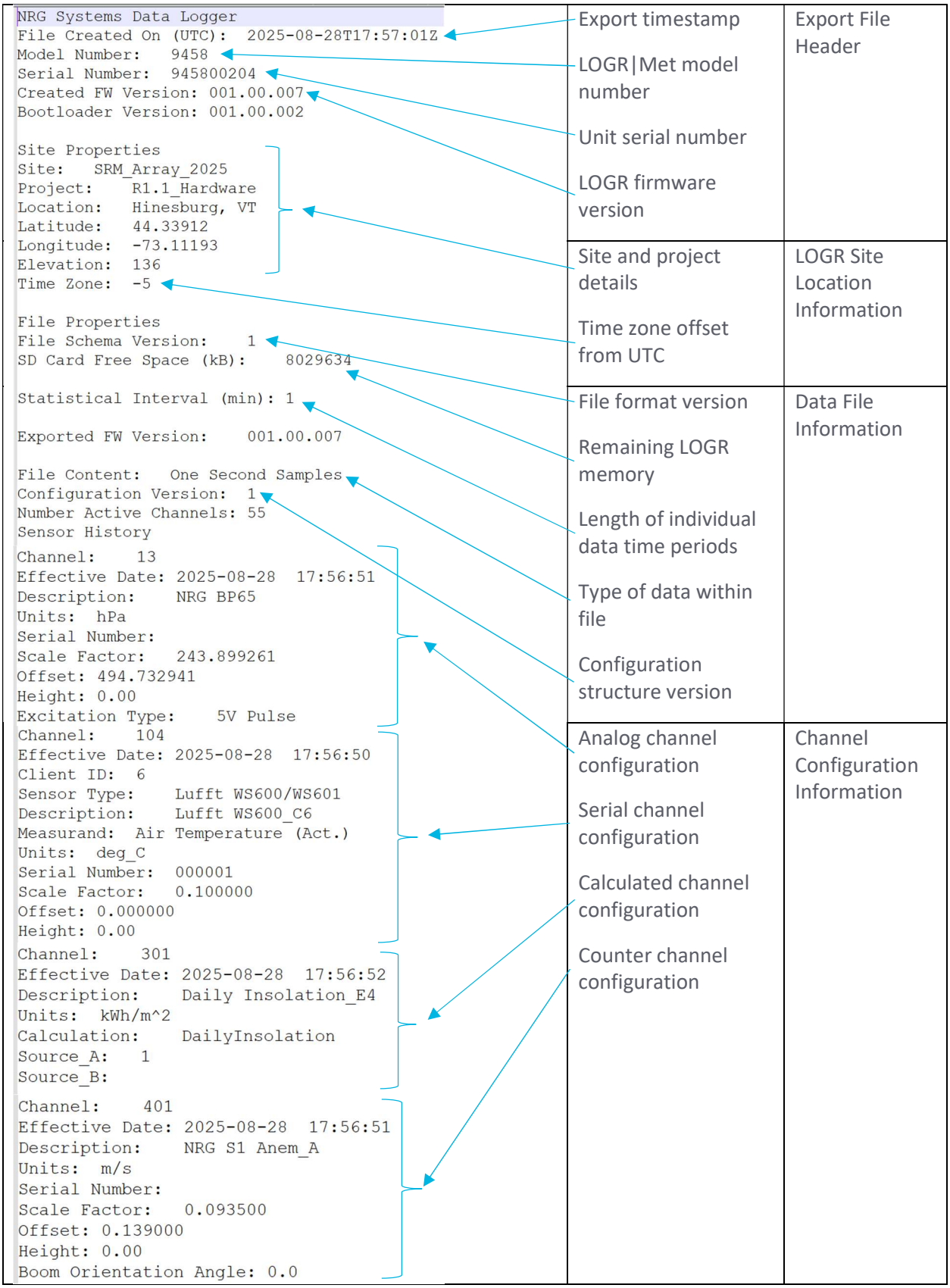
Files are transferred as ASCII (tab delimited) via SFTP, SMTP with TLS (no binary to ASCII conversion software is required by the receiver as needed with SymphoniePRO data files).

The NRG Python Package (optional) for LOGR|Solar is available and extendable to LOGR|Met. It assists with data processing transformations when building out custom data pipelines.

NRG Cloud (optional) provides data collection, storage, fleet management (administration of logger updates, configuration changes, data sharing).

Example exported data file:





```
NRG Systems Data Logger
File Created On (UTC):  2025-08-28T17:57:01Z
Model Number:   9458
Serial Number:  945800204
Created FW Version: 001.00.007
Bootloader Version: 001.00.002

Site Properties
Site:   SRM_Array_2025
Project:    R1.1_Hardware
Location:   Hinesburg, VT
Latitude:   44.33912
Longitude:  -73.11193
Elevation:  136
Time Zone:  -5

File Properties
File Schema Version:    1
SD Card Free Space (kB):    8029634

Statistical Interval (min): 1

Exported FW Version:    001.00.007

File Content:   One Second Samples
Configuration Version:  1
Number Active Channels: 55
Sensor History
Channel:    13
Effective Date: 2025-08-28  17:56:51
Description:    NRG BP65
Units:  hPa
Serial Number:
Scale Factor:   243.899261
Offset: 494.732941
Height: 0.00
Excitation Type:    5V Pulse
Channel:    104
Effective Date: 2025-08-28  17:56:50
Client ID:  6
Sensor Type:    Lufft WS600/WS601
Description:    Lufft WS600_C6
Measurand:  Air Temperature (Act.)
Units:  deg_C
Serial Number:  000001
Scale Factor:   0.100000
Offset: 0.000000
Height: 0.00
Channel:    301
Effective Date: 2025-08-28  17:56:52
Description:    Daily Insolation_E4
Units:  kWh/m^2
Calculation:    DailyInsolation
Source_A:   1
Source_B:
Channel:    401
Effective Date: 2025-08-28  17:56:51
Description:    NRG S1 Anem_A
Units:  m/s
Serial Number:
Scale Factor:   0.093500
Offset: 0.139000
Height: 0.00
Boom Orientation Angle: 0.0
```

Export timestamp LOGR|Met model number Unit serial number LOGR firmware version	Export File Header
Site and project details Time zone offset from UTC	LOGR Site Location Information
File format version Remaining LOGR memory Length of individual data time periods Type of data within file Configuration structure version	Data File Information
Analog channel configuration Serial channel configuration Calculated channel configuration Counter channel configuration	Channel Configuration Information

Samples Only data file:

Data			
Timestamp	Ch1_Samples_W/m^2	Ch3_Samples_W/m^2	Ch5_Samples_deg
2025-08-28T17:57:00Z	24.8592	42.6936	265
2025-08-28T17:57:01Z	24.9693	42.7617	265
2025-08-28T17:57:02Z	25.2127	42.9519	265
2025-08-28T17:57:03Z	25.2099	42.9519	265
2025-08-28T17:57:04Z	25.3199	42.9901	265
2025-08-28T17:57:05Z	25.4869	43.1337	265
2025-08-28T17:57:06Z	25.5204	43.1365	265
2025-08-28T17:57:07Z	25.6109	43.1664	265
2025-08-28T17:57:08Z	25.7657	43.296	265
2025-08-28T17:57:09Z	25.7181	43.2969	265
2025-08-28T17:57:10Z	25.7676	43.3221	265
2025-08-28T17:57:11Z	25.9242	43.4946	265
2025-08-28T17:57:12Z	25.8524	43.4807	265
2025-08-28T17:57:13Z	25.8897	43.517	265
2025-08-28T17:57:14Z	26.052	43.6672	265
2025-08-28T17:57:15Z	25.9793	43.6439	265
2025-08-28T17:57:16Z	26.0268	43.6886	265
2025-08-28T17:57:17Z	26.1481	43.7912	265

Stats Only data file:

Data				
Timestamp	Ch1_Avg_W/m^2	Ch1_Min_W/m^2	Ch1_Max_W/m^2	Ch1_SD_W/m^2
2025-08-28T17:57:00Z	26.0163	24.8592	26.2935	0.3319
2025-08-28T17:58:00Z	26.572	26.1294	27.1888	0.2903
2025-08-28T17:59:00Z	27.4909	27.117	28.0178	0.2436

Diagnostic data file format is also provided in plain text and consists of statistical data for individual boards.

Diagnostic data available:

- MCU board supply voltages and currents
- Analog board voltage and currents
- Counter board voltage and currents
- Serial board voltage and currents
- COM port excitation voltage and current
- Power and battery voltage inputs
- Battery charging circuit voltage and current
- Charging state and status

Event log file format is also provided in plain text and consists of information, activity, and fault events that could be useful to users and NRG technicians. A healthy logger will generate small event files. A typical full event file should look like the following:

```
1633635390, ACTION, SRVEL_ACT_DLGR_CREATING_NEW_PACKAGE_FILE, New Package: 70_1633635389_000201_001803.dat
1633635402, ACTION, SRVEL_ACT_ETH_INIT_START_FTP_CLIENT, Ethernet Init - Starting FTP Client
1633635402, INFO, SRVEL_INF_ETH_INIT_COMPLETE, Ethernet Initialization Complete
1633635403, ACTION, SRVEL_ACT_ETH_SNTP_TIME_UPDATED, SUBSYS_SNTP: NTP Time Adjusted by 4 seconds
1633635526, ACTION, SRVEL_ACT_ETH_START_DHCP_CLIENT, SUBSYS_ETHERNET: Eth Init - Starting DHCP Client....
1633635526, ACTION, SRVEL_ACT_ETH_DHCP_DISABLED_GETTING_IP_FROM_CFG, SUBSYS_ETH: DHCP disabled-getting IPAddress from cfg
1633635526, ACTION, SRVEL_ACT_ETH_INIT_START_DHCP_CLIENT, SUBSYS_ETHERNET: Eth Init - Starting DNS Client
1633635527, ACTION, SRVEL_ACT_ETH_INIT_START_SNTP_CLIENT, SUBSYS_ETHERNET: Eth Init - Starting SNTP Client
1633635527, ACTION, SRVEL_ACT_ETH_INIT_SNTP_CLIENT, SUBSYS_SNTP: Initializing Unicast Client
1633635527, INFO, SRVEL_INF_PRINTING_IP_ADDRESS, SNTP IP Address: 192.163.188. 77
1633635527, ACTION, SRVEL_ACT_ETH_STARTING_SNTP_CLIENT, SUBSYS_SNTP: Starting Unicast Client
1633635527, INFO, SRVEL_INF_ETH_WAITING_FOR_SNTP, SUBSYS_SNTP: Waiting 15 secs for server to respond
1633635536, ACTION, SRVEL_ACT_ETH_INIT_START_FTP_CLIENT, Ethernet Init - Starting FTP Client
1633635536, INFO, SRVEL_INF_ETH_INIT_COMPLETE, Ethernet Initialization Complete
1633635536, ACTION, SRVEL_ACT_ETH_SNTP_TIME_UPDATED, SUBSYS_SNTP: NTP Time Adjusted by -1 seconds
```

Physical Interfaces

Ethernet

LOGR|Met has two Ethernet ports supporting TCP/IP connections for integration with SCADA systems external routers or other networks.

Modbus RTU

LOGR|Met includes one Modbus RTU port, which can be configured with various baud rates and parity settings to support external devices polling the logger.

Wi-Fi

All LOGR|Met models include a compact Wi-Fi antenna (Item #20246), which enables local wireless access to the device. Attach the Wi-Fi antenna to the SMA port labeled “Wi-Fi” on the LOGR|Met enclosure.

Cellular

Cellular-enabled LOGR|Met models (e.g., #9459 and #9460) require at least one LTE antenna for cellular communication. Attach the provided LTE antenna (Item #17030) to the SMA port labeled “CELL”.
A standard SIM card compatible with LTE CAT 4 must be inserted for cellular functionality. LOGR|Met supports SIM cards from any carrier that supports this standard.

Cellular Diversity

The diversity antenna enhances LTE CAT 4 performance by reducing interference and enabling MIMO (Multiple Input, Multiple Output) communication. To use this feature, connect a second LTE antenna to the SMA port labeled “DIV.” This can be done with two separate antennas (CELL and DIV) or a single diversity antenna with two SMA connectors. For best results, space the antennas about 3 inches apart to minimize interference and improve reception.

GPS

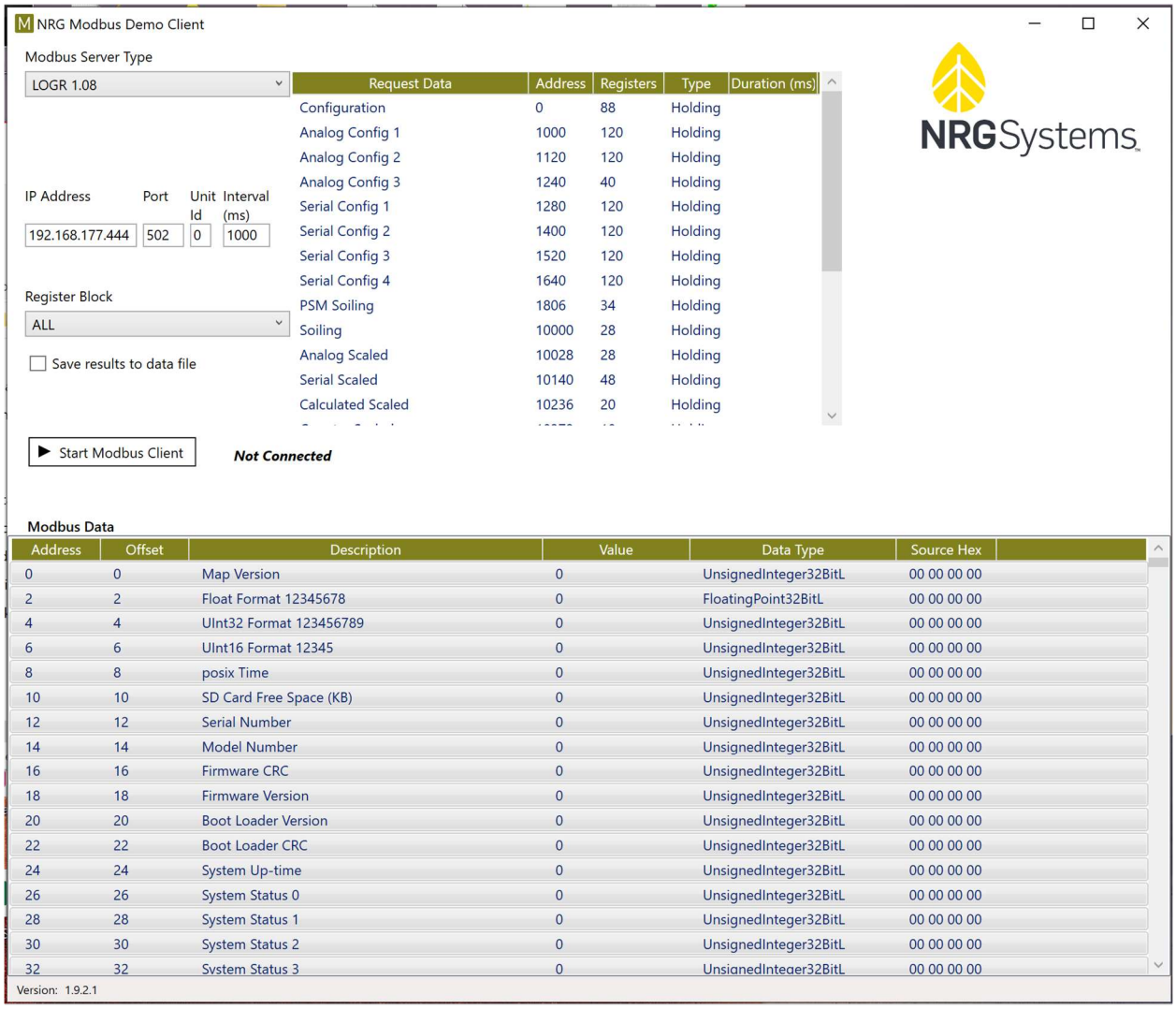
The GPS antenna provides satellite-based location and time synchronization for cellular-enabled LOGR|Met models. Attach the provided antenna (Item #20358) to the SMA port labeled “GPS” and mount with a clear view of the sky for optimal signal reception.

Modbus

Modbus Demo Client

The Modbus Demo Client is a free desktop software utility that facilitates installation where configuration of the LOGR Modbus server is required. The utility allows the user to read real-time values from the logger registers and can establish and troubleshoot the proper connectivity of the measurement system.

Note that **LOGR 1.08** should be selected from the *Modbus Server Type* dropdown menu in the upper left corner of the window to view the correct Modbus map configuration.



Access to the Modbus Demo Client is found here:

https://www.nrgsystems.com/support/product-support/software/ipackaccess-modbus-client-demonstration-application

Communication Schedules

NRG Cloud

NRG Cloud feature allows the logger to automatically connect to NRG Cloud at the user-defined time of day (e.g., 6:00 AM) and at a specified frequency interval (e.g., daily, every 2 days, etc.). Its primary

purpose is to transfer recorded data from the logger to the NRG Cloud for remote access and analysis as well as process queued commands from the cloud.

The logger connects to the cloud and asks for logger jobs to be performed.

- Send unsent data from logger to Cloud
- Pick up a firmware update from Cloud and apply to logger
- Reboot the logger

To connect LOGR to NRG Cloud the following is required:

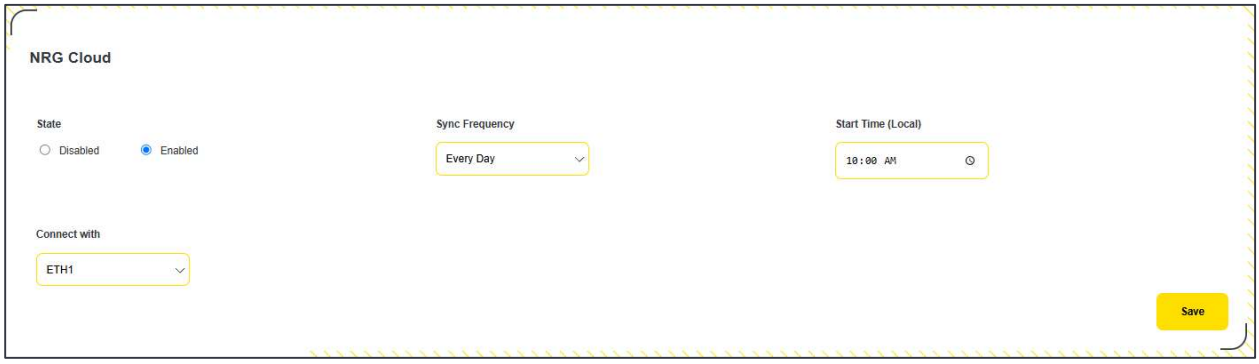
- An active NRG Cloud user account
- Network connection to the Cloud
    - Attached LTE modem with active data SIM (static IP SIM is not required)
    - Ethernet connection with access to the internet

Typical Settings

- NRG Cloud Schedule “Enabled”
- Sync Frequency “Every Day”
- Start Time “6:00AM”
- Connect with “ETH1 (Ext. Modem)”

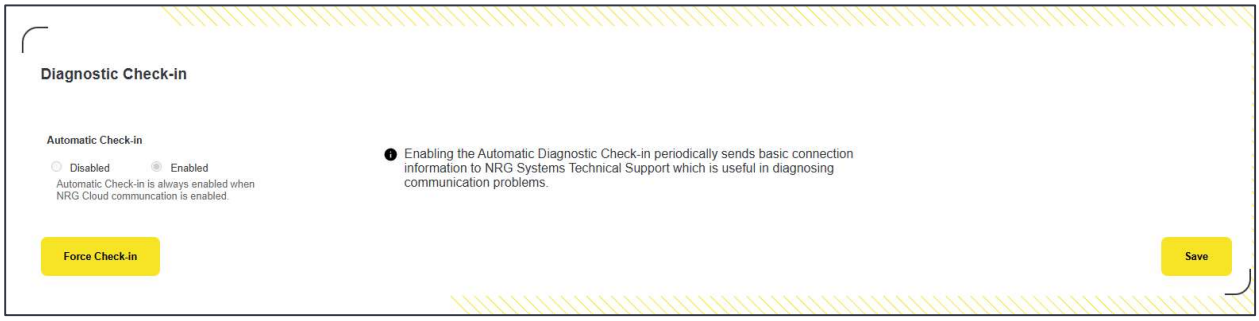
All NRG LOGR|Met data loggers are shipped “Cloud Enabled”, so the user does not need to enter any more username or passwords to achieve this functionality.

