

ABB solar monitoring

# Product manual

## VSN730 System Monitor



Operators are required to read this manual and scrupulously follow the indications reported in it, since ABB cannot be held responsible for damages caused to people and/or things, or the equipment, if the warranty conditions are not observed.



### **IMPORTANT SAFETY INSTRUCTIONS**

*This manual contains important safety instructions that must be followed during installation and maintenance of the equipment.*



### **SAVE THESE INSTRUCTIONS!**

*This manual must be considered as an integral part of the equipment, and must be available at all times to everyone who interacts with the equipment.*

## Symbols and signs

In the manual, the danger or hazard zones are indicated with signs, labels, symbols, or icons.



Generic hazard - Important safety information. This points out operations or situations in which staff must be very careful.



Hazardous voltage - This points out operations or situations in which staff must be very careful due to hazardous voltage.



This points out that it is mandatory to carry out the described operations using the clothing and/or personal protective equipment provided by the employer.



Positive pole and negative pole of the input voltage (DC)



This points out that the examined area must not be entered or that the described operation must not be carried out.

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## Not included in the supply



ABB accepts no liability for failure to comply with the instructions for correct installation and will not be held responsible for systems upstream or downstream the equipment it has supplied. It is absolutely forbidden to modify the equipment. Any modification, manipulation, or alteration not expressly agreed with the manufacturer, concerning either hardware or software, shall result in the immediate cancellation of the warranty.

The Customer is fully liable for any modifications made to the system.

Given the countless array of system configurations and installation environments possible, it is essential to check the following: sufficient space suitable for housing the equipment; airborne noise produced depending on the environment; potential flammability hazards.

ABB will NOT be held liable for defects or malfunctions arising from: improper use of the equipment; deterioration resulting from transportation or particular environmental conditions; performing maintenance incorrectly or not at all; tampering or unsafe repairs; use or installation by unqualified persons.

ABB will NOT be held responsible for the disposal of: displays, cables, batteries, accumulators etc. The Customer shall therefore arrange for the disposal of substances potentially harmful to the environment in accordance with the legislation in force in the country of installation.

## Field of use, general conditions

ABB shall not be liable for any damages whatsoever that may result from incorrect or careless operations.



*You may not use the equipment for a use that does not conform to that provided for in the field of use. The equipment MUST NOT be used by inexperienced staff, or even experienced staff if carrying out operations on the equipment that fail to comply with the indications in this manual and enclosed documentation.*

### Intended or allowed use

This device is monitoring equipment designed for data collection and low-voltage connection to inverters, weather stations, string combiners, and other photovoltaic equipment.

This device contains only control circuits and is intended for installation into a general-purpose branch circuit behind by a branch protection device.

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## System overview

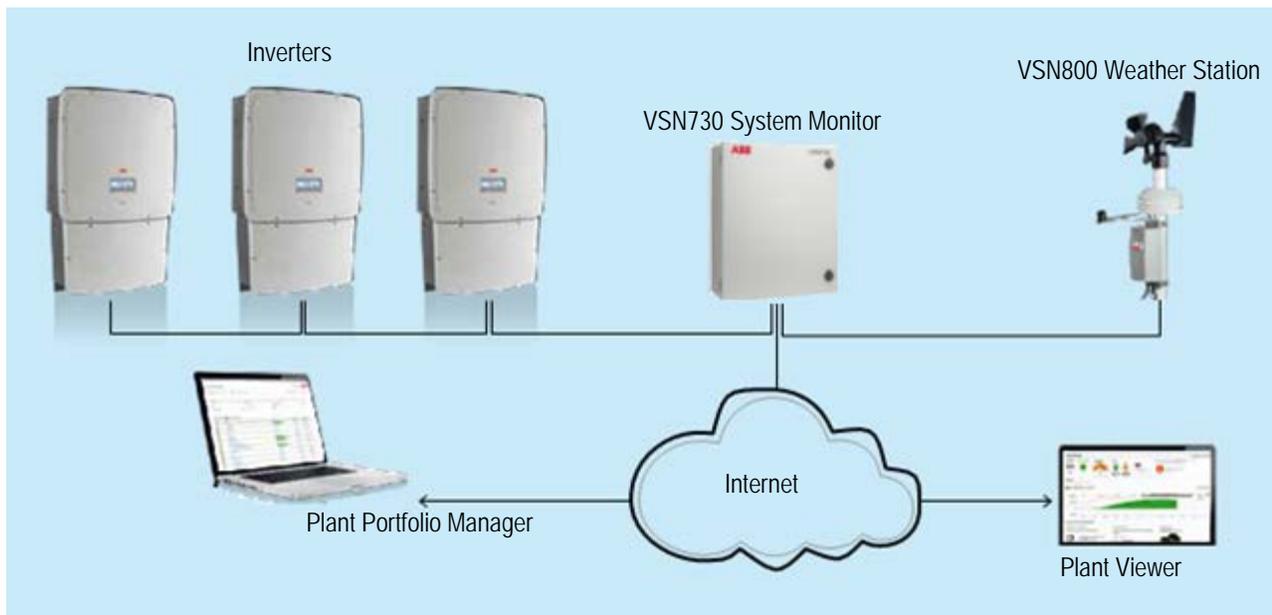
The VSN730 System Monitor is a cost-effective solution for remote data acquisition and reporting of PV system data. The System Monitor enables smaller commercial installations with multiple inverters to benefit from advanced energy reports, energy analysis, and troubleshooting. The System Monitor collects and analyzes energy generation data from all connected inverters as well as weather station data (optional). System performance and energy information are logged into a database on the Aurora Vision® Plant Management Platform, where it can be retrieved and used for analysis via any standard web-browser on an Internet connected device.

The Installer logs on to the Aurora Vision website to register the System Monitor and ensures that the logger is correctly passing information to the servers. The Installer provides a URL(s) to the end user for access to Aurora Vision Plant Viewer for viewing system performance. The Installer can also monitor all of their sites through a web-browser using Aurora Vision Plant Portfolio Manager.

