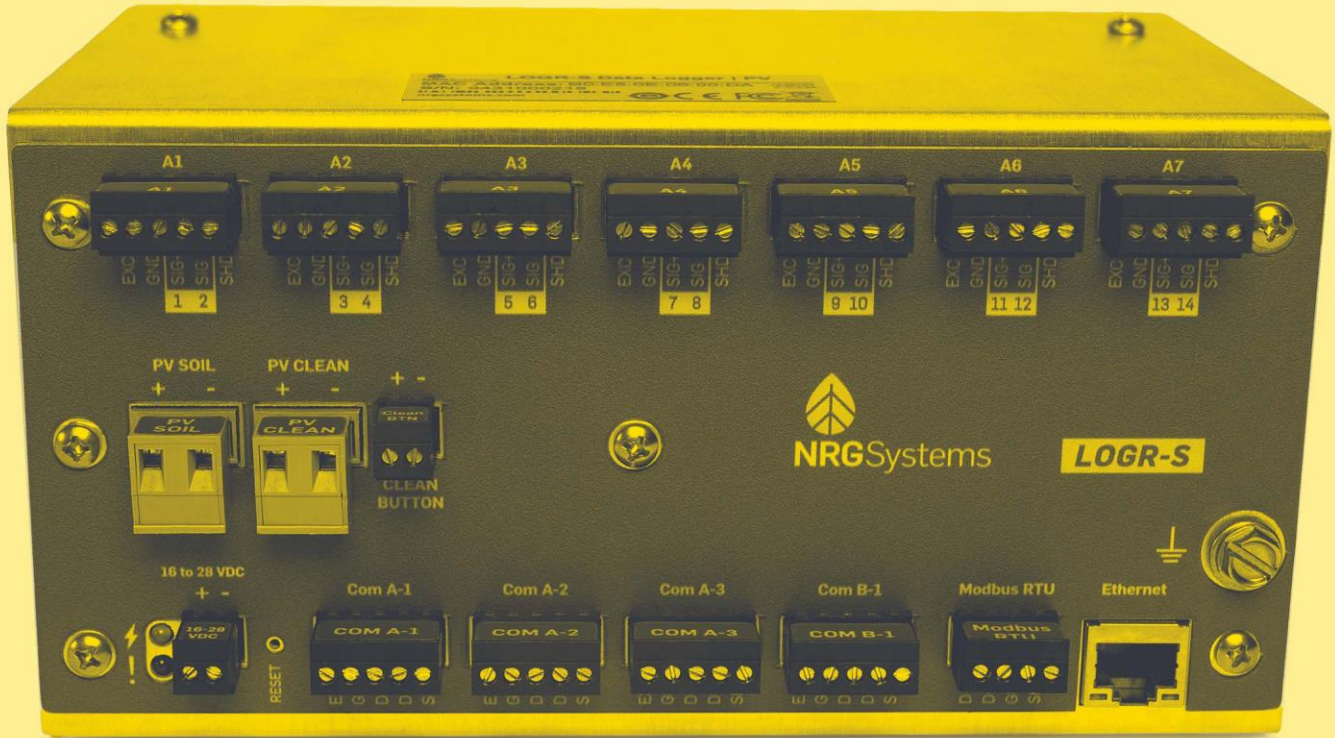


NRG LOGR-S

USER'S MANUAL



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SECTION 1 | INTRODUCTION

About This Manual

This manual is organized to provide a system overview followed by more detailed configuration and installation instructions.

Typographic Conventions

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

Instructions in **Bold** type direct you to perform an operation on 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 serious injury or damage.



This symbol indicates a serious hazard to the user that could result in death or dismemberment.



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.



Quick Start

The basic steps necessary to start receiving data from your LOGR system are as follows:

1. Connect
 - 16 to 28 V DC power supply (4 A max) to power terminals
 - Ethernet cable from computing device to LOGR Ethernet port
2. Open a web browser and connect to the LOGR default IP Address via URL: IP address/index
3. Configure FTP Server (optional feature)
4. Update LOGR firmware
5. Configure:
 - Static IP Address (Logger > Network Settings)
 - Site name, project name, location details (Logger > System Configuration)
 - Time Zone setting (Logger > System Configuration)
 - NTP server (Logger > Time Synchronization, optional)
 - Channels for the sensors you wish to connect (Sensors menu)
 - FTP settings (Logger > File Transfer Settings, optional)
6. Save
7. Update LOGR firmware, if indicated.



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 in the product documentation on the NRG website (<https://www.nrgsystems.com/products/solar-data-loggers/detail/logr-s-data-logger/>).

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

Telephone: +1 802-482-2255 ext. 3

Fax: +1 802-482-2272

Email: support@nrgsystems.com

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

- Customer name
- Who purchased equipment
- Item number or description
- Serial number(s)
- When equipment was purchased
- Where equipment is installed including terrain and climatic conditions
- Description of the problem with some detail
- What events took place leading up to the problem
- What you have tried while attempting 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 area. If you need assistance at times other than our regular business hours, we suggest visiting our website, www.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 Data Logger (introduced September 2021) is a versatile, high-utility data logger and real-time sensor interface designed for post-construction solar resource monitoring applications (e.g., performance monitoring and forecasting).

Powered by 16 to 28 V DC, this compact DIN rail-mountable logger is compatible with a wide range of industry-standard (Modbus RTU and analog) sensors, with onboard dedicated PV soiling inputs supporting PV soiling studies.

Configuration is performed by connecting directly through the LOGR's Ethernet port and using the internal web interface to navigate and save channel configurations, update firmware, and check basic functionality. No proprietary configuration software is required, and a Modbus client utility is provided to test final configurations.

Data are acquired once per second and averaged into 1-minute intervals; intervals are time stamped with the beginning time of each interval. A comprehensive Modbus register set provides users easy access via Modbus TCP or RTU.

Internal storage holds 90 days of 1-second data to backfill SCADA systems. The onboard FTP client moves ASCII data files from the logger onto a user specified FTP server via the Local Area Network, allowing SCADA operators to continuously gather and collect backup data. The user can also load configuration "command" data onto the FTP server, which the LOGR will retrieve and apply (firmware updates, logger configuration, sensor configuration, reboot, etc.).

A comprehensive analog sensor section is capable of up to 7 differential or 14 single-ended measurements (or a combination thereof) and provides (12 V) sensor excitation ports as well as current source excitation for RTDs and thermistors. Also included is built-in surge and ESD protection, tested to IEC 61000-4-5 for surge immunity.

An expanded serial sensor section can support up to 12 Modbus RTU sensors and up to 24 measurands in total. Data collection via Modbus registers is available for both one second and statistical (average, max, min, and standard deviation) measurements.

Labeled terminal ports with removeable connectors facilitate error-free installations and maintenance.

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



LOGR-S Data Logger

Data

LOGR data acquisition provides for:

- 1 Hz sampling rate
- Statistical data, processed at 1-minute intervals
- Data storage via internal 8 GB microSD card
- FTP Client

Communications

- Ethernet port to access built-in webserver and Modbus data retrieval

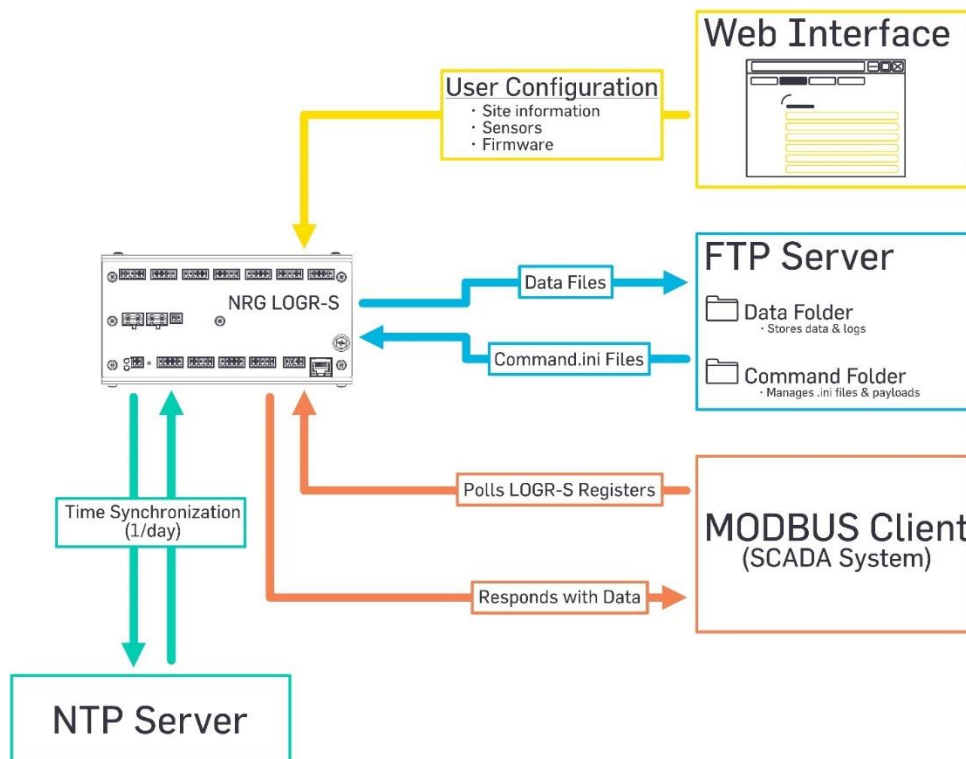
Concept of Operation

LOGR requires network infrastructure support to operate as a sensor-to-SCADA interface:

- Modbus Client (SCADA system to poll LOGR)
- Web Browser (for configuration of LOGR, e.g., Google Chrome)

Optionally, the LOGR utilizes:

- Local FTP Server (LOGR will deposit data/diagnostic/event log files if needed for backup purposes)
- Local FTP Client (for Administration of LOGR, such as downloading/uploading unit or sensor configurations)
- Local NTP Server (LOGR will time synchronize once daily if a local NTP server is provided)





Channels

Below is a summary of available measurement channels on LOGR Data Logger | PV:

Channel Type	Channel Count (Capacity)	Channel Number Range
Analog*	14	1 to 14
Serial	24	101 to 124
PV Soiling Ratio	1**	201
Calculated	10	301 to 310

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

**Calculated from PV Clean & PV Soil inputs

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 out your 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 very 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.



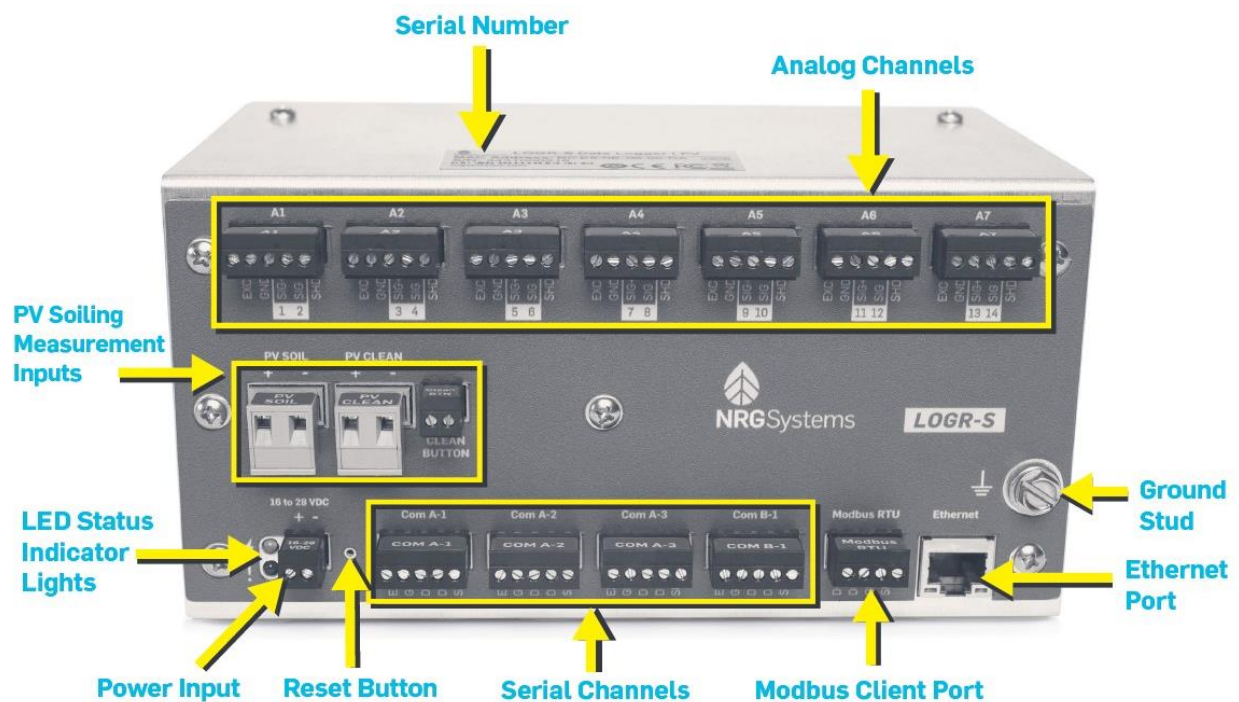
SECTION 2 | SYSTEM OVERVIEW

This section of the manual is designed to provide you with the basic information needed to prepare and install your LOGR system. See **Error! Reference source not found.** for explanations on the User Interface, and **Error! Reference source not found.** for physical installation & wiring.

Unpacking LOGR

Confirm that you have received all components by comparing your order to the packing list included with your shipment. Immediately contact NRG Systems if any of the components are missing.

Components Map





LOGR-S Data Logger

Each LOGR can be identified by the label on the top of the case, which contains the “NRG LOGR” model name, serial number (9431XXXXXX) and MAC Address.

Serial Number & Logger Identification label



Analog Channel Ports	Seven ports can support up to fourteen (14) single ended sensors, or up to seven (7) differential sensors.
Serial Channel Ports	Three COM-A and one COM-B serial ports can support up to twelve (12) sensors with programmable baud rates differing between the A and B ports. Twenty-four (24) serial channels are available for measurand configuration.
PV Soiling Measurement Inputs	These ports are designed to support the NRG Soiling Measurement Kit which delivers a ratio between clean and soiled PV panels. These ports also accept power and ground inputs from other PV panels. Wire gauges accepted are 24 to 12 AWG (0.205 to 3.31 mm ²).
LED Status Indicator Lights	Two LEDs, one green (power) and one red (fault), provide immediate user feedback at the logger. A steady green light indicated consistent power and proper function of the LOGR. A blinking red light indicates errors or an in-progress firmware update.
Power Input	LOGR requires 16 to 28 VDC of power input. The logger typically draws 75 mA at 16 V (1.2 W) when unloaded.
Modbus Client Port	This Modbus RTU port allows the LOGR to connect directly with a computer, or to another logger.
Ethernet Port	This ethernet port features a green LED to indicate traffic. The flashing light indicates active data acquisition transfer.
Ground Stud	The #10 grounding stud should be connected to earth ground with either the provided grounding cable or alternative.
Reset Button	The logger can be reset to factory default by inserting a paper clip to depress the recessed button. Note that the IP Address will also revert to default 192.168.179.252.



Power Source

LOGR requires a DC power supply of 16 to 28 V DC and consumes up to 4 A of current at 16 V when supplying power to attached smart sensors. Nominal supply voltage is 16 V, and the unit contains no boost regulators.

If the voltage decreases below 16 V, the unit still functions but **Modbus and analog sensor excitation ports follow the input voltage down**. When the input voltage gets dangerously low and data can no longer be reliably acquired and recorded, the unit will shut down so that all internal settings are protected.



SECTION 3 | PRE-INSTALLATION PREPARATION

While LOGR is easy to set up, it is a good idea to get familiar with the system before going to the installation site. The following sections provide an overview of the software you will use to prepare your LOGR system for field installation. Relevant operational details are provided to help you optimize the system and its communications for your site and project.

Connecting through the Ethernet port

Once LOGR is powered, it performs a starting sequence and will emit a beep when ready for configuration. Connect to LOGR via Ethernet with a standard Cat 5 or Cat 6 cable to a device running a web browser.

The **LOGR default IP Address is 192.168.179.252.**

Type **192.168.179.252/index.htm** into a web browser address bar.



Network Settings Configuration

Configuring the IP Address

To secure your LOGR unit, it can be set to use DHCP for use on a network containing a DHCP server or use a static IP address (default option). To set the IP address, navigate to the Logger Menu at the top of the window and select **Network Settings** from the drop-down options.

Ethernet Settings

Obtain IP Address Automatically

Enabled Disabled

IP Address

195 168 155 220

Net Mask Address

255 255 240 0

Gateway Address

195 168 155 8

DNS Address

195 168 155 55

Cancel Apply

Decide whether to obtain an IP address and related settings automatically (use DHCP) or to enter them manually.
If DHCP is disabled, enter the desired network address configuration above. Press the tab key to advance to the next field. After pressing the 'Apply' button a confirmation screen containing the new configuration will be displayed.
The new configuration will not take effect until confirmed. The confirmation screen will only appear if manually entering the configuration.

Using DHCP

– *Obtain IP Address Automatically* | **Enabled**

– *Obtain IP Address Automatically* | **Disabled**

– **Enter values for the fields below: ***

IP Address

Using Static IP address

Net Mask Address

Gateway Address

DNS Address

*These fields are only editable when *Obtain IP Address Automatically* is disabled.



LOGR-S Data Logger

When completed select the yellow **Apply** button, then confirm values are correct and select the **Confirm** button on the resulting Network Address Confirmation screen.

LOGR takes about 10 seconds to confirm the settings change and will emit a beep when complete. The home page address becomes X.X.X.X/index.htm, where X.X.X.X is the newly specified IP Address.

If a link cannot be made and a static IP address has not been set, *the LOGR defaults to IP Address 192.168.179.252.*



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

*The reset button is located **between the 16 to 28 V DC** input and the **COM A-1** serial channel block.*

If set to use DHCP and obtain a web address automatically, and a DHCP server is not found, LOGR **defaults to IP Address 192.168.179.252.**

Once configured, LOGR should be connected to a SCADA network where real-time data is available via Modbus TCP and are viewable on the webserver **Sensor Outputs** home page.



*For any single LOGR unit only **ONE** user may be logged into the webserver at any given time. If two browsers are open and connected to the same LOGR IP address, full functionality will not be available and saving edits and configurations may be hindered.*



Modbus RTU

LOGR has an available Modbus RTU Client Port which enables the logger to be used with a Modbus server to query the registers in the SCADA map.

To configure this port:

1. Navigate to the **Logger** menu at the top of the page and select **Network Settings** from the drop-down options.
2. Scroll to the **Modbus RTU Settings** to complete setup.
3. Edit the **Client Address**, **Baud Rate**, **Data Bits**, **Parity**, **Stop Bits** as necessary and choose if the **Termination Resistor** is *Enabled* or *Disabled*.
4. Click the yellow **Save** button to apply changes to the port settings. Note that when these values are saved the LOGR will reboot.

Modbus RTU Settings

Client Address: 1

Baud Rate: 19200

Data Bits: 8

Parity: Even

Stop Bits: 1

Termination Resistor: Enabled Disabled

Save



NTP Server

For improved time accuracy, an NTP server can be configured for daily time updates.

To configure:

1. Navigate to the Logger menu at the top of the page and select **Time Synchronization** from the drop-down options. The LOGR defaults to **Disabled** (no NTP checks).
2. Set the NTP mode to **Local** and enter the IP Address or URL of your local NTP server.
3. Click the yellow **Apply** button.

The screenshot shows the 'NTP Configuration' section of the web application. At the top, there are four tabs: 'Status', 'Logger', 'Sensors', and 'Support'. The 'Logger' tab is selected. Below the tabs, the 'NTP Configuration' section is displayed. It includes a 'Mode' section with three radio buttons: 'Auto', 'Local' (which is selected), and 'Disabled'. Below this is a text input field labeled 'NTP Server IP / URL (local mode only)' containing the text 'techservtest.nrgsystems.inc'. At the bottom right of the configuration area, there are two buttons: 'Cancel' and 'Apply'.



Note that LOGR has an embedded coin cell battery installed to maintain operation of the real-time clock through power disruptions.



System Configuration

Navigate to the Logger menu at the top of the page and select **System Configuration** from the drop-down options.

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). Format 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). Format 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.

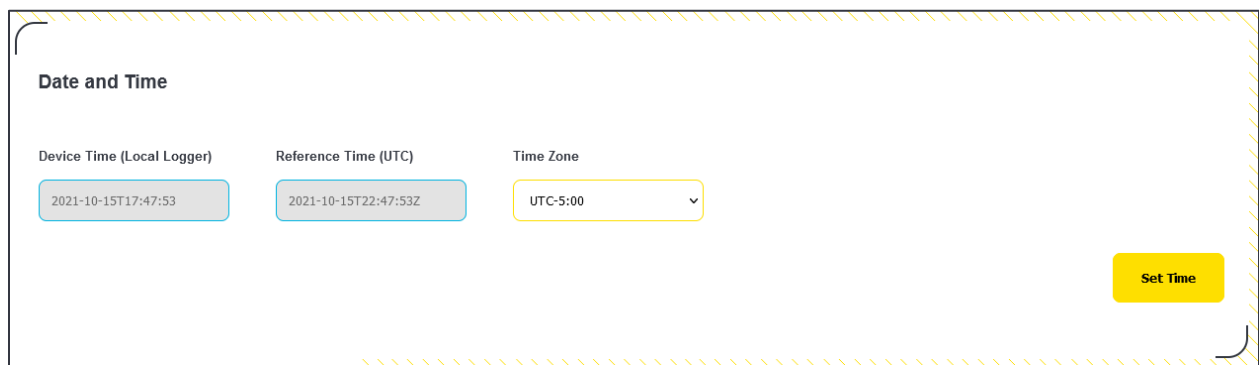
Site Properties

<p><small>Site</small></p> <input style="width: 90%;" type="text" value="NRG Systems"/>	<p><small>Project</small></p> <input style="width: 90%;" type="text" value="Testing Facility"/>	<p><small>Location</small></p> <input style="width: 90%;" type="text" value="Hinesburg, VT"/>
<p><small>Latitude</small></p> <input style="width: 90%;" type="text" value="44.3388939"/>	<p><small>Longitude</small></p> <input style="width: 90%;" type="text" value="-73.1120224"/>	<p><small>Elevation (m)</small></p> <input style="width: 90%;" type="text" value="136"/>



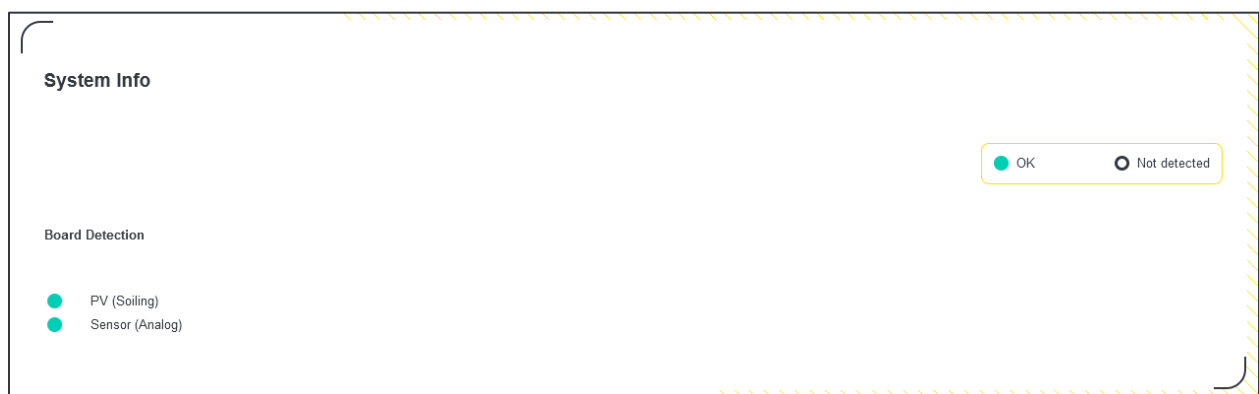
Date and Time

Device Time (Local Logger)	The LOGR 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 drop-down list. Note: Use logger local standard time (not daylight-saving time). The logger clock will not adjust for daylight saving time.



System Info

This section provides information on the installed and configured PC boards of this LOGR.





Channel Configuration & Data Collection

Analog Sensors

LOGR provides **seven ports** for a total of **fourteen analog channel options**. These are used for measuring parameters including solar radiation, PV temperature, ambient temperature, barometric pressure, relative humidity, and more. The LOGR analog sensor ports have **12 V excitation** with a limit of **50 mA per port**.

Each port can be configured to support two single-ended sensors, each on a separate channel, or one differential sensor. This totals seven differential or fourteen single-ended sensors (or a combination thereof). LOGR 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 Sensor Connections section on page 37.

Voltage Level	Measurement Accuracy at 25°C
(-75 to +75) mV	10uV
(-1.1 to +1.1) V	400uV
(-10 to +10) V	900uV

Both 1-second and statistical (average, max, min, and standard deviation) data are available via Modbus registers. The web server home page provides a quick view of live data to ensure sensors are connected and performing properly during setup.



Analog Channel Configuration

Navigate to the Sensor menu at the top of the page and select **Analog Channels** from the drop-down options. Select **Configure** next to the channel of your choice.

The screenshot shows a navigation bar with 'Status', 'Logger', 'Sensors', and 'Support'. The 'Sensors' menu is active, and the 'Analog Channels' section is highlighted. Below the title is a table with columns: Port, Channel, Description, Serial Number, and a 'Configure' button for each row.

Port	Channel	Description	Serial Number	
A1	1	No Sensor	000000000	Configure
	2	No Sensor	000000000	Configure
A2	3	No Sensor	000000000	Configure

Selecting **Configure** for a specific channel will send you to the **Analog Channel Configuration** page for the specified channel.

The screenshot shows the 'Analog Channel Configuration' page for 'Port A1-Ch 1'. It includes an 'Enable Configuration' checkbox (unchecked), a 'Sensor Type' dropdown (set to 'No Sensor'), and several input fields: 'Description' (No Sensor), 'Units', 'Slope' (1.00000), 'Offset' (0.00000), 'Serial Number' (000000000), 'Height (m)' (1.00), 'Elevation Angle' (0.0), 'Azimuth Angle' (0.0), and 'Modbus Address' (10028). At the bottom right are 'Back', 'Reset', and 'Done' buttons.

1. Using the **Sensor Type** drop-down, select the sensor you are programming onto this channel.
2. Edit the “Description” to fit your needs as necessary.
3. Edit the “Slope” and “Offset” fields if the included default values should be changed.
4. Enter the sensor serial number. The field can include numerical and alphabetical characters if necessary.



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5. Enter sensor height in meters.
6. Enter the elevation angle & azimuth angle.
7. Select **Done** when all relevant values have been entered to return to the **Analog Channels** page.
8. Repeat with the remaining occupied analog sensor channels.

The newly-configured channels are displayed as “UNSAVED CHANGES.”

Analog Channels				
Port	Channel	Description	Serial Number	
UNSAVED CHANGES				
A1	1	NRG BP20	180535758	Configure
	2	No Sensor	000000000	Configure
A2	3	No Sensor	000000000	Configure
	4	No Sensor	000000000	Configure
A3	5	No Sensor	000000000	Configure
	6	No Sensor	000000000	Configure
A4	7	No Sensor	000000000	Configure
	8	No Sensor	000000000	Configure



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

A6	11	No Sensor	000000000	<input type="button" value="Configure"/>
	12	No Sensor	000000000	<input type="button" value="Configure"/>
A7	13	No Sensor	000000000	<input type="button" value="Configure"/>
	14	No Sensor	000000000	<input type="button" value="Configure"/>
UNSAVED CHANGES				
				<input type="button" value="Save"/>



LOGR-S Data Logger

Modbus RTU Serial Sensor Configuration

LOGR supports up to 12 Modbus RTU sensors (6 on COM-A and 6 on COM-B) and 24 measurands in total. *Do not connect more than 6 RTU sensors and gather 12 measurands per COM port.* Both one second and statistical (average, max, min, and standard deviation) 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

Navigate to the Sensor menu at the top of the page and select **Serial Ports Setup** from the drop-down options. This page allows for COM ports A and B to be set for differing Baud Rates, Stop Bits, Data Bits, and Parity, allowing for greater Modbus serial sensor accommodation. Click the yellow **Save** button on the bottom right of the page when configuration is complete.

The LOGR will reboot to reload the new settings.

Serial Port Setup

COM-A

Baud Rate

2400 9600 19200 38400 115200 230400 460800 921600

Stop Bits

0 1 2

Data Bits

8 9

Parity

None Even Odd

COM-B

Baud Rate

2400 9600 19200 38400 115200 230400 460800 921600

Stop Bits

0 1 2

Data Bits

8 9

Parity

None Even Odd



Serial Channel Configuration

To configure LOGR with your serial sensors:

1. Navigate to the **Sensor** menu at the top of the page and select **Serial Sensor Setup** from the drop-down options.
2. Check the “Configured” checkbox.
3. Using the drop-down menus, select the **Port** (COM-A or COM-B), then the **Sensor Type** from the list of supported serial sensors.
4. Edit the “Sensor Description” to fit your needs as necessary. The field auto-populates with the Sensor Type chosen.
5. Edit the “Client Address” to match that of the programmed sensor ID.
6. Enter the sensor serial number given by the manufacturer.
7. Scroll down and click the yellow **Save** button.

Configured	Port	Sensor Type	Sensor Description	Client Address	Serial Number
<input type="checkbox"/>	COM-A	No Sensor	No Sensor	1	000001
<input type="checkbox"/>	COM-A	No Sensor	No Sensor	2	000001
<input type="checkbox"/>	COM-A	No Sensor	No Sensor	3	000001
<input type="checkbox"/>	COM-A	No Sensor	No Sensor	4	000001
<input type="checkbox"/>	COM-A	No Sensor	No Sensor	5	000001
<input type="checkbox"/>	COM-A	No Sensor	No Sensor	6	000001



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

Enabled	Channel	Sensor	Measurand	Slope	Offset
<input type="checkbox"/>	101	No Sensor	No Measurand	1.00000	0.00000
<input type="checkbox"/>	102	No Sensor	No Measurand	1.00000	0.00000
<input type="checkbox"/>	103	No Sensor	No Measurand	1.00000	0.00000
<input type="checkbox"/>	104	No Sensor	No Measurand	1.00000	0.00000

To configure serial channels:

1. Select the desired previously configured sensor from the *Sensor* drop-down menu. This will automatically check the *Enabled* checkbox in the first column for the channel.
2. Select the desired Measurand from the drop-down menu.
3. Edit the *Slope* and *Offset* fields if the included default values should be changed.
4. Repeat for as many channels as necessary.
5. Click the yellow **Save** button at the bottom of the screen to save the channel configurations.

Enabled	Channel	Sensor	Measurand	Slope	Offset
<input checked="" type="checkbox"/>	101	Hukseflux SR30	Irradiance	0.01000	0.00000
<input checked="" type="checkbox"/>	102	Hukseflux SR30	Irradiance (UC)	0.01000	0.00000
<input checked="" type="checkbox"/>	103	Hukseflux SR30	Body Temp	0.01000	0.00000
<input checked="" type="checkbox"/>	104	Hukseflux SR30	Humidity	0.01000	0.00000
<input checked="" type="checkbox"/>	105	Hukseflux SR30	Tilt	0.01000	0.00000
<input checked="" type="checkbox"/>	106	Hukseflux SR30	Heater Current	1.00000	0.00000
<input checked="" type="checkbox"/>	107	Hukseflux SR30	Fan Speed	1.00000	0.00000
<input type="checkbox"/>	108	No Sensor	No Measurand	1.00000	0.00000
<input type="checkbox"/>	109	No Sensor	No Measurand	1.00000	0.00000



LOGR-S Data Logger

After saving the channel configurations, the Web Interface will automatically route to the **Sensor Outputs** home page where Active channels report live data. The drop-down menu at the top right corner of the table allows alternative views of All, Active, Inactive, and Unconfigured channels.

Sensor Outputs

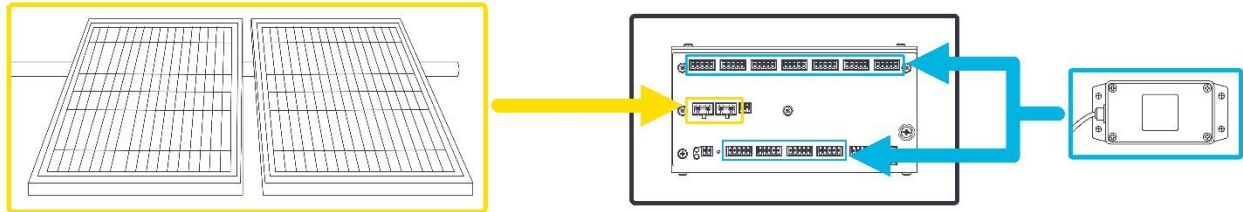
Active

Channel Number	Type	Description	Data
1	Analog	NRG BP20	0.00 hPa
101	Serial	Hukseflux SR30-Irradiance	0.97 W/m ²
102	Serial	Hukseflux SR30-Irradiance (UC)	0.96 W/m ²
103	Serial	Hukseflux SR30-Body Temp	34.25 deg_C
104	Serial	Hukseflux SR30-Humidity	11.04 %
105	Serial	Hukseflux SR30-Tilt	0.17 deg
106	Serial	Hukseflux SR30-Heater Current	335.00 mA
107	Serial	Hukseflux SR30-Fan Speed	9077.00 rpm



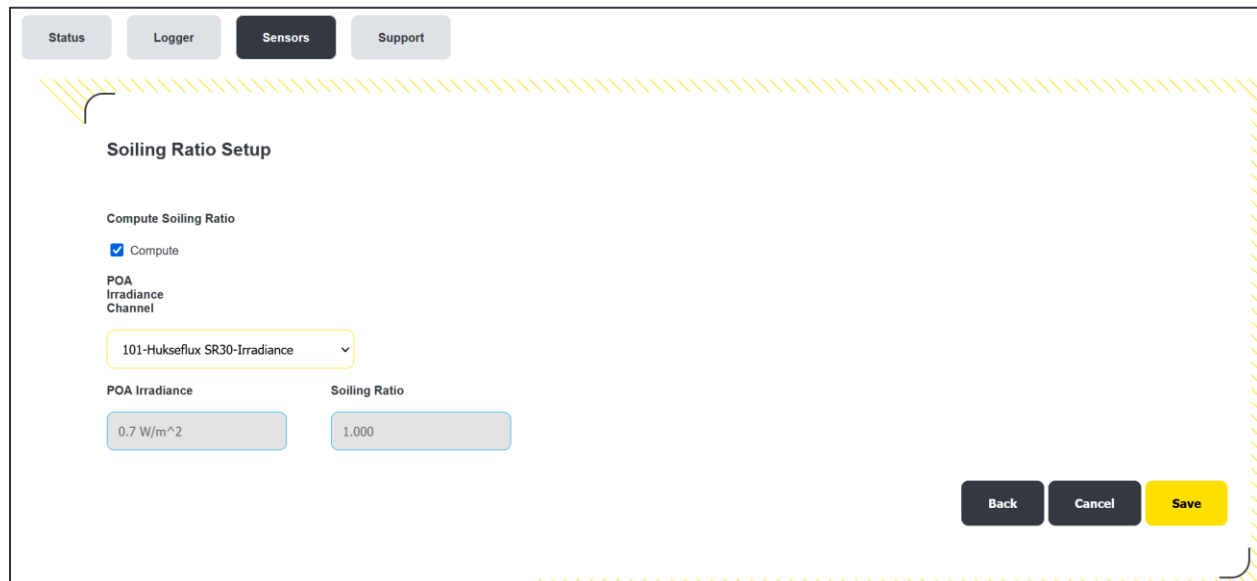
PV Soiling Configuration

LOGR uses the NREL Soiling Method to measure and provide a Daily Soiling Ratio, which requires a **plane-of-array (POA) irradiance sensor** in addition to the **two PV panels**. Terminal ports on the front panel of LOGR are provided for landing wires from “PV Soil” and “PV Clean” panels.



To configure PV soiling measurements:

1. Navigate to the **Sensor** menu at the top of the page and select **Soiling Ratio Setup** from the drop-down options.
2. Check the **Compute** box.
3. Choose **POA Irradiance Channel** from the drop-down options.
4. Click the yellow **Save** button.



This saved PV Soiling Ratio channel can then be viewed with the other Active channels on the **Sensor Outputs** home page.



LOGR-S Data Logger

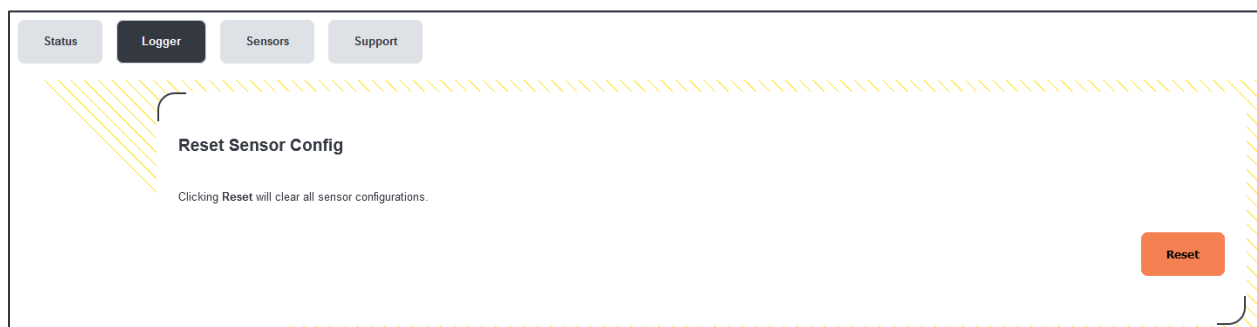
Navigating to the **Sensor** menu at the top of the page and selecting **Soiling Ratio Setup** from the drop-down options also displays the date and time of the last panel cleaning.

That cleaning timestamp is collected on this page and in the corresponding Modbus Register either when the yellow **Clean Panel** (virtual) button is clicked on the page, or when the physical “Clean Panel” button at the soiling panels is pressed for two seconds.



Sensor Configuration Reset

Clearing all sensor configurations is possible by navigating to the **Logger** menu at the top of the page and selecting **Reset Sensor Config** from the dropdown menu. Clicking the orange **Reset** button will remove all values from the Analog, Serial, Soiling Station, and Calculated channels. Note that this action cannot be rescinded and exporting a sensor configuration is recommended before proceeding. See FTP Command Files to complete a sensor configuration export.





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 microSD card embedded within the LOGR.

If a connection with the LOGR is lost, the SD card will store files (data, diagnostics, and event logs) for up to 90 days. These files can be retrieved via FTP. See **Data File Transfer** in Section 4.5 for more information.

Firmware Updates

To update firmware or view details of the firmware version, navigate to the **Logger** menu at the top of the page and select **Firmware** from the drop-down menu. This page details “Application Firmware Version,” “Bootloader Firmware Version” and the firmware “Status.”

The screenshot shows the 'Firmware Update' page in the LOGR-S Data Logger web interface. The navigation bar at the top includes 'Status', 'Logger', 'Sensors', and 'Support' tabs. The 'Logger' tab is selected. The main content area is titled 'Firmware Update' and contains the following instructions:

1. Select a valid firmware file (*.bfw).
2. Click Upload to begin update.

LOGR will apply firmware and reboot, disconnecting web service for up to 2 minutes.
Refresh the page to re-establish the browser connection.

Below the instructions, there are three input fields:

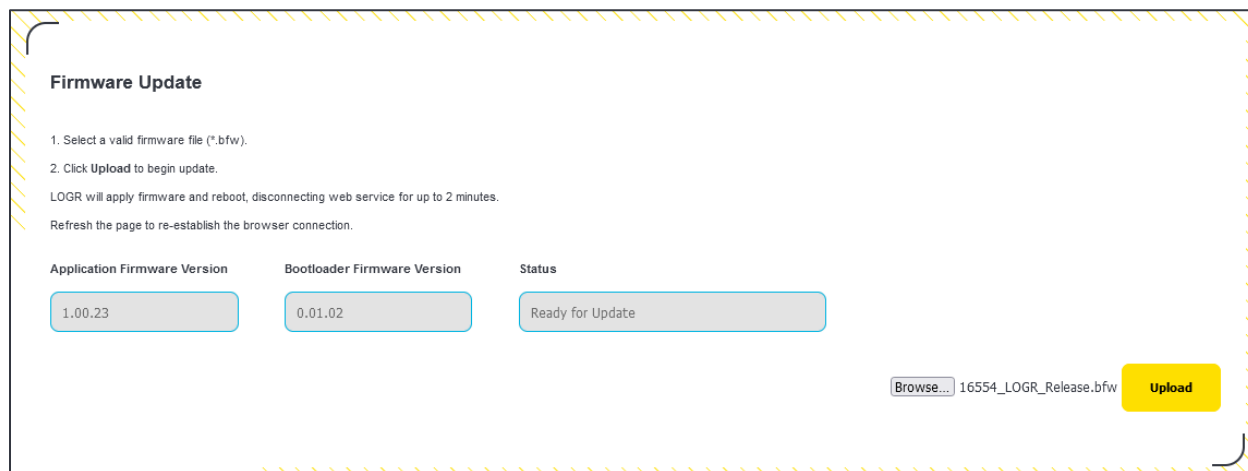
- Application Firmware Version: 1.00.23
- Bootloader Firmware Version: 0.01.02
- Status: Ready for Update

At the bottom right, there is a 'Browse...' button with the text 'No file selected.' and a yellow 'Upload' button.

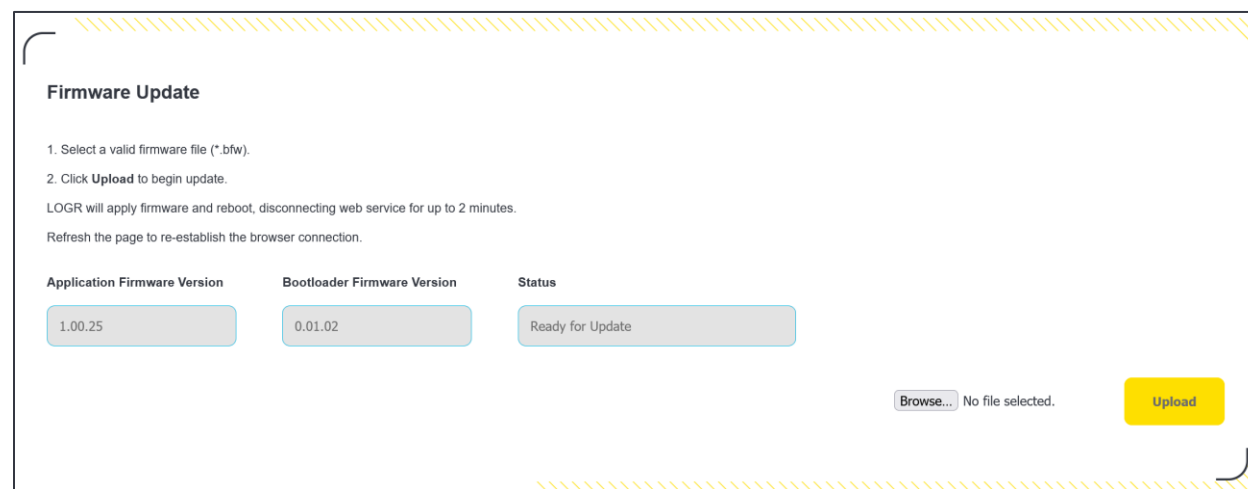


LOGR-S Data Logger

To update LOGR firmware using the web server, click the **Browse** button, navigate to and open a valid .bfw firmware file. Click the yellow **Upload** button.



The LOGR will beep to confirm the action has been accepted by resetting and returning the web server to the **Sensor Outputs** home page. This process may take several minutes, during which the web server will be unresponsive. The LOGR will reboot when the action is completed, and the updated firmware can then be confirmed by navigating back to the **Firmware** page under the **Logger** menu.





FTP

LOGR has a built in FTP client capable of picking up a `command.ini` file from a local FTP server. Command files can be used to save sensor configurations, unit configurations, update the device firmware (which can also be completed using the web server), and rebooting the logger. Note that much of the functionality of the FTP client and server can be more easily completed via the webserver.

Command Files

Command files are used to communicate between LOGR and the configured FTP server in both directions. Many of the actions completed with command files can also be completed with the web server. Command files will only be picked up by LOGR if the file name is `command.ini` and will only be processed if the file content is formatted correctly.

To enact a command file:

1. Navigate to the FTP server and find the command directory specified by the LOGR's File Transfer Settings.
2. Navigate to the folder for the LOGR in question (folder name is the serial number of the LOGR e.g. 000300). If the folder does not exist for the specified logger, create it.
3. Place the desired `command.ini` file and any necessary associated files onto the FTP server (note only ONE `command.ini` file can be placed in the folder at a given time).
4. Ensure the LOGR is configured to regularly check the FTP server for `command.ini` files (see File Transfer Settings)
5. Once the `command.ini` has been processed, the `command.ini` file and any associated files will have the unix timestamp appended to it, so that a user can identify that the file has been sent to the LOGR.



Command File Options

Command Type	Description	Contents
Reboot	This file commands the LOGR to reboot. Note that this command retains ethernet settings and does not return the unit to the default IP Address.	<pre>[command] command = reboot</pre>
Firmware Update*	This file commands an update to the LOGR firmware. Note that the updated firmware file (*.bfw) must also be placed on the FTP server and the name in the command.ini file must be the match the file on the server.	<pre>[command] command = load fw file [file parameters] file name = 16554_LOGR_1_02_00.bfw [reboot parameters] reboot now = yes</pre>
Export Sensor Configuration	If you want to save your sensor configuration for transfer to another LOGR or to have as a backup, this command file can be placed on the FTP server. Once the export is complete, there will be a unit_config_XXXXX.bin file on the FTP server.	<pre>[command] command = export sensor config</pre>
Import Sensor Configuration	To import a formerly exported sensor configuration file to a LOGR, this command file can be placed on the FTP server. Ensure that the file to be imported has a name that matches the name in the command.ini file.	<pre>[command] command = import sensor config [file parameters] file name = sensor_config_000300.bin</pre>
Export Unit Configuration	If you want to save your unit configuration for transfer to another LOGR or to have as a backup, this command file can be placed on the FTP server. Once the export is complete, there will be a unit_config_XXXXX.bin file on the FTP server.	<pre>[command] command = export unit config</pre>



Import Unit Configuration

To import a formerly exported unit configuration file to a LOGR, this command file can be placed on the FTP server. Ensure that the file to be imported has a name that matches the name in the command.ini file.

```
[command]
command = import unit
config
[file parameters]
file name =
unit_config_000300.bin
```

Export Files Configuration*

Data, Diagnostic, and Log files can be exported via a command.ini file. The data range and file type must be specified within the command file. Files will be exported to the “/data” folder in the subfolder of the same serial number as the LOGR they originated from.

```
[command]
command = export data
files
[export dates] ; yyyy-mm-
dd
start date = 2021-09-01
end date   = 2021-09-10
[file parameters]
file type = samples only
; valid values are: stats
only, samples only, stats
and samples
```

**Hukseflux SR30 Heater Control**

This file can be placed on the FTP server to control the heater of the Hukseflux SR30 pyranometer. As a default, the sensor fan is always on. The ambient temperature used for the SR30 heater control must be a single ended analog temperature sensor (such as the NRG 110S or NRG T60) and **must be wired to Channel 14**. The SR30 controller will turn the heater on/off based on the value of the temperature sensor and the control temperature settings in the command file.

This only values in this file that should be edited are the “on temperature” which is the temperature (in degrees C) below which the SR30 heater should turn on and “hysteresis” which is the amount of temperature lag (in degrees C) for heater control. The other parameters are registers and values specific to the SR30 sensor and should not be altered.

```
[command]
instruction = serial
sensor control
[control params]
heater coil = 1
fan coil = 3
temperature reg = 6
temperature reg count = 1
on temperature = 50
hysteresis = 5
```

**These command options are actionable via the webserver.*



Diagnostics

LOGR tracks all major voltages and currents in the system for diagnostic purposes and real time values can be viewed in the webserver. Navigate to the **Status** menu at the top of the page and select **Diagnostics** from the dropdown options. Diagnostic information is divided into three sections: Control, Analog, and Excitation Status.

Control Diagnostics

This section contains voltage and current information of the main (control) board of LOGR; these values are constantly monitored. Measurements within normal limits display a corresponding green status circle, while measurements not within tolerance show a red status circle to indicate an error condition.

Control

● OK ✖ Error

Status	Register	Description	Data
●	10284	VIN Raw Power (V)	17.57
●	10286	VSENSE 12.4V (V)	12.43
●	10288	ISENSE 12.4V (mA)	1.61
●	10290	VSENSE 3.3V (V)	3.29
●	10292	ISENSE 3.3V (mA)	209.52
●	10294	VSENSE COM-A EXC (V)	12.39
●	10296	ISENSE COM-A EXC (mA)	0.81
●	10298	VSENSE COM-B EXC (V)	12.36
●	10300	ISENSE COM-B EXC (mA)	0.81



Analog Diagnostics

This section contains voltage and current information from the analog board of LOGR; these values are constantly monitored. Measurements within normal limits display a corresponding green status circle, while measurements not within tolerance show a red status circle to indicate an error condition.

Analog

● OK ✖ Error

Status	Register	Description	Data
●	10332	+VIN RAW POWER (V)	17.57
●	10334	VSENSE 13.3V (V)	13.42
●	10336	VSENSE 15V (V)	15.12
●	10338	VSENSE 12V (V)	12.08
●	10340	VSENSE 5V (V)	5.06
●	10342	-VIN RAW POWER (V)	-17.35
●	10344	VSENSE -15V (V)	-15.09
●	10346	ISENSE 12V (mA)	2.63

Excitation Status

This section displays the status of sensor excitations. In the event of a channel failure (for example, due to an electrical short or high current), the corresponding port (analog or serial) will display a red status circle to indicate an error condition.

Excitation Status

● OK ✖ Error

Status	Description
●	A1 EXCITATION
●	A2 EXCITATION
●	A3 EXCITATION
●	A4 EXCITATION
●	A5 EXCITATION
●	A6 EXCITATION
●	A7 EXCITATION
●	COM-A EXCITATION
●	COM-B EXCITATION



Status Registers

LOGR constantly monitors various parameters and functions. Navigating to the **Status** menu at the top of the page and selecting **Status Registers** from the dropdown menu will display several status registers. All registers are available via SCADA; however, the critical parameters (Modbus Registers 32 and 34) are displayed on this page and can be reviewed for major function faults. Registers within normal limits display a corresponding green status circle, while registers not within tolerance show a red status circle to indicate an error condition.

Fault Registers

● OK ✖ Error

Description of Fault	Modbus Register (Bit)	Fault
COM A Error	Register 32 (Bit 0)	●
COM B Error	Register 32 (Bit 1)	●
Analog Board Timeout	Register 32 (Bit 2)	●
PV Board Timeout	Register 32 (Bit 3)	●
Unit Config CRC Fault	Register 32 (Bit 16)	●
Sensor Config CRC Fault	Register 32 (Bit 17)	●
No Analog Voltage Reference	Register 32 (Bit 18)	●
FTP Connection Fault	Register 34 (Bit 0)	●
FTP Transfer Fault	Register 34 (Bit 1)	●
FTP Directory Fault	Register 34 (Bit 2)	●
HTTP Fault	Register 34 (Bit 3)	●
SNTP Fault	Register 34 (Bit 4)	●
TCP Fault	Register 34 (Bit 5)	●
DNS Fault	Register 34 (Bit 6)	●
DHCP Fault	Register 34 (Bit 7)	●
Ethernet Overrun	Register 34 (Bit 8)	●
SD Card Fault	Register 34 (Bit 9)	●



SECTION 4 | FIELD INSTALLATION

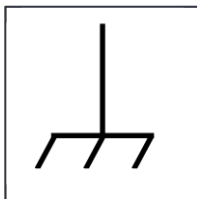
Grounding & Lightning Considerations



Properly grounding your system helps protect your logger, sensors, and data.

It is your responsibility to provide proper earth grounding for the tower, logger, and sensors. All warranties on NRG instruments and sensors are voided if your system is not properly grounded.

Meteorological sensors, loggers, and towers accumulate static electrical 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 grounding terminal, labelled with chassis ground symbol to the left must be connected to a suitable earth ground.

*The LOGR 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 can include a local earth terminal (such as a driven ground rod) and its connected grounding conductor. In grid-connected applications, the electrical safety ground may be suitable. The NRG shelter box kit which includes the AC grid power supply provides a grounding connection to the electrical grid safety ground.

The logger provides internal connections at the “SHLD” terminal of each sensor terminal block to the LOGR chassis ground. These terminals make it easy to connect the cable shields for each sensor cable to ground.



Mounting

Within a shelter box, LOGR mounts onto a 35mm DIN Rail with a pair of removeable insulating clips (included).



To install LOGR onto 35 mm DIN Rail:

1. Anchor the bottom of the black attachment clips on the back of the LOGR onto the bottom edge of the DIN rail by angling the unit.
2. Push the unit upward to compress the clip attachment springs.
3. Push the top towards the rail.
4. Release the unit onto the rail and check the unit is secure.

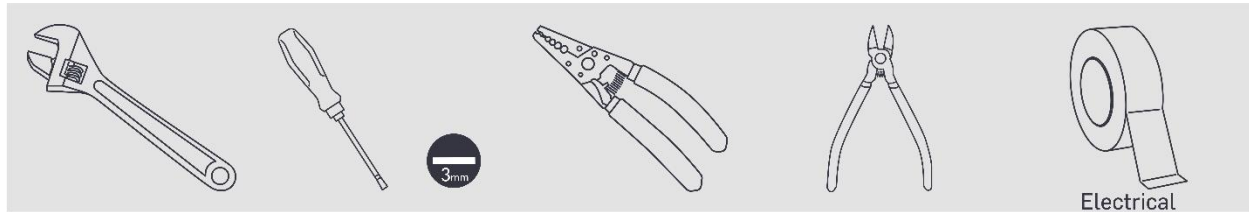


LOGR was designed to be installed in an enclosure rated for environmental protection of IP66 or better.

Do not install LOGR in an unprotected location outdoors.



Required Tools



Sensor Connections

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 Description	Part Specification Notes	Maximum Cables
12590	Strain Relief	Break-thru/Skinned-over .17”-.22” cable diameter 3/4” NPT threaded	5
16506	Strain Relief	Break-thru/Skinned-over .13”-.25” cable diameter M32-5 threaded	7
16545	Strain Relief	Break-thru/Skinned-over .24”-.30” cable diameter 1” NPT threaded	5

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).

All wires coming down a 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.



Sensor wires should be stripped to expose only 5 mm (1/4 inch) of bare wire. Stripping off more insulation could allow the wires to touch and cause an electrical short.

If sensor wires come pre-stripped beyond 5 mm (1/4 inch), then trim the exposed ends to the correct length.

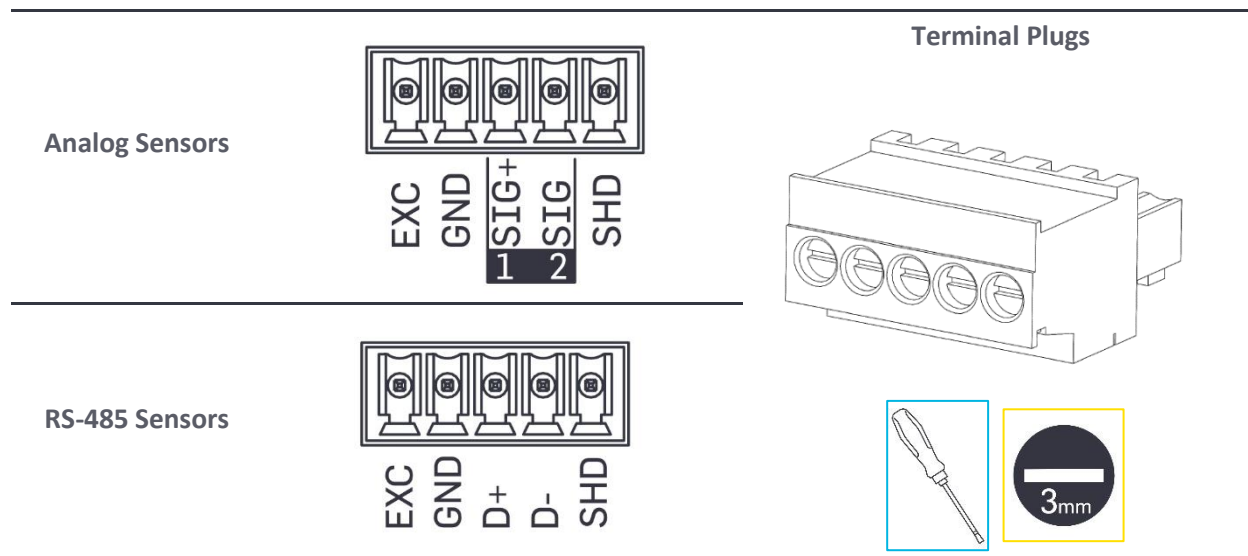
Labeling the end of sensor wires during installation is recommended for future configuration and troubleshooting.