Diagnostic Check-in will be automatically enabled if cloud is enabled.



Diagnostic Check-in

If the Enable Diagnostic Check-In box is checked, basic connection status information is automatically sent to NRG Systems Technical Support once per day. This information can be useful in diagnosing fault states and communication problems. If the logger is configured to send data to NRG Cloud, the Diagnostic Check In is automatically enabled.



Logger Listening

Logger Listening allows inbound connections when using SIM cards with static IP addresses. To provide remote access, the external modem must be powered on. This can be accomplished by configuring the Logger Listening schedule to activate one of the logger's switched power outputs (OP1, OP2, or OP3), supplying power to the modem during the designated listening window. If the battery input measures below 12V, logger listening will not be enabled to conserve system power.

If the battery input measures below 12V, logger listening will not be enabled to conserve system power.

- Logger Listening "Enabled"
- Frequency "Every Day"
- Start Time "7:00AM"
- Listen For "4 hours" (understand the station battery capacity and load configuring this setting)
- Listen with "ETH1 (Ext. Modem)"

File Transfer Schedule

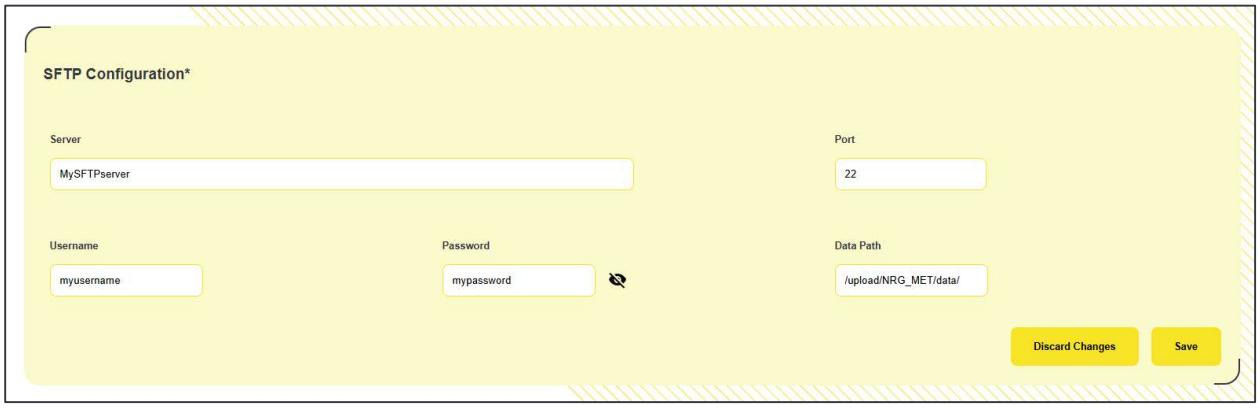
This feature allows the logger to send data by SFTP or SMTP (Email) to a properly configured, reachable SFTP or SMTP server. This occurs at the user-defined time of day (e.g., 6:00 AM) and at a specified

frequency interval (e.g., daily, every 2 days, etc.). The user also needs to select which ethernet interface (ETH1 or ETH2) communication will occur over, as well as the choice of file types to send. Its purpose is to transfer recorded data from the logger to the server. The user can retrieve data from the SFTP server using an SFTP client. In the case of SMTP, the user can retrieve data from their email account. It is not possible to use both SFTP and SMTP concurrently.

SFTP Configuration

Allows the user to specify the details of the SFTP server they wish to use. Note that LOGR|Met supports SFTP (standard port 22) and does not support unsecure FTP.

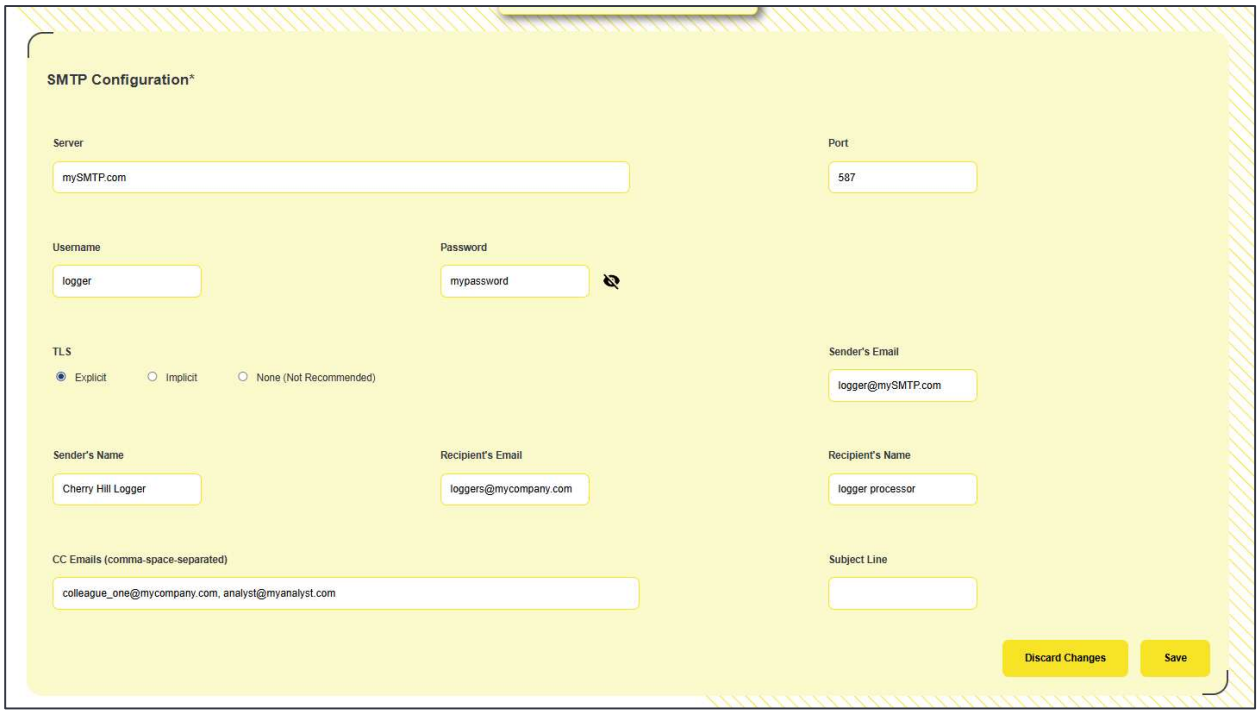
- Server IP / URL
- Port
- Username
- Password
- Data Path



SMTP Configuration

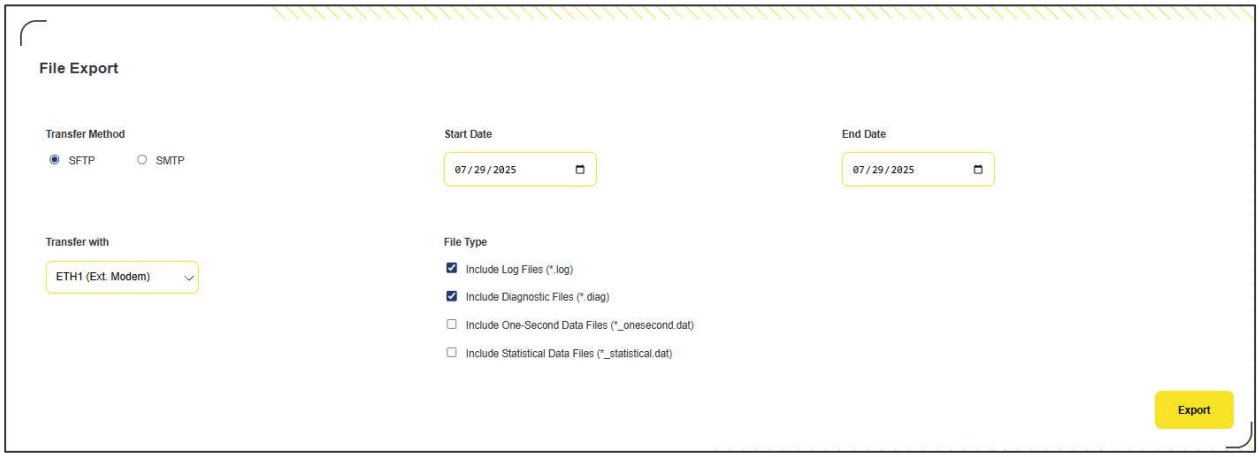
Allows the user to specify the details of the SMTP server they wish to use. Note that LOGR|Met supports Transport Layer Security (TLS) encryption. The server must be reachable by the logger and active.

- Server IP / URL
- Port (25 and 587 typical)
- Username
- Password
- TLS setting (Explicit is recommended as it is most flexible)
- Sender's Email (username@domainname of the SMTP server)
- Sender's Name
- Recipient's Email
- Recipient's Name
- CC Emails
- Subject Line



File Export

Allows the user to transfer files by SFTP or SMTP "on demand." The user can select the Transfer Method, start and end date, transfer with (ETH1 or ETH2) and File Types to send. Once the transfer is started it will continue in the background until completed or the transfer process can be overridden by starting a new on demand file export.



SECTION 6 | POWER SYSTEMS

Powering the LOGR|Met

LOGR|Met requires a DC power supply of **12 to 28 VDC** and typically consumes 125mA of current at 16 V (2W) when unloaded. Nominal supply voltage is 16 V. Power input can be provided by batteries, solar (PV), DC input source, or any combination of these.

Integrated Charge Controller

The LOGR|Met has an internal charge controller that will charge the battery connected to the “Battery” input when DC and/or PV power are available. To charge from the DC input, this supply must provide voltage greater than the battery voltage. For full charging, this requires DC supplies of 15V or more. The charge controller will limit the voltage and current to charge the battery fully and safely.

The battery charger provides Maximum Power Point Tracking (MPPT). When used with PV panels, the charger varies the current drawn from the charging source, to allow the panel to operate at the maximum power point. As insolation varies, the MPPT tracking delivers the maximum energy to the battery. When charging from voltage regulated DC power, the MPPT tracking will not significantly affect battery charging.

The charge controller has three power connections (DC, PV, Bat)

DC Input

The “DC” connection is intended to be connected to external power source providing DC power. The entire logger system can be powered from this input. Typical power sources are 12 to 24 V DC power supplies. The LOGR|Met power system will adapt to voltages as low as 10V and still provide 12 V excitation supplies to the attached sensors.

The DC Input is rated for up to 28 V DC.

PV Input

The “PV” connection is intended to be connected to a solar panel. The entire logger system can be powered from this input when PV power is available. The panel should be specified for 12 V charging, with a maximum power point above ~13 V. Panel power rating may vary depending on system needs.

As with the DC input, the PV Input is rated for up to 28 V DC. Suitable PV panels will have an open circuit voltage less than 28 V. As with the DC input, the PV input has overvoltage protection.

Battery Input

The “Battery” connection is intended to be connected directly to a 12 V (6 cells) lead-acid chemistry battery. The size (Amp-hour capacity) of the battery can vary depending on the application.

The entire logger system can be powered from this input. The LOGR|Met power system will adapt to voltages as low as 10V and still provide 12 V excitation supplies to the attached sensors.

When power is available at either the DC or PV input, the LOGR|Met will shift the load from the battery to the DC inputs, as well as charge the battery.

Powering Sensors

LOGR|Met provides one excitation output per port, supporting analog, counter, and serial sensor channels. Analog excitation can be configured for either 5V or 12V and operated in constant or pulsed mode. Pulsed excitation is ideal for sensors with rapid startup times, allowing the logger to briefly power the sensor, wait, take a reading, and then disable power. Some analog sensors require continuous power and are better suited to constant excitation mode. Counter and serial ports provide a constant 12V excitation. Each port includes a smart fuse that limits current draw to protect both the logger and sensors. Refer to the specifications table for maximum current available per port.

Grid-Tied Power Systems

If grid power is present, NRG provides a power supply system pre-configured to fit the standard LOGR shelter box. When using another power supply, review the Essential Safety Information section and ensure it is sized appropriately for the anticipated loads.

Autonomous Power Systems

For installations without grid power, or when backup power is required, NRG can provide a pre-configured power solution for a specific installation, based on the proven power systems technology used in our SRM Systems. Please inquire with the NRG Sales Department and provide the following information:

- Location (latitude and longitude)

- Desired days of backup capacity (typically 1 to 5 days)
- Sensors, or sensor power requirements (Watts)

SECTION 7 | TROUBLESHOOTING

Complete a functional check of the following items when troubleshooting an issue with a logger.

- If logger in not responding, check LED indicator lights for illumination and confirm power source is live and power supply configuration is accurate.
- If logger is powered but not accessible, confirm network configurations and internet resources such as time servers.
- View diagnostics via the web GUI and make note of any error indicators.
- If logger is not transmitting data, confirm communication configurations.
- Confirm External Modem connections to logger and network, antenna connections, and configurations including SIM card activation with service provider.
- Confirm logger antenna connections.
- If sensor is not communicating, confirm sensor wiring and trace cable to confirm it is undamaged. Swap in a known functional sensor to further troubleshoot. Check logger diagnostics to confirm sensor boards and terminal ports are functional.
- If logger UI live data does not match SCADA data, confirm the correct Modbus register is being polled.
- Confirm the microSD Card is inserted fully and correctly into the logger.

LED Light and Audible Indicators

Error Indicators

Indicator(s)	Condition
Red LED 1x/second Short sad beep 1x/minute	SD Card Error: Not present, read-only, corrupted, or not formatted.
Red LED solid Long continuous sad beep	Boot/Internal Circuit Error
Red LED 3x in a row, pauses, and repeats Short sad beep 1x/10 seconds	Modbus Sensor Read Error

Normal Indicators

Indicator(s)	Condition
Blue LED blinking	Wi-Fi SSID is available
Blue LED solid	Wi-Fi SSID is connected
Green LED blinking	Power startup routine in process
Green LED solid	Power status good; internal voltages are satisfactory
Red, Green, Blue LEDs blinking	Firmware update in progress
Audible Indicator 1x at top of hour	Operation normal

APPENDIX A | TECHNICAL SPECIFICATIONS

Please see nrgsystems.com for current product specifications.

NO MODEM (Model #9458)

DESCRIPTION	
Instrument type	NRG Data Logging Instrument
Applications	Wind Resource Assessment, Wind Resource Monitoring, Solar Resource Assessment, Solar Resource Monitoring, SCADA sensor interface
DATA COLLECTION	
Sampling interval	1 Hz (IEC 61724-1 and IEC 61400-12-1:2022 compliant)
Averaging interval	Selectable 1-minute (IEC 61724-1:2021 compliant), 5-minute, or 10-minute (IEC 61400-12-1:2022 compliant)
Real time clock	• Internal with battery backup • Time synchronization via SNTP
Storage medium	8 GB microSD card
Maximum data storage	>1 year (all data with maximum configuration)
Channel capacity	• Sixteen (16) analog channels (single-ended) or eight (8) differential • Selectable Excitation on each Analog port, 5 V or 12 V, constant or pulsed • Four Modbus ports; Up to Twenty-four (24) Modbus Sensors with up to 48 total Measurands • Ten (10) counter channels, with independent 12 V excitation on each • Twenty (20) calculated channels • Three (3) outputs to power external equipment including heater/ ventilators or external modems
Counter channels sensor compatibility	Built in support for a wide array of anemometers including: • NRG S1 or other opto anemometers • NRG 40C, Class 1, or compatible sine wave anemometers • Reed switch anemometers • Other frequency signals up to 2,500 Hz • Includes totalizer mode for tipping-bucket rain gauge and other accumulator sensors
Analog Channels Sensor Compatibility	Built in support for a wide array of analog sensors including: • NRG meteorological sensor suite (200M Wind Direction, T60 Temperature, BP65 Barometric Pressure, RH5X Relative Humidity, etc.) • Potentiometer wind vanes (NRG 200P, Thies, Wind Monitor) • Industry-standard analog pyranometers (Hukseflux SRxx series, EKO MS-xx series, Kipp & Zonen CMP series, etc.) • NRG PVT1 or other 10 kΩ NTC thermistors

	• RTD (Pt100, Pt1000) type temperature sensors
RS-485 Channels Sensor Compatibility	• Built-in support for most Modbus RTU sensors (including Hukseflux SR series) • Contact NRG to discuss support for additional model types or protocols.
Parameters recorded for each channel	• Average • Standard deviation • Minimum and maximum 1-s sample • Optionally records each 1-s sample • IEC 61400-12-1:2022 compliant; statistics reported depend on measurement type.
Data Delivery	Supported Protocols: • SMTP-TLS • SFTP
Security	• Password-protected web server access • Web server uses secure HTTPS • E-mail via secure SMTP • All file transfers via secure SFTP
Counter Channel Measurement Accuracy	• IEC 61400-12-1:2022 compliant • No missed pulses • Timebase accuracy 20 ppm

Analog Measurement Uncertainty (K=2)	• All voltage signal
	  ○ +/-10 V range, single-ended: 256.724 uV, differential: 579.338 uV
	  ○ +/- 1.2 V range, single-ended: 67.0302 uV, differential: 37.027 uV
	  ○ +/- 75 V range, single-ended: 60.647 uV, differential: 6.509 uV
	• Thermistor 10 kΩ NTC: 0.006°C
	• Pt100 RTD: 0.054 °C
	• Pt1000 RTD: 0.053 °C
	• 1 kΩ potentiometer wind vane: 0.063°
	• 10 kΩ potentiometer wind vane: 0.032°

RESOLUTION	
Analog measurement resolution	24-bit signed A/D conversion
SOFTWARE	
Type	• Onboard web server for logger configuration and administration • Modbus Demo Client for testing prior to connecting to SCADA
CONFIGURATION	
User interface	• Web browser on computer or smartphone connected on Ethernet or Wi-Fi