Aurora Vision is a multi-plant management portal that lets you inspect and analyze all of your power plants. The System Monitor in conjunction with the Aurora Vision solution brings the following benefits:

- Safeguard Your Investment and Maximize Your Return
- Improved Solar Energy System Efficiency
- Lower Life Cycle Costs
- Real-time and Historic Data Presented Using Web-based Devices
- Alarm Functions and Device Communication Failure
- Remote Access to all Data Using Internet Technology

### Commercial Application with System Monitor Using a Stand Alone Weather Station



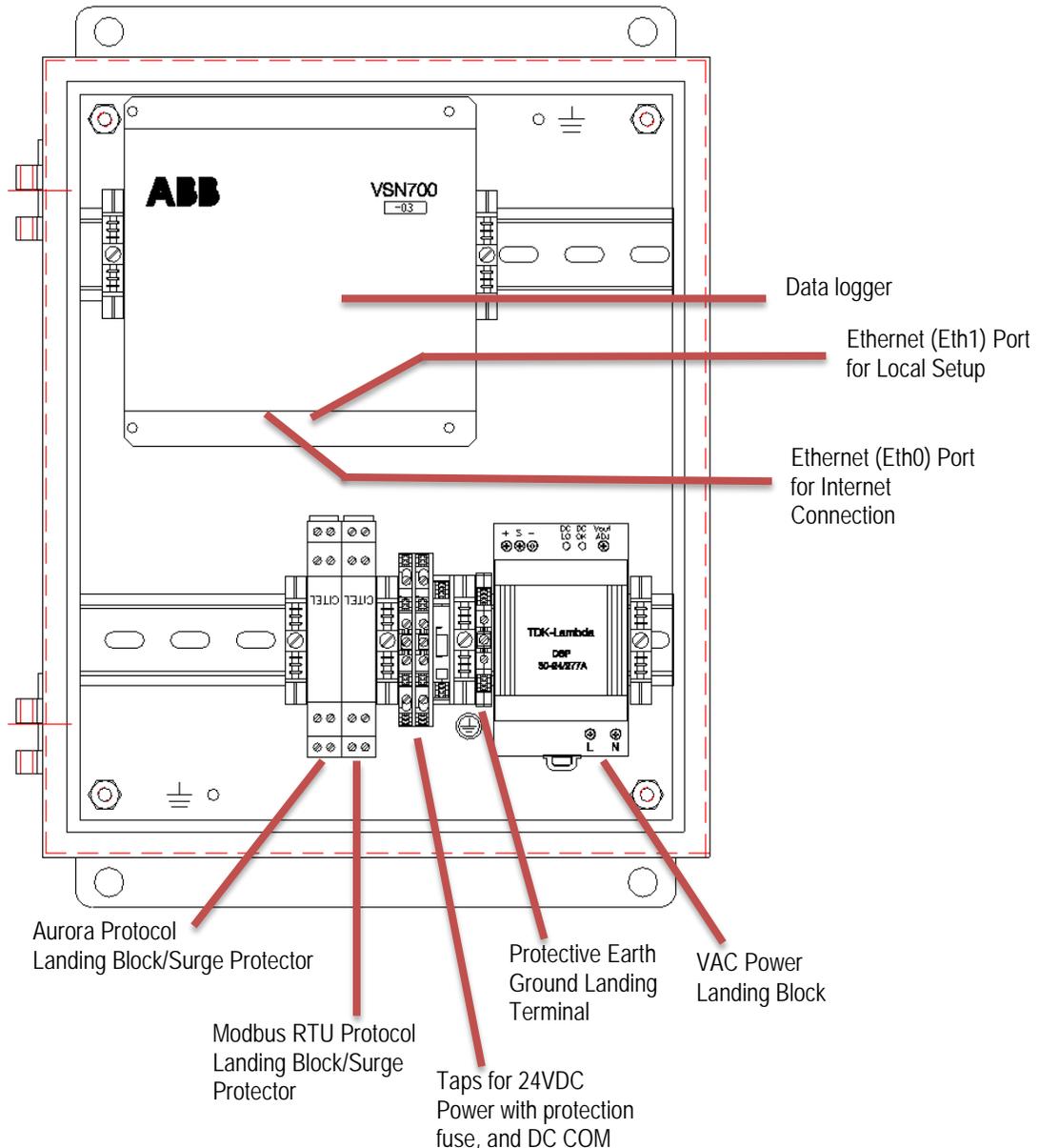
This guide provides instructions for installing the System Monitor hardware to work directly with ABB and/or Power-One legacy inverters and for setting up the Aurora Vision Plant Management Platform for remote data access.

The System Monitor consists of a NEMA 4/4X rated steel enclosure containing a data logger/gateway, AC/DC power supply, serial data line surge protection, and DC protection fuse. The data logger connects to the Local Area Network (LAN) with an Ethernet RJ45 connection. Typically it connects to a Digital Subscriber Line (DSL) or Cable router/gateway for internet access, though any internet connection will work.

The System Monitor is available in two versions. The VSN730-03 has the capability to monitor up to 10 ABB or Power-One legacy string inverters and one ABB (VSN800 Weather Station) or Power-One legacy weather station. Inverters can be single-phase or three-phase string inverters. The VSN730-05 has no software limitations on the number of devices it can monitor, but it is recommended that no more than 20 devices be connected to each port.

## Components

The picture below shows the interior of the System Monitor enclosure.



## Installation

Read and follow these instructions before performing any installation or servicing of the System Monitor. Personnel working on these products should have appropriate training and experience with high voltage devices and direct current electrical systems. Appropriate use of personal protective equipment (PPE) is required.

### Safety overview

This manual contains important instructions that should be followed during the installation and maintenance of the System Monitor. Photovoltaic modules pass direct current (DC) when the photovoltaic module is exposed to sunlight. Current can arc across gaps and may cause injury or death if improper connection or disconnection is made. To reduce the risk of electrical shock, and to ensure the safe installation and operation of this product, safety symbols have been placed throughout this manual to indicate dangerous conditions and important safety instructions.



*During normal operation of the System Monitor, dangerous voltages flow through many parts of the system, including: terminals, all I/O Modules (Inputs and Outputs) and their circuits. All Primary and Secondary circuits can, at times, produce lethal voltages and currents. Avoid contact with any current-carrying surfaces. Installation may also require close proximity to high-voltage high-current wires, so proper caution should be exercised when installing these devices.*



*Make sure all power is switched off before performing installation. These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so.*



*Do not change the factory pre-wiring. Modification to the factory pre-wiring, without authorization from ABB, may cause lethal shock and/or fire hazards and voids the product's warranty.*

- Make sure all power is switched off before performing installation.
- In the United States, all installations and servicing must be performed by authorized personnel and in compliance with the National Electrical Code (NEC) ANSI/NFPA 70, as well as all state and local code requirements.
- In Canada, wiring methods shall be in accordance with Canadian Electrical Code, Part I.
- For CE compliance, installations and servicing must be performed in accordance with IEC 60364-4-41.
- Before installing or using this device, read all instructions and cautionary markings located in (or on) the products and the manual.
- To reduce the chance of short-circuits when installing or servicing, use insulated tools.
- Remove all jewelry while installing this system. This will greatly reduce the chance of accidental exposure to live circuits.
- Contact us if the System Monitor enclosure is damaged or if its contents are compromised. Discontinue installation until the problem is resolved.
- Do not apply more than the maximum rated voltage to the device. Refer to [Electrical Specifications](#) and/or device labels and to the specifications for all devices before applying voltages. Do not HIPOT/Dielectric test any outputs, inputs, or communications terminals.

## Preparation



Make sure you have the following tools and materials prior to starting installation.