Connecting Sensor Wires to LOGR

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

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 LOGR faceplate.



There are two signal terminals to each analog sensor port: **SIG+** and **SIG** with accompanying channel numbers below.

When connecting a single-ended analog sensor to a port, land the signal wire in the SIG+/SIG terminal that 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 used by the sensor so the even channel number of the pair cannot be configured. For example, if a 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.

After all sensors have been connected to the wiring panel:

- Confirm correct wiring by reviewing each sensor channel on the webserver.
- Coat the wiring panel terminal screws with an anti-corrosive product (such as PreservIT P100L from Caig Laboratories or Vaseline petroleum jelly).



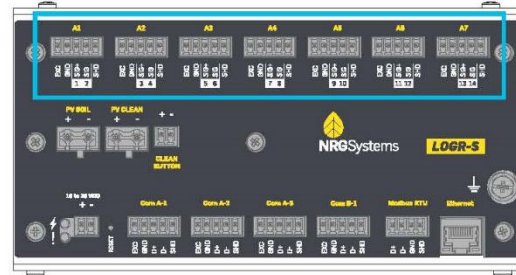
Wiring Map




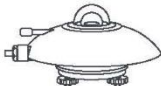







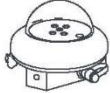

























Refer to this diagram to connect standard sensors to the LOGR or refer to the manufacturer’s instructions for each sensor.



LOGR-S WIRING MAP
Analog Channels (A1-A7)

Page 1 of 2



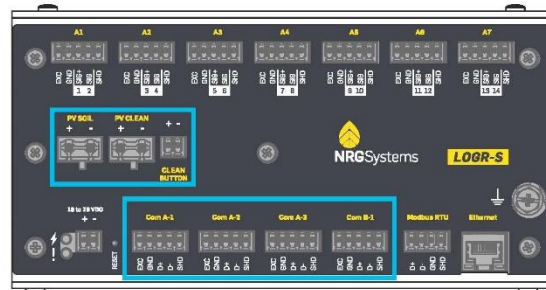
<p>EKO MS-80</p>  <p>Sensor</p> <p>Brn  ----- SIG+</p> <p>Wht  ----- SIG</p> <p>Bare ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>Hukseflux SR11, SR12, and SR20</p>  <p>Sensor</p> <p>Wht  ----- SIG+</p> <p>Grn  ----- SIG</p> <p>Blk  ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>Kipp & Zonen CMP3, CMP10, CMP11</p>  <p>Sensor</p> <p>Wht  ----- SIG+</p> <p>Grn  ----- SIG</p> <p>Blk  ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>Delta-T SPN1</p>  <p>Sensor</p> <p>Pnk  ----- EXC</p> <p>Grn  ----- GND</p> <p>* Wht  ----- SIG+ GHI</p> <p>* Brn  ----- SIG DIF</p> <p>Braid ----- SHD</p> <p>Red  ----- Heater Power Supply</p> <p>Blu  ----- Heater Ground</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+ GHI</p> <p>SIG DIF</p> <p>SHD</p>
<p>NRG PVT1</p>  <p>Sensor</p> <p>Red  ----- EXC</p> <p>Blk  ----- GND</p> <p>Grn  ----- SIG+</p> <p>Wht  ----- SIG</p> <p>Shield ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>NRG T60 or 110S</p>  <p>Sensor</p> <p>Red  ----- EXC</p> <p>Blk  ----- GND</p> <p>* Wht  ----- SIG+</p> <p>Shield ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p> <p><i>Note: Use on Ch. 14 for SR30 Control</i></p>	<p>NRG BP60 or BP20</p>  <p>Sensor</p> <p>Red  ----- EXC</p> <p>Blk  ----- GND</p> <p>* Wht  ----- SIG+</p> <p>Shield ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>NRG RH5X</p>  <p>Sensor</p> <p>Red  ----- EXC</p> <p>Blk  ----- GND</p> <p>* Wht  ----- SIG+</p> <p>Shield ----- SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>
<p>PT100, PT1000 or Thermistor, 4-wire connection</p>  <p>Sensor</p> <p>Current ----- EXC</p> <p>Common ----- GND</p> <p>Signal+ ----- SIG+</p> <p>Signal ----- SIG</p> <p>SHD</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>RM Young Vert Prop 27106</p>  <p>Sensor</p> <p>Terminal A ----- GND</p> <p>* Terminal B ----- SIG+</p> <p>Logger</p> <p>EXC</p> <p>GND</p> <p>SIG+</p> <p>SIG</p> <p>SHD</p>	<p>*</p> <p>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.</p> <p>See user manual for more information.</p>	



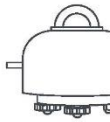

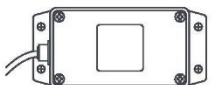





LOGR-S WIRING MAP

Serial Channels (COM-A1 to COM-B1) and PV Panels for Soiling

Page 2 of 2



<p>EKO MS-80S</p>  <p>Sensor Logger</p> <p>Brn ■ EXC Wht □ GND Blu ■ D+ Blk ■ D- Ylw ■ SHD</p>	<p>EKO MS-40M</p>  <p>Sensor Logger</p> <p>Brn ■ EXC Wht □ GND Blu ■ D+ Blk ■ D- Gry ■ & Shield SHD</p>	<p>Hukseflux SR30-D1</p>  <p>Sensor Logger</p> <p>Brn ■ EXC Blk ■ GND Wht □ D+ Gry ■ D- Blu ■ SHD</p>	<p>Hukseflux SR20-D2</p>  <p>Sensor Logger</p> <p>Red ■ EXC Blu ■ GND Wht □ D+ Grn ■ D- Blk ■ SHD</p>
<p>Atonometrics RC18</p>  <p>Sensor Logger</p> <p>Pnk ■ EXC Blk ■ GND Wht □ D+ Pur ■ D- Shield SHD</p>	<p>Kipp & Zonen DustIQ</p>  <p>Sensor Logger</p> <p>Wht □ EXC Blk ■ GND Ylw ■ D+ Gry ■ D- Blu ■ SHD</p>	<p>Lufft WS300 & WS600</p>  <p>Sensor Logger</p> <p>Brn ■ EXC Wht □ GND Grn ■ D+ Ylw ■ D- SHD</p>	<p>PV Panels for Soiling</p>  <p>Panels Logger</p> <p>Red ■ + Blk ■ -</p> <p>or</p> <p>Wht □ + Blu ■ -</p> <p>or</p> <p>Wht □ + Blk ■ -</p>



Logger Data Acquisition

LOGR starts recording data and delivering it to the SCADA system as soon as it is powered up. A backup of all SCADA data is stored on an embedded microSD card installed inside the logger. If this data is needed as a backup or to send to NRG Technical Services for troubleshooting, it can be exported to the FTP server either with a command file or via the webserver.

Data File Transfer

Once a valid local FTP server has been set up, the file transfer process can commence. Ensure that a **Command** directory and **Data** directory have been created. In each folder there should be a subfolder for each connected logger named as the five-digit SN (ex 00201).

1. Navigate to the **Logger** menu at the top of the page and select **File Transfer Settings** from the drop-down menu.
2. Change the **State** to *Enabled*.
3. Change the **Mode** to *Active* or *Passive* (based on your server needs).
4. Check the boxes to enable *Commands* and *Data*.
5. Enter the necessary information including the local **FTP Server IP / URL**, **Username**, **Password**, **Command Directory Path** (e.g. /Vegahome/commands), and **Data Directory Path** (e.g. /Vegahome/data). The **FTP Command / Data Period (minutes)** determines the frequency that the local FTP is checked for commands.

Note that for this process to work correctly, the directories must be named "commands" and "data" respectively.

6. Click the yellow **Apply** button to save the changes.



FTP Configuration

State
 Enable Disabled

Mode
 Active Passive

Enabled Options
 Commands Data

FTP Server IP / URL

Username

Password
 Show Password

Command Directory Path

Data Directory Path

FTP Command / Data Period (minutes)

The logger is now configured to transfer to/from the local FTP server.



LOGR-S Data Logger

File Types

The files stored on the internal microSD card 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.

Data Files (*.diag)	<i>This file type contains time stamped logger data (one second, statistical or both) and human readable header text providing information regarding the logger configuration and site location.</i>
Diagnostic Files (*.diag)	<i>This file type contains statistical diagnostic data (voltages and currents) for troubleshooting purposes.</i>
Log Files (*.log)	<i>This file type contains a list of unix timestamped events and errors.</i>

Data File Types:

One-Second Data File	<i>Sends one second sensor data only.</i>
Statistical Data File	<i>Default option. Sends statistical data only.</i>
Both	<i>Sends a file with both one second and statistical data.</i>

File Transfer Schedule

Below the FTP Configuration box, a daily scheduled transfer can be set to automatically send files to the FTP server. These are hourly files containing data (*.dat), diagnostic information (*.diag), and event logs (*.log). First, choose a specific time **When to Auto Send** the daily transfer and choose the **File Type** (see descriptions above). Click the yellow **Save** button to apply the configuration.

File Transfer Schedule

When to Auto Send

Never
 Send Once Daily at

File Type

One Second Data File
 Statistical Data File
 Both

Save



LOGR-S Data Logger

File Export

Alternatively, data files can be sent on demand, when needed, to the FTP server. In the **File Export** box, select a *Start Date* and *End Date* for a range to retrieve data files. The *Start Date* must precede or equal the *End Date*. Matching dates will send only files from the chosen day. Files are stored for up to 90 days and the *Start Date* cannot be more than 90 days before the current date.

Select the *File Type* (see file type descriptions above) to export and click the yellow **Transfer** button to enact the action. Diagnostic and log files are sent regardless of the data file type selected.

The screenshot shows a web interface for file export. It has a title 'File Export'. Below the title are two date pickers: 'Start Date' with the value '09 / 20 / 2021' and 'End Date' with the value '10 / 04 / 2021'. Underneath is a 'File Type' section with three radio button options: 'One Second Data File', 'Statistical Data File' (which is selected), and 'Both'. A yellow button labeled 'Transfer' is positioned in the bottom right corner of the form area.

All exported files are human-readable and file names are formatted as:

YYYYMMDD_HHMM_XXXXX_ZZZZZZ, where XXXXX is the LOGR serial number, and ZZZZZZ is the index of the file.

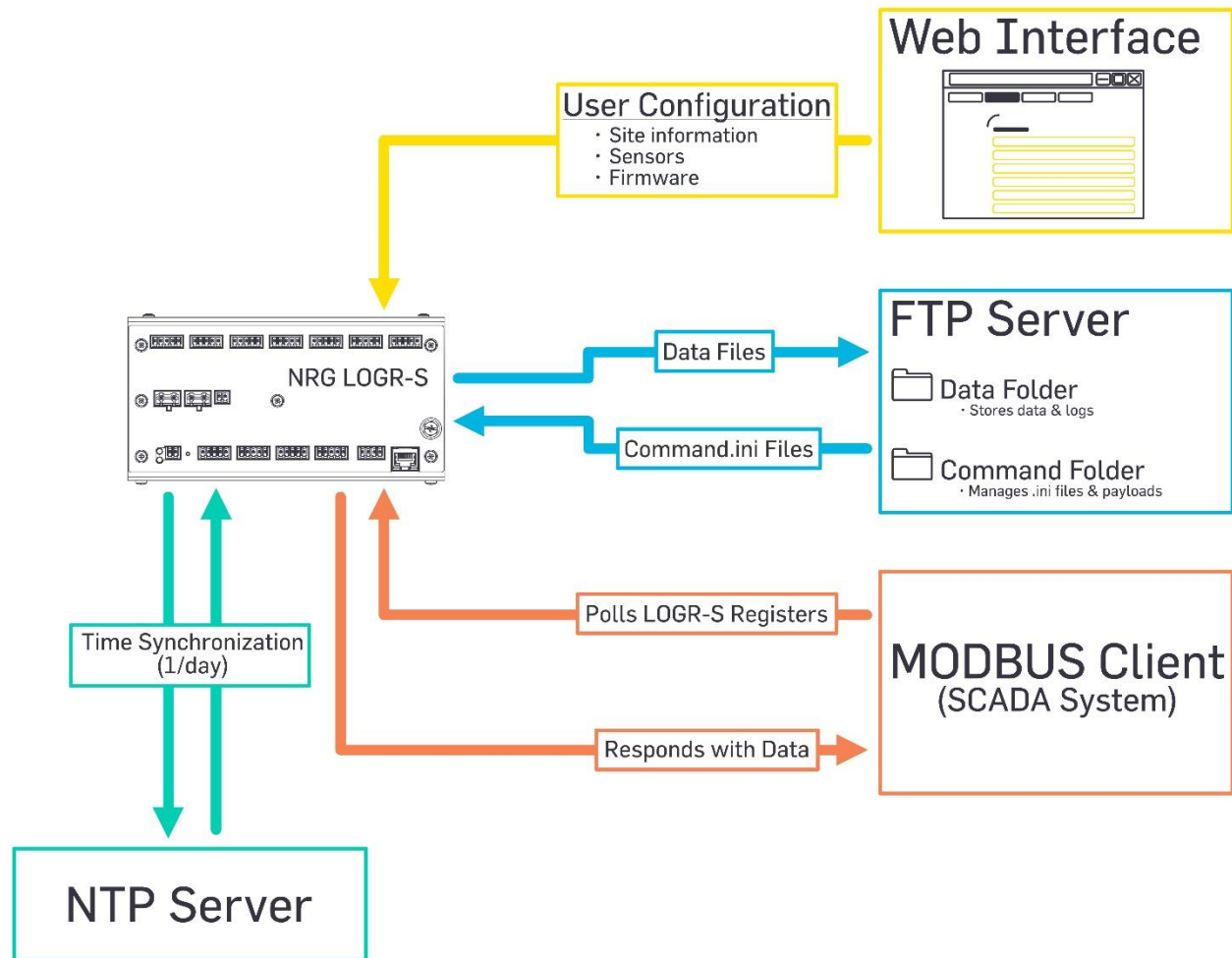
For example, the file `20210801_2300_000214_000327.*` was created on August 1, 2021 at 11 PM, was logged by LOGR serial number 214, and has a file index number of 327. All files from that date and time have the same name and are followed by the appropriate file type extension (*.dat, *.log, *.diag).



SECTION 5 | COMMUNICATION & DATA

Modbus

Network & Data Flow





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 LOGR registers.

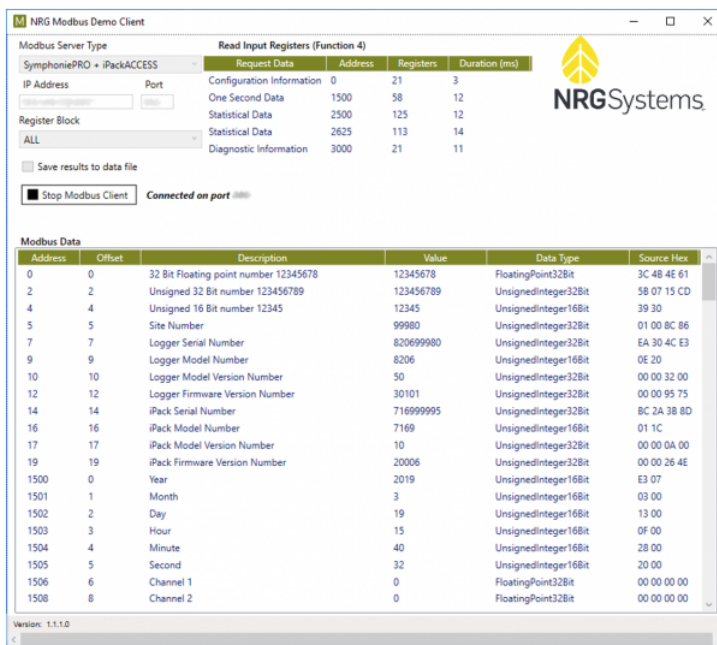
Access to the Modbus Demo Client is found here:

<https://www.nrgsystems.com/support/product-support/software/ipackaccess-modbus-client->



MODBUS DEMO CLIENT UTILITY

[DOWNLOAD EXE \(438 KB\)](#)



This application communicates with NRG products (e.g., *Symphonie® iPackACCESS*) via Modbus TCP and can be used to view the Modbus Register Set of the connected device. It is a lightweight utility that can be run off of a USB drive and be used at various points in your network to establish and troubleshoot the proper connectivity of your measurement system.

[demonstration-application](#)

Modbus Map

See Appendix B | Modbus Map Appendix B | Modbus Map



Export File Format

Data collected and stored by the LOGR system is comprised of a sensor sample data file, a diagnostic data file, and an event log. These data are exported in a human-readable format as plain ASCII text.

A sensor sample data file consists of three sections:

- Unit configuration parameters
- Sensor description and channel configuration information
- Sensor sample data from enabled channels

Depending on the file export type selected, the sensor sample data section will contain one of three formats (see File Types on page 42):

- Samples only
- Statistics only
- Samples and statistics



Example exported data file:

```

NRG Systems Data Logger
File created on: 2021-09-16T12:20:38Z
Model number: 9431
Serial number: 209
FW version: 1.01.00

Site Properties
Site: NRG Hinesburg
Project: LOGR_S Long term testing
Location: PV string A3
Latitude: 44.33889
Longitude: -73.11202
Elevation: 136
Time zone: -5

File properties
File schema version: 1
File content: STATS_AND_SAMPLES
SD card free space (kB): 7979237

Configuration_Version: 1
Soiling_Ratio: Enabled

Analog_Channel_14
Description: NRG T60 on 14
Units: deg_C
Serial_#: 000000123
Scale_Factor: 44.743641
Offset: -40.855549

Serial_Channel_115
Sensor_Type: Hukseflux SR30
Description: Hukseflux SR30 on 'B'
Measurand: Irradiance
Units: W/m^2
Serial_#: 000001
Scale_Factor: 0.000000
Offset: -0.000000

Soiling_Channel_201
POA_Channel: 14
Open_Circuit_Time: 20
Short_Circuit_Time: 5
    
```

Export File Header

- Export timestamp
- LOGR model number
- Unit serial number
- Firmware version

LOGR Site Location Information

- Time zone offset from UTC

Data File Information

- File format version
- Type of data within file
- LOGR internal memory remaining
- Configuration structure version

Channel Configuration Information

- Analog channel configuration
- Serial channel configuration
- PV soiling channel configuration



LOGR-S Data Logger

Samples Only data file:

Sample_Timestamp	Ch1_Samples_hPa
2021-10-07T08:00:01Z	1012.6927
2021-10-07T08:00:02Z	1012.6984
2021-10-07T08:00:03Z	1012.6927
2021-10-07T08:00:04Z	1012.6959
2021-10-07T08:00:05Z	1012.6959
2021-10-07T08:00:06Z	1012.7005
2021-10-07T08:00:07Z	1012.6891
2021-10-07T08:00:08Z	1012.7057
2021-10-07T08:00:09Z	1012.7100
2021-10-07T08:00:10Z	1012.7057
2021-10-07T08:00:11Z	1012.7042
2021-10-07T08:00:12Z	1012.7100
2021-10-07T08:00:13Z	1012.7198
2021-10-07T08:00:14Z	1012.6990
2021-10-07T08:00:15Z	1012.6901
2021-10-07T08:00:16Z	1012.7036
2021-10-07T08:00:17Z	1012.6953
2021-10-07T08:00:18Z	1012.6964
2021-10-07T08:00:19Z	1012.7000
2021-10-07T08:00:20Z	1012.6922

Stats Only data file:

Stats_Timestamp	Ch1_Avg_hPa	Ch1_Min_hPa	Ch1_Max_hPa	Ch1_SD_hPa
2021-10-07T19:37:00Z	1009.6680	1009.6525	1009.6885	0.0073
2021-10-07T19:38:00Z	1009.6813	1009.6635	1009.6984	0.0083
2021-10-07T19:39:00Z	1009.6866	1009.6681	1009.6989	0.0066
2021-10-07T19:40:00Z	1009.6920	1009.6722	1009.7040	0.0068
2021-10-07T19:41:00Z	1009.6848	1009.6655	1009.7046	0.0079
2021-10-07T19:42:00Z	1009.6700	1009.6447	1009.6906	0.0100
2021-10-07T19:43:00Z	1009.6555	1009.6370	1009.6786	0.0083



Stats and Samples data file:

Sample_Timestamp	Stats_Timestamp	Ch1_Samples_hPa	Ch1_Avg_hPa	Ch1_Min_hPa	Ch1_Max_hPa	Ch1_SD_hPa
2021-10-07T19:51:00Z	2021-10-07T19:51:00Z	1009.5510	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:01Z	2021-10-07T19:51:00Z	1009.5541	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:02Z	2021-10-07T19:51:00Z	1009.5505	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:03Z	2021-10-07T19:51:00Z	1009.5286	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:04Z	2021-10-07T19:51:00Z	1009.5302	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:05Z	2021-10-07T19:51:00Z	1009.5536	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:06Z	2021-10-07T19:51:00Z	1009.5490	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:07Z	2021-10-07T19:51:00Z	1009.5494	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:08Z	2021-10-07T19:51:00Z	1009.5505	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:09Z	2021-10-07T19:51:00Z	1009.5396	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:10Z	2021-10-07T19:51:00Z	1009.5427	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:11Z	2021-10-07T19:51:00Z	1009.5484	1009.5509	1009.5234	1009.5765	0.0116
2021-10-07T19:51:12Z	2021-10-07T19:51:00Z	1009.5432	1009.5509	1009.5234	1009.5765	0.0116

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

Diagnostic data for the MCU board:

- Raw power in
- 12.4V supply Voltage
- 12.4V supply current mA
- 3.3V supply voltage
- 3.3V supply current mA
- COM-A excitation voltage
- COM-A excitation current mA
- COM-B excitation voltage
- COM-B excitation current mA

Diagnostic data for the analog sensor board:

- +VIN Raw power
- 13.3V voltage
- 13.3V current mA
- 15V voltage
- 12V voltage
- 5V voltage
- -VIN Raw power
- 12V current mA



LOGR-S Data Logger

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 LOGR unit will generate very 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|
```



SECTION 6 | POWER SYSTEMS

Powering the LOGR Logger

The LOGR data logger requires 16 to 36 V DC power. The logger typically draws 75 mA at 16 V (1.2 W) when unloaded.

Powering Sensors

LOGR also provides regulated 12 V DC power outputs at each serial sensor port and up to 50 mA per analog sensor port. It also provides up to 1000 mA shared between the three COM-A ports, plus up to 1000 mA to the COM-B port for serial connected sensors.

For power planning, simply add the sensor power requirements to the LOGR base power requirements to determine the power load of the relevant system. The maximum power load supported via LOGR is 2350 mA at 12 V. For power planning purposes, assume a maximum of 1.6 W (100 mA at 16 V) for the LOGR alone, for a total of 2450 mA at 12 V, or about 30 W total.

Note that the efficient power regulators in the LOGR will draw less current when input voltage is higher.

Grid-Tied Power Systems

When grid power is available, NRG has a power supply system preconfigured to fit the standard LOGR shelter box, sized to deliver up to 60 W of 15 V DC power.

Autonomous Power Systems

For installations without grid power, or when backup power is required, NRG can provide a preconfigured power solution for your 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)



APPENDIX A | TECHNICAL SPECIFICATIONS

Please see nrgsystems.com for up-to-date product specifications.

Description	Instrument type	High utility data logger and real-time sensor interface
	Applications	Solar resource monitoring
Data Collection	Sampling interval	1 Hz (IEC 61724-1 compliant)
	Averaging interval	1-minute (IEC 61724-1 compliant)
	Real time clock	Internal battery-backed with time synchronization
	Storage medium	8 GB microSD
	Maximum data storage	90 days (all data with maximum configuration)
	Channel Capacity	<ul style="list-style-type: none"> • Fourteen (14) analog channels (single-ended); Seven (7) differential • Twenty-four (24) serial channels via two (2) RS-485 communication ports • Two (2) PV Input channels (soiling measurement) • Ten (10) calculated channels plus dedicated soiling ratio calculation • Counter channel support coming soon
	Analog Channels Sensor Compatibility	<p>Compatible with a wide array of sensors including:</p> <ul style="list-style-type: none"> • Standard analog sensors including NRG meteorological sensor suite (T60 Temperature, BP60 Barometric Pressure, RH5X Relative Humidity, etc.) • Industry-standard pyranometers (Hukseflux SRxx series, EKO MS-xx series, Kipp & Zonen CMP series, etc.) • 10K NTC Thermistor and RTD (PT100, PT1000) type temperature sensors
	Analog Measurement Accuracy	<p>Uncertainty (k=2):</p> <ul style="list-style-type: none"> ☒ 450 μV @ (-10 to +10) V ☒ 61 μV @ (-1 to +1) V ☒ 8.5 μV @ (-70 to +70) mV
	RS-485 Channels Sensor Compatibility	Supports configurable Modbus RTU data acquisition. Contact NRG to discuss support for additional model types or protocols.
	Parameters recorded for each channel	<ul style="list-style-type: none"> • Average • Standard deviation • Minimum/Maximum 1-sec sample <p>Note: Statistics reported on each channel dependent on measurement type</p>
	Data delivery	<ul style="list-style-type: none"> • Real-time data delivery via Modbus registers (TCP via Ethernet or RTU via RS-485) • Scheduled delivery of historical data via FTP • On-demand transfer of historical data via internal web server to FTP
	Security	Password-protected web server access
Resolution	Analog measurement resolution	24-bit signed A/D conversion
Software	Type	<ul style="list-style-type: none"> • Onboard web server for logger configuration and administration • Modbus Demo Client to test configured unit prior to connecting to SCADA



LOGR-S Data Logger

Configuration	User interface	<ul style="list-style-type: none"> • Web-based user interface via Ethernet connected computing device with web browser • Recessed reset button on front panel • Audible beeper for user feedback
Connections	Sensor wiring	Integrated wiring panel featuring removable terminal blocks: <ul style="list-style-type: none"> • Seven (7) dedicated analog sensor wiring ports • Four (4) dedicated RS-485 sensor wiring ports • Two (2) dedicated PV input ports • Enclosure ground lug connects to earth ground with included ground cable
	Expansion slots	Available module slots include: <ul style="list-style-type: none"> • MCU (processor) module • Analog module • PV input module • Counter module (coming soon)
	Communication ports	<ul style="list-style-type: none"> • Ethernet port for web browser, FTP, Modbus TCP (server) • RS-485 port for Modbus RTU (server)
Power requirements	Batteries	Coin cell battery for clock backup
	External power input	(16 to 28) VDC
	External solar input	Contact NRG sales for accompanying backup power supply system options
	External power output	<ul style="list-style-type: none"> • Constant 12 V source for powering analog sensors (50 mA per excitation port, 7 ports) • Constant 12 V source for powering Modbus sensors (1000 mA shared by three COM-A ports and additional 1000mA to COM-B port)
Installation	Mounting	35 mm DIN Rail
	Tools required	<ul style="list-style-type: none"> • Screwdriver for wiring input terminals (included) • LAN-connected computing device with web browser
Environmental	Operating temperature range	-40 °C to 65 °C (-40 °F to 149 °F)
	Operating humidity range	<ul style="list-style-type: none"> • 0 to 100% relative humidity non-condensing • IP65 ingress protection with proper installation in NRG shelter box enclosure
Physical	Dimensions	(190.5 x 101.6 x 101.6) mm
Materials	Enclosure	Formed aluminum enclosure
Shipping	Shipping weight	0.85 kg (includes 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	UnsignedInteger32BitL
28	28	System Status 1	UnsignedInteger32BitL
30	30	System Status 2	UnsignedInteger32BitL
32	32	System Status 3	UnsignedInteger32BitL
34	34	System Status 4	UnsignedInteger32BitL
36	36	System Status 5	UnsignedInteger32BitL
38	38	System Status 6	UnsignedInteger32BitL
40	40	System Status 7	UnsignedInteger32BitL
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	Master Baud 1	UnsignedInteger32BitL
54	54	Master Parity 1	UnsignedInteger32BitL
56	56	Master Data Bits 1	UnsignedInteger32BitL
58	58	Master Stop Bits 1	UnsignedInteger32BitL
60	60	Master Baud 2	UnsignedInteger32BitL
62	62	Master Parity 2	UnsignedInteger32BitL
64	64	Master Data Bits 2	UnsignedInteger32BitL
66	66	Master Stop Bits 2	UnsignedInteger32BitL
68	68	Net DHCP Enabled	UnsignedInteger32BitL
70	70	Cal Ref Voltage	UnsignedInteger32BitL
72	72	Card Config	UnsignedInteger32BitL



LOGR-S Data Logger

10000	0	Year UTC	UnsignedInteger32BitL
10002	2	Month UTC	UnsignedInteger32BitL
10004	4	Day UTC	UnsignedInteger32BitL
10006	6	Hour UTC	UnsignedInteger32BitL
10008	8	Minute UTC	UnsignedInteger32BitL
10010	10	Second UTC	UnsignedInteger32BitL
10012	12	iShortCircuitClean	FloatingPoint32BitL
10014	14	vOpenCircuitClean	FloatingPoint32BitL
10016	16	iShortCircuitSoil	FloatingPoint32BitL
10018	18	vOpenCircuitSoil	FloatingPoint32BitL
10020	20	unused	FloatingPoint32BitL
10022	22	unused	FloatingPoint32BitL
10024	24	Soiling Ratio	FloatingPoint32BitL
10026	26	Clean Time	UnsignedInteger32BitL
10028	0	Analog Scaled Channel 1	FloatingPoint32BitL
10030	2	Analog Scaled Channel 2	FloatingPoint32BitL
10032	4	Analog Scaled Channel 3	FloatingPoint32BitL
10034	6	Analog Scaled Channel 4	FloatingPoint32BitL
10036	8	Analog Scaled Channel 5	FloatingPoint32BitL
10038	10	Analog Scaled Channel 6	FloatingPoint32BitL
10040	12	Analog Scaled Channel 7	FloatingPoint32BitL
10042	14	Analog Scaled Channel 8	FloatingPoint32BitL
10044	16	Analog Scaled Channel 9	FloatingPoint32BitL
10046	18	Analog Scaled Channel 10	FloatingPoint32BitL
10048	20	Analog Scaled Channel 11	FloatingPoint32BitL
10050	22	Analog Scaled Channel 12	FloatingPoint32BitL
10052	24	Analog Scaled Channel 13	FloatingPoint32BitL
10054	26	Analog Scaled Channel 14	FloatingPoint32BitL
10140	0	Serial Scaled Channel 101	FloatingPoint32BitL
10142	2	Serial Scaled Channel 102	FloatingPoint32BitL
10144	4	Serial Scaled Channel 103	FloatingPoint32BitL
10146	6	Serial Scaled Channel 104	FloatingPoint32BitL
10148	8	Serial Scaled Channel 105	FloatingPoint32BitL
10150	10	Serial Scaled Channel 106	FloatingPoint32BitL
10152	12	Serial Scaled Channel 107	FloatingPoint32BitL
10154	14	Serial Scaled Channel 108	FloatingPoint32BitL
10156	16	Serial Scaled Channel 109	FloatingPoint32BitL
10158	18	Serial Scaled Channel 110	FloatingPoint32BitL
10160	20	Serial Scaled Channel 111	FloatingPoint32BitL
10162	22	Serial Scaled Channel 112	FloatingPoint32BitL



10164	24	Serial Scaled Channel 113	FloatingPoint32BitL
10166	26	Serial Scaled Channel 114	FloatingPoint32BitL
10168	28	Serial Scaled Channel 115	FloatingPoint32BitL
10170	30	Serial Scaled Channel 116	FloatingPoint32BitL
10172	32	Serial Scaled Channel 117	FloatingPoint32BitL
10174	34	Serial Scaled Channel 118	FloatingPoint32BitL
10176	36	Serial Scaled Channel 119	FloatingPoint32BitL
10178	38	Serial Scaled Channel 120	FloatingPoint32BitL
10180	40	Serial Scaled Channel 121	FloatingPoint32BitL
10182	42	Serial Scaled Channel 122	FloatingPoint32BitL
10184	44	Serial Scaled Channel 123	FloatingPoint32BitL
10186	46	Serial Scaled Channel 124	FloatingPoint32BitL
10236	0	Calculated Scaled Channel 301	FloatingPoint32BitL
10238	2	Calculated Scaled Channel 302	FloatingPoint32BitL
10240	4	Calculated Scaled Channel 303	FloatingPoint32BitL
10242	6	Calculated Scaled Channel 304	FloatingPoint32BitL
10244	8	Calculated Scaled Channel 305	FloatingPoint32BitL
10246	10	Calculated Scaled Channel 306	FloatingPoint32BitL
10248	12	Calculated Scaled Channel 307	FloatingPoint32BitL
10250	14	Calculated Scaled Channel 308	FloatingPoint32BitL
10252	16	Calculated Scaled Channel 309	FloatingPoint32BitL
10254	18	Calculated Scaled Channel 310	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 2 Average	FloatingPoint32BitL
15022	22	Analog Stats Channel 2 Min	FloatingPoint32BitL
15024	24	Analog Stats Channel 2 Max	FloatingPoint32BitL
15026	26	Analog Stats Channel 2 SD	FloatingPoint32BitL
15028	28	Analog Stats Channel 3 Average	FloatingPoint32BitL
15030	30	Analog Stats Channel 3 Min	FloatingPoint32BitL
15032	32	Analog Stats Channel 3 Max	FloatingPoint32BitL
15034	34	Analog Stats Channel 3 SD	FloatingPoint32BitL



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15036	36	Analog Stats Channel 4 Average	FloatingPoint32BitL
15038	38	Analog Stats Channel 4 Min	FloatingPoint32BitL
15040	40	Analog Stats Channel 4 Max	FloatingPoint32BitL
15042	42	Analog Stats Channel 4 SD	FloatingPoint32BitL
15044	44	Analog Stats Channel 5 Average	FloatingPoint32BitL
15046	46	Analog Stats Channel 5 Min	FloatingPoint32BitL
15048	48	Analog Stats Channel 5 Max	FloatingPoint32BitL
15050	50	Analog Stats Channel 5 SD	FloatingPoint32BitL
15052	52	Analog Stats Channel 6 Average	FloatingPoint32BitL
15054	54	Analog Stats Channel 6 Min	FloatingPoint32BitL
15056	56	Analog Stats Channel 6 Max	FloatingPoint32BitL
15058	58	Analog Stats Channel 6 SD	FloatingPoint32BitL
15060	60	Analog Stats Channel 7 Average	FloatingPoint32BitL
15062	62	Analog Stats Channel 7 Min	FloatingPoint32BitL
15064	64	Analog Stats Channel 7 Max	FloatingPoint32BitL
15066	66	Analog Stats Channel 7 SD	FloatingPoint32BitL
15068	68	Analog Stats Channel 8 Average	FloatingPoint32BitL
15070	70	Analog Stats Channel 8 Min	FloatingPoint32BitL
15072	72	Analog Stats Channel 8 Max	FloatingPoint32BitL
15074	74	Analog Stats Channel 8 SD	FloatingPoint32BitL
15076	76	Analog Stats Channel 9 Average	FloatingPoint32BitL
15078	78	Analog Stats Channel 9 Min	FloatingPoint32BitL
15080	80	Analog Stats Channel 9 Max	FloatingPoint32BitL
15082	82	Analog Stats Channel 9 SD	FloatingPoint32BitL
15084	84	Analog Stats Channel 10 Average	FloatingPoint32BitL
15086	86	Analog Stats Channel 10 Min	FloatingPoint32BitL
15088	88	Analog Stats Channel 10 Max	FloatingPoint32BitL
15090	90	Analog Stats Channel 10 SD	FloatingPoint32BitL
15092	92	Analog Stats Channel 11 Average	FloatingPoint32BitL
15094	94	Analog Stats Channel 11 Min	FloatingPoint32BitL
15096	96	Analog Stats Channel 11 Max	FloatingPoint32BitL
15098	98	Analog Stats Channel 11 SD	FloatingPoint32BitL
15100	100	Analog Stats Channel 12 Average	FloatingPoint32BitL
15102	102	Analog Stats Channel 12 Min	FloatingPoint32BitL
15104	104	Analog Stats Channel 12 Max	FloatingPoint32BitL
15106	106	Analog Stats Channel 12 SD	FloatingPoint32BitL
15108	108	Analog Stats Channel 13 Average	FloatingPoint32BitL
15110	110	Analog Stats Channel 13 Min	FloatingPoint32BitL
15112	112	Analog Stats Channel 13 Max	FloatingPoint32BitL
15114	114	Analog Stats Channel 13 SD	FloatingPoint32BitL



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15116	116	Analog Stats Channel 14 Average	FloatingPoint32BitL
15118	118	Analog Stats Channel 14 Min	FloatingPoint32BitL
15120	120	Analog Stats Channel 14 Max	FloatingPoint32BitL
15122	122	Analog Stats Channel 14 SD	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 102 Average	FloatingPoint32BitL
15470	10	Serial Stats Channel 102 Min	FloatingPoint32BitL
15472	12	Serial Stats Channel 102 Max	FloatingPoint32BitL
15474	14	Serial Stats Channel 102 SD	FloatingPoint32BitL
15476	16	Serial Stats Channel 103 Average	FloatingPoint32BitL
15478	18	Serial Stats Channel 103 Min	FloatingPoint32BitL
15480	20	Serial Stats Channel 103 Max	FloatingPoint32BitL
15482	22	Serial Stats Channel 103 SD	FloatingPoint32BitL
15484	24	Serial Stats Channel 104 Average	FloatingPoint32BitL
15486	26	Serial Stats Channel 104 Min	FloatingPoint32BitL
15488	28	Serial Stats Channel 104 Max	FloatingPoint32BitL
15490	30	Serial Stats Channel 104 SD	FloatingPoint32BitL
15492	32	Serial Stats Channel 105 Average	FloatingPoint32BitL
15494	34	Serial Stats Channel 105 Min	FloatingPoint32BitL
15496	36	Serial Stats Channel 105 Max	FloatingPoint32BitL
15498	38	Serial Stats Channel 105 SD	FloatingPoint32BitL
15500	40	Serial Stats Channel 106 Average	FloatingPoint32BitL
15502	42	Serial Stats Channel 106 Min	FloatingPoint32BitL
15504	44	Serial Stats Channel 106 Max	FloatingPoint32BitL
15506	46	Serial Stats Channel 106 SD	FloatingPoint32BitL
15508	48	Serial Stats Channel 107 Average	FloatingPoint32BitL
15510	50	Serial Stats Channel 107 Min	FloatingPoint32BitL
15512	52	Serial Stats Channel 107 Max	FloatingPoint32BitL
15514	54	Serial Stats Channel 107 SD	FloatingPoint32BitL
15516	56	Serial Stats Channel 108 Average	FloatingPoint32BitL
15518	58	Serial Stats Channel 108 Min	FloatingPoint32BitL
15520	60	Serial Stats Channel 108 Max	FloatingPoint32BitL
15522	62	Serial Stats Channel 108 SD	FloatingPoint32BitL
15524	64	Serial Stats Channel 109 Average	FloatingPoint32BitL
15526	66	Serial Stats Channel 109 Min	FloatingPoint32BitL
15528	68	Serial Stats Channel 109 Max	FloatingPoint32BitL
15530	70	Serial Stats Channel 109 SD	FloatingPoint32BitL



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15532	72	Serial Stats Channel 110 Average	FloatingPoint32BitL
15534	74	Serial Stats Channel 110 Min	FloatingPoint32BitL
15536	76	Serial Stats Channel 110 Max	FloatingPoint32BitL
15538	78	Serial Stats Channel 110 SD	FloatingPoint32BitL
15540	80	Serial Stats Channel 111 Average	FloatingPoint32BitL
15542	82	Serial Stats Channel 111 Min	FloatingPoint32BitL
15544	84	Serial Stats Channel 111 Max	FloatingPoint32BitL
15546	86	Serial Stats Channel 111 SD	FloatingPoint32BitL
15548	88	Serial Stats Channel 112 Average	FloatingPoint32BitL
15550	90	Serial Stats Channel 112 Min	FloatingPoint32BitL
15552	92	Serial Stats Channel 112 Max	FloatingPoint32BitL
15554	94	Serial Stats Channel 112 SD	FloatingPoint32BitL
15556	96	Serial Stats Channel 113 Average	FloatingPoint32BitL
15558	98	Serial Stats Channel 113 Min	FloatingPoint32BitL
15560	100	Serial Stats Channel 113 Max	FloatingPoint32BitL
15562	102	Serial Stats Channel 113 SD	FloatingPoint32BitL
15564	104	Serial Stats Channel 114 Average	FloatingPoint32BitL
15566	106	Serial Stats Channel 114 Min	FloatingPoint32BitL
15568	108	Serial Stats Channel 114 Max	FloatingPoint32BitL
15570	110	Serial Stats Channel 114 SD	FloatingPoint32BitL
15572	112	Serial Stats Channel 115 Average	FloatingPoint32BitL
15574	114	Serial Stats Channel 115 Min	FloatingPoint32BitL
15576	116	Serial Stats Channel 115 Max	FloatingPoint32BitL
15578	118	Serial Stats Channel 115 SD	FloatingPoint32BitL
15580	0	Serial Stats Channel 116 Average	FloatingPoint32BitL
15582	2	Serial Stats Channel 116 Min	FloatingPoint32BitL
15584	4	Serial Stats Channel 116 Max	FloatingPoint32BitL
15586	6	Serial Stats Channel 116 SD	FloatingPoint32BitL
15588	8	Serial Stats Channel 117 Average	FloatingPoint32BitL
15590	10	Serial Stats Channel 117 Min	FloatingPoint32BitL
15592	12	Serial Stats Channel 117 Max	FloatingPoint32BitL
15594	14	Serial Stats Channel 117 SD	FloatingPoint32BitL
15596	16	Serial Stats Channel 118 Average	FloatingPoint32BitL
15598	18	Serial Stats Channel 118 Min	FloatingPoint32BitL
15600	20	Serial Stats Channel 118 Max	FloatingPoint32BitL
15602	22	Serial Stats Channel 118 SD	FloatingPoint32BitL
15604	24	Serial Stats Channel 119 Average	FloatingPoint32BitL
15606	26	Serial Stats Channel 119 Min	FloatingPoint32BitL
15608	28	Serial Stats Channel 119 Max	FloatingPoint32BitL
15610	30	Serial Stats Channel 119 SD	FloatingPoint32BitL



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15612	32	Serial Stats Channel 120 Average	FloatingPoint32BitL
15614	34	Serial Stats Channel 120 Min	FloatingPoint32BitL
15616	36	Serial Stats Channel 120 Max	FloatingPoint32BitL
15618	38	Serial Stats Channel 120 SD	FloatingPoint32BitL
15620	40	Serial Stats Channel 121 Average	FloatingPoint32BitL
15622	42	Serial Stats Channel 121 Min	FloatingPoint32BitL
15624	44	Serial Stats Channel 121 Max	FloatingPoint32BitL
15626	46	Serial Stats Channel 121 SD	FloatingPoint32BitL
15628	48	Serial Stats Channel 122 Average	FloatingPoint32BitL
15630	50	Serial Stats Channel 122 Min	FloatingPoint32BitL
15632	52	Serial Stats Channel 122 Max	FloatingPoint32BitL
15634	54	Serial Stats Channel 122 SD	FloatingPoint32BitL
15636	56	Serial Stats Channel 123 Average	FloatingPoint32BitL
15638	58	Serial Stats Channel 123 Min	FloatingPoint32BitL
15640	60	Serial Stats Channel 123 Max	FloatingPoint32BitL
15642	62	Serial Stats Channel 123 SD	FloatingPoint32BitL
15644	64	Serial Stats Channel 124 Average	FloatingPoint32BitL
15646	66	Serial Stats Channel 124 Min	FloatingPoint32BitL
15648	68	Serial Stats Channel 124 Max	FloatingPoint32BitL
15650	70	Serial Stats Channel 124 SD	FloatingPoint32BitL
15844	0	Calculated Stats Channel 301 Average	FloatingPoint32BitL
15846	2	Calculated Stats Channel 301 Min	FloatingPoint32BitL
15848	4	Calculated Stats Channel 301 Max	FloatingPoint32BitL
15850	6	Calculated Stats Channel 301 SD	FloatingPoint32BitL
15852	8	Calculated Stats Channel 302 Average	FloatingPoint32BitL
15854	10	Calculated Stats Channel 302 Min	FloatingPoint32BitL
15856	12	Calculated Stats Channel 302 Max	FloatingPoint32BitL
15858	14	Calculated Stats Channel 302 SD	FloatingPoint32BitL
15860	16	Calculated Stats Channel 303 Average	FloatingPoint32BitL
15862	18	Calculated Stats Channel 303 Min	FloatingPoint32BitL
15864	20	Calculated Stats Channel 303 Max	FloatingPoint32BitL
15866	22	Calculated Stats Channel 303 SD	FloatingPoint32BitL
15868	24	Calculated Stats Channel 304 Average	FloatingPoint32BitL
15870	26	Calculated Stats Channel 304 Min	FloatingPoint32BitL
15872	28	Calculated Stats Channel 304 Max	FloatingPoint32BitL
15874	30	Calculated Stats Channel 304 SD	FloatingPoint32BitL
15876	32	Calculated Stats Channel 305 Average	FloatingPoint32BitL
15878	34	Calculated Stats Channel 305 Min	FloatingPoint32BitL
15880	36	Calculated Stats Channel 305 Max	FloatingPoint32BitL
15882	38	Calculated Stats Channel 305 SD	FloatingPoint32BitL



LOGR-S Data Logger

15884	40	Calculated Stats Channel 306 Average	FloatingPoint32BitL
15886	42	Calculated Stats Channel 306 Min	FloatingPoint32BitL
15888	44	Calculated Stats Channel 306 Max	FloatingPoint32BitL
15890	46	Calculated Stats Channel 306 SD	FloatingPoint32BitL
15892	48	Calculated Stats Channel 307 Average	FloatingPoint32BitL
15894	50	Calculated Stats Channel 307 Min	FloatingPoint32BitL
15896	52	Calculated Stats Channel 307 Max	FloatingPoint32BitL
15898	54	Calculated Stats Channel 307 SD	FloatingPoint32BitL
15900	56	Calculated Stats Channel 308 Average	FloatingPoint32BitL
15902	58	Calculated Stats Channel 308 Min	FloatingPoint32BitL
15904	60	Calculated Stats Channel 308 Max	FloatingPoint32BitL
15906	62	Calculated Stats Channel 308 SD	FloatingPoint32BitL
15908	64	Calculated Stats Channel 309 Average	FloatingPoint32BitL
15910	66	Calculated Stats Channel 309 Min	FloatingPoint32BitL
15912	68	Calculated Stats Channel 309 Max	FloatingPoint32BitL
15914	70	Calculated Stats Channel 309 SD	FloatingPoint32BitL
15916	72	Calculated Stats Channel 310 Average	FloatingPoint32BitL
15918	74	Calculated Stats Channel 310 Min	FloatingPoint32BitL
15920	76	Calculated Stats Channel 310 Max	FloatingPoint32BitL
15922	78	Calculated Stats Channel 310 SD	FloatingPoint32BitL
16020	0	MCU Diag VIn Raw Power Average	FloatingPoint32BitL
16022	2	MCU Diag VIn Raw Power Min	FloatingPoint32BitL
16024	4	MCU Diag VIn Raw Power Max	FloatingPoint32BitL
16026	6	MCU Diag VIn Raw Power SD	FloatingPoint32BitL
16028	8	MCU Diag VSense 12.4V Average	FloatingPoint32BitL
16030	10	MCU Diag VSense 12.4V Min	FloatingPoint32BitL
16032	12	MCU Diag VSense 12.4V Max	FloatingPoint32BitL
16034	14	MCU Diag VSense 12.4V SD	FloatingPoint32BitL
16036	16	MCU Diag ISense 12.4V Average	FloatingPoint32BitL
16038	18	MCU Diag ISense 12.4V Min	FloatingPoint32BitL
16040	20	MCU Diag ISense 12.4V Max	FloatingPoint32BitL
16042	22	MCU Diag ISense 12.4V SD	FloatingPoint32BitL
16044	24	MCU Diag VSense 3.3V Average	FloatingPoint32BitL
16046	26	MCU Diag VSense 3.3V Min	FloatingPoint32BitL
16048	28	MCU Diag VSense 3.3V Max	FloatingPoint32BitL
16050	30	MCU Diag VSense 3.3V SD	FloatingPoint32BitL
16052	32	MCU Diag ISense 3.3V Average	FloatingPoint32BitL
16054	34	MCU Diag ISense 3.3V Min	FloatingPoint32BitL
16056	36	MCU Diag ISense 3.3V Max	FloatingPoint32BitL
16058	38	MCU Diag ISense 3.3V SD	FloatingPoint32BitL



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16060	40	MCU Diag VSense COM-A EXC Average	FloatingPoint32BitL
16062	42	MCU Diag VSense COM-A EXC Min	FloatingPoint32BitL
16064	44	MCU Diag VSense COM-A EXC Max	FloatingPoint32BitL
16066	46	MCU Diag VSense COM-A EXC SD	FloatingPoint32BitL
16068	48	MCU Diag ISense COM-A EXC Average	FloatingPoint32BitL
16070	50	MCU Diag ISense COM-A EXC Min	FloatingPoint32BitL
16072	52	MCU Diag ISense COM-A EXC Max	FloatingPoint32BitL
16074	54	MCU Diag ISense COM-A EXC SD	FloatingPoint32BitL
16076	56	MCU Diag VSense COM-B EXC Average	FloatingPoint32BitL
16078	58	MCU Diag VSense COM-B EXC Min	FloatingPoint32BitL
16080	60	MCU Diag VSense COM-B EXC Max	FloatingPoint32BitL
16082	62	MCU Diag VSense COM-B EXC SD	FloatingPoint32BitL
16084	64	MCU Diag ISense COM-B EXC Average	FloatingPoint32BitL
16086	66	MCU Diag ISense COM-B EXC Min	FloatingPoint32BitL
16088	68	MCU Diag ISense COM-B EXC Max	FloatingPoint32BitL
16090	70	MCU Diag ISense COM-B EXC SD	FloatingPoint32BitL
16196	0	Analog Diag +VIn Raw Power Average	FloatingPoint32BitL
16198	2	Analog Diag +VIn Raw Power Min	FloatingPoint32BitL
16200	4	Analog Diag +VIn Raw Power Max	FloatingPoint32BitL
16202	6	Analog Diag +VIn Raw Power SD	FloatingPoint32BitL
16204	8	Analog Diag VSense 13.3V Average	FloatingPoint32BitL
16206	10	Analog Diag VSense 13.3V Min	FloatingPoint32BitL
16208	12	Analog Diag VSense 13.3V Max	FloatingPoint32BitL
16210	14	Analog Diag VSense 13.3V SD	FloatingPoint32BitL
16212	16	Analog Diag VSense 15V Average	FloatingPoint32BitL
16214	18	Analog Diag VSense 15V Min	FloatingPoint32BitL
16216	20	Analog Diag VSense 15V Max	FloatingPoint32BitL
16218	22	Analog Diag VSense 15V SD	FloatingPoint32BitL
16220	24	Analog Diag VSense 12V Average	FloatingPoint32BitL
16222	26	Analog Diag VSense 12V Min	FloatingPoint32BitL
16224	28	Analog Diag VSense 12V Max	FloatingPoint32BitL
16226	30	Analog Diag VSense 12V SD	FloatingPoint32BitL
16228	32	Analog Diag VSense 5V Average	FloatingPoint32BitL
16230	34	Analog Diag VSense 5V Min	FloatingPoint32BitL
16232	36	Analog Diag VSense 5V Max	FloatingPoint32BitL
16234	38	Analog Diag VSense 5V SD	FloatingPoint32BitL
16236	40	Analog Diag -VIn Raw Power Average	FloatingPoint32BitL
16238	42	Analog Diag -VIn Raw Power Min	FloatingPoint32BitL
16240	44	Analog Diag -VIn Raw Power Max	FloatingPoint32BitL
16242	46	Analog Diag -VIn Raw Power SD	FloatingPoint32BitL



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16244	48	Analog Diag VSense-15V Average	FloatingPoint32BitL
16246	50	Analog Diag VSense-15V Min	FloatingPoint32BitL
16248	52	Analog Diag VSense-15V Max	FloatingPoint32BitL
16250	54	Analog Diag VSense-15V SD	FloatingPoint32BitL
16252	56	Analog Diag ISense 12V Average	FloatingPoint32BitL
16254	58	Analog Diag ISense 12V Min	FloatingPoint32BitL
16256	60	Analog Diag ISense 12V Max	FloatingPoint32BitL
16258	62	Analog Diag ISense 12V SD	FloatingPoint32BitL



APPENDIX C | DECLARATION OF CONFORMITY

NRG Systems Declaration of Conformity



LOGR-S, PV Data Loggers

Declaration of Conformity

(in accordance with ISO/IEC 17050-1:2004)

NRG Systems Document Number: 16635 Rev A

Supplier: NRG Systems, Inc.
 Supplier Address: 110 Riggs Road, Hinesburg, VT 05461, USA
 Telephone: 802 482 2255, Fax: 802 482 2272
 Email: sales@nrgsystems.com

Declares under its sole authority that the Products: Logger, LOGR-S, PV, including:

Logger, LOGR-S, PV	Item 9431
Various sensors	Item 14610, 15788, 14442

are in conformity with the requirements of the relevant Union harmonization legislation and technical specifications below:

EMC:

Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (recast)

EN 61326-1:2020 Electrical equipment for measurement, control, and laboratory Use –

Item	Category
IEC 61326-1:2020 IAW CISPR 11 30 MHz -1000 MHz	Radiated Emissions, Enclosure
IEC 61326-1:2020 IAW EN 61000-4-2; 4kV contact/8kV air	ESD Immunity, Enclosure
IEC 61326-1:2020 IAW EN 61000-4-3; 10/3 V/m 80 -6000 MHz	Radiated Immunity, Enclosure
IEC 61326-1:2020 IAW EN 61000-4-4; 1 kV	Transient Immunity, DC/ Signal Port
IEC 61326-1:2020 IAW EN 61000-4-5; 1 kV	Surge Immunity, DC/ Signal Port
IEC 61326-1:2020 IAW EN 61000-4-6; 3 V 0.15 - 80 MHz	Conducted Immunity, DC/ Signal Port
IEC 61326-1:2020 IAW EN 61000-4-8; 30 A/m 50/60 Hz	Magnetic Immunity, Enclosure



NRG Systems Declaration of Conformity



LOGR-S, PV Data Loggers

RoHS:

Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment

Safety:

Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on general product safety


IEC 61010-1:2010-06 Safety requirements for electrical equipment for measurement, control, and laboratory use

Item	Category
IEC 61010-1:2019 Paragraph 4.4	Measurement Equipment Safety
IEC 61010-1:2019 Paragraphs remaining as applicable	Measurement Equipment Safety

Additional Information:

1. This product complies with the requirements of the applicable directives **2014/30/EU, 2011/65/EU,** and standard **2001/95/EC** and therefore, the product is CE marked in accordance with **93/68/EEC**.
2. All circuits are extra low voltage (ELV), therefore **Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits**, known as the Low Voltage Directive (LVD), does not apply.
3. The design documentation, test reports, and assessment laboratory accreditation are under document control in NRG Systems, Engineering Department.

Issued at Hinesburg, VT, USA
14 July 2021



 Michael Purdue VP of Engineering



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 an RMA (return merchandise authorization) number by calling us at the number below or by emailing support@nrgsystems.com, or by submitting a request through our website's Technical Services area.

Please provide the serial number of the item as well as date of purchase. No products will be accepted for warranty work without an RMA number. The product must be returned, postage prepaid, to NRG with a brief description of the problem, RMA 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 RMA number. Inspect your shipments for damage to packages or missing packages 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 you insured the shipment yourself, report any damages to your insurance carrier.

Sending Items for Repair

International Customers

Contact NRG Systems by phone, email, or through our website to obtain an RMA number (Return Material Authorization). Write the RMA number clearly on all shipping cartons.

Tel: 802-482-2255 Fax: 802-482-2272

Email: support@nrgsystems.com Website: <https://www.nrgsystems.com/support/customer-support/>



LOGR-S Data Logger

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.

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.)

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.

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.

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 items 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.

Example of ship to address:

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

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

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

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

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.



LOGR-S Data Logger

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 is shipped.

US Customers

Please see items 1, 4, and 5 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

Deceglie, M. G., Muller, M., Kurtz, S., & Defreitas, Z. (2016). 43rd IEEE Photovoltaic Specialists Conference. In *National Renewable Energy Laboratory*. Portland; SunPower Corporation. Retrieved from <https://www.nrel.gov/docs/fy16osti/65763.pdf>.