	• System configuration access and extensive diagnostics available via web interface • Wi-Fi wake/ sleep button • 3 LED indicators and audible beeper for user feedback • Recessed reset button on front panel
CONNECTIONS	
Sensor wiring	• 8 analog sensor wiring ports • Two single ended or one differential sensor per Analog port • Excitation configurable for 5 V or 12 V, up to 50 mA per Analog port to power sensors • Four (4) dedicated RS-485 sensor wiring ports • Excitation 12 V at up to 1 A per RS-485 port to power sensors • 10 Counter channel ports • Excitation 12 V, up to 50 mA per Counter port to power sensors • 2 outputs to control 12 V loads or relays • 1 output to control 5 V loads or relays • Enclosure ground lug connects to functional earth ground with included ground cable
Communication ports	• Ethernet port serves web access, SNTP, SFTP, SMTP email, or Modbus TCP. • Ethernet port connects to external modem for remote access • Modbus RTU port for connection to SCADA • Creates a Wi-Fi hot spot for web access using any computer or smartphone with Wi-Fi
POWER REQUIREMENTS	
Built in charge controller	• Combines DC power and PV power to charge battery and power the system • MPPT for PV input • Preconfigured for 12 V (6 cell) lead-acid batteries • Max 6 A charging
Batteries	Coin cell battery for clock backup
External power input	• DC (grid or other) 12 to 28 V DC, 15 A capacity • PV, 28 V max, 15 A capacity • Battery port for external 12 V lead-acid battery, 15 A capacity
INSTALLATION	
Mounting	35 mm DIN rail, 247 mm (13 U) wide
Tools required	• 2 mm flat blade screwdriver for wiring input terminals • 5/16" nut driver or wrench for ground terminal
Configuration and Diagnostics	Access configuration and diagnostics via an Ethernet or Wi-Fi connected device with web browser

ENVIRONMENTAL	
Operating temperature range	-40 °C to 65 °C (-40 °F to 149 °F)
Operating humidity range	• 0 to 100% relative humidity non-condensing • IP65 ingress protection with proper installation in NRG shelter box enclosure
PHYSICAL	
Dimensions	247 mm x 137 mm x 133 mm (9.72” x 5.39” x 5.24”)
MATERIALS	
Enclosure	Formed aluminum enclosure
SHIPPING	
Shipping weight	1.8 kg (4 lbs.) (with included grounding wire and sensor plug set)

APPENDIX B | MODBUS MAP

Address	Offset	Description	Type
0	0	Map Version	UnsignedInteger32BitL
2	2	Float Format 12345678	FloatingPoint32BitL
4	4	UInt32 Format 123456789	UnsignedInteger32BitL
6	6	UInt16 Format 12345	UnsignedInteger32BitL
8	8	posix Time	UnsignedInteger32BitL
10	10	SD Card Free Space (KB)	UnsignedInteger32BitL
12	12	Serial Number	UnsignedInteger32BitL
14	14	Model Number	UnsignedInteger32BitL
16	16	Firmware CRC	UnsignedInteger32BitL
18	18	Firmware Version	UnsignedInteger32BitL
20	20	Boot Loader Version	UnsignedInteger32BitL
22	22	Boot Loader CRC	UnsignedInteger32BitL
24	24	System Up-time	UnsignedInteger32BitL
26	26	System Status 0 Upper	UnsignedInteger16Bit
27	27	System Status 0 Lower	UnsignedInteger16Bit
28	28	System Status 1 Upper	UnsignedInteger16Bit
29	29	System Status 1 Lower	UnsignedInteger16Bit
30	30	System Status 2 Upper	UnsignedInteger16Bit
31	31	System Status 2 Lower	UnsignedInteger16Bit
32	32	System Status 3 Upper	UnsignedInteger16Bit
33	33	System Status 3 Lower	UnsignedInteger16Bit
34	34	System Status 4 Upper	UnsignedInteger16Bit
35	35	System Status 4 Lower	UnsignedInteger16Bit
36	36	System Status 5 Upper	UnsignedInteger16Bit
37	37	System Status 5 Lower	UnsignedInteger16Bit
38	38	System Status 6 Upper	UnsignedInteger16Bit
39	39	System Status 6 Lower	UnsignedInteger16Bit
40	40	System Status 7 Upper	UnsignedInteger16Bit
41	41	System Status 7 Lower	UnsignedInteger16Bit
42	42	Slave Baud	UnsignedInteger32BitL
44	44	Slave Parity	UnsignedInteger32BitL
46	46	Slave Data Bits	UnsignedInteger32BitL
48	48	Slave Stop Bits	UnsignedInteger32BitL
50	50	Slave Address	UnsignedInteger32BitL
52	52	cfgEth1DhcpEnabled	UnsignedInteger32BitL
54	54	cfgEth2DhcpEnabled	UnsignedInteger32BitL
56	56	calRefVoltage	UnsignedInteger32BitL
58	58	cardConfig	UnsignedInteger32BitL
60	60	cfgNetNtpEnabled	UnsignedInteger32BitL
62	62	siteName	UnsignedInteger32BitL
64	64	rolloverCounter	UnsignedInteger32BitL
66	66	Latitude	FloatingPoint32BitL

68	68	Longitude	FloatingPoint32BitL
70	70	Elevation	FloatingPoint32BitL
72	72	Timezone Offset (15 minutes)	FloatingPoint32BitL
74	74	Stat Interval	UnsignedInteger32BitL
76	76	Termination Register Enabled	UnsignedInteger32BitL
78	78	userSpare[0]	UnsignedInteger32BitL
80	80	userSpare[1]	UnsignedInteger32BitL
82	82	userSpare[2]	UnsignedInteger32BitL
84	84	userSpare[3]	UnsignedInteger32BitL
86	86	userSpare[4]	UnsignedInteger32BitL
88	88	userSpare[5]	UnsignedInteger32BitL
90	90	userSpare[6]	UnsignedInteger32BitL
92	92	userSpare[7]	UnsignedInteger32BitL
94	94	userSpare[8]	UnsignedInteger32BitL
96	96	userSpare[9]	UnsignedInteger32BitL
98	98	userSpare[10]	UnsignedInteger32BitL
100	100	userSpare[11]	UnsignedInteger32BitL
9000	0	Effective Irradiance Clean (G) channel 209	FloatingPoint32BitL
9002	2	Soiling Ratio Isc Index (SRIsc) channel 210	FloatingPoint32BitL
9004	4	Daily Soiling Ratio channel 211	FloatingPoint32BitL
9006	6	Effective Irradiance Soil (G) channel 212	FloatingPoint32BitL
9008	8	Number of Data Points for day channel 213	UnsignedInteger32BitL
9010	10	Temp coefficient of Isc_Clean (%)	FloatingPoint32BitL
9012	12	Temp coefficient of Isc_Soil (%)	FloatingPoint32BitL
9014	14	Temp coefficient of Voc_Clean (%)	FloatingPoint32BitL
9016	16	Temp coefficient of Voc_Soil (%)	FloatingPoint32BitL
9018	18	STC Irradiance	FloatingPoint32BitL
9020	20	STC Temperature	FloatingPoint32BitL
9022	22	PV Clean Isc at STC	FloatingPoint32BitL
9024	24	PV Soil Isc at STC	FloatingPoint32BitL
9026	26	Minimum Irradiance G to include	FloatingPoint32BitL
9028	28	Minutes to each side solar noon	UnsignedInteger32BitL
9030	30	Solar Noon Hour	UnsignedInteger32BitL
9032	32	Solar Noon Minute	UnsignedInteger32BitL
9034	34	Method	UnsignedInteger32BitL
10012	0	Analog Scaled Channel 1	FloatingPoint32BitL
10014	2	Analog Scaled Channel 2	FloatingPoint32BitL
10016	4	Analog Scaled Channel 3	FloatingPoint32BitL
10018	6	Analog Scaled Channel 4	FloatingPoint32BitL
10020	8	Analog Scaled Channel 5	FloatingPoint32BitL
10022	10	Analog Scaled Channel 6	FloatingPoint32BitL
10024	12	Analog Scaled Channel 7	FloatingPoint32BitL
10026	14	Analog Scaled Channel 8	FloatingPoint32BitL
10028	16	Analog Scaled Channel 9	FloatingPoint32BitL
10030	18	Analog Scaled Channel 10	FloatingPoint32BitL

10032	20	Analog Scaled Channel 11	FloatingPoint32BitL
10034	22	Analog Scaled Channel 12	FloatingPoint32BitL
10036	24	Analog Scaled Channel 13	FloatingPoint32BitL
10038	26	Analog Scaled Channel 14	FloatingPoint32BitL
10040	28	Analog Scaled Channel 15	FloatingPoint32BitL
10042	30	Analog Scaled Channel 16	FloatingPoint32BitL
10124	0	Serial Scaled Channel 101	FloatingPoint32BitL
10126	2	Serial Scaled Channel 102	FloatingPoint32BitL
10128	4	Serial Scaled Channel 103	FloatingPoint32BitL
10130	6	Serial Scaled Channel 104	FloatingPoint32BitL
10132	8	Serial Scaled Channel 105	FloatingPoint32BitL
10134	10	Serial Scaled Channel 106	FloatingPoint32BitL
10136	12	Serial Scaled Channel 107	FloatingPoint32BitL
10138	14	Serial Scaled Channel 108	FloatingPoint32BitL
10140	16	Serial Scaled Channel 109	FloatingPoint32BitL
10142	18	Serial Scaled Channel 110	FloatingPoint32BitL
10144	20	Serial Scaled Channel 111	FloatingPoint32BitL
10146	22	Serial Scaled Channel 112	FloatingPoint32BitL
10148	24	Serial Scaled Channel 113	FloatingPoint32BitL
10150	26	Serial Scaled Channel 114	FloatingPoint32BitL
10152	28	Serial Scaled Channel 115	FloatingPoint32BitL
10154	30	Serial Scaled Channel 116	FloatingPoint32BitL
10156	32	Serial Scaled Channel 117	FloatingPoint32BitL
10158	34	Serial Scaled Channel 118	FloatingPoint32BitL
10160	36	Serial Scaled Channel 119	FloatingPoint32BitL
10162	38	Serial Scaled Channel 120	FloatingPoint32BitL
10164	40	Serial Scaled Channel 121	FloatingPoint32BitL
10166	42	Serial Scaled Channel 122	FloatingPoint32BitL
10168	44	Serial Scaled Channel 123	FloatingPoint32BitL
10170	46	Serial Scaled Channel 124	FloatingPoint32BitL
10172	48	Serial Scaled Channel 125	FloatingPoint32BitL
10174	50	Serial Scaled Channel 126	FloatingPoint32BitL
10176	52	Serial Scaled Channel 127	FloatingPoint32BitL
10178	54	Serial Scaled Channel 128	FloatingPoint32BitL
10180	56	Serial Scaled Channel 129	FloatingPoint32BitL
10182	58	Serial Scaled Channel 130	FloatingPoint32BitL
10184	60	Serial Scaled Channel 131	FloatingPoint32BitL
10186	62	Serial Scaled Channel 132	FloatingPoint32BitL
10188	64	Serial Scaled Channel 133	FloatingPoint32BitL
10190	66	Serial Scaled Channel 134	FloatingPoint32BitL
10192	68	Serial Scaled Channel 135	FloatingPoint32BitL
10194	70	Serial Scaled Channel 136	FloatingPoint32BitL
10196	72	Serial Scaled Channel 137	FloatingPoint32BitL
10198	74	Serial Scaled Channel 138	FloatingPoint32BitL
10200	76	Serial Scaled Channel 139	FloatingPoint32BitL

10202	78	Serial Scaled Channel 140	FloatingPoint32BitL
10204	80	Serial Scaled Channel 141	FloatingPoint32BitL
10206	82	Serial Scaled Channel 142	FloatingPoint32BitL
10208	84	Serial Scaled Channel 143	FloatingPoint32BitL
10210	86	Serial Scaled Channel 144	FloatingPoint32BitL
10212	88	Serial Scaled Channel 145	FloatingPoint32BitL
10214	90	Serial Scaled Channel 146	FloatingPoint32BitL
10216	92	Serial Scaled Channel 147	FloatingPoint32BitL
10218	94	Serial Scaled Channel 148	FloatingPoint32BitL
10364	0	Calculated Scaled Channel 301	FloatingPoint32BitL
10366	2	Calculated Scaled Channel 302	FloatingPoint32BitL
10368	4	Calculated Scaled Channel 303	FloatingPoint32BitL
10370	6	Calculated Scaled Channel 304	FloatingPoint32BitL
10372	8	Calculated Scaled Channel 305	FloatingPoint32BitL
10374	10	Calculated Scaled Channel 306	FloatingPoint32BitL
10376	12	Calculated Scaled Channel 307	FloatingPoint32BitL
10378	14	Calculated Scaled Channel 308	FloatingPoint32BitL
10380	16	Calculated Scaled Channel 309	FloatingPoint32BitL
10382	18	Calculated Scaled Channel 310	FloatingPoint32BitL
10384	20	Calculated Scaled Channel 311	FloatingPoint32BitL
10386	22	Calculated Scaled Channel 312	FloatingPoint32BitL
10388	24	Calculated Scaled Channel 313	FloatingPoint32BitL
10390	26	Calculated Scaled Channel 314	FloatingPoint32BitL
10392	28	Calculated Scaled Channel 315	FloatingPoint32BitL
10394	30	Calculated Scaled Channel 316	FloatingPoint32BitL
10396	32	Calculated Scaled Channel 317	FloatingPoint32BitL
10398	34	Calculated Scaled Channel 318	FloatingPoint32BitL
10400	36	Calculated Scaled Channel 319	FloatingPoint32BitL
10402	38	Calculated Scaled Channel 320	FloatingPoint32BitL
10418	0	Counter Scaled Channel 401	FloatingPoint32BitL
10420	2	Counter Scaled Channel 402	FloatingPoint32BitL
10422	4	Counter Scaled Channel 403	FloatingPoint32BitL
10424	6	Counter Scaled Channel 404	FloatingPoint32BitL
10426	8	Counter Scaled Channel 405	FloatingPoint32BitL
10428	10	Counter Scaled Channel 406	FloatingPoint32BitL
10430	12	Counter Scaled Channel 407	FloatingPoint32BitL
10432	14	Counter Scaled Channel 408	FloatingPoint32BitL
10434	16	Counter Scaled Channel 409	FloatingPoint32BitL
10436	18	Counter Scaled Channel 410	FloatingPoint32BitL
15000	0	Year UTC	UnsignedInteger32BitL
15002	2	Month UTC	UnsignedInteger32BitL
15004	4	Day UTC	UnsignedInteger32BitL
15006	6	Hour UTC	UnsignedInteger32BitL
15008	8	Minute UTC	UnsignedInteger32BitL
15010	10	Second UTC	UnsignedInteger32BitL

15012	12	Analog Stats Channel 1 Average	FloatingPoint32BitL
15014	14	Analog Stats Channel 1 Min	FloatingPoint32BitL
15016	16	Analog Stats Channel 1 Max	FloatingPoint32BitL
15018	18	Analog Stats Channel 1 SD	FloatingPoint32BitL
15020	20	Analog Stats Channel 1 Unique	FloatingPoint32BitL
15022	22	Analog Stats Channel 2 Average	FloatingPoint32BitL
15024	24	Analog Stats Channel 2 Min	FloatingPoint32BitL
15026	26	Analog Stats Channel 2 Max	FloatingPoint32BitL
15028	28	Analog Stats Channel 2 SD	FloatingPoint32BitL
15030	30	Analog Stats Channel 2 Unique	FloatingPoint32BitL
15032	32	Analog Stats Channel 3 Average	FloatingPoint32BitL
15034	34	Analog Stats Channel 3 Min	FloatingPoint32BitL
15036	36	Analog Stats Channel 3 Max	FloatingPoint32BitL
15038	38	Analog Stats Channel 3 SD	FloatingPoint32BitL
15040	40	Analog Stats Channel 3 Unique	FloatingPoint32BitL
15042	42	Analog Stats Channel 4 Average	FloatingPoint32BitL
15044	44	Analog Stats Channel 4 Min	FloatingPoint32BitL
15046	46	Analog Stats Channel 4 Max	FloatingPoint32BitL
15048	48	Analog Stats Channel 4 SD	FloatingPoint32BitL
15050	50	Analog Stats Channel 4 Unique	FloatingPoint32BitL
15052	52	Analog Stats Channel 5 Average	FloatingPoint32BitL
15054	54	Analog Stats Channel 5 Min	FloatingPoint32BitL
15056	56	Analog Stats Channel 5 Max	FloatingPoint32BitL
15058	58	Analog Stats Channel 5 SD	FloatingPoint32BitL
15060	60	Analog Stats Channel 5 Unique	FloatingPoint32BitL
15062	62	Analog Stats Channel 6 Average	FloatingPoint32BitL
15064	64	Analog Stats Channel 6 Min	FloatingPoint32BitL
15066	66	Analog Stats Channel 6 Max	FloatingPoint32BitL
15068	68	Analog Stats Channel 6 SD	FloatingPoint32BitL
15070	70	Analog Stats Channel 6 Unique	FloatingPoint32BitL
15072	72	Analog Stats Channel 7 Average	FloatingPoint32BitL
15074	74	Analog Stats Channel 7 Min	FloatingPoint32BitL
15076	76	Analog Stats Channel 7 Max	FloatingPoint32BitL
15078	78	Analog Stats Channel 7 SD	FloatingPoint32BitL
15080	80	Analog Stats Channel 7 Unique	FloatingPoint32BitL
15082	82	Analog Stats Channel 8 Average	FloatingPoint32BitL
15084	84	Analog Stats Channel 8 Min	FloatingPoint32BitL
15086	86	Analog Stats Channel 8 Max	FloatingPoint32BitL
15088	88	Analog Stats Channel 8 SD	FloatingPoint32BitL
15090	90	Analog Stats Channel 8 Unique	FloatingPoint32BitL
15092	92	Analog Stats Channel 9 Average	FloatingPoint32BitL
15094	94	Analog Stats Channel 9 Min	FloatingPoint32BitL
15096	96	Analog Stats Channel 9 Max	FloatingPoint32BitL
15098	98	Analog Stats Channel 9 SD	FloatingPoint32BitL
15100	100	Analog Stats Channel 9 Unique	FloatingPoint32BitL