### Tools

- Standard Electrician's Toolkit
- Drill capable of penetrating the System Monitor enclosure
- Personal Protective Equipment (Gloves, Goggles, Clothing)

### Materials and Test Equipment

- Rust inhibiting agent to treat bare metal around drill locations
- Conduit fittings appropriate for maintaining the NEMA 4/4X rating of the enclosure
- Twisted-Pair RS-485 Wire (Belden 3106A or equivalent).  
**DO NOT USE CAT5/6 CABLE FOR THE RS-485 DATA WIRE.**
- Ethernet Cable to make Network Connection
- Laptop Computer with Internet Browser
- Second Ethernet Cable for servicing
- Mounting Screws and/or Brackets (Mounting materials not included)

It is also useful to know if you need to perform Asset Registration or final End-to-End Data Checks after physical installation is complete. If so, you will need a User ID/password to log in to Plant Portfolio Manager, and additionally you will need Administrator privileges to access the Administration tool. See the **Commissioning** section for details.

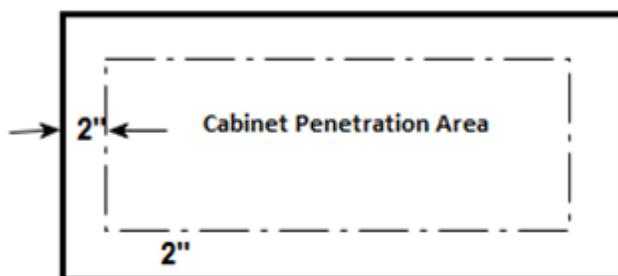
## Enclosure installation

Determine the location of the System Monitor enclosure. It must be located within 100 meters (330 feet) of an Internet connection and within 1200 meters (4000 feet) of your inverter(s).

Mount the enclosure out of direct sunlight in a location where it will not be exposed to continuous water flow, snow and ice build-up, and/or areas of extreme temperature. The included power supply requires an ambient temperature between -25°C and 50°C but the logger can operate between -40°C and 85°C. Install the enclosure using the external enclosure mounting tabs with appropriate hardware (not included). Drilling holes in the back plate is not recommended and will void the warranty. The enclosure box is a NEMA 4/4x/12 (IP65) enclosure so it may be mounted in a vertical (where the door opens out) or a horizontal (where the door opens up) orientation.

## Conduit entry location

It is recommended that conduit entry come in through the bottom of the box. Drill holes at least 2" from any edge. Remove any metal shavings and treat bare metal with rust inhibitors.



**System Monitor Enclosure, Bottom**

The use of UL 514B type conduit fittings are required to maintain the NEMA 4/4x/12 rating of the enclosure. The maximum size conduit that may be used on a System Monitor product is 1 inch.

## Protective earth grounding

The System Monitor, housed in a metallic enclosure, must be earth grounded. Please refer to NEC Article 690, or the appropriate IEC standard, on grounding photovoltaic arrays for specific requirements. The yellow/green terminal to the left of the power supply is for landing Protective Earth Ground. A cable is factory pre-installed that ensures ground continuity to the door of the enclosure.

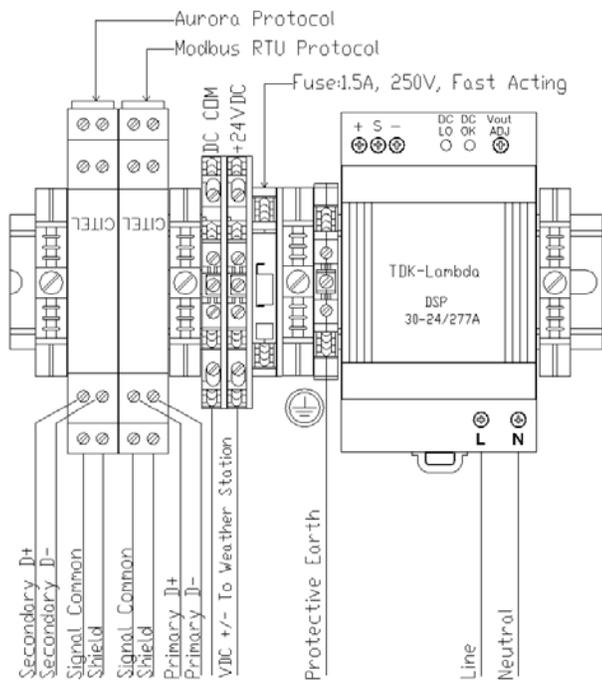
## Supply system monitor with power

To provide power to the System Monitor, you will need to supply a 100-277VAC 50/60 Hz 1.5A power source. The power supply is labeled TDK-LAMBDA. The AC Line voltage conductor is connected to terminal L on the power supply and the Neutral conductor (or Line 2) connected to the terminal N. Connect Protective Earth Ground conductor to the green/yellow terminal block just to the left of the power supply.



*Make sure the service panel (primary circuit) and the monitoring enclosure are de-energized before proceeding with the installation. If connecting to a compatible 3-wire Delta system or connecting Line-to-Line in a Split-phase system, the System Monitor must be installed behind a double-pole circuit protection device that simultaneously disconnects both ungrounded lines in the event of a ground fault.*

The 100-277VAC power is converted to DC power and pre-wired within the cabinet to the other components in the System Monitor. A DC protection fuse is located within the terminal block that the power supply's +V output connects to on the left of the power supply. The fuse is a fast acting 5x20mm cartridge rated for 1.5A and 250V.



To verify the power connection, turn on the power line connected to the System Monitor. Check the data logger power. There is a pair of light emitting diodes (LEDs) on the side of the data logger, opposite the RS-485/DC power terminal block. The LEDs flash during system boot and then LED2 turns solid green when power is supplied and the system is ready.

## RS-485 cabling and connections

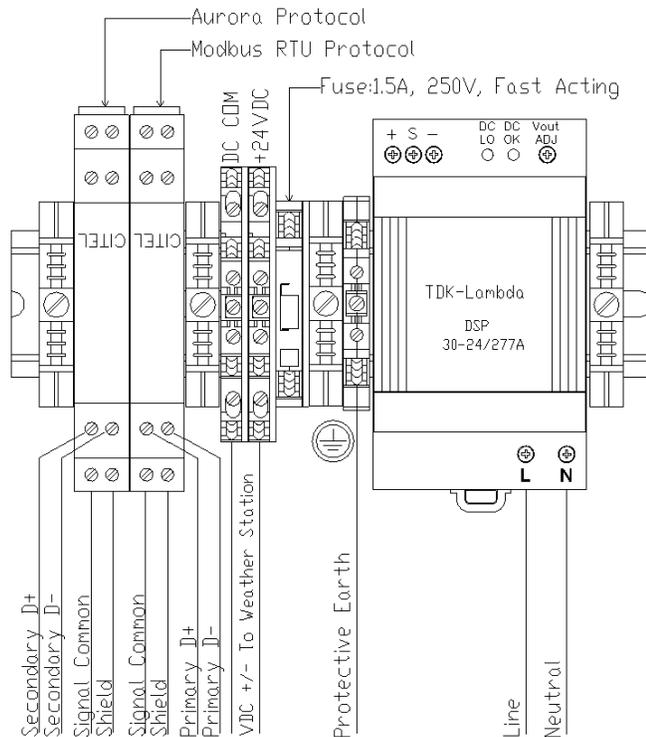
Connect shielded twisted-pair wire to the RS-485 terminals on the inverter(s). If there are multiple inverters, wire the inverters in a daisy chain configuration. Use RS-485 data wire with one twisted-pair of conductors, one signal ground conductor, and a shield with drain wire (Belden 3106A or equivalent). **DO NOT USE CAT5/6 CABLE FOR THE RS-485 DATA WIRE.**



*Maintain separate 24 VDC device power and RS-485 communication daisy chains.*

Positive D(+) and negative D(-) RS-485 connectors are the two connection points for the communication signal. Polarity must be maintained in the RS-485 daisy chain. Devices will not communicate if you connect the D(+) of one device to the D(-) of another device. All wires come into the connectors straight up and are secured using the small screw facing outward. The twisted-pair for D(+) and D(-) should only be untwisted as much as necessary to fit the wires into the connectors and at most about 3 inches. Use the following image (RS-485 DATA WIRING) for orientation.

Connect the RS-485 Signal Common and the cable Shield wires to the lower connectors on the same yellow CITELE landing block. Connect the Signal Common wire to the connector on the left and the cable Shield to the connector on the right.<sup>1</sup>



<sup>1</sup> The shield of an RS-485 daisy chain should only connect to ground at one point. If the shield's drain wire is landed to earth ground elsewhere, do not connect to ground in the System Monitor and trim the shield's drain wire inside the System Monitor so it can't come in contact with conductive surfaces.

## Cable requirements

RS-485 data terminals can accept stranded copper wire of size #16-#24 AWG. ABB recommends stranded copper size #18-#22 AWG with a twisted-pair of conductors, a signal return (common) conductor, and a shield with drain wire. Belden 3106A or equivalent cable is recommended. Do not run the remote device data cable next to large current carrying conductors. If the cable used has multiple twisted-pairs, then one twisted-pair should be shorted together for the signal return wire.

The recommended RS-485 cable requirements are listed below:

- Cable must be rated for RS-485 by the manufacturer
- Cable must be shielded to at least 90% coverage
- Cable must have nominal impedance between 100-150 ohms
- Cable must have at least one twisted-pair
- Cable must have a third conductor for signal return or common (signal ground)

### Three-Wire Belden 3106A Cable



RS-485 Wire	Belden 3106a Wire Color	System Monitor Connection Point
RS-485 Positive	Orange/White stripe	Citel, top tier, left terminal
RS-485 Negative	White/Orange stripe	Citel, top tier, right terminal
Signal Ground	Blue/White stripe	Citel, bottom tier, left terminal
Cable Shield	----	Citel, bottom tier, right terminal

## Inverter address configuration

For systems with multiple inverters, each inverter must be manually assigned a different RS-485 address. Refer to the inverter manual(s) for instructions on how to set inverter addresses and exact inverter connection points. Write down the serial number and RS-485 address for each inverter so you can determine which inverter is which on the monitoring system.

## Daisy chain termination

For systems with multiple devices, the RS-485 network must be terminated at the final inverter or device by a 120 Ohm resistance across the D+ and D- conductors to minimize signal reflection due to impedance mismatch. ABB inverters have a switch on their communication boards for setting the termination resistance. The farthest inverter in the daisy chain must be terminated by setting the inverter termination switch to ON. For all other inverters or devices in the daisy chain, turn OFF the termination switch. Refer to the inverter(s) or device's manual for location(s) of the RS-485 termination switch.<sup>2</sup>

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<sup>2</sup> In some environments you may experience poor RS-485 signal quality due to noise. If signal quality is a problem, double-check that the last inverter in the chain is terminated and other inverters are not terminated. If problems persist, it may prove helpful to attach a 120 Ohm 0.5 Watt resistor across the D+ and D- screw terminals on the data logger.

## Commissioning

The following are the major steps required to make sure the system is operational and data is being passed to the Aurora Vision platform:

1. Connect the data logger to your Ethernet network.
2. Configure the data logger through its web-based user interface.
3. Verify that you have a working Internet connection from the data logger to Aurora Vision's servers.
4. Perform Asset Registration using the Administration tool on the Aurora Vision website.
5. Verify end-to-end data transfer using the Plant Portfolio Manager in Aurora Vision.

Commissioning is not complete until you have performed the final two steps above over the Internet. However, these two steps do not necessarily need to be performed as part of the hardware installation.

## Connect to the Internet

Connect the data logger to the Internet through a local area network. Use standard Ethernet cable and connect it to the Ethernet RJ-45 port marked **Eth0** on the front of the data logger. The data logger can connect through any switch or router in your network.<sup>3</sup>

Verify that the data logger has an Ethernet connection. The **Eth0** LED can be used for detecting network link and network traffic:

- Eth0 LED = GREEN = Link
- Eth0 LED = GREEN BLINK = Traffic
- Eth0 LED = OFF = No network link

If no activity is seen on the LEDs, double-check all connections.

ABB recommends a wired Internet connection because it is more reliable and requires less setup. If it is necessary to connect to a wireless network, a wireless network bridge with an Ethernet port is required. Purchase and configure the wireless network bridge that is compatible with the host wireless network. Ensure that the wireless connection is operational with a laptop before connecting it to the **Eth0** port of the data logger.

ABB does not provide Internet service or the cables required to connect the data logger to the Internet.

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<sup>3</sup> The data logger is by default set to DHCP and will try to acquire its IP-address from the DHCP server on your local network (LAN). The data logger is designed for use on an Ethernet network and must be assigned an IP address (DHCP or static) to make it accessible. If it is required to set a static IP for the data logger, your connection will not work until this address is set. If required, refer to the section below on setting a Static IP address. Normally no ports should need to be opened in the network firewall. The data logger will use port 443 outbound to transmit the data.

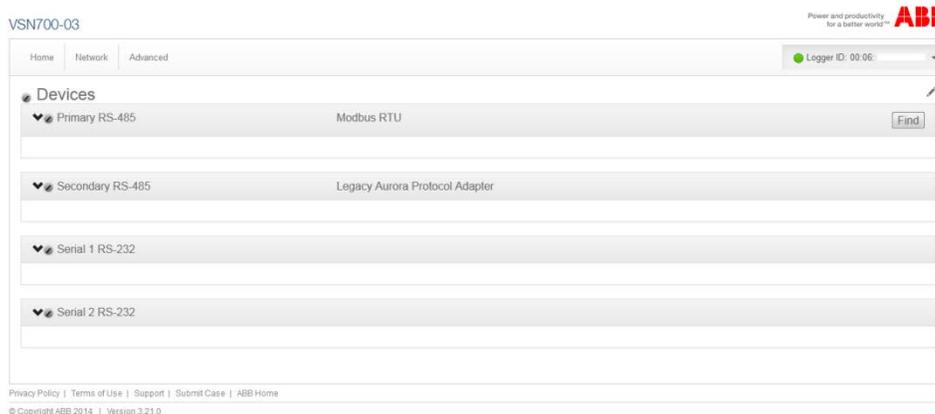
## Configure the data logger

The installer must use a laptop with an Ethernet cable to communicate directly to the data logger's web-based user interface for configuration. The data logger's user interface has many options and capabilities, but here we only describe those necessary to get your system up and running.

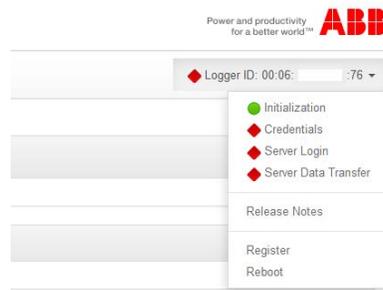
1. Configure the laptop's Ethernet port to obtain a Dynamic IP address automatically through DHCP; typically, laptops are already configured this way.
2. Connect the Ethernet cable between the secondary Ethernet port marked **Eth1** on the data logger and the laptop computer.
3. Wait for the laptop to obtain an IP address from the data logger and then open an Internet browser window on the computer. Type the following URL in the address bar

<http://172.17.17.1>

4. The following Home page (or similar<sup>4</sup>) will appear:



Select the tabs across the top to perform configuration operations and select one of the ports in the **Devices** list to set up devices. Verify all the icons for the data logger in the status area to the right are green. It may take some time for all the icons to turn green.



The MAC address (Logger ID) for the data logger is displayed at the top of the page. Be sure to write down the MAC address of the data logger. The MAC address is needed later for Asset Registration.

<sup>4</sup> Due to the constantly evolving nature of software, the images shown in this manual may be out of sync with the current user interface. The options mentioned should still be accessible, but may be renamed or accessed in a different way than is described in this manual. Browse to <https://docs.auroravision.net> for the latest manual.

The plant must be created as an asset using the Administration tool on Aurora Vision before the data logger can be assigned and registered. To register the logger now, press the **Logger Registration** button. You will be re-directed to the web page to register the logger and associate it with your plant.

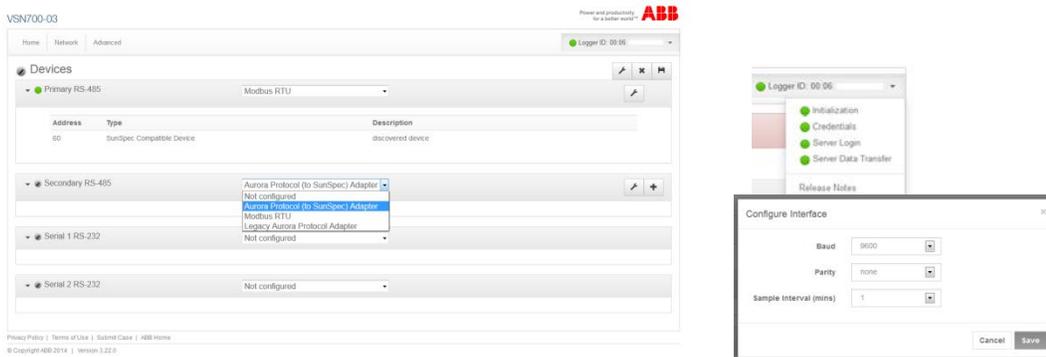
See the Plant Portfolio Manager Users Guide found at <https://docs.auroravision.net> for more information on registering a logger.

## Configure for inverters

The Devices list on the Home page will show all the different devices connected through all the ports on the data logger. It is essential that the devices you set up here match how devices are physically connected to your data logger.

For systems with multiple inverters, each inverter in a daisy chain must be manually assigned a different RS-485 address. All inverters connected in a daisy chain must use the same communication protocol and protocol settings.<sup>5</sup> Refer to the inverter manual(s) for instructions on connecting RS-485 wiring and configuring the inverter's communication protocol settings and address. Write down the serial number and RS-485 address for each inverter so you can determine which inverter is which on the monitoring system.

By default, only the two RS-485 ports are set up on the data logger. The Primary RS-485 port is set to **Modbus RTU** and the Secondary RS-485 is set to **Aurora Protocol (to SunSpec) Adapter**.<sup>6</sup> The protocol used on an interface is configured by clicking on the pencil icon  in the upper right, just below the Logger ID. Select the protocol for each interface based on the protocol used by your inverters through the drop-down menu(s) as shown below. On the far right of each interface click the wrench icon  to configure the protocol settings and device sampling time. Save any changes made using the save icon  and then the logger must be rebooted for the changes to take affect.



In a typical installation, ABB (and/or Power-One) inverters should be connected in a daisy-chain to the data logger's Secondary RS-485 port through the surge protection device on the left (Aurora Protocol). Inverters that use Aurora Protocol will be automatically discovered. ABB PRO inverters use Modbus RTU protocol and therefore must be connected to an interface set for Modbus RTU. Using the data logger's default settings, PRO inverters should be connected in a daisy-chain to the Primary RS-485 port through the surge protection device on the right (Modbus RTU). ABB PRO

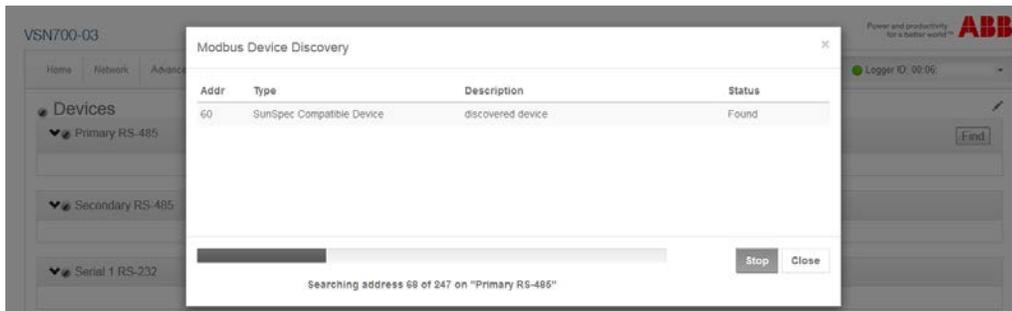
<sup>5</sup> If your device uses the Modbus RTU protocol, it must be configured to use 1 stop bit in the Modbus RTU frame as this is the only option that is supported by the data logger. The baud rate and parity checking are configurable on the data logger.

<sup>6</sup> If this is an older installation with only older Power-One Legacy inverters, you can change the Secondary RS-485 interface to **Legacy Aurora Protocol Adapter**. This selection only works if all inverters use the older Aurora Protocol without the SunSpec adapter.

inverters can be discovered using the Find button to the right of the Modbus RTU interface they are connected to.



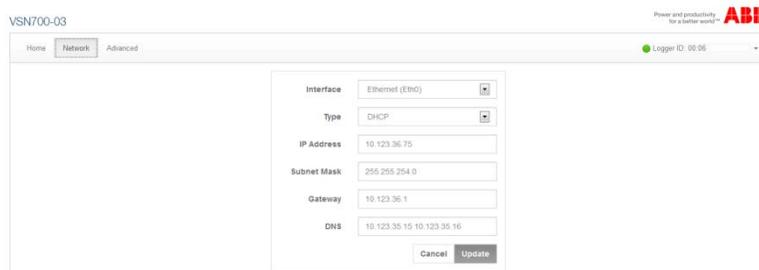
In the **Modbus Device Discovery** window click **Start** and then wait for it to find all your connected inverters. Once it finds all devices, click **Stop** and then click **Close** to close the window and return to device configuration. There is no need to wait for it to finish.



## Set a static IP address

Setting a Static IP is only necessary if required by your network. In almost all cases you can skip this section.

1. Obtain Static IP address information for the site.
2. Select the **Network** tab. Set the **Type** (Network Connection Type) field to **Static**. The page allows you to type in the following information:
  - IP address
  - Subnet Mask
  - Gateway
  - **DNS** (put a single space between primary and secondary DNS servers)
3. Press **Update** at the bottom of the page.



The data logger needs to be rebooted before network changes take affect.

## Verify Internet connectivity to Aurora Vision servers

1. Verify that the Ethernet cable is connected between **Eth0** and your network.
2. The data logger acts as a router. From your laptop connected to **Eth1**, verify internet connectivity by opening an Internet browser window and connecting to <https://www.auroravision.net>.
3. The remaining steps for commissioning are performed via the Internet to check end-to-end communications. Proceed with one of the following steps:
  - If you are not responsible for these remaining steps, be sure to pass on the MAC address (Logger ID) information to the responsible party. Remove the cable from **Eth1**. Installation is complete.
  - If asset registration is already complete, proceed to the section on **End-to-End Data Check**.
  - If asset registration is not complete, proceed to the next section on **Asset Registration**.

## Asset registration

Asset registration is performed on Aurora Vision through the Administration tool of Plant Portfolio Manager. Asset Registration assigns the MAC address of your logger to a specific plant in Plant Portfolio Manager. Asset registration can be performed before or after the on-site installation is complete. When you register the data logger, all the assets (inverters) reporting to the data logger are also registered. The plant must be created as an asset using the Administration tool before the data logger can be assigned and registered. Note that access to Administration tool requires an Aurora Vision User ID and password with Administrator privileges.

From the data logger's user interface, click on **Register** in the Logger ID drop-down menu and you will be re-directed to the Register Logger page. If you are not using the data logger's user interface, go to <https://admin.auroravision.net/customeradmin>. Select **Register Logger** and type in the MAC address of the data logger to register it. The Register Logger page allows you to select the plant that the data will be associated with.

See the Plant Portfolio Manager User Guide at <https://docs.auroravision.net> for help in using the Administration tool for logger registration.

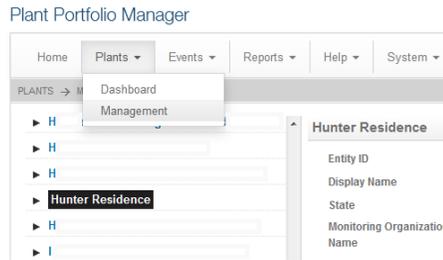
## End-to-end data check

The last check is to make sure that data is actually being reported and is visible in the Plant Portfolio Manager. Wait 15 minutes and log on to [www.auroravision.net](http://www.auroravision.net) using a web browser on an Internet connected device. Within Plant Portfolio Manager, go to the **Plants > Dashboard** page for the plant and open the **Device Status** panel. Verify that the energy readings agree with the inverter(s) and that all of the monitored devices are communicating, as indicated by the **Last Reported** time.

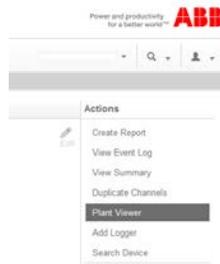
## Plant Viewer access for end users

The Installer must supply the customer with their unique Aurora Vision Plant Viewer URL so they can access Plant Viewer and monitor their system. To find the URL for a specific customer's site within Plant Portfolio Manager, follow these steps:

1. Log on to Plant Portfolio Manager at [www.auroravision.net](http://www.auroravision.net) and go to **Plants > Management**.
2. Select the customer's plant from the asset list in the screen area to the left.



3. Once the correct asset is displayed, select **Plant Viewer** from the **Actions** menu.



4. A page displays to configure the customer's Plant Viewer options. Scroll down to the **Published View** section. The URL to provide to the customer is in the **Share URL** field.

**Hunter Residence**

**Customize**

Company Logo  
The company logo image will be displayed at the top of the dashboard page in the public 'kiosk' view

**Choose Image**

Note Images can be in PNG, GIF, or JPG format. Logo Images should be less than 1024px wide and 200px tall.

Public Display Options

- Display Status
- Display Address
- Display Usage
- Display Modules

Unit Preferences  
Units that you want to be displayed on the kiosk

- US Customary
- Metric

**Sharing Options** Public

**Unshare**

**Published View**

Share URL

<https://easyview.auroravision.net/easyview/index.html?entityId=47>

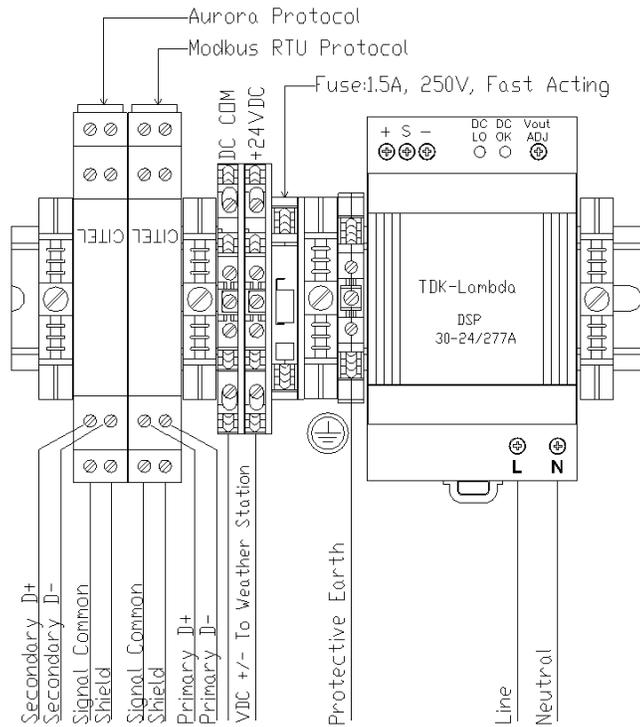
```
<iframe style=padding:0px;margin:0px;border:none' height='1200' width='1000'
frameborder='0' scrolling='no' src=https://easyview.auroravision.net/easyview
/index.html?entityId=47?> </iframe>
```

For detailed information about plant sharing options see the Plant Portfolio Manager User Guide found at <https://docs.auroravision.net>

## Adding an ABB weather station

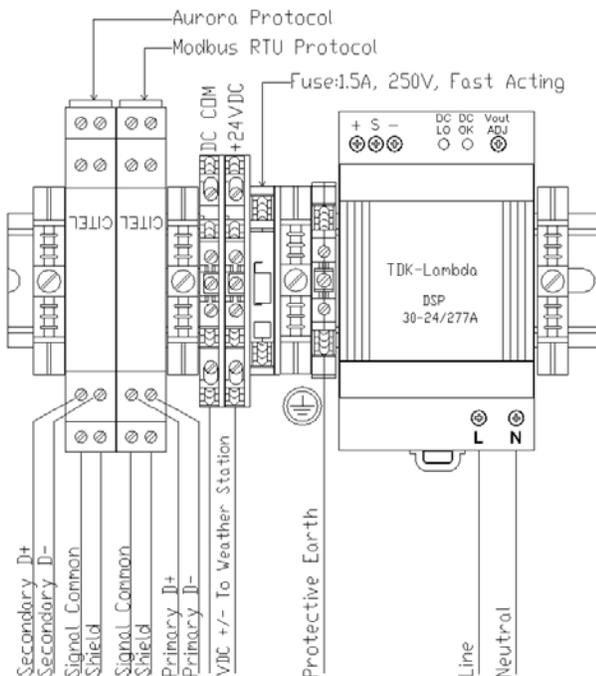
The VSN800 Weather Station is wired to the **Primary RS-485** port on the data logger through a surge protection device. The weather station can be connected directly to the System Monitor or can be connected in a daisy-chain with other Modbus RTU devices. Power for the weather station can be tapped from the +24VDC and DC COM landing blocks. The VSN800 can use the 24VDC power from the VSN730, but 24VDC power is not required. The VSN800 can operate using power in the range 10-30VDC.

1. Connect shielded twisted-pair wire to the RS-485 terminals on the VSN800 Weather Station. Use RS-485 data wire with one twisted-pair of conductors, one signal ground conductor, and a shield with drain wire (Belden 3106A or equivalent). **DO NOT USE CAT5/6 CABLE FOR THE RS-485 DATA WIRE.**
2. Connect the other end of the shielded twisted-pair wire to the Citel surge protection device. Use the table and figure below to make the proper connections.



Connections	Example VSN800 Weather Station RS-485 Pin Label	Citel Connectors, RS-485 Wiring	DIN Rail Connectors, Weather Station Power
RS-485 Negative (-)	RS-485 A(-)	D-	-----
RS-485 Positive (+)	RS-485 B(+)	D+	-----
Signal Ground	RS-485 GND	Signal Common	-----
Shield	RS-485 Shield	Shield	-----
VDC Power Ground	GND	-----	24- (VDC-)
VDC Power	24VDC	-----	24+ (VDC+)

3. Connect DC power to the weather station using twisted-pair wire. Do not use the DC power supply or ground connectors on the data logger's terminal block to power the weather station. The weather station can tap the VDC+ (24+) and VDC- (24-). Using the System Monitor as the power source is optional; any appropriate DC power supply that meets the specifications of the weather station may be used. See the table above and use the following image for wiring power from the System Monitor to the weather station. **DO NOT USE CAT5/6 CABLE FOR THE POWER WIRES.**



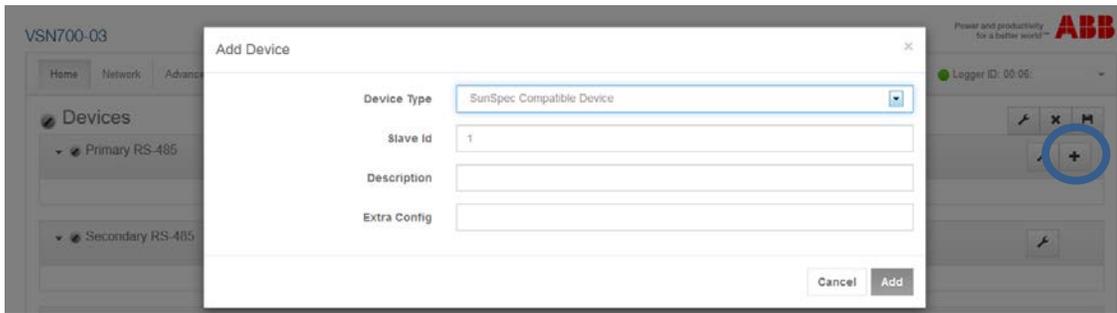
## Configuration for a weather station device

The port configuration for the **Primary RS-485** port on the data logger must remain set to **Modbus RTU** (default value) if connecting a weather station.

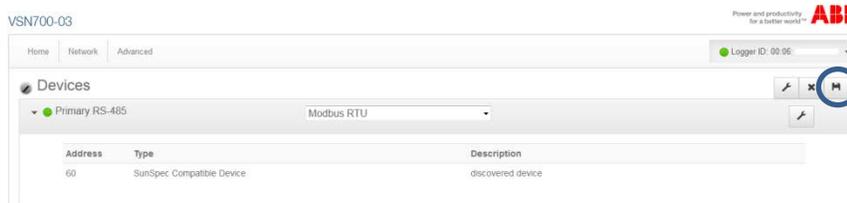
Configure the Primary RS-485 port using the following procedure. Bring up the data logger's user interface in the same manner as for configuring inverters (connect data logger directly to a laptop through Eth1 and go to <http://172.17.17.1>). The weather station can be discovered using the Find button as previously described in the Inverter configuration section. In the **Modbus Device Discovery** window click **Start** and wait for the scan to find the weather station (it should be found at address 60). After it is found, **Stop** and **Close** the scan.

Alternatively, the weather station can be manually added to the data logger as follows:

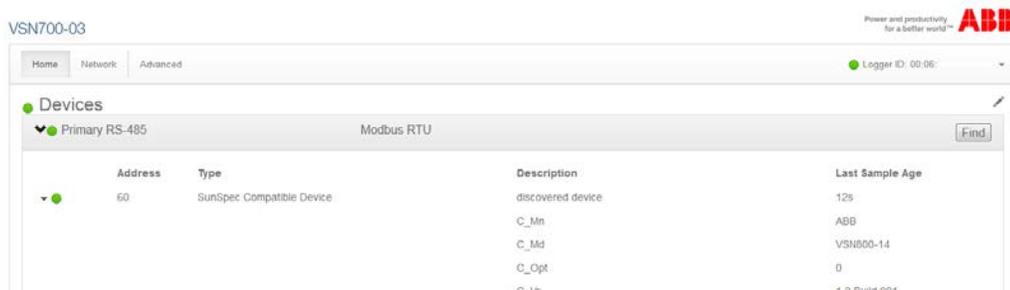
1. Go to the **Home** tab. Click on the Pencil  icon across from **Devices**.
2. Select the Plus  button on the **Primary RS-485** bar to add a device. A window appears to enter device settings.



3. Select SunSpec Compatible Device as the Device Type from the pull-down menu.
4. Set the **Slave Id** field to the Modbus address of the weather station. Note that for the VSN800-12 and VSN800-14 weather station models the default Modbus address is 60.
5. Enter a **Description** to help you identify the device if you need to change configurations later.
6. Click the **Add** button.
7. The device will be added to the **Devices** page, listed under the **Primary RS-485** port.
8. Press the Save  icon at the top to commit changes.



9. After making changes, you are returned to the **Devices** page with the status indicators, as shown below. It may take some time for the weather station to report data and for all the status lights on the left to turn green.



## Troubleshooting

### Troubleshooting guide

**Issue: Plant Portfolio Manager does not show recent information from the monitoring system.**

1. Verify the data logger is connected to power and the data logger LED2 = GREEN.
2. Verify that the data logger has a network link, by checking that the **Eth0** LED on the data logger is green. If there is no network link then test the Ethernet (Cat5 or better) cable with an appropriate data cable tester and verify the router, switch, or hub is operational.
3. Verify that you have a working Internet connection. This can be tested with a laptop by unplugging the Ethernet cable from Eth0 and connecting it to the laptop and testing to see if the laptop can connect to the Internet using the dynamic or static TCP/IP configuration for this network.
4. If all of the previous steps are correct restart the data logger by unplugging and then supplying power to the data logger.
5. If all of the previous steps do not help this issue contact ABB Technical Support.

**Issue: data logger is not receiving power.**

1. Check that the DC OK light on the power supply is green. If it is not, make sure that VAC input is OK.
2. Check if the wiring from the TDK-LAMBDA V+ and V- DC outputs is secured to the 24+/24- terminal blocks and is the correct polarity.
3. Check that the wiring from the 24+/24- terminals blocks is secured to the data logger's VDC and GND screw terminals and is the correct polarity.
4. Check to see if the DC fuse is blown and replace if necessary. If you replace a blown fuse and it immediately blows again, check that all the conductors are properly secured in the correct terminals.
5. If you have a weather station, check to see if there is a problem with the wiring to the weather station (i.e., secure attachments and the correct polarity). If the wiring to the weather station is OK, test that the weather station itself does not have a fault.
6. If after performing all these steps the data logger is still having problems, it could indicate the data logger is defective. Contact ABB Technical Support.

**Issue: I cannot connect directly to the web interface on the data logger.**

1. Verify the data logger is connected to power and the data logger LED2 = GREEN.
2. Verify that you have a working Ethernet cable. One end of the cable should be connected to **Eth1** and the other to your computer's Ethernet port. You should see a link LED illuminated for both the data logger and the computer.
3. Verify that the Network settings on the computer. The Network settings for the Ethernet connection should be set to DHCP "Automatically obtain an IP address". Try to "Repair" the network connection on the computer.
4. If all of the previous steps are correct restart the data logger by unplugging the power cord, wait 30 seconds, and then resupply power. Also restart your computer.
5. Try using a different Ethernet cable; your cable may be defective.

**Issue: I do not see all of the inverters.**

1. Make sure that the inverter is a supported ABB, or legacy Power-One, string inverter.

2. Verify that the inverter(s) is properly wired and is wired to the correct surge protection device in the System Monitor. Also verify that the communication protocol and protocol settings on the inverter and the data logger match.
3. After 3 minutes select refresh on your web browser.
4. Close your web browser and reconnect to the data logger web page and select the **Home** page (<http://172.17.17.1>).
5. Power cycle the data logger and wait for another three minutes and check the changes.
6. If all of the previous steps do not help this issue contact ABB Technical Support.

**Issue: I do not see recent data for an inverter.**

1. Select refresh on your web browser.
2. Close your web browser and reconnect to the data logger **Home** page (<http://172.17.17.1>).
3. Check to make sure the inverter has power. Check the inverter's user/installation manual.
4. Check to make sure the RS-485 communication wires are properly connected. Make sure the data conductors are not swapped. Measure the DC Voltage across D+ and D- at both the monitoring enclosure and at the data terminals of the remote device. If the measurement is 0 VDC you have a short in the data wires. If the difference between the two measurements is greater than 3 VDC then you may have an open circuit.
5. If all of the previous steps do not help this issue contact ABB Technical Support.

## Troubleshooting/Resetting a data logger

Consult this section if you suspect there is a problem with the data logger. Some problems can be fixed by rebooting the logger or by restoring the logger to its factory defaults.

On the end of the top side data logger housing (surface opposite the side with the Ethernet ports) are two small recessed buttons and two LEDs. The two buttons can be used to reset the system CPU (force a reboot) and to restore the unit to factory defaults. The two LEDs indicate the current status of the unit or the stage of the boot process.



Checking the status LEDs on the logger is the first thing to do when troubleshooting a logger. A solid orange LED1 (or no LEDs lit with 24VDC present) is an indication that the logger is not running properly and may need replacement if the problem persists.

Press the Reset button closest to the corner of the data logger to reboot the unit. You will need to wait until the logger is fully rebooted and then check to see if data is being transmitted correctly to see if this fixes the problem.

If problems persist, you may need to restore the data logger to factory defaults. Follow these steps to restore the data logger firmware to factory default.

1. Reboot the system. Momentarily press the Reset button on the logger or power cycle the System Monitor.
2. Within 5 seconds of resetting or power cycling the system, hold down the Factory Restore button until both LEDs blink in a synchronized pattern. That is, both will blink on and off at the

same time. This should occur 15 to 30 seconds after step 1, depending on whether or not the eth0 Ethernet interface is functional. If you cannot see the LEDs clearly, hold down the Factory Restore button for 30 seconds to be sure.

The factory restore removes all user configurations but keeps any firmware upgrades. The ports have to be reconfigured as Modbus or Aurora Protocol if different than factory settings. Devices have to be rediscovered and any other configuration information added again. ABB Technical Support will also need to be contacted to reset the data logger's Aurora Vision credentials.

The table below shows the meaning of LED indicators during the start-up process and normal operation.

Boot/Operation Stage	LED Indicators
Powered Off	Both LEDs off
First Stage Boot loader	Orange LED1 lit solid
Second Stage Boot loader	Orange and Green LEDs lit solid
Kernel loading	No LEDs lit
Resetting to Factory Defaults (only if triggered)	Both Orange and Green LEDs blink synchronized
System Initialization	Green and Orange LEDs blink alternately
Running normally	Green LED2 lit solid

## How to contact ABB technical support

For technical support please go to [www.abb.com/solar](http://www.abb.com/solar). When requesting technical support, please provide the following information:

- Model #.
- Unit serial number.
- Site/project name.
- Problem description.

Be prepared to describe the problem you are experiencing including specific details of the application, installation, and any additional pertinent information.

In the event that the equipment needs to be returned to the factory for any reason, please call to obtain a RMA# (Return Merchandise Authorization number). Do not return items without a RMA# displayed on the outside of the package.

If you require an advance replacement to be shipped before the RMA unit has been received by ABB, you will need to submit a valid purchase order for the replacement unit, referencing the RMA# on the P.O. When we receive the faulty unit, we will credit the cost of the replacement, if it is covered by the warranty.

Include a written statement describing the problems.

Send the package with shipping prepaid to our factory address. Insure your shipment. Our warranty does not cover damage incurred during transit.

## System monitor specