Hukseflux SR30 Pyranometer Programming with Remote Power Supply (RPS)

For the NRG SymphoniePRO Logger

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INTRODUCTION

This document provides information for using the Hukseflux SR30 pyranometer with the NRG SymphoniePRO logger.

The Hukseflux SR30 is an ISO 9060 Secondary Standard sensor compliant with IEC 61724-1 Class A requirements which provides measurements for Global Horizontal Irradiance (GHI), temperature corrected GHI, sensor tilt angle, ventilator speed, heater current, internal humidity and pressure, body temperature, and more through an RS-485 Modbus RTU interface. The RS-485Modbus RTU communication settings are configured using a software utility provided by Hukseflux. The sensor contains active electronics, along with an internal heating and ventilating system that consumes 2.3 Watts of power at 12 VDC.

When performing an off-grid measurement campaign, use of a Remote Power Supply (RPS) solution is required. Sizing the power supply is dependent on site location (climate), days of desired autonomy, and number of SR30 sensors being installed. Please consult your NRG Systems representative to discuss RPS sizing for your specific installation.

This document is geared towards the off-grid installation with RPS, although all sensor mounting and configuration information also applies to PV Farm-monitoring applications where adequate grid power is typically available without use of the RPS.
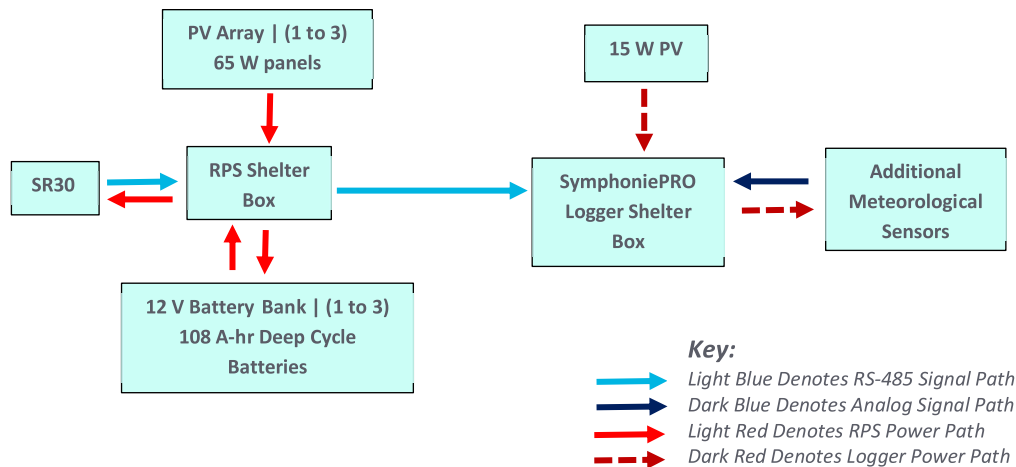
SYSTEM OVERVIEW

The SR30 requires an RS-485 enabled SymphoniePRO logger (firmware 3.1 or greater) and Remote Power Supply (RPS) for operation. Additionally, the SymphoniePRO requires that the SR30 is properly configured with proper baud rate and slave address settings. The RPS is contained in a separate pre-configured shelter box which can be mounted directly below the logger shelter box on the NRG SRA tower using supplied hose clamps.
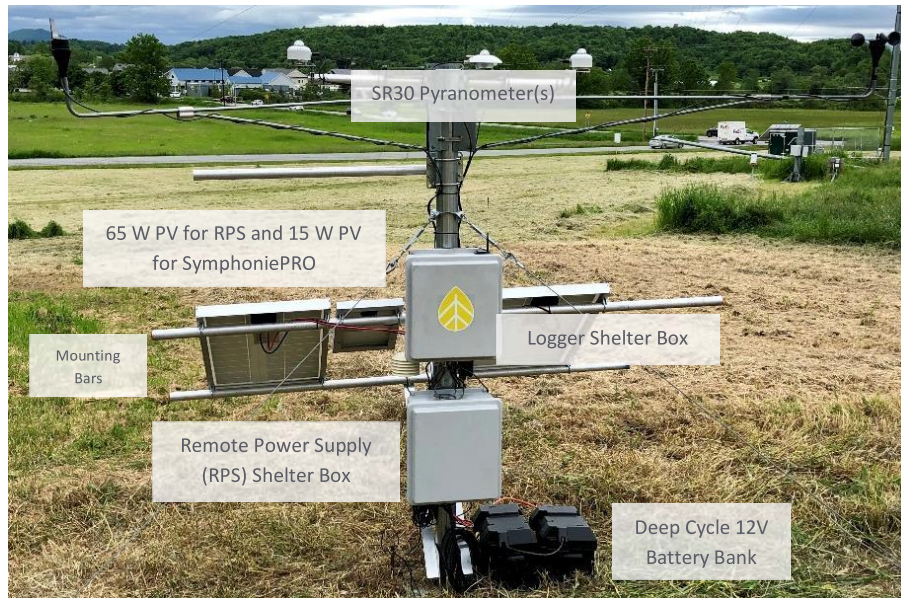
The RPS contains a charge controller and associated terminals and switches for connecting PV, battery and load (SR30). Additionally, the SR30 RS-485 sensor signal wires connect to terminals inside the RPS, and two (shielded 2C) cables connect the RS-485 signals landed at the RPS to the logger wiring panel COM A and COM B terminals contained in the logger shelter box.

Key:
- Light Blue Denotes RS-485 Signal Path
- Dark Blue Denotes Analog Signal Path
- Light Red Denotes RPS Power Path
- Dark Red Denotes Logger Power Path

INSTALLATION

NRG provides an assortment of pyranometer mounting accessories. Please consult with your NRG salesperson for your installation.

Tower Layout & Orientation

Correct layout of your Solar Resource Tower is important, starting with the baseplate and anchor points. The addition of the RPS requires that one guywire is directly out the south side of the tower (in norther latitudes), and the anchor point should be 2.1 m (7 Ft) or greater from the tower.

Any tubular booms for mounting pyranometers to the tower should be mounted so they are aligned east west. When retrofitting existing towers, you may need to move anchor points.

PV Array Mounting

Your kit includes PV panels and associated mounting hardware consisting of tubular cross booms, struts and assorted U-bolts and clamps. This section describes how to install the array.

Baseplate

Starting at the base of the tower, remove the top tower bolt and replace it with the threaded rod/washers/nuts.

Make certain the baseplate is oriented with the bolts pointing east and west, so that the support struts for the PV array can be mounted facing south in order to properly orient the PV panels.
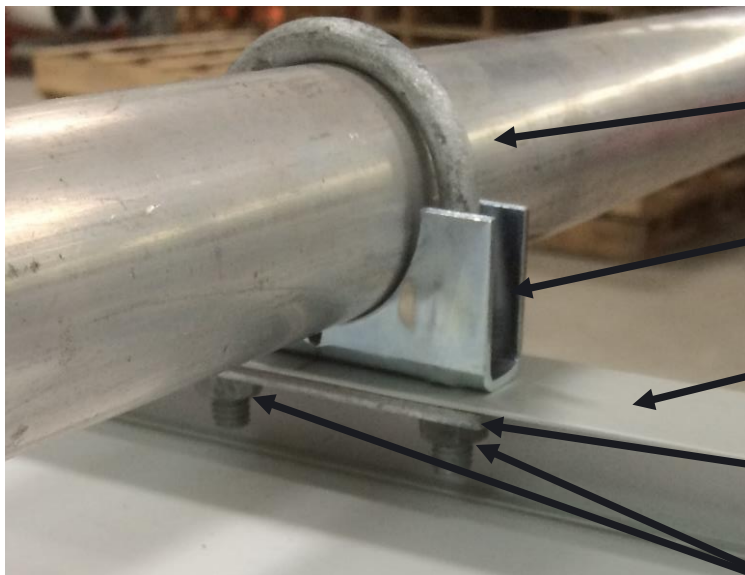

Remove top tower bolt

Replace with threaded rod/washers/nuts
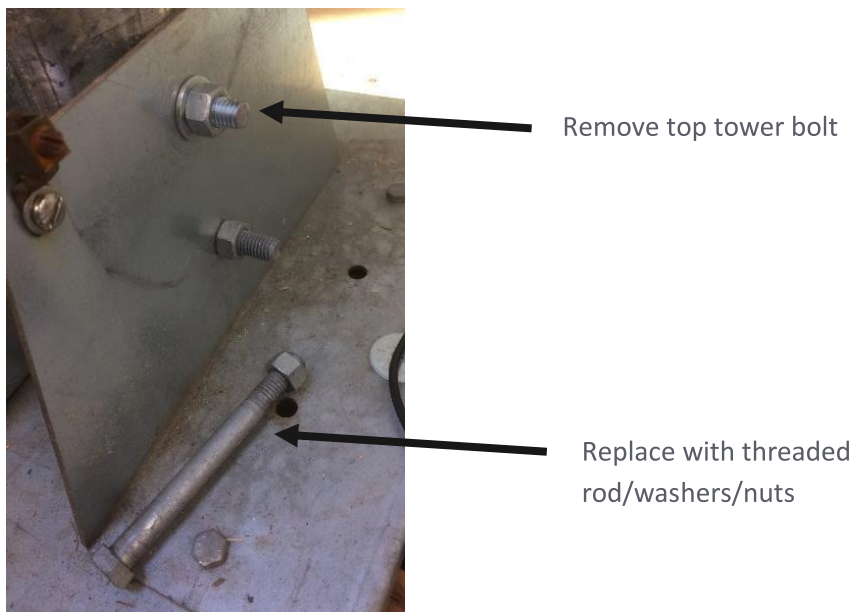
PV Mounting Booms

Attach upper PV boom 1.27m (50 inches) up the tower on the south side

PV Panels

Attach all U-bolts loosely to back of panels.

U-bolt

Clamp Bracket

PV Frame

Plate

Nuts

Slide panels into position on upper boom.

- *For southern locations (more horizontal deployment angle) it is recommended to mount with the solar panel junction box on bottom to locate panel out further to reduce tower shading.*
- *For northern locations (steeper deployment angles) junction box should be located at the top to raise the overall panel height.*

Slide lower boom into panels.

Support Struts

Attach support struts to base with struts directly in contact with base and washers on the outside.
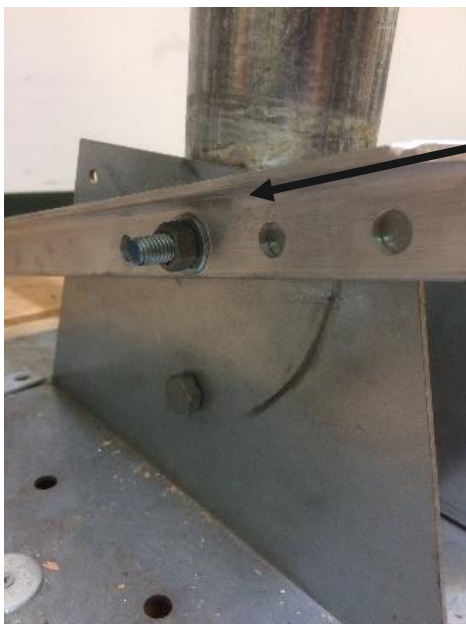
Snug nuts on either side of tube down, but do not tighten so much as to deform tower tube excessively.

Swing lower panel out and swing struts up and attach using U-bolts in the desired holes with plate under strut.

Angle is adjustable using the various upper and lower strut holes and the mounting height of the upper boom.

Always loosen all PV U-bolts when adjusting angle.

Using a ½ inch open ended wrench, tighten down all U-bolts when desired PV angle is obtained.

RPS Box Mounting

The RPS shelter box conveniently mounts directly below the logger shelter box on the tower with the supplied hose clamps.

RPS Battery Power

The RPS kit is a 12V DC system and will utilize (1 to 3) 108 A-hr Sealed Lead Acid (SLA) batteries. When using more than one battery, it will be necessary to chain the batteries to create a battery bank (cables included).

⚠️ **These batteries contain a significant amount of energy. Use caution or serious injury may occur.**

- Place each battery into a supplied battery box prior to making the connections, but don't secure the box tops until you have routed the battery cabling.
- *Connect [+] to [+] on the batteries, and connect [-] to [-] using the 4 Gauge (AWG) battery cables. Use black for [-] and red for [+] terminals.* Be sure to route the cabling through the inlets in the battery box tops.
- Connect the 10 AWG 2C cable to the battery bank you have created. Temporarily wrap electrical tape around the ends of the cable. At a later step, this cable will feed into the RPS shelter box and connect to the charge controller portion of the system.

⚠️ *Keep the bare ends of the 10 AWG 2C cable separated. Do not let them come in contact with each other or you.*

SR30 Mounting

Attach SR30 to plate with spring loaded center screw. (This may be easier to do before sliding the U-bolt bracket onto boom.) *Boom is typically located at very top of the tower on North side.*

- Choose orientation and loosely thread outer screws into sensor.
- Position and level bracket on boom.
- Level sensor with adjustable feet and lock down with outer two screws.
- Center screw can be locked by tightening nut against sensor using a 10mm open end wrench.
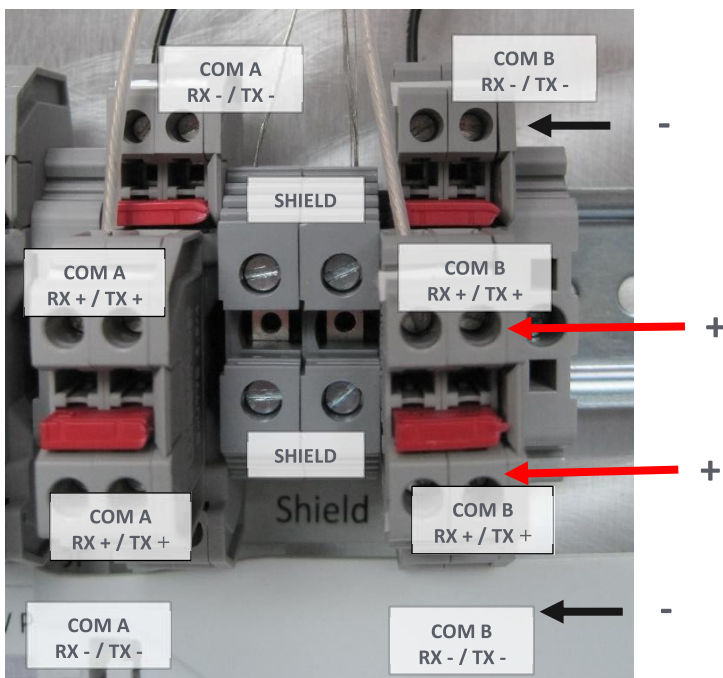
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WIRING

Wiring up the SR30 has some differences from standard analog sensors, mostly due to inclusion of the RPS.

Connections (RPS to Logger Wiring Panel)

The RPS comes pre-configured with two shielded 2C cables installed which connect to the SymphoniePRO wiring panel as follows.

Note: with this DIN Rail Mounted Terminal Style, "front" terminals are "+" and "back" terminals are "- ".

RPS Shelter Box COM A Terminal	Connector Wire	SymphoniePRO Wiring Panel Terminal	Note
RX+/TX+	clear	COM A RX+/TX+	NRG Supplies 2C cable already installed in RPS Shelter Box | User needs to connect to SymphoniePRO Wiring Panel
RX-/TX-	black	COM A RX-/TX-	
Shield	shield	SHD	

| RPS Shelter Box COM B Terminal	Connector Wire	SymphoniePRO Wiring Panel Terminal	Note
RX+/TX+	clear	COM B RX+/TX+	NRG Supplies 2C cable already installed in RPS Shelter Box | User needs to connect to SymphoniePRO Wiring Panel
RX-/TX-	black	COM B RX-/TX-	
Shield	shield	SHD	

SR30 Cable

SR30 sensors are equipped with a multi-conductor cable, which both powers the sensor and carries output signals. Please consult the documentation which came with the pyranometer to ensure that the wires are correctly identified and connected. The SR30 cable consists of 4 bare wires plus a shield on one end, and a M12 connector on the other end. The M12 plugs into the sensor and is secured by turning the outer barrel until snug.

Connections (SR30 RS-485 Signals to RPS)

Once the M12 end of the sensor cable is secured to the sensor, connect the SR30 to the RPS as follows on COM A. When connecting multiple SR30 sensors, use the same scheme for COM B.

Note that the SR30 power wires (brown and black) are not to be connected at this step.
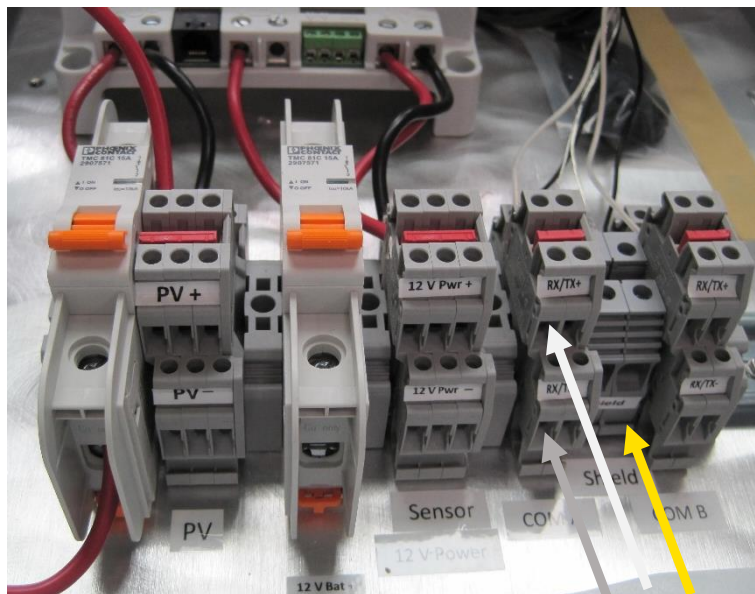
RPS Shelter Box Terminal	SR30 Cable Wire
Leave disconnected at this step	*brown*
Leave disconnected at this step-	*black*
COM A RX+/TX+	*white*
COM A RX-/TX-	*grey*
Shield	*yellow or bare*

Logger Wiring Panel Label

Note there are two versions of the labeling on the 26 channel wiring panel. The second version of the label was introduced in June of 2019.

Please note that the terminal function of the wiring panel did not change, only the label for the RS-485 terminals, which means all shipped 26 channel wiring panels are compatible. Please check your wiring panel, and wire to the terminals shown in the "NEW WIRING PANEL" image.
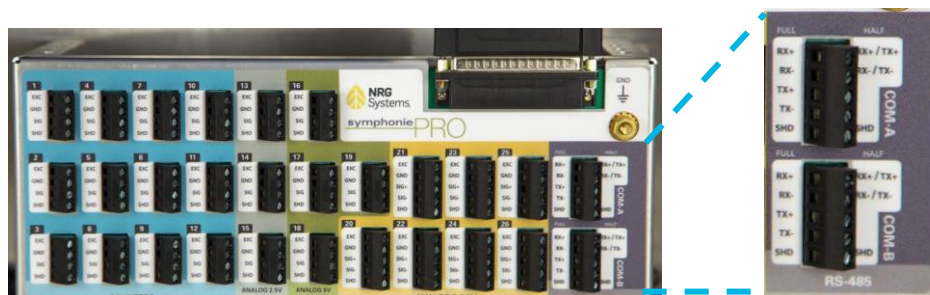
CAUTION! ON THE ORIGINAL WIRING PANEL SHIPPED UNTIL JUNE 2019 THE RX/TX HALF DUPLEX WIRING LABEL WAS INCORRECT

NEW WIRING PANEL SHIPMENTS BEGAN IN JUNE 2019 AND THE RX/TX HALF DUPLEX WIRING LABEL HAS BEEN FIXED

CONFIGURING THE SR30

SR30 Factory Default Settings

The SR30 sensor ships from Hukseflux preconfigured for 19200 baud and slave address 1. When multiple sensors are to be installed on one logger, the user needs to make certain that no two devices on the same COM port have the same slave address.

Changing the SR30 Slave Address

The slave address for the SR30 can be changed by using a software utility available from Hukseflux (https://www.hukseflux.com/downloads). A USB to RS-485 adapter will be required; the Hukseflux SR30 manual contains additional information.

NRG can also preconfigure the Slave Address prior to shipment as a service, if desired.

CONFIGURING THE RPS

The RPS utilizes (1 to3) 12 V Deep Cycle batteries, (1 to 3) 65 W PV panels, a charge controller and all necessary terminals and switches.

Batteries

Make certain the 12 V Bat. Disconnect Switch is set to the off position and connect the heavy duty battery cable "**+**" to the 12 V Bat. Disconnect Switch bottom terminal, and the battery cable "**–**" to the Morningstar battery "**-**" terminal.

Keep the 12 V Bat. Disconnect Switch in the off position until you are ready to power on the entire system (after all connections have been made and double checked).

Disconnect switch in off

12 V Battery Bank	Heavy Duty Battery Cable Wire	RPS Terminal
Battery -	Black	Morningstar Battery –
Battery **+**	Red	Bottom of 12V Battery Disconnect Switch
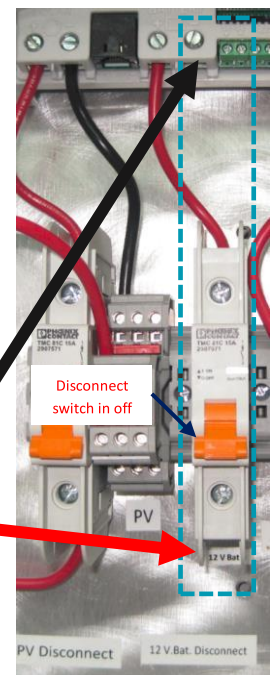
PV Panels

Make certain the PV disconnect switch is set to the off position and connect the PV panels to the PV terminals in the RPS (front terminal is + and rear terminal is -).


Switch in off position

PV Panel (-) connects to rear terminals
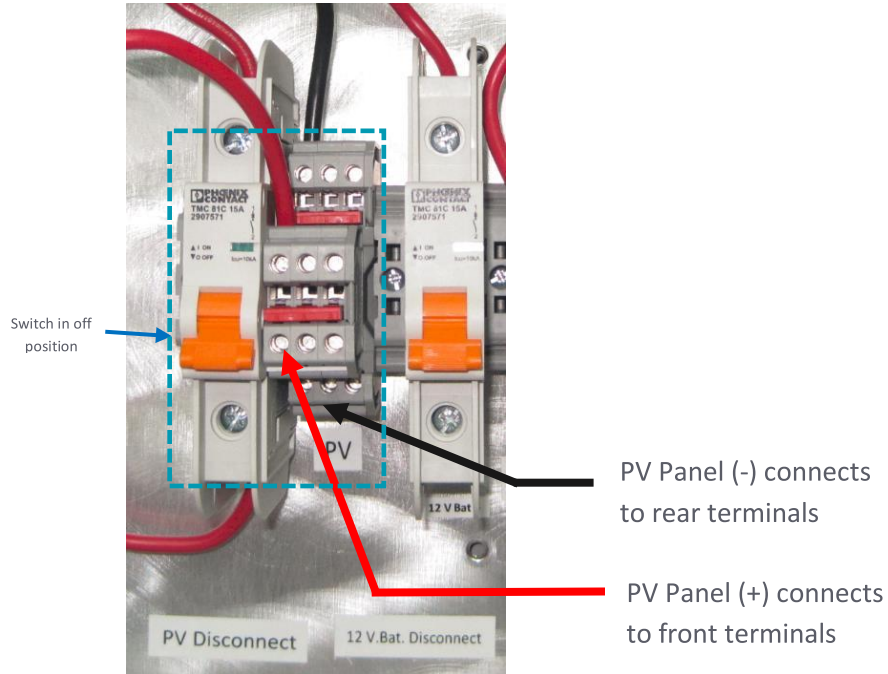
PV Panel (+) connects to front terminals

SR30 Power Connections and RPS Start-up

Once the battery and PV are connected, turn the **12 V Bat. Disconnect** Switch to the ON position, and then turn the **PV Disconnect** Switch to the ON position.

Finally, connect the SR30 black wire to the 12 V Pwr - and brown wire to the Pwr + terminals found in the RPS.
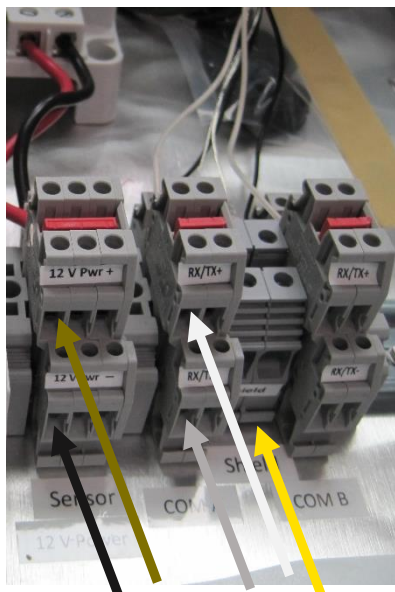
RPS Shelter Box Terminal	SR30 Cable Wire
12 V Pwr +	brown
12 V Pwr -	black
COM A RX+/TX+	white
COM A RX-/TX-	grey
Shield	yellow or bare

CONFIGURING THE SYMPHONIEPRO

Configuration can be performed using SymphoniePRO Desktop software by connecting directly to the logger's USB-B port, or by establishing a remote connection via MetLink. Please consult the SymphoniePRO user manual for more detail.

Overview

- Open the Desktop Application. With the logger connected to the computer, open the site from the Fleet View page.
- Navigate to the Channels tab, located in the Instruments sidebar. If the Instruments sidebar is not available, the application is not connected to the logger and will need remediation before continuing.

Using RS-485 COM A and COM B

The SymphoniePRO 26 channel wiring panel allows access to the two RS-485 communication ports included with every SymphoniePRO logger shipped to date. Logger firmware 3.1 (and greater) and SymphoniePRO Desktop Application version 3.7.0 and greater are required. Please check NRG Systems website for the latest software (freely available).

RS-485 Modbus RTU Slave Address and Baud Rate

The Slave Address of a device (smart sensor) must be known prior to adding the device to either COM Port A or B, and the Slave Address shown in SymphoniePRO Desktop's Channel Configuration tab must match the Slave Address already present in the device. The device Slave Address is typically set to a default value by the device manufacturer or can be configured using a tool provided by the device manufacturer.

SymphoniePRO communicates with RS-485 devices by sending a Modbus message containing the Slave Address of the targeted device. Although all devices on the bus "hear" every transmission, only the device with the matching Slave Address will respond. When multiple sensors are to be installed on one logger, the user needs to make certain that no two devices on the same COM port have the same slave address.

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Channels

In the Channels tab, expand the Serial channel area and select the channel you wish to program.

Using the "Load From Defaults" dropdown menu, select "SR30-Irradiance" to load the sensor's default settings. Choose the COM port and Slave Address for the SR-30. Default Slave Address for the SR30 is 1.

Once the first serial channel has been configured, additional SR30 serial channels can be configured with each channel corresponding to an available Measurand.

To do so, go to the next channel and set the COM and Slave Address to match the first channel. This will tie the new channel to the same sensor based on COM and Slave Address.

Description, Serial Number, Height, Boom Bearing will auto-populate based on the COM and Slave Address match. Pick a Measurand for the channel and continue the process until all desired Measurands have been configured.

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| − | 28 | ⏻ Statistics | ⊞ Modbus RTU | Port A: Slave 1; SR30-Irradiance-UC | 3500 | 2.20m | 0.0 ° (N) | 1 | 0 | W/m^2 |

COM Port	A ▼		Description	SR30-Irradiance-UC		Register Address:	4
Slave Address	1 ⓘ		Serial Number	3500		Number of Registers:	2
Device	SR30 Pyranometer ▼					Baud Rate:	
Measurand	Solar Irradiance (UC) ▼		Height	2.2 Meters			
Data Logging Mode	⏻ Statistics ▼		Boom Bearing	0 Degrees ⓘ			
Channel Type	⊞ Modbus RTU ▼		Sensor Transfer Function				
			Scale Factor	1			
			Offset	0			
			Units	W/m^2			

| − | 29 | ⏻ Statistics | ⊞ Modbus RTU | Port A: Slave 1; SR30-Temp | 3500 | 2.20m | 0.0 ° (N) | 1 | 0 | C |

COM Port	A ▼		Description	SR30-Temp		Register Address:	6
Slave Address	1 ⓘ		Serial Number	3500		Number of Registers:	1
Device	SR30 Pyranometer ▼					Baud Rate:	
Measurand	Body Temp ▼		Height	2.2 Meters			
Data Logging Mode	⏻ Statistics ▼		Boom Bearing	0 Degrees ⓘ			
Channel Type	⊞ Modbus RTU ▼		Sensor Transfer Function				
			Scale Factor	1			
			Offset	0			
			Units	C			

| − | 30 | ⏻ Statistics | ⊞ Modbus RTU | Port A: Slave 1; SR30-Humidity | 3500 | 2.20m | 0.0 ° (N) | 1 | 0 | % |

COM Port	A ▼		Description	SR30-Humidity		Register Address:	98
Slave Address	1 ⓘ		Serial Number	3500		Number of Registers:	1
Device	SR30 Pyranometer ▼					Baud Rate:	
Measurand	Humidity (RH) ▼		Height	2.2 Meters			
Data Logging Mode	⏻ Statistics ▼		Boom Bearing	0 Degrees ⓘ			
Channel Type	⊞ Modbus RTU ▼		Sensor Transfer Function				
			Scale Factor	1			
			Offset	0			
			Units	%			

| − | 31 | ⏻ Statistics | ⊞ Modbus RTU | Port A: Slave 1; SR30-Tilt | 3500 | 2.20m | 0.0 ° (N) | 1 | 0 | Deg |

COM Port	A ▼		Description	SR30-Tilt		Register Address:	195
Slave Address	1 ⓘ		Serial Number	3500		Number of Registers:	1
Device	SR30 Pyranometer ▼					Baud Rate:	
Measurand	Tilt Angle Avg ▼		Height	2.2 Meters			
Data Logging Mode	⏻ Statistics ▼		Boom Bearing	0 Degrees ⓘ			
Channel Type	⊞ Modbus RTU ▼		Sensor Transfer Function				
			Scale Factor	1			
			Offset	0			
			Units	Deg			

Using the SR30 Pyranometer on SymphoniePRO loggers

SR30 Heater and Fan Settings

SR30 heater control is provided by the logger and requires an ambient temperature sensor such as the NRG 110S or T60 be connected to the logger.

Additionally, it is strongly recommended to keep the fan on at all times. Heater control is enabled when the "Heater Current" Measurand is selected on a channel as shown below.