15102	102	Analog Stats Channel 10 Average	FloatingPoint32BitL
15104	104	Analog Stats Channel 10 Min	FloatingPoint32BitL
15106	106	Analog Stats Channel 10 Max	FloatingPoint32BitL
15108	108	Analog Stats Channel 10 SD	FloatingPoint32BitL
15110	110	Analog Stats Channel 10 Unique	FloatingPoint32BitL
15112	112	Analog Stats Channel 11 Average	FloatingPoint32BitL
15114	114	Analog Stats Channel 11 Min	FloatingPoint32BitL
15116	116	Analog Stats Channel 11 Max	FloatingPoint32BitL
15118	118	Analog Stats Channel 11 SD	FloatingPoint32BitL
15120	120	Analog Stats Channel 11 Unique	FloatingPoint32BitL
15122	122	Analog Stats Channel 12 Average	FloatingPoint32BitL
15124	124	Analog Stats Channel 12 Min	FloatingPoint32BitL
15126	126	Analog Stats Channel 12 Max	FloatingPoint32BitL
15128	128	Analog Stats Channel 12 SD	FloatingPoint32BitL
15130	130	Analog Stats Channel 12 Unique	FloatingPoint32BitL
15132	132	Analog Stats Channel 13 Average	FloatingPoint32BitL
15134	134	Analog Stats Channel 13 Min	FloatingPoint32BitL
15136	136	Analog Stats Channel 13 Max	FloatingPoint32BitL
15138	138	Analog Stats Channel 13 SD	FloatingPoint32BitL
15140	140	Analog Stats Channel 13 Unique	FloatingPoint32BitL
15142	142	Analog Stats Channel 14 Average	FloatingPoint32BitL
15144	144	Analog Stats Channel 14 Min	FloatingPoint32BitL
15146	146	Analog Stats Channel 14 Max	FloatingPoint32BitL
15148	148	Analog Stats Channel 14 SD	FloatingPoint32BitL
15150	150	Analog Stats Channel 14 Unique	FloatingPoint32BitL
15152	152	Analog Stats Channel 15 Average	FloatingPoint32BitL
15154	154	Analog Stats Channel 15 Min	FloatingPoint32BitL
15156	156	Analog Stats Channel 15 Max	FloatingPoint32BitL
15158	158	Analog Stats Channel 15 SD	FloatingPoint32BitL
15160	160	Analog Stats Channel 15 Unique	FloatingPoint32BitL
15162	162	Analog Stats Channel 16 Average	FloatingPoint32BitL
15164	164	Analog Stats Channel 16 Min	FloatingPoint32BitL
15166	166	Analog Stats Channel 16 Max	FloatingPoint32BitL
15168	168	Analog Stats Channel 16 SD	FloatingPoint32BitL
15170	170	Analog Stats Channel 16 Unique	FloatingPoint32BitL
15460	0	Serial Stats Channel 101 Average	FloatingPoint32BitL
15462	2	Serial Stats Channel 101 Min	FloatingPoint32BitL
15464	4	Serial Stats Channel 101 Max	FloatingPoint32BitL
15466	6	Serial Stats Channel 101 SD	FloatingPoint32BitL
15468	8	Serial Stats Channel 101 Unique	FloatingPoint32BitL
15470	10	Serial Stats Channel 102 Average	FloatingPoint32BitL
15472	12	Serial Stats Channel 102 Min	FloatingPoint32BitL
15474	14	Serial Stats Channel 102 Max	FloatingPoint32BitL
15476	16	Serial Stats Channel 102 SD	FloatingPoint32BitL
15478	18	Serial Stats Channel 102 Unique	FloatingPoint32BitL

15480	20	Serial Stats Channel 103 Average	FloatingPoint32BitL
15482	22	Serial Stats Channel 103 Min	FloatingPoint32BitL
15484	24	Serial Stats Channel 103 Max	FloatingPoint32BitL
15486	26	Serial Stats Channel 103 SD	FloatingPoint32BitL
15488	28	Serial Stats Channel 103 Unique	FloatingPoint32BitL
15490	30	Serial Stats Channel 104 Average	FloatingPoint32BitL
15492	32	Serial Stats Channel 104 Min	FloatingPoint32BitL
15494	34	Serial Stats Channel 104 Max	FloatingPoint32BitL
15496	36	Serial Stats Channel 104 SD	FloatingPoint32BitL
15498	38	Serial Stats Channel 104 Unique	FloatingPoint32BitL
15500	40	Serial Stats Channel 105 Average	FloatingPoint32BitL
15502	42	Serial Stats Channel 105 Min	FloatingPoint32BitL
15504	44	Serial Stats Channel 105 Max	FloatingPoint32BitL
15506	46	Serial Stats Channel 105 SD	FloatingPoint32BitL
15508	48	Serial Stats Channel 105 Unique	FloatingPoint32BitL
15510	50	Serial Stats Channel 106 Average	FloatingPoint32BitL
15512	52	Serial Stats Channel 106 Min	FloatingPoint32BitL
15514	54	Serial Stats Channel 106 Max	FloatingPoint32BitL
15516	56	Serial Stats Channel 106 SD	FloatingPoint32BitL
15518	58	Serial Stats Channel 106 Unique	FloatingPoint32BitL
15520	60	Serial Stats Channel 107 Average	FloatingPoint32BitL
15522	62	Serial Stats Channel 107 Min	FloatingPoint32BitL
15524	64	Serial Stats Channel 107 Max	FloatingPoint32BitL
15526	66	Serial Stats Channel 107 SD	FloatingPoint32BitL
15528	68	Serial Stats Channel 107 Unique	FloatingPoint32BitL
15530	70	Serial Stats Channel 108 Average	FloatingPoint32BitL
15532	72	Serial Stats Channel 108 Min	FloatingPoint32BitL
15534	74	Serial Stats Channel 108 Max	FloatingPoint32BitL
15536	76	Serial Stats Channel 108 SD	FloatingPoint32BitL
15538	78	Serial Stats Channel 108 Unique	FloatingPoint32BitL
15540	80	Serial Stats Channel 109 Average	FloatingPoint32BitL
15542	82	Serial Stats Channel 109 Min	FloatingPoint32BitL
15544	84	Serial Stats Channel 109 Max	FloatingPoint32BitL
15546	86	Serial Stats Channel 109 SD	FloatingPoint32BitL
15548	88	Serial Stats Channel 109 Unique	FloatingPoint32BitL
15550	90	Serial Stats Channel 110 Average	FloatingPoint32BitL
15552	92	Serial Stats Channel 110 Min	FloatingPoint32BitL
15554	94	Serial Stats Channel 110 Max	FloatingPoint32BitL
15556	96	Serial Stats Channel 110 SD	FloatingPoint32BitL
15558	98	Serial Stats Channel 110 Unique	FloatingPoint32BitL
15560	100	Serial Stats Channel 111 Average	FloatingPoint32BitL
15562	102	Serial Stats Channel 111 Min	FloatingPoint32BitL
15564	104	Serial Stats Channel 111 Max	FloatingPoint32BitL
15566	106	Serial Stats Channel 111 SD	FloatingPoint32BitL
15568	108	Serial Stats Channel 111 Unique	FloatingPoint32BitL

15570	110	Serial Stats Channel 112 Average	FloatingPoint32BitL
15572	112	Serial Stats Channel 112 Min	FloatingPoint32BitL
15574	114	Serial Stats Channel 112 Max	FloatingPoint32BitL
15576	116	Serial Stats Channel 112 SD	FloatingPoint32BitL
15578	118	Serial Stats Channel 112 Unique	FloatingPoint32BitL
15580	120	Serial Stats Channel 113 Average	FloatingPoint32BitL
15582	122	Serial Stats Channel 113 Min	FloatingPoint32BitL
15584	124	Serial Stats Channel 113 Max	FloatingPoint32BitL
15586	126	Serial Stats Channel 113 SD	FloatingPoint32BitL
15588	128	Serial Stats Channel 113 Unique	FloatingPoint32BitL
15590	130	Serial Stats Channel 114 Average	FloatingPoint32BitL
15592	132	Serial Stats Channel 114 Min	FloatingPoint32BitL
15594	134	Serial Stats Channel 114 Max	FloatingPoint32BitL
15596	136	Serial Stats Channel 114 SD	FloatingPoint32BitL
15598	138	Serial Stats Channel 114 Unique	FloatingPoint32BitL
15600	140	Serial Stats Channel 115 Average	FloatingPoint32BitL
15602	142	Serial Stats Channel 115 Min	FloatingPoint32BitL
15604	144	Serial Stats Channel 115 Max	FloatingPoint32BitL
15606	146	Serial Stats Channel 115 SD	FloatingPoint32BitL
15608	148	Serial Stats Channel 115 Unique	FloatingPoint32BitL
15610	150	Serial Stats Channel 116 Average	FloatingPoint32BitL
15612	152	Serial Stats Channel 116 Min	FloatingPoint32BitL
15614	154	Serial Stats Channel 116 Max	FloatingPoint32BitL
15616	156	Serial Stats Channel 116 SD	FloatingPoint32BitL
15618	158	Serial Stats Channel 116 Unique	FloatingPoint32BitL
15620	160	Serial Stats Channel 117 Average	FloatingPoint32BitL
15622	162	Serial Stats Channel 117 Min	FloatingPoint32BitL
15624	164	Serial Stats Channel 117 Max	FloatingPoint32BitL
15626	166	Serial Stats Channel 117 SD	FloatingPoint32BitL
15628	168	Serial Stats Channel 117 Unique	FloatingPoint32BitL
15630	170	Serial Stats Channel 118 Average	FloatingPoint32BitL
15632	172	Serial Stats Channel 118 Min	FloatingPoint32BitL
15634	174	Serial Stats Channel 118 Max	FloatingPoint32BitL
15636	176	Serial Stats Channel 118 SD	FloatingPoint32BitL
15638	178	Serial Stats Channel 118 Unique	FloatingPoint32BitL
15640	180	Serial Stats Channel 119 Average	FloatingPoint32BitL
15642	182	Serial Stats Channel 119 Min	FloatingPoint32BitL
15644	184	Serial Stats Channel 119 Max	FloatingPoint32BitL
15646	186	Serial Stats Channel 119 SD	FloatingPoint32BitL
15648	188	Serial Stats Channel 119 Unique	FloatingPoint32BitL
15650	190	Serial Stats Channel 120 Average	FloatingPoint32BitL
15652	192	Serial Stats Channel 120 Min	FloatingPoint32BitL
15654	194	Serial Stats Channel 120 Max	FloatingPoint32BitL
15656	196	Serial Stats Channel 120 SD	FloatingPoint32BitL
15658	198	Serial Stats Channel 120 Unique	FloatingPoint32BitL

15660	200	Serial Stats Channel 121 Average	FloatingPoint32BitL
15662	202	Serial Stats Channel 121 Min	FloatingPoint32BitL
15664	204	Serial Stats Channel 121 Max	FloatingPoint32BitL
15666	206	Serial Stats Channel 121 SD	FloatingPoint32BitL
15668	208	Serial Stats Channel 121 Unique	FloatingPoint32BitL
15670	210	Serial Stats Channel 122 Average	FloatingPoint32BitL
15672	212	Serial Stats Channel 122 Min	FloatingPoint32BitL
15674	214	Serial Stats Channel 122 Max	FloatingPoint32BitL
15676	216	Serial Stats Channel 122 SD	FloatingPoint32BitL
15678	218	Serial Stats Channel 122 Unique	FloatingPoint32BitL
15680	220	Serial Stats Channel 123 Average	FloatingPoint32BitL
15682	222	Serial Stats Channel 123 Min	FloatingPoint32BitL
15684	224	Serial Stats Channel 123 Max	FloatingPoint32BitL
15686	226	Serial Stats Channel 123 SD	FloatingPoint32BitL
15688	228	Serial Stats Channel 123 Unique	FloatingPoint32BitL
15690	230	Serial Stats Channel 124 Average	FloatingPoint32BitL
15692	232	Serial Stats Channel 124 Min	FloatingPoint32BitL
15694	234	Serial Stats Channel 124 Max	FloatingPoint32BitL
15696	236	Serial Stats Channel 124 SD	FloatingPoint32BitL
15698	238	Serial Stats Channel 124 Unique	FloatingPoint32BitL
15700	240	Serial Stats Channel 125 Average	FloatingPoint32BitL
15702	242	Serial Stats Channel 125 Min	FloatingPoint32BitL
15704	244	Serial Stats Channel 125 Max	FloatingPoint32BitL
15706	246	Serial Stats Channel 125 SD	FloatingPoint32BitL
15708	248	Serial Stats Channel 125 Unique	FloatingPoint32BitL
15710	250	Serial Stats Channel 126 Average	FloatingPoint32BitL
15712	252	Serial Stats Channel 126 Min	FloatingPoint32BitL
15714	254	Serial Stats Channel 126 Max	FloatingPoint32BitL
15716	256	Serial Stats Channel 126 SD	FloatingPoint32BitL
15718	258	Serial Stats Channel 126 Unique	FloatingPoint32BitL
15720	260	Serial Stats Channel 127 Average	FloatingPoint32BitL
15722	262	Serial Stats Channel 127 Min	FloatingPoint32BitL
15724	264	Serial Stats Channel 127 Max	FloatingPoint32BitL
15726	266	Serial Stats Channel 127 SD	FloatingPoint32BitL
15728	268	Serial Stats Channel 127 Unique	FloatingPoint32BitL
15730	270	Serial Stats Channel 128 Average	FloatingPoint32BitL
15732	272	Serial Stats Channel 128 Min	FloatingPoint32BitL
15734	274	Serial Stats Channel 128 Max	FloatingPoint32BitL
15736	276	Serial Stats Channel 128 SD	FloatingPoint32BitL
15738	278	Serial Stats Channel 128 Unique	FloatingPoint32BitL
15740	280	Serial Stats Channel 129 Average	FloatingPoint32BitL
15742	282	Serial Stats Channel 129 Min	FloatingPoint32BitL
15744	284	Serial Stats Channel 129 Max	FloatingPoint32BitL
15746	286	Serial Stats Channel 129 SD	FloatingPoint32BitL
15748	288	Serial Stats Channel 129 Unique	FloatingPoint32BitL

15750	290	Serial Stats Channel 130 Average	FloatingPoint32BitL
15752	292	Serial Stats Channel 130 Min	FloatingPoint32BitL
15754	294	Serial Stats Channel 130 Max	FloatingPoint32BitL
15756	296	Serial Stats Channel 130 SD	FloatingPoint32BitL
15758	298	Serial Stats Channel 130 Unique	FloatingPoint32BitL
15760	300	Serial Stats Channel 131 Average	FloatingPoint32BitL
15762	302	Serial Stats Channel 131 Min	FloatingPoint32BitL
15764	304	Serial Stats Channel 131 Max	FloatingPoint32BitL
15766	306	Serial Stats Channel 131 SD	FloatingPoint32BitL
15768	308	Serial Stats Channel 131 Unique	FloatingPoint32BitL
15770	310	Serial Stats Channel 132 Average	FloatingPoint32BitL
15772	312	Serial Stats Channel 132 Min	FloatingPoint32BitL
15774	314	Serial Stats Channel 132 Max	FloatingPoint32BitL
15776	316	Serial Stats Channel 132 SD	FloatingPoint32BitL
15778	318	Serial Stats Channel 132 Unique	FloatingPoint32BitL
15780	320	Serial Stats Channel 133 Average	FloatingPoint32BitL
15782	322	Serial Stats Channel 133 Min	FloatingPoint32BitL
15784	324	Serial Stats Channel 133 Max	FloatingPoint32BitL
15786	326	Serial Stats Channel 133 SD	FloatingPoint32BitL
15788	328	Serial Stats Channel 133 Unique	FloatingPoint32BitL
15790	330	Serial Stats Channel 134 Average	FloatingPoint32BitL
15792	332	Serial Stats Channel 134 Min	FloatingPoint32BitL
15794	334	Serial Stats Channel 134 Max	FloatingPoint32BitL
15796	336	Serial Stats Channel 134 SD	FloatingPoint32BitL
15798	338	Serial Stats Channel 134 Unique	FloatingPoint32BitL
15800	340	Serial Stats Channel 135 Average	FloatingPoint32BitL
15802	342	Serial Stats Channel 135 Min	FloatingPoint32BitL
15804	344	Serial Stats Channel 135 Max	FloatingPoint32BitL
15806	346	Serial Stats Channel 135 SD	FloatingPoint32BitL
15808	348	Serial Stats Channel 135 Unique	FloatingPoint32BitL
15810	350	Serial Stats Channel 136 Average	FloatingPoint32BitL
15812	352	Serial Stats Channel 136 Min	FloatingPoint32BitL
15814	354	Serial Stats Channel 136 Max	FloatingPoint32BitL
15816	356	Serial Stats Channel 136 SD	FloatingPoint32BitL
15818	358	Serial Stats Channel 136 Unique	FloatingPoint32BitL
15820	360	Serial Stats Channel 137 Average	FloatingPoint32BitL
15822	362	Serial Stats Channel 137 Min	FloatingPoint32BitL
15824	364	Serial Stats Channel 137 Max	FloatingPoint32BitL
15826	366	Serial Stats Channel 137 SD	FloatingPoint32BitL
15828	368	Serial Stats Channel 137 Unique	FloatingPoint32BitL
15830	370	Serial Stats Channel 138 Average	FloatingPoint32BitL
15832	372	Serial Stats Channel 138 Min	FloatingPoint32BitL
15834	374	Serial Stats Channel 138 Max	FloatingPoint32BitL
15836	376	Serial Stats Channel 138 SD	FloatingPoint32BitL
15838	378	Serial Stats Channel 138 Unique	FloatingPoint32BitL

15840	380	Serial Stats Channel 139 Average	FloatingPoint32BitL
15842	382	Serial Stats Channel 139 Min	FloatingPoint32BitL
15844	384	Serial Stats Channel 139 Max	FloatingPoint32BitL
15846	386	Serial Stats Channel 139 SD	FloatingPoint32BitL
15848	388	Serial Stats Channel 139 Unique	FloatingPoint32BitL
15850	390	Serial Stats Channel 140 Average	FloatingPoint32BitL
15852	392	Serial Stats Channel 140 Min	FloatingPoint32BitL
15854	394	Serial Stats Channel 140 Max	FloatingPoint32BitL
15856	396	Serial Stats Channel 140 SD	FloatingPoint32BitL
15858	398	Serial Stats Channel 140 Unique	FloatingPoint32BitL
15860	400	Serial Stats Channel 141 Average	FloatingPoint32BitL
15862	402	Serial Stats Channel 141 Min	FloatingPoint32BitL
15864	404	Serial Stats Channel 141 Max	FloatingPoint32BitL
15866	406	Serial Stats Channel 141 SD	FloatingPoint32BitL
15868	408	Serial Stats Channel 141 Unique	FloatingPoint32BitL
15870	410	Serial Stats Channel 142 Average	FloatingPoint32BitL
15872	412	Serial Stats Channel 142 Min	FloatingPoint32BitL
15874	414	Serial Stats Channel 142 Max	FloatingPoint32BitL
15876	416	Serial Stats Channel 142 SD	FloatingPoint32BitL
15878	418	Serial Stats Channel 142 Unique	FloatingPoint32BitL
15880	420	Serial Stats Channel 143 Average	FloatingPoint32BitL
15882	422	Serial Stats Channel 143 Min	FloatingPoint32BitL
15884	424	Serial Stats Channel 143 Max	FloatingPoint32BitL
15886	426	Serial Stats Channel 143 SD	FloatingPoint32BitL
15888	428	Serial Stats Channel 143 Unique	FloatingPoint32BitL
15890	430	Serial Stats Channel 144 Average	FloatingPoint32BitL
15892	432	Serial Stats Channel 144 Min	FloatingPoint32BitL
15894	434	Serial Stats Channel 144 Max	FloatingPoint32BitL
15896	436	Serial Stats Channel 144 SD	FloatingPoint32BitL
15898	438	Serial Stats Channel 144 Unique	FloatingPoint32BitL
15900	440	Serial Stats Channel 145 Average	FloatingPoint32BitL
15902	442	Serial Stats Channel 145 Min	FloatingPoint32BitL
15904	444	Serial Stats Channel 145 Max	FloatingPoint32BitL
15906	446	Serial Stats Channel 145 SD	FloatingPoint32BitL
15908	448	Serial Stats Channel 145 Unique	FloatingPoint32BitL
15910	450	Serial Stats Channel 146 Average	FloatingPoint32BitL
15912	452	Serial Stats Channel 146 Min	FloatingPoint32BitL
15914	454	Serial Stats Channel 146 Max	FloatingPoint32BitL
15916	456	Serial Stats Channel 146 SD	FloatingPoint32BitL
15918	458	Serial Stats Channel 146 Unique	FloatingPoint32BitL
15920	460	Serial Stats Channel 147 Average	FloatingPoint32BitL
15922	462	Serial Stats Channel 147 Min	FloatingPoint32BitL
15924	464	Serial Stats Channel 147 Max	FloatingPoint32BitL
15926	466	Serial Stats Channel 147 SD	FloatingPoint32BitL
15928	468	Serial Stats Channel 147 Unique	FloatingPoint32BitL

15930	470	Serial Stats Channel 148 Average	FloatingPoint32BitL
15932	472	Serial Stats Channel 148 Min	FloatingPoint32BitL
15934	474	Serial Stats Channel 148 Max	FloatingPoint32BitL
15936	476	Serial Stats Channel 148 SD	FloatingPoint32BitL
15938	478	Serial Stats Channel 148 Unique	FloatingPoint32BitL
16564	0	Calculated Stats Channel 301 Average	FloatingPoint32BitL
16566	2	Calculated Stats Channel 301 Min	FloatingPoint32BitL
16568	4	Calculated Stats Channel 301 Max	FloatingPoint32BitL
16570	6	Calculated Stats Channel 301 SD	FloatingPoint32BitL
16572	8	Calculated Stats Channel 302 Average	FloatingPoint32BitL
16574	10	Calculated Stats Channel 302 Min	FloatingPoint32BitL
16576	12	Calculated Stats Channel 302 Max	FloatingPoint32BitL
16578	14	Calculated Stats Channel 302 SD	FloatingPoint32BitL
16580	16	Calculated Stats Channel 303 Average	FloatingPoint32BitL
16582	18	Calculated Stats Channel 303 Min	FloatingPoint32BitL
16584	20	Calculated Stats Channel 303 Max	FloatingPoint32BitL
16586	22	Calculated Stats Channel 303 SD	FloatingPoint32BitL
16588	24	Calculated Stats Channel 304 Average	FloatingPoint32BitL
16590	26	Calculated Stats Channel 304 Min	FloatingPoint32BitL
16592	28	Calculated Stats Channel 304 Max	FloatingPoint32BitL
16594	30	Calculated Stats Channel 304 SD	FloatingPoint32BitL
16596	32	Calculated Stats Channel 305 Average	FloatingPoint32BitL
16598	34	Calculated Stats Channel 305 Min	FloatingPoint32BitL
16600	36	Calculated Stats Channel 305 Max	FloatingPoint32BitL
16602	38	Calculated Stats Channel 305 SD	FloatingPoint32BitL
16604	40	Calculated Stats Channel 306 Average	FloatingPoint32BitL
16606	42	Calculated Stats Channel 306 Min	FloatingPoint32BitL
16608	44	Calculated Stats Channel 306 Max	FloatingPoint32BitL
16610	46	Calculated Stats Channel 306 SD	FloatingPoint32BitL
16612	48	Calculated Stats Channel 307 Average	FloatingPoint32BitL
16614	50	Calculated Stats Channel 307 Min	FloatingPoint32BitL
16616	52	Calculated Stats Channel 307 Max	FloatingPoint32BitL
16618	54	Calculated Stats Channel 307 SD	FloatingPoint32BitL
16620	56	Calculated Stats Channel 308 Average	FloatingPoint32BitL
16622	58	Calculated Stats Channel 308 Min	FloatingPoint32BitL
16624	60	Calculated Stats Channel 308 Max	FloatingPoint32BitL
16626	62	Calculated Stats Channel 308 SD	FloatingPoint32BitL
16628	64	Calculated Stats Channel 309 Average	FloatingPoint32BitL
16630	66	Calculated Stats Channel 309 Min	FloatingPoint32BitL
16632	68	Calculated Stats Channel 309 Max	FloatingPoint32BitL
16634	70	Calculated Stats Channel 309 SD	FloatingPoint32BitL
16636	72	Calculated Stats Channel 310 Average	FloatingPoint32BitL
16638	74	Calculated Stats Channel 310 Min	FloatingPoint32BitL
16640	76	Calculated Stats Channel 310 Max	FloatingPoint32BitL
16642	78	Calculated Stats Channel 310 SD	FloatingPoint32BitL

16644	80	Calculated Stats Channel 311 Average	FloatingPoint32BitL
16646	82	Calculated Stats Channel 311 Min	FloatingPoint32BitL
16648	84	Calculated Stats Channel 311 Max	FloatingPoint32BitL
16650	86	Calculated Stats Channel 311 SD	FloatingPoint32BitL
16652	88	Calculated Stats Channel 312 Average	FloatingPoint32BitL
16654	90	Calculated Stats Channel 312 Min	FloatingPoint32BitL
16656	92	Calculated Stats Channel 312 Max	FloatingPoint32BitL
16658	94	Calculated Stats Channel 312 SD	FloatingPoint32BitL
16660	96	Calculated Stats Channel 313 Average	FloatingPoint32BitL
16662	98	Calculated Stats Channel 313 Min	FloatingPoint32BitL
16664	100	Calculated Stats Channel 313 Max	FloatingPoint32BitL
16666	102	Calculated Stats Channel 313 SD	FloatingPoint32BitL
16668	104	Calculated Stats Channel 314 Average	FloatingPoint32BitL
16670	106	Calculated Stats Channel 314 Min	FloatingPoint32BitL
16672	108	Calculated Stats Channel 314 Max	FloatingPoint32BitL
16674	110	Calculated Stats Channel 314 SD	FloatingPoint32BitL
16676	112	Calculated Stats Channel 315 Average	FloatingPoint32BitL
16678	114	Calculated Stats Channel 315 Min	FloatingPoint32BitL
16680	116	Calculated Stats Channel 315 Max	FloatingPoint32BitL
16682	118	Calculated Stats Channel 315 SD	FloatingPoint32BitL
16684	120	Calculated Stats Channel 316 Average	FloatingPoint32BitL
16686	122	Calculated Stats Channel 316 Min	FloatingPoint32BitL
16688	124	Calculated Stats Channel 316 Max	FloatingPoint32BitL
16690	126	Calculated Stats Channel 316 SD	FloatingPoint32BitL
16692	128	Calculated Stats Channel 317 Average	FloatingPoint32BitL
16694	130	Calculated Stats Channel 317 Min	FloatingPoint32BitL
16696	132	Calculated Stats Channel 317 Max	FloatingPoint32BitL
16698	134	Calculated Stats Channel 317 SD	FloatingPoint32BitL
16700	136	Calculated Stats Channel 318 Average	FloatingPoint32BitL
16702	138	Calculated Stats Channel 318 Min	FloatingPoint32BitL
16704	140	Calculated Stats Channel 318 Max	FloatingPoint32BitL
16706	142	Calculated Stats Channel 318 SD	FloatingPoint32BitL
16708	144	Calculated Stats Channel 319 Average	FloatingPoint32BitL
16710	146	Calculated Stats Channel 319 Min	FloatingPoint32BitL
16712	148	Calculated Stats Channel 319 Max	FloatingPoint32BitL
16714	150	Calculated Stats Channel 319 SD	FloatingPoint32BitL
16716	152	Calculated Stats Channel 320 Average	FloatingPoint32BitL
16718	154	Calculated Stats Channel 320 Min	FloatingPoint32BitL
16720	156	Calculated Stats Channel 320 Max	FloatingPoint32BitL
16722	158	Calculated Stats Channel 320 SD	FloatingPoint32BitL
16764	0	Counter Stats Channel 401 Average	FloatingPoint32BitL
16766	2	Counter Stats Channel 401 Min	FloatingPoint32BitL
16768	4	Counter Stats Channel 401 Max	FloatingPoint32BitL
16770	6	Counter Stats Channel 401 SD	FloatingPoint32BitL
16772	8	Counter Stats Channel 401 Unique	FloatingPoint32BitL

16774	10	Counter Stats Channel 401 Wind Stat	FloatingPoint32BitL
16776	12	Counter Stats Channel 402 Average	FloatingPoint32BitL
16778	14	Counter Stats Channel 402 Min	FloatingPoint32BitL
16780	16	Counter Stats Channel 402 Max	FloatingPoint32BitL
16782	18	Counter Stats Channel 402 SD	FloatingPoint32BitL
16784	20	Counter Stats Channel 402 Unique	FloatingPoint32BitL
16786	22	Counter Stats Channel 402 Wind Stat	FloatingPoint32BitL
16788	24	Counter Stats Channel 403 Average	FloatingPoint32BitL
16790	26	Counter Stats Channel 403 Min	FloatingPoint32BitL
16792	28	Counter Stats Channel 403 Max	FloatingPoint32BitL
16794	30	Counter Stats Channel 403 SD	FloatingPoint32BitL
16796	32	Counter Stats Channel 403 Unique	FloatingPoint32BitL
16798	34	Counter Stats Channel 403 Wind Stat	FloatingPoint32BitL
16800	36	Counter Stats Channel 404 Average	FloatingPoint32BitL
16802	38	Counter Stats Channel 404 Min	FloatingPoint32BitL
16804	40	Counter Stats Channel 404 Max	FloatingPoint32BitL
16806	42	Counter Stats Channel 404 SD	FloatingPoint32BitL
16808	44	Counter Stats Channel 404 Unique	FloatingPoint32BitL
16810	46	Counter Stats Channel 404 Wind Stat	FloatingPoint32BitL
16812	48	Counter Stats Channel 405 Average	FloatingPoint32BitL
16814	50	Counter Stats Channel 405 Min	FloatingPoint32BitL
16816	52	Counter Stats Channel 405 Max	FloatingPoint32BitL
16818	54	Counter Stats Channel 405 SD	FloatingPoint32BitL
16820	56	Counter Stats Channel 405 Unique	FloatingPoint32BitL
16822	58	Counter Stats Channel 405 Wind Stat	FloatingPoint32BitL
16824	60	Counter Stats Channel 406 Average	FloatingPoint32BitL
16826	62	Counter Stats Channel 406 Min	FloatingPoint32BitL
16828	64	Counter Stats Channel 406 Max	FloatingPoint32BitL
16830	66	Counter Stats Channel 406 SD	FloatingPoint32BitL
16832	68	Counter Stats Channel 406 Unique	FloatingPoint32BitL
16834	70	Counter Stats Channel 406 Wind Stat	FloatingPoint32BitL
16836	72	Counter Stats Channel 407 Average	FloatingPoint32BitL
16838	74	Counter Stats Channel 407 Min	FloatingPoint32BitL
16840	76	Counter Stats Channel 407 Max	FloatingPoint32BitL
16842	78	Counter Stats Channel 407 SD	FloatingPoint32BitL
16844	80	Counter Stats Channel 407 Unique	FloatingPoint32BitL
16846	82	Counter Stats Channel 407 Wind Stat	FloatingPoint32BitL
16848	84	Counter Stats Channel 408 Average	FloatingPoint32BitL
16850	86	Counter Stats Channel 408 Min	FloatingPoint32BitL
16852	88	Counter Stats Channel 408 Max	FloatingPoint32BitL
16854	90	Counter Stats Channel 408 SD	FloatingPoint32BitL
16856	92	Counter Stats Channel 408 Unique	FloatingPoint32BitL
16858	94	Counter Stats Channel 408 Wind Stat	FloatingPoint32BitL
16860	96	Counter Stats Channel 409 Average	FloatingPoint32BitL
16862	98	Counter Stats Channel 409 Min	FloatingPoint32BitL

16864	100	Counter Stats Channel 409 Max	FloatingPoint32BitL
16866	102	Counter Stats Channel 409 SD	FloatingPoint32BitL
16868	104	Counter Stats Channel 409 Unique	FloatingPoint32BitL
16870	106	Counter Stats Channel 409 Wind Stat	FloatingPoint32BitL
16872	108	Counter Stats Channel 410 Average	FloatingPoint32BitL
16874	110	Counter Stats Channel 410 Min	FloatingPoint32BitL
16876	112	Counter Stats Channel 410 Max	FloatingPoint32BitL
16878	114	Counter Stats Channel 410 SD	FloatingPoint32BitL
16880	116	Counter Stats Channel 410 Unique	FloatingPoint32BitL
16882	118	Counter Stats Channel 410 Wind Stat	FloatingPoint32BitL
10510	0	Analog Diagnostics 12V7	FloatingPoint32BitL
10512	2	Analog Diagnostics 5V	FloatingPoint32BitL
10514	4	Analog Diagnostics 3V3	FloatingPoint32BitL
10516	6	Analog Diagnostics 15V1-AVDD	FloatingPoint32BitL
10518	8	Analog Diagnostics 15V1-AVEE	FloatingPoint32BitL
10520	10	Analog Diagnostics 5V REF	FloatingPoint32BitL
10522	12	Analog Diagnostics 5V0-AVDD	FloatingPoint32BitL
10524	14	Analog Diagnostics 12V-EXC	FloatingPoint32BitL
10526	16	Analog Diagnostics EXC-ISENSE / A1	FloatingPoint32BitL
10528	18	Analog Diagnostics EXC-ISENSE / A2	FloatingPoint32BitL
10530	20	Analog Diagnostics EXC-ISENSE / A3	FloatingPoint32BitL
10532	22	Analog Diagnostics EXC-ISENSE / A4	FloatingPoint32BitL
10534	24	Analog Diagnostics EXC-ISENSE / A5	FloatingPoint32BitL
10536	26	Analog Diagnostics EXC-ISENSE / A6	FloatingPoint32BitL
10538	28	Analog Diagnostics EXC-ISENSE / A7	FloatingPoint32BitL
10540	30	Analog Diagnostics EXC-ISENSE / A8	FloatingPoint32BitL
10542	32	Analog Diagnostics EXC-VSENSE A1	FloatingPoint32BitL
10544	34	Analog Diagnostics EXC-VSENSE A2	FloatingPoint32BitL
10546	36	Analog Diagnostics EXC-VSENSE A3	FloatingPoint32BitL
10548	38	Analog Diagnostics EXC-VSENSE A4	FloatingPoint32BitL
10550	40	Analog Diagnostics EXC-VSENSE A5	FloatingPoint32BitL
10552	42	Analog Diagnostics EXC-VSENSE A6	FloatingPoint32BitL
10554	44	Analog Diagnostics EXC-VSENSE A7	FloatingPoint32BitL
10556	46	Analog Diagnostics EXC-VSENSE A8	FloatingPoint32BitL
10586	0	Serial Diagnostics DC Grid Input	FloatingPoint32BitL
10588	2	Serial Diagnostics PV Panel Input	FloatingPoint32BitL
10590	4	Serial Diagnostics 12V7-VSENSE	FloatingPoint32BitL
10592	6	Serial Diagnostics 12V7-ISENSE	FloatingPoint32BitL
10594	8	Serial Diagnostics 5V0-ISENSE	FloatingPoint32BitL
10596	10	Serial Diagnostics 5V0-VSENSE	FloatingPoint32BitL
10598	12	Serial Diagnostics 3V3-ISENSE	FloatingPoint32BitL
10600	14	Serial Diagnostics 3V3-VSENSE	FloatingPoint32BitL
10602	16	Serial Diagnostics EXC-VSENSE COMD	FloatingPoint32BitL
10604	18	Serial Diagnostics EXC-ISENSE COMD	FloatingPoint32BitL
10606	20	Serial Diagnostics EXC-VSENSE COMC	FloatingPoint32BitL

10608	22	Serial Diagnostics EXC-ISENSE COMC	FloatingPoint32BitL
10610	24	Serial Diagnostics EXC-VSENSE COMB	FloatingPoint32BitL
10612	26	Serial Diagnostics EXC-ISENSE COMB	FloatingPoint32BitL
10614	28	Serial Diagnostics EXC-VSENSE COMA	FloatingPoint32BitL
10616	30	Serial Diagnostics EXC-ISENSE COMA	FloatingPoint32BitL
10618	32	Serial Diagnostics SDI-VSENSE	FloatingPoint32BitL
10620	34	Serial Diagnostics SDI-ISENSE	FloatingPoint32BitL
10622	36	Serial Diagnostics 232-VSENSE	FloatingPoint32BitL
10624	38	Serial Diagnostics 232-ISENSE	FloatingPoint32BitL
10626	40	Serial Diagnostics VSENSE OP1 (V)	FloatingPoint32BitL
10628	42	Serial Diagnostics ISENSE OP1 (A)	FloatingPoint32BitL
10630	44	Serial Diagnostics VSENSE OP2 (V)	FloatingPoint32BitL
10632	46	Serial Diagnostics ISENSE OP2 (A)	FloatingPoint32BitL
10634	48	Serial Diagnostics VSENSE OP3 (V)	FloatingPoint32BitL
10636	50	Serial Diagnostics ISENSE OP3 (A)	FloatingPoint32BitL
10678	0	Counter Diagnostics 12V7	FloatingPoint32BitL
10680	2	Counter Diagnostics 3V3	FloatingPoint32BitL
10682	4	Counter Diagnostics ISENSE 1	FloatingPoint32BitL
10684	6	Counter Diagnostics ISENSE 2	FloatingPoint32BitL
10686	8	Counter Diagnostics ISENSE 3	FloatingPoint32BitL
10688	10	Counter Diagnostics ISENSE 4	FloatingPoint32BitL
10690	12	Counter Diagnostics ISENSE 5	FloatingPoint32BitL
10692	14	Counter Diagnostics ISENSE 6	FloatingPoint32BitL
10694	16	Counter Diagnostics ISENSE 7	FloatingPoint32BitL
10696	18	Counter Diagnostics ISENSE 8	FloatingPoint32BitL
10698	20	Counter Diagnostics ISENSE 9	FloatingPoint32BitL
10700	22	Counter Diagnostics ISENSE 10	FloatingPoint32BitL
432	0	Analog Board Fault Lower 32 bits	UnsignedInteger32BitL
434	2	Analog Board Fault Upper 32 bits	UnsignedInteger32BitL
754	0	Counter Board Fault Lower 32 bits	UnsignedInteger32BitL
756	2	Counter Board Fault Upper 32 bits	UnsignedInteger32BitL
1018	0	Serial Board Fault Bits 0-15 Fault	UnsignedInteger16Bit
1019	1	Serial Board Fault Bits 16-32 Fault	UnsignedInteger16Bit
1020	2	Serial Board Fault Bits 32-49 Fault	UnsignedInteger16Bit
1021	3	Serial Board Fault Bits 48-66 Fault	UnsignedInteger16Bit
10474	0	Main Power Rail 12V7-MON	FloatingPoint32BitL
10476	2	Main Power Rail 3V3-MON	FloatingPoint32BitL
342	0	Battery Charger Battery Voltage	FloatingPoint32BitL
344	2	Battery Charger Battery Current	FloatingPoint32BitL
346	4	Battery Charger System Voltage	FloatingPoint32BitL
348	6	Battery Charger Input Voltage	FloatingPoint32BitL
350	8	Battery Charger Input Current	FloatingPoint32BitL
352	10	Battery Charger State	UnsignedInteger32BitL
354	12	Battery Charger Status	UnsignedInteger32BitL
356	14	Battery Charger Battery Chemistry	UnsignedInteger32BitL

APPENDIX C | DECLARATIONS OF CONFORMITY

To view current Declarations of Conformity including CE, China RoHS, and others, visit the following page: [NRG LOGR|Met Declarations of Conformity]

APPENDIX D | WARRANTY

NRG Systems (NRG) warrants its products for a period of two years from date of original purchase solely for the benefit of the original consumer purchaser. If this product is determined to be defective in materials or workmanship, NRG will, at NRG's option, repair or replace this product without charge. This warranty does not cover damage due to improper installation or use, accident or misuse, damages due to any unauthorized service or lightning. This warranty also will not apply if any seal on any instrument or sensor is broken, if any internal components have been manipulated, if any cable has been severed, or the equipment was not adequately grounded.

To return a defective product, request a Service Request (SR) number by calling us at the number below or by emailing Technical Services at support@nrgsystems.com.

Please provide the serial number of the item as well as date of purchase. No products will be accepted for warranty work without an SR number. The product must be returned, postage prepaid, to NRG with a brief description of the problem, SR number and a return address with phone number.

The foregoing limited warranty is given in lieu of all other warranties, express or implied. NRG specifically disclaims all implied warranties including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose.

The above limited warranty expressly excludes, and NRG shall not be liable for, any incidental or consequential damages caused by or related to the selection, use of, inability to use, or malfunction of this product.

NRG will make a good faith effort to repair or replace promptly any product which proves to be defective within the warranty period. First, contact NRG or the representative from whom the product was purchased and ask for an SR number. Inspect shipments for damage to packages or missing items immediately upon receipt. Record any such exceptions on the freight receipt of the delivery agent. If any contents are damaged or missing, report this in writing to the freight carrier and send NRG a copy of the damage report. If the shipment has been insured, report any damages to the insurance carrier.

Sending Items for Repair

International Customers

1. Contact NRG Systems by phone or email to obtain a Service Request (SR) number. Write the SR number clearly on all shipping cartons.

Tel: 802-482-2255

Email: *support@nrgsystems.com*

Website: *nrgsystems.com/support/customer-support/*

Before sending the repair item to NRG Systems, check with your local customs authorities about provisions in your country for exporting and re-importing repair items. Some countries treat repair shipments like new shipments and charge import duties and taxes again upon re-importation. Other countries have specific steps to follow or specific forms to complete which help reduce the import duties upon re-import of the item.

2. **Send your item to NRG Systems "Delivery Duty Paid"** (see address below) using a door-to-door courier service such as UPS, FedEx, or DHL. If the repair is not urgent, please send your package by Airmail. (Courier services deliver the package directly to us, customs cleared.)

3. ***NRG Systems will not accept packages shipped Freight Collect or with Collect charges.***

If NRG Systems refuses the shipment, the courier service will charge your account return freight charges.

4. ***DO NOT send return items by direct or consolidated air freight service with an airline.***

The cost for air freight may seem lower than the courier service, but air freight costs do not include customs clearance, airport handling, break bulk fees, and inland delivery to NRG Systems.

5. **Attach a Commercial Invoice** to the carton. The Commercial Invoice should include the following information:

Name and address of the shipper.

NRG Systems' complete address and telephone number as the consignee.

Description of the item(s) being returned.

Quantity of each item being returned.

Value for customs / insurance (purchase price or replacement cost).

Number of cartons with respective weights and dimensions.

Please include the following statement to avoid paying US import duties:

Example of ship to address:

NRG Systems
Attn: SR# _____
110 Riggs Road
Hinesburg, VT 05461 USA
1-802-482-2255

"These items are being returned to their U.S. manufacturer. Country of manufacture and origin is USA, HTS CODE 9801.00.1012."

6. **Pack your repair item in a sturdy packing carton.** Tag each item with a brief description of the problem.

7. **Insure your shipment** against damage or loss in transit. Be sure to check the appropriate box and enter a "Value for Carriage" (insurance) on your air waybill. The value is the purchase price of the equipment or what it would cost to replace the equipment if the shipment were lost. Keep a record of the tracking number.

Once your item arrives, we will assess the item and notify you of the repair cost. Any repair charges and freight costs, if applicable, are payable before NRG Systems will return the repaired item to you via door-to-door courier service. NRG Systems will send you a shipment advisement when the repaired item has shipped.

US Customers

Please see items 1, 3, 6, and 7 above. Send your item(s) to NRG Systems "**Freight Prepaid and Insured**." **Shipments sent Freight Collect will not be accepted by NRG Systems.**

APPENDIX E | REFERENCES

Daniel R, Deceglie MG, Micheli L, Muller M. 2017. *Time series analysis of photovoltaic soiling station data: version 1.0* [Internet]. Golden (CO): National Renewable Energy Laboratory and Colorado School of Mines; [cited 2025 Sep 16]. Available from: https://www.nrel.gov/docs/fy17osti/69131.pdf

Lawrence MG. 2005. The relationship between relative humidity and the dewpoint temperature in moist air: a simple conversion and applications. *Bull Am Meteorol Soc*. 86(2):225–233.

World Meteorological Organization (WMO). 2022. *Task Team – GCOS Surface Reference Network (TT-GSRN) implementation of a pilot network requirements and station nomination: version 5.0* [Internet]. Geneva (CH): WMO; [cited 2025 Sep 16]. Available from: https://extranet.wmo.int/edistrib_exped/grp_has/_ar/Archives%202011_2022/Archives%202022/27831-2022-I-GCOS-GSRN-PS_ar.pdf

Andrews R, Holmgren W, Lorenzo T, Hansen C. 2025. *pvlib/solarposition.py* [Internet]. Tucson (AZ): GitHub; [cited 2025 Sep 16]. Available from: https://github.com/pvlib/pvlib-python/blob/main/pvlib/solarposition.py#L34-L129

APPENDIX F | SOLAR ACCESSORIES

NRG Pulsed Soiling Measurement Kit

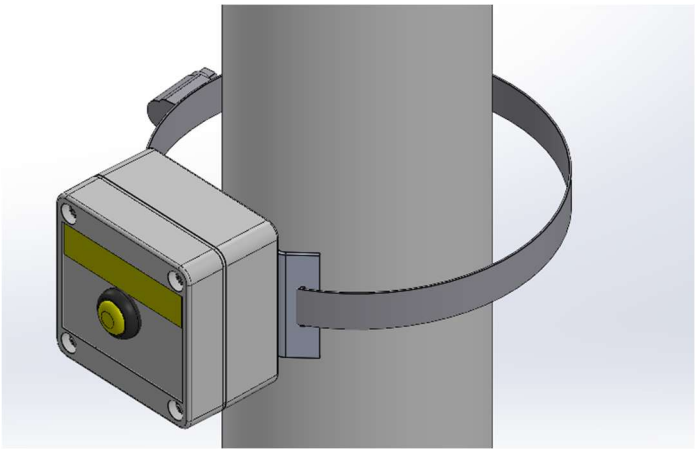
The NRG Pulsed Soiling Measurement Kit is available for both Crystalline (NRG item #19045) or Thin Film (NRG item #19046) panels, as well as 30 W array mounted (NRG item #19047) or tower mounted (NRG item #19048) panels. The kit provides users with the critical information needed to accurately and reliably quantify the site-specific impacts of soiling caused by dust, snow, and other particles on prospective as well as operating PV projects.

Solar Maintenance Button

The NRG Solar Maintenance Button (NRG item #17993 and #17994) is an optional accessory which can be connected to LOGR|Met counter channels.

Installation

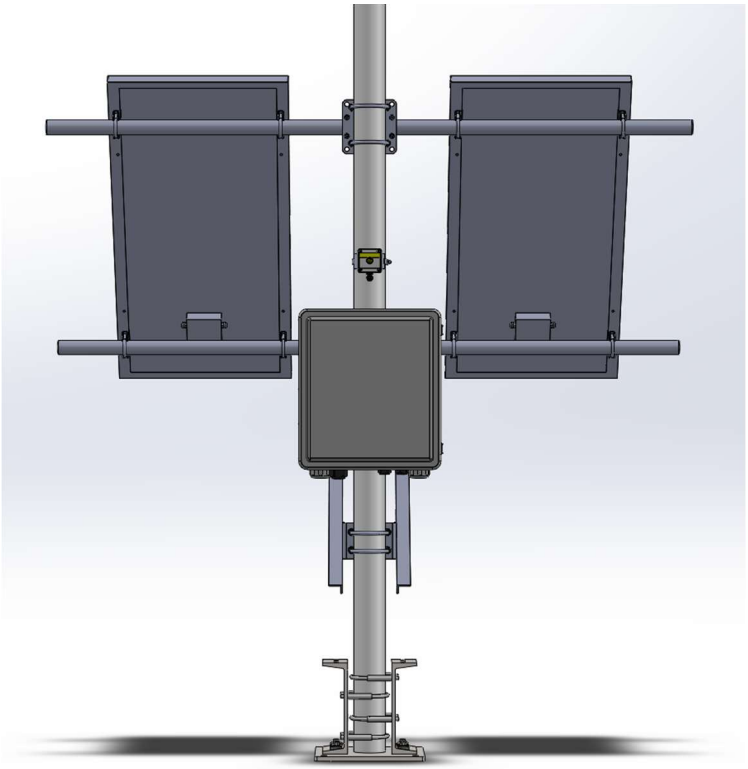
The Maintenance Button is designed with a simple mounting bracket which utilizes a hose clamp for installation onto a tower, boom, or torque tube. The kit is sold with either a 3m (kit #18904) or 20m cable length (kit #18905).



Simply feed the hose clamp through the bracket mounted to the back of the button housing. Locate the button at an easily accessible height within cable distance to the logger and tighten the hose clamp using a 5/16” hex driver, socket, or slotted screwdriver.

To connect the button to the logger, use a small flathead screwdriver to secure the 2-wire button cable into a Counter terminal block on the face of the LOGR. Note that the button cabling is *not* polarity sensitive.

Configure the related Counter Channel utilizing the Rain Gauge dropdown option. The button can be tested by pressing and then viewing the live data value in the LOGR|Met web UI.



APPENDIX G | RELATED ITEMS TABLE

NRG Item Name	Item Number	Description
Assembly, Shelter Box, 16 x 14 x 8, Bored, Pattern C	16458	Small Shelter Box
Circuit Breaker, Din Rail, 15A	11460	15A Breakers for PV and Battery
Auxiliary RPS, Batt Kit	15730 (58Ah) 14482 (100Ah) 14483 (200Ah) 14484 (300Ah)	Remote Power System Backup Battery Kit
Marine Battery Box	11528	Battery Storage Box
Mounted Battery Bracket	20926 (10” Tubular tower) 15736 (3.5” Tubular tower) 21021 (Lattice tower)	Battery Bracket Mount
Battery Bracket Lock Kit	20980	Battery Bracket Lock
Cable- Battery Interconnect	11530 (Red) 11531 (Black)	Battery Interconnect Cabling
Router, Teltonika, RUT241	19795	Teltonika Modem (RUT241)
Assembly, NRG SP100	20325 (Logger-side) 20304 (Array-side)	SP100 Surge Protection Device
Soiling Measurement Kit	19045 (High Current) 19046 (High Voltage) 19047 (30 W SRM) 19048 (30 W SRA)	Pulsed Soiling Module (PSM1)
UPS, LOGR|Met, PV, SRA and WRA	9465	SRA/WRA Power Supply
RPS PV Panel Kit	20258 (SRA 100W) 19710 (SRA 200W) 17572 (WRA 10” Tubular tower 100W)	Remote Power System PV Panel Kit

APPENDIX H | EXTERNAL MODEM CONFIGURATION

NRG LOGR|Met can interface with Ethernet-based LTE modems by providing both power and communication through its built-in hardware features.

This appendix outlines how LOGR|Met can be configured to supply switched 12V power to an external LTE modem via the OP1, or OP2 output ports, while simultaneously handling data communication over its ETH1 Ethernet port. This configuration enables efficient and controlled connectivity to remote servers, including NRG Cloud, SNTP servers, SFTP servers, or SMTP servers.

Equipment and Accessories Required

- Computer
- USB to Ethernet converter cable
- Web browser
- LOGR|Met
- Teltonika RUT241 modem
- LTE Antenna (dual)
- Modem power cable assembly to connect to LOGR OP port
- Ethernet cable (~0.25 m)
- Active SIM card from Verizon or AT&T, or other carrier
    - APN for SIM card (provider will supply)

Preparing the Teltonika RUT241 Modem

Obtain and Activate SIM Card

Note that it can take several days to ship and provision a SIM card from a service provider.

1. Confirm SIM is active with data service by contacting the service provider.
2. Verify the APN associated with the SIM by contacting the service provider.
3. If using a static IP SIM card, verify the provider has assigned a static IP to the SIM.

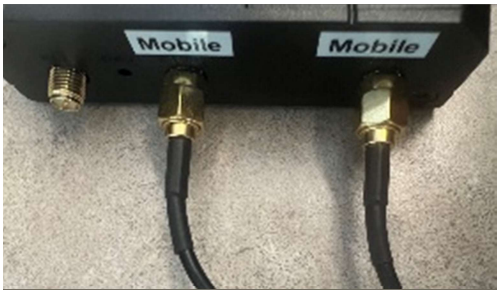
SIM Card Installation

1. Open the SIM card door using the push-pin tool provided with the modem.

2. Remove the SIM card tray and insert the active SIM card into the tray.
3. Reinsert the SIM card tray into the Teltonika RUT241 modem.

Connect Antennas

1. Attach the **two** LTE antennas to the SMA connectors labeled "Mobile" on the modem. It does not matter which antenna lead is connected to which "Mobile" port—either antenna can be connected to either connector.

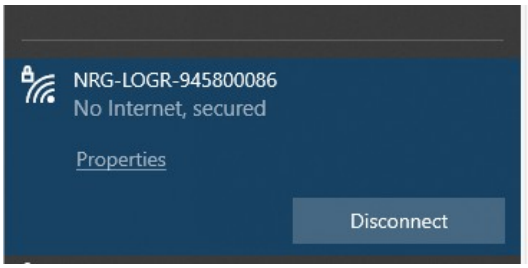


Connect Teltonika RUT241 to LOGR|Met (ETH and Power)

1. Connect the LTE WAN port to the LOGR|Met ETH1 port using the ethernet cable.
2. Connect the RUT241 power connector to LOGR OP1 12 V using power cable.
    - *Note OP1 and OP2 provide 12 V, while OP3 provides 5 V.* ***Do not use OP3*** *for the RUT241 as it requires (9 to 30) V DC.*

Configure LOGR|Met for Teltonika RUT241

1. Turn the LOGR|Met Wi-Fi ON by pushing the white wake button in the top right corner of the logger denoted by the sun icon.
2. Connect the PC to the Wi-Fi Access Point network provided by the LOGR|Met.
    - Wi-Fi Access Point password: logrmet123 (also located LOGR label).

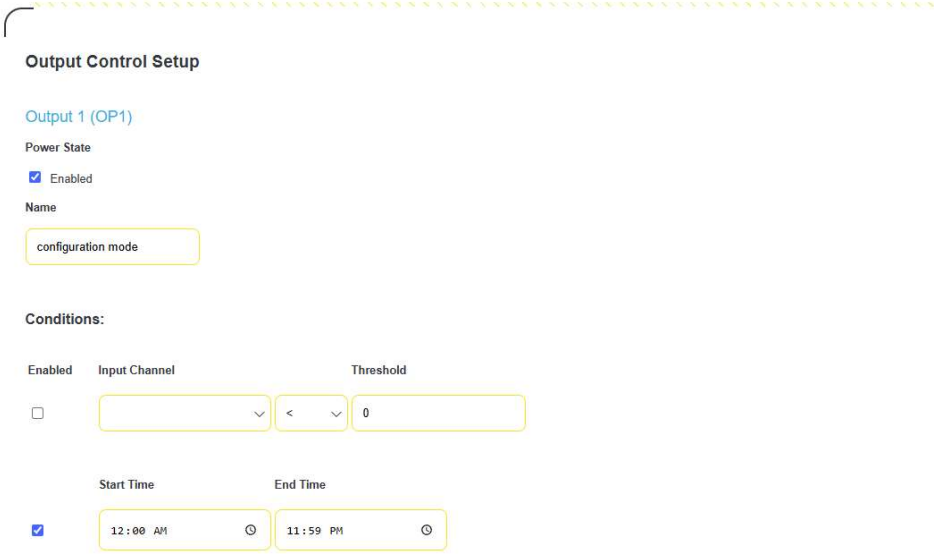


3. Open a web browser and enter IP address **https://192.168.0.1** (also located LOGR label) into the URL bar. Click through the security warning windows to proceed.
4. When prompted, enter the logger credentials (also located LOGR label):
    - Username: logruser
    - Password: logrpassword

Configure Output 1 to Power Modem

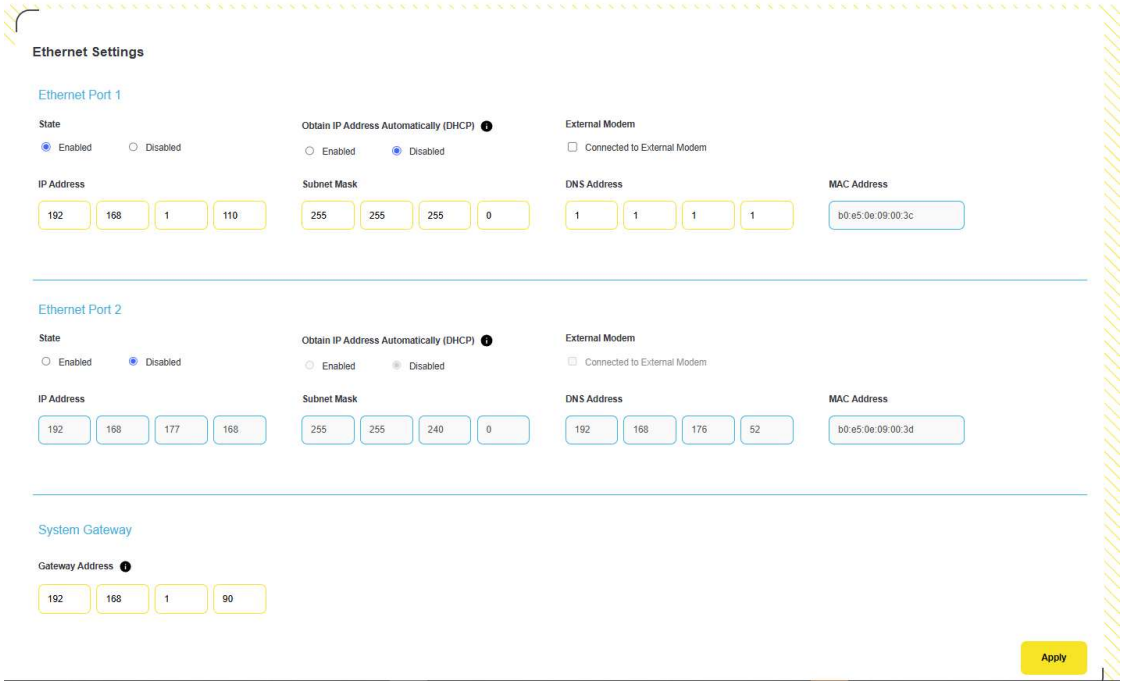
Programming the OP1 Control will provide uninterrupted power to the modem during the configuration process, allowing work on the modem to be completed without it switching off.

1. In the logger web UI, use the **Sensors** dropdown menu to select the **Output Control** option.
2. Enable the **Output 1 (OP1)** Control and enter a name such as, “configuration mode”.
3. Enter Start and End Times **12:00AM to 11:59PM**.
4. Save to proceed.



LOGR Network Settings

1. Use the **Logger** dropdown menu to select the **Local Network Settings** option.
2. Configure the Ethernet Settings section with the following details and **Apply** to save settings:
   - Ethernet Port 1 **Enabled**
   - Obtain IP Address Automatically (DHCP) **Disabled**
   - IP Address **192.168.1.110**
   - Subnet Mask **255.255.255.0**
   - **Do NOT check** External Modem "Connected to External Modem" as this will be enabled in a later step when the system is fully configured for use.
   - Ethernet Port 2 **Disabled**
   - System Gateway **192.168.1.90**



Example LOGR Communication Settings

The procedure descriptions below are examples of additional communications settings and configurations. While nonstandard, they are used as an expansion of LOGR|Met capabilities.

Use the **Logger** dropdown menu to select the **Communications** option.

NRG Cloud

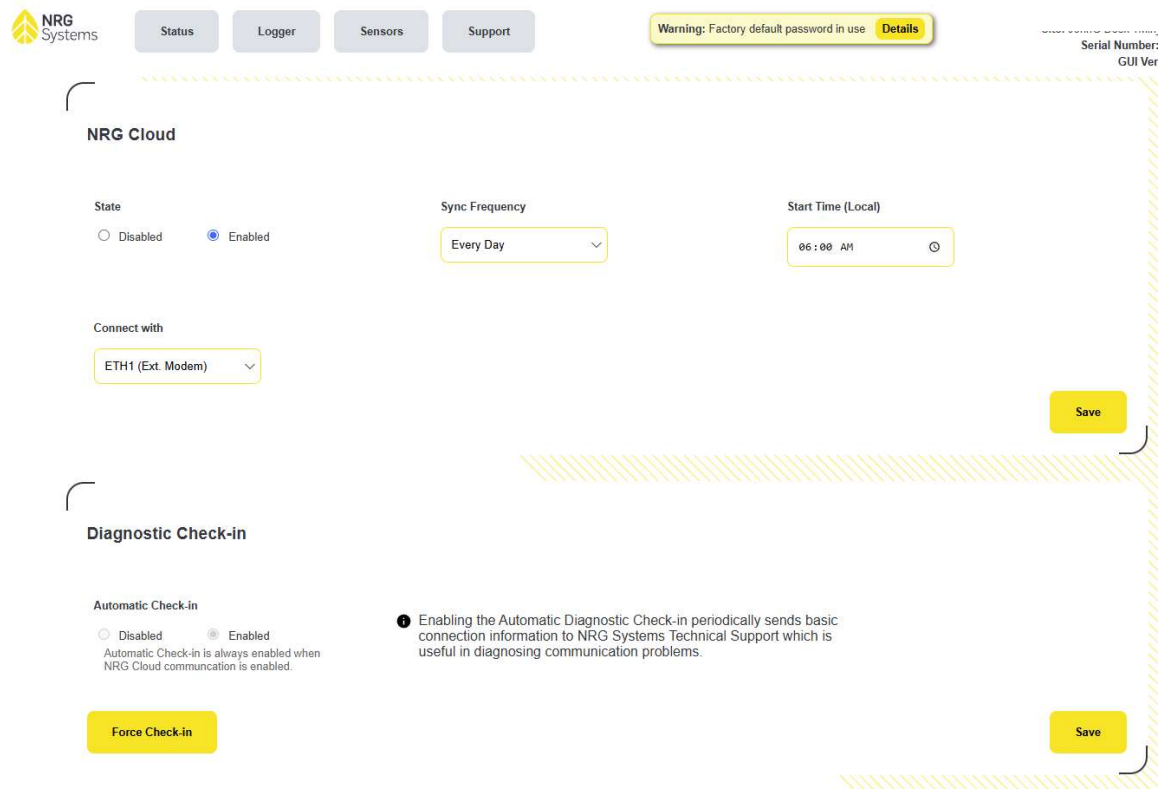
To connect LOGR|Met with NRG Cloud an active data SIM card is needed, however a static IP is not necessary.

1. Configure the NRG Cloud section with the following details:
   - NRG Cloud State **Enabled**

- Sync Frequency **Every Day**
- Start Time (Local) **6:00AM**
- Connect with **ETH1 (Ext. Modem)** from the dropdown menu

2. Click the yellow **Save** button to enable changes.

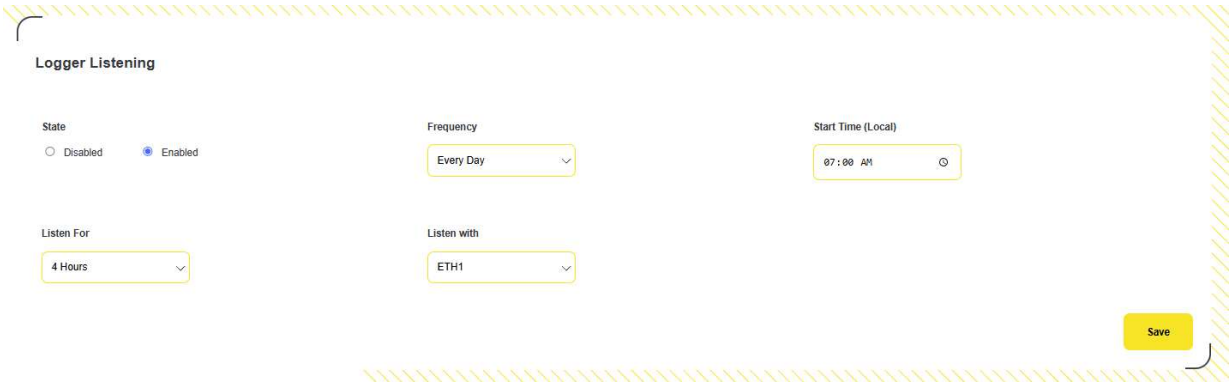
Note that the Diagnostic Check-in in the section below will be automatically enabled if NRG Cloud is enabled.



Logger Listening

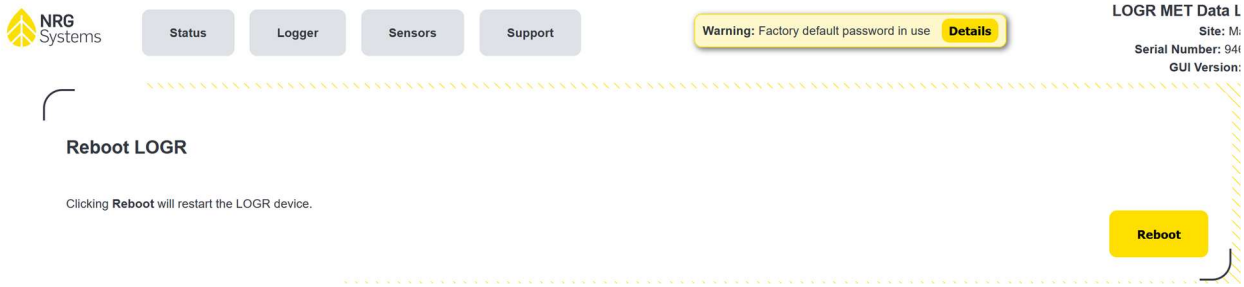
Logger Listening allows inbound connections when using an active SIM card with a static IP address. To provide remote access, the modem must be powered on. This is accomplished by configuring the Logger Listening schedule to activate the logger's switched output (OP1 recommended) which supplies power to the modem during the designated listening window.

1. Configure the Logger Listening section with the following details:
   - Logger Listening **Enabled**
   - Frequency **Every Day**
   - Start Time **7:00 AM**
   - Listen For **4 Hours**
     - Understand your battery capacity and load when setting
   - Listen with **ETH1** (modem)



LOGR Reboot After Communications Updates

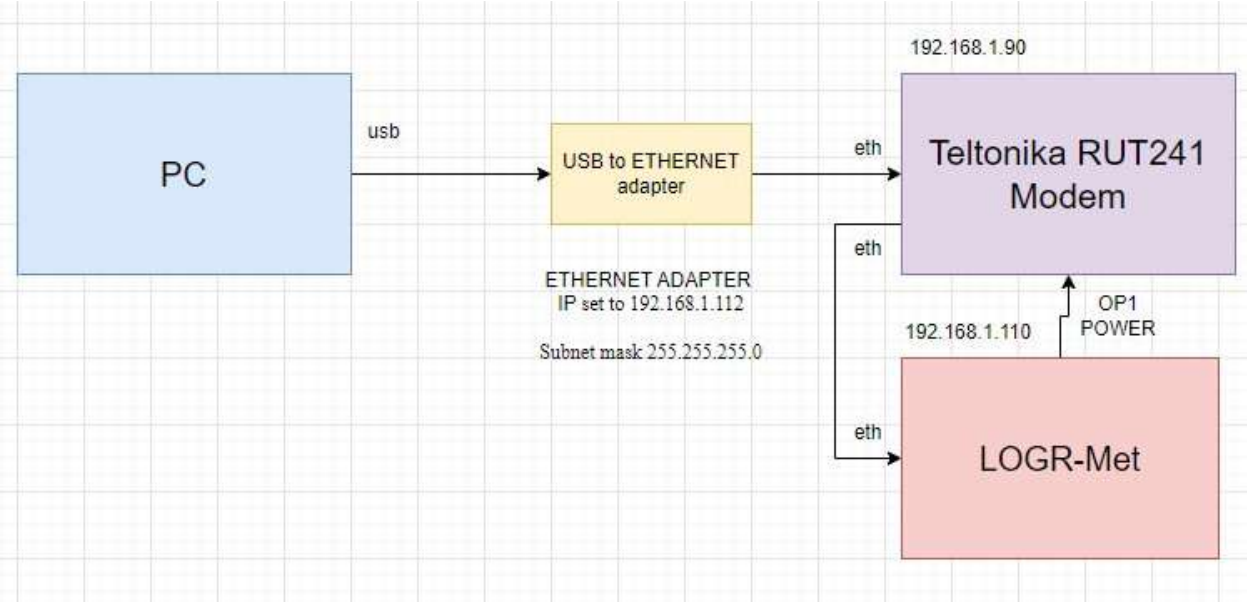
Perform a logger reboot after applying the above changes to the Communications settings.



1. Use the **Logger** dropdown menu to select the **Maintenance** option.
2. Click the yellow **Reboot** button to start the action.
   - Observe the modem LEDs blink for about one minute on power up. If the modem registers with the network, the LEDs will settle into a static pattern indicating signal strength (three LEDs lit indicates three “bars” of signal strength).
   - If you need to make any changes to your modem configuration you can do so now (see below).

Teltonika RUT241 Configuration Changes

After successfully connecting the modem to the LOGR, the Teltonika RUT241 can be connected to a PC with an ethernet cable for additional internal configuration changes. It is recommended to utilize a USB to Ethernet converter accessory, which enables a PC to connect directly with an ethernet port as diagrammed below.



Common modem configuration changes which may be necessary:

- Loading or saving a pre-made configuration file
- Setting the APN
- Adding Port Forwarding Rules
- Setting the Network Carrier
- Scanning for Available Networks
- Adding Firewall Rules or Zone Forwardings

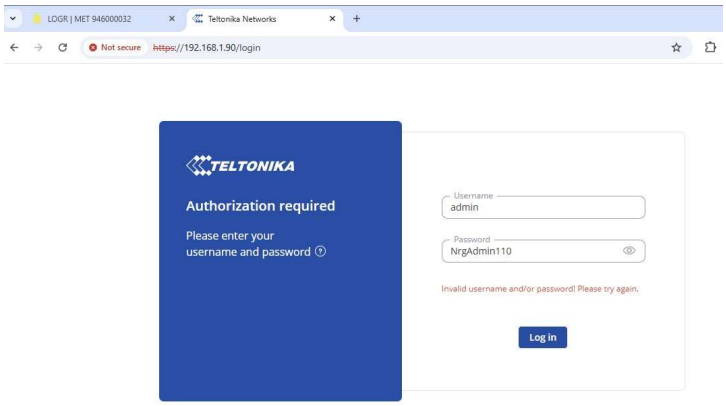
Accessing the Modem

If the modem was previously configured by NRG systems:

1. After physically connecting the modem to a PC, open a web browser and enter **https:\\192.168.1.90** into the URL bar.
2. Enter the following credentials:
   - Username: admin
   - Password: NrgAdmin110

If the modem has never been configured before, use the information printed on the modem:

1. After physically connecting the modem to a PC, open a web browser and enter **https:\\192.168.1.1** into the URL bar.
2. Enter the following credentials:
   - Username: admin
   - Password: see back of modem
3. After default credentials are entered, a prompt will open for a password update.

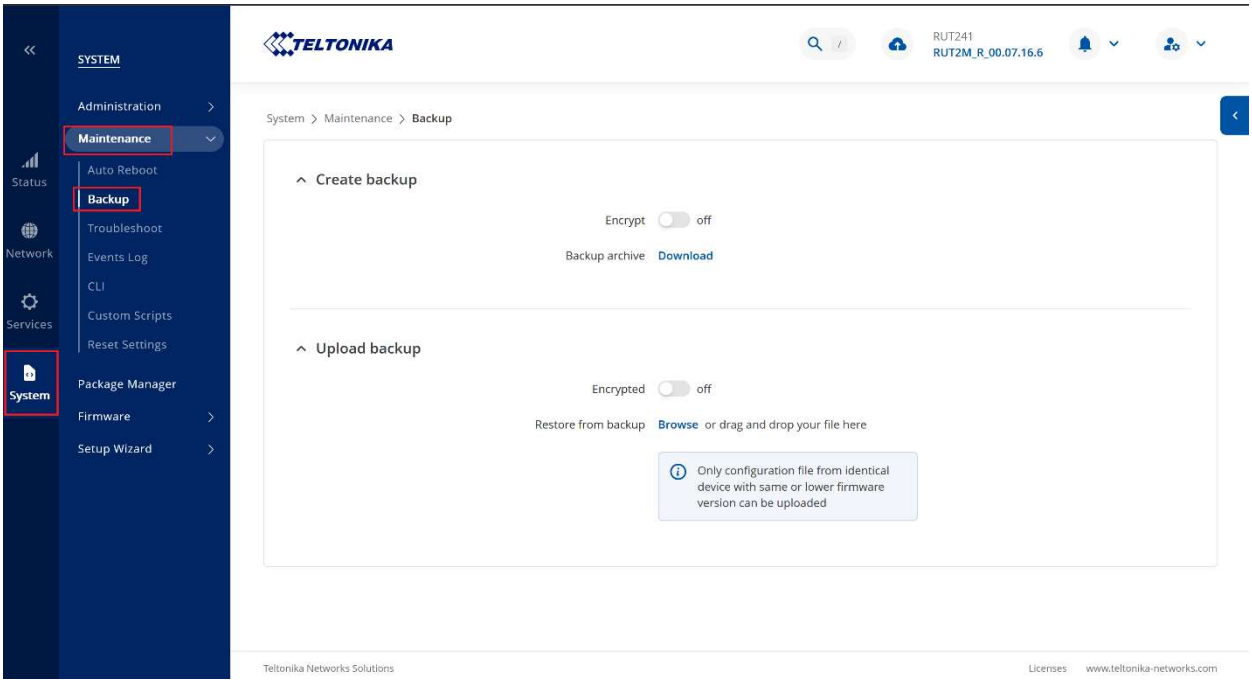


Loading a Pre-made Configuration File

NRG Technical Support may be able to assist in the creation of a modem configuration file for common carriers. NRG will need to know the Service Provider, the APN assigned by your service provider, and if the SIM card has static IP service or not.

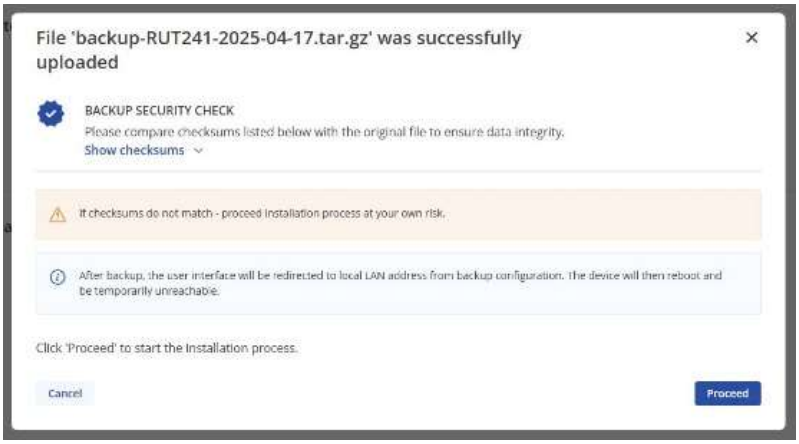
To load a pre-made configuration into the Teltonika RUT241 modem, first connect with the modem as instructed above. The system may prompt a necessary firmware update before this is possible. See instructions below.

1. Enter the **System** menu on the left side, then the **Maintenance** menu, and select **Backup**.



2. To upload the pre-made configuration file to the modem, drag and drop the file (*.tar) onto the **Upload backup** area of the page.

3. The following message will appear. Click **Proceed** to start the installation process.

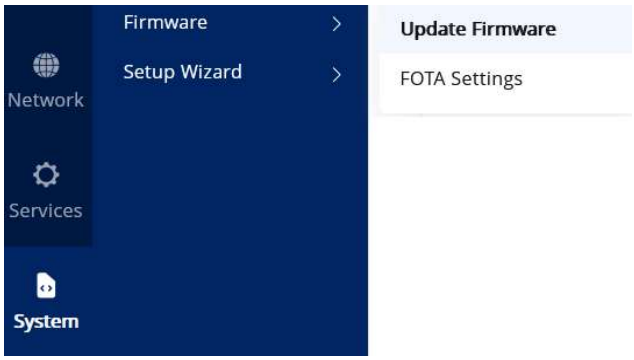


4. Confirm the file load success after 2-4 minutes. A webpage refresh may be necessary.

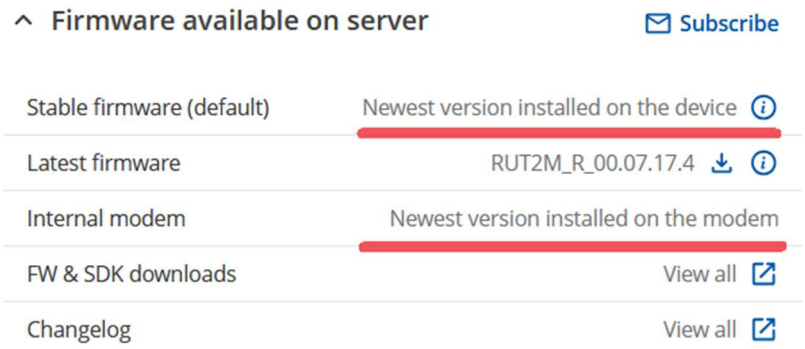
Updating the RUT241 Firmware

The system may prompt a necessary firmware update to the modem.

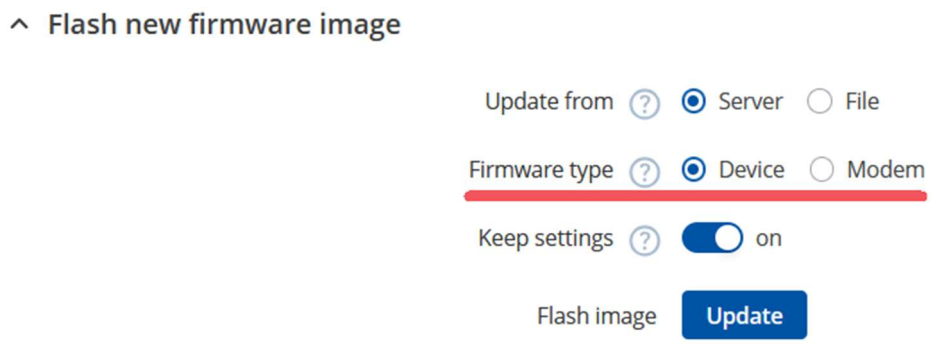
1. Enter the **System** menu on the left side, then the **Firmware** menu, and select **Update Firmware**.



2. Check for new firmware availability for either the router or the modem component of the RUT241.
   - Disregard the **Latest Firmware** unless there is a specific need not met by the **Stable firmware (default)** version.



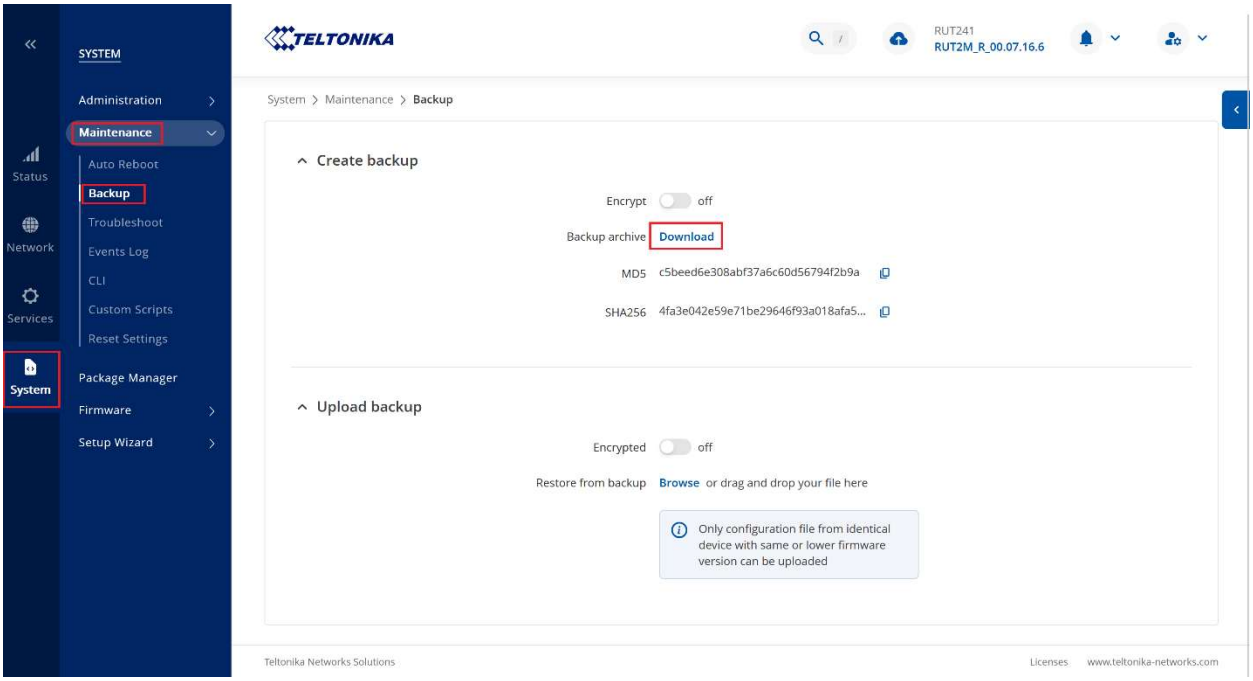
3. In the Flash new firmware image section, select which firmware to update.
   - **Device** updates the entire device, including all networking software.
   - **Modem** updates just the LTE communications components of the device.
4. Click the blue **Update** button to enact updates.



Saving a Configuration to a File

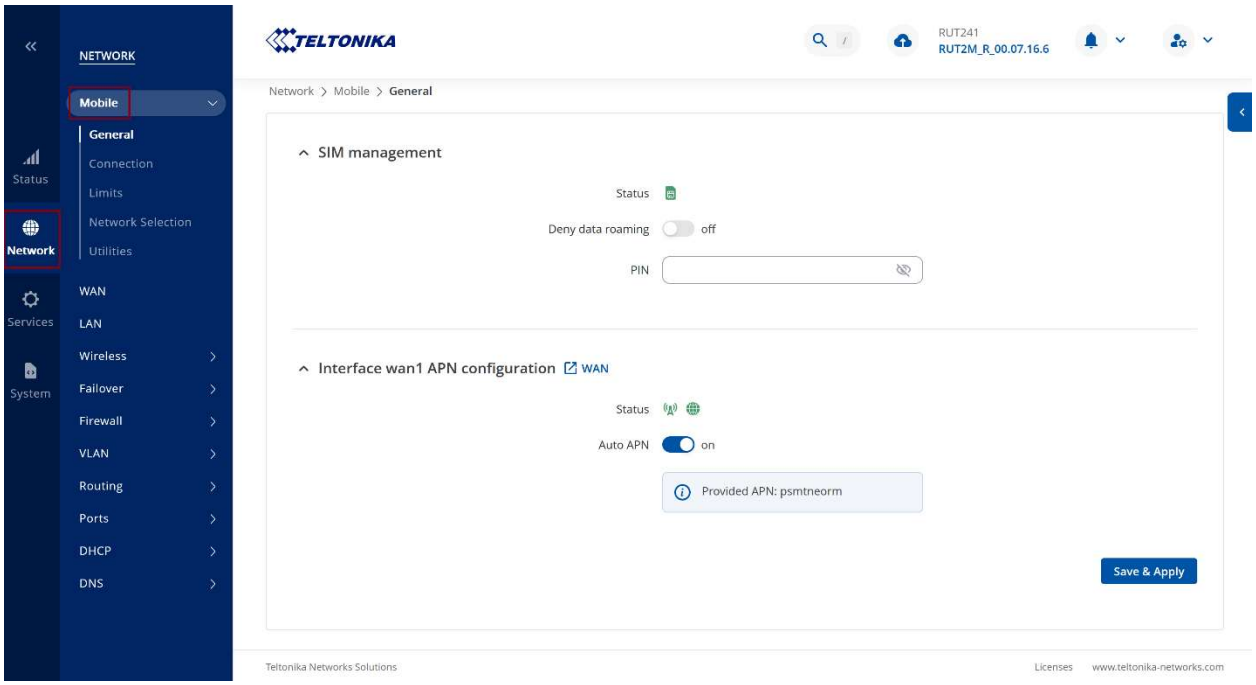
Saving a current modem configuration to a file allows it to be reused on this or other modems for simplified future set-up.

1. Enter the **System** menu on the left side, then the **Maintenance** menu, and select **Backup**.
2. In the **Create backup** section of the page click **Download.** The file will save to your local Downloads folder.

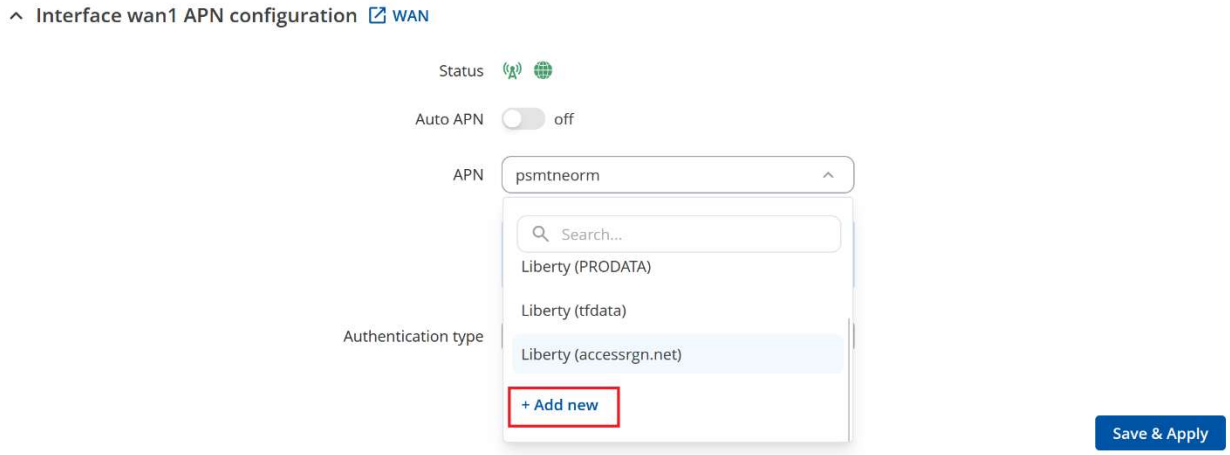


Change the Carrier APN

1. Enter the **Network** menu on the left side, then choose **Mobile**.



2. In the **Interface wan1 APN configuration** section of the page, turn **Auto APN OFF**. Using the APN dropdown menu, select the relevant Service Provider + APN combination. If that combination is not available on the menu select **+Add new** at the bottom of the list and enter the APN provided by the service carrier.



3. Click the blue **Save & Apply** button to update the configuration.

Adding Port Forwarding Rules

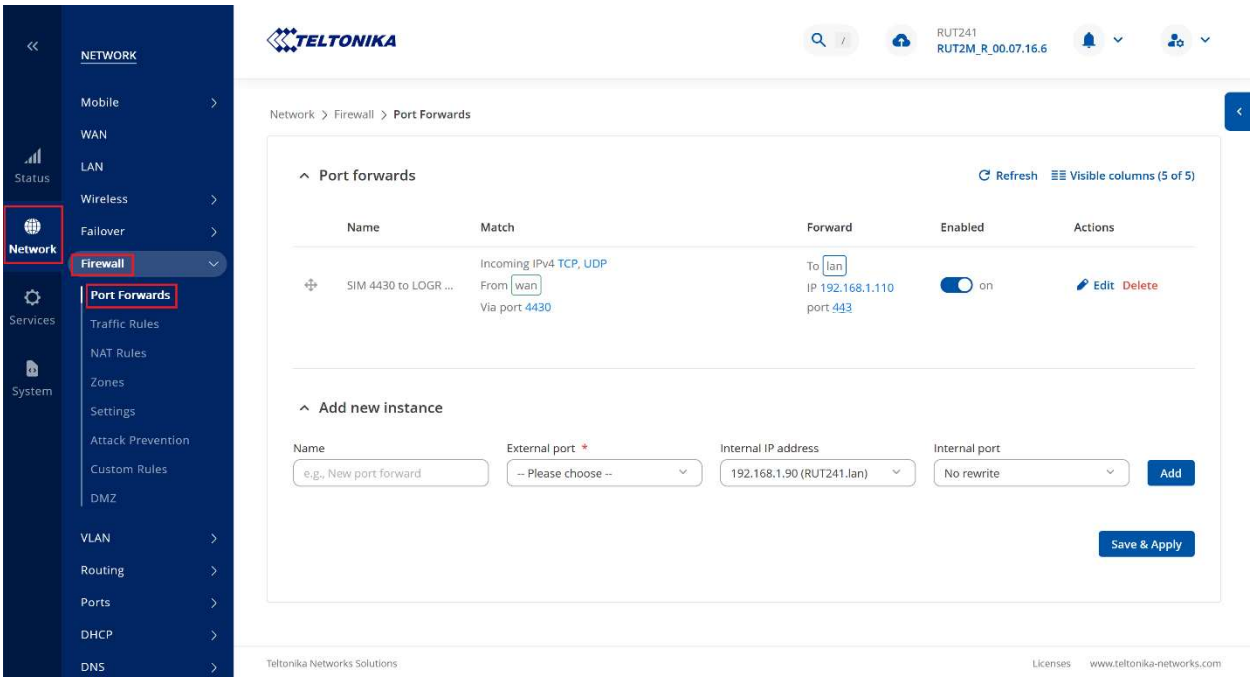
The RUT241 modem can be configured to support custom port forwarding rules.

1. Enter the **Network** menu on the left side, then the **Firewall** menu, and select **Port Forwards**. To create a new rule, use the **Add new instance** section of the page.

- LOGR|Met devices accept HTTPS traffic on port 443 via its local IP address, while the modem's web interface also uses port 443 on its public static IP. To avoid this port conflict, configure a forwarding rule that maps an alternate external port (e.g., **4430**) to the LOGR|Met internal port **443**.

For example, if the modem's static IP is 168.xxx.yyy.169, access can be granted via the following addresses:

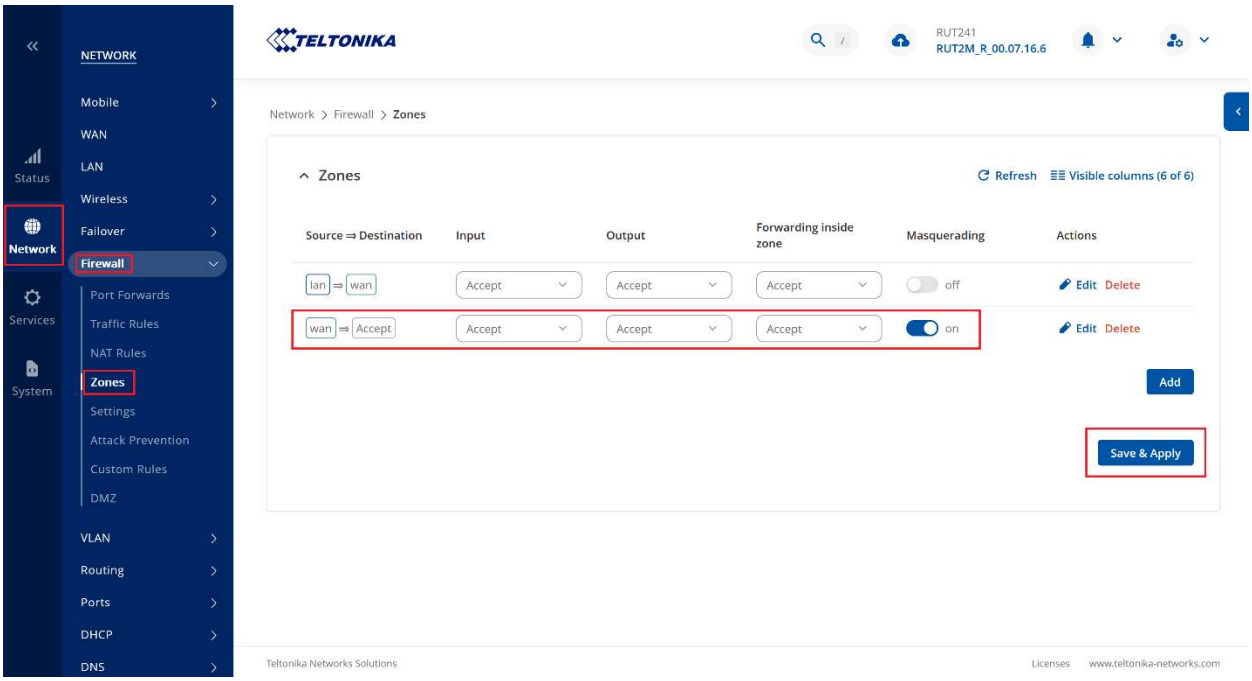
- Access the LOGR|Met at: https://168.xxx.yyy.169:4430
- Access the modem UI at: https://168.xxx.yyy.169:443



Adding Zone Forwardings

The RUT241 modem can be configured to support custom zone forwarding rules.

1. Enter the **Network** menu on the left side, then the **Firewall** menu, and select **Zones**.
   - The modem can accept WAN requests (requests at the Static IP Address of the active SIM card) once zones are enabled to accept using the dropdown menus.
2. In the **wan => Accept** row, make selections from the **Input**, **Output**, and **Forwarding inside zone** dropdown menus and ensure **Masquerading** is **ON**.
3. Click the blue **Save & Apply** button to enact zone forwarding.



Teltonika RUT241 Modem Testing

After configuring the modem, complete the following procedure to confirm communication functionality.

Testing Basic SIM Card (no Static IP)

Testing protocol to verify communication with the NRG Cloud.

1. Configure the Cloud connection schedule to link with the logger a few minutes in the future.
2. Open a web browser that has public internet access and open a connection to the NRG Cloud.
3. Wait until the scheduled Cloud connection time has passed and check the Cloud account to confirm the logger has checked in and uploaded files.

Testing Static IP SIM Card

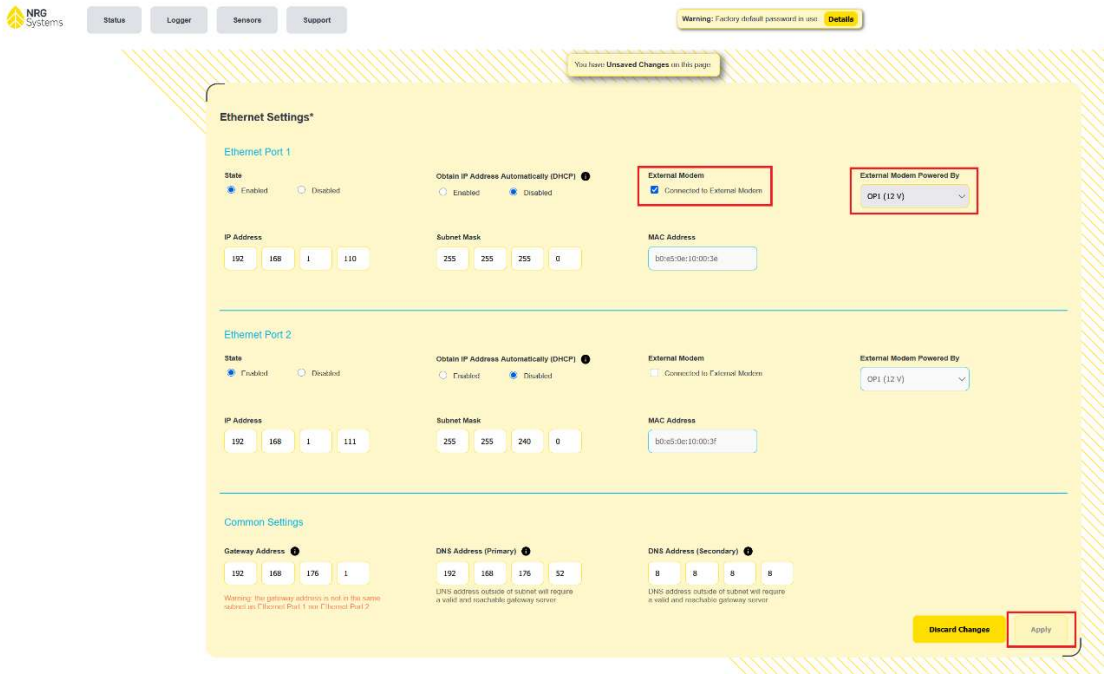
Verifying the below configurations with allow for the administration of changes to both the logger and modem remotely.

1. Verify connection to the modem at its static IP address and port from a web browser that has public internet access:
    - https://XXX.YYY.ZZZ.AAA/
2. Verify connection to the LOGR|Met at its static IP address and port from a web browser that has public internet access:
    - https://XXX.YYY.ZZZ.AAA**:4430/index.htm**

Finalize LOGR|Met Modem Configuration

After modem configuration and testing, finalize the LOGR|Met Power Scheme to control the Modem.

1. Use the **Logger** dropdown menu to select the **Local Network Settings** option.
2. Check the External Modem **Connected to External Modem** box.
3. Using the External Modem Powered By dropdown menu, select **OP1**.
4. Click the yellow **Apply** button to save all changes.



5. Finalize all communication schedules if not completed already.
    - Cloud Sync
    - Diagnostic Check-in
    - Logger Listening
    - SFTP or SMTP
    - SNTP Time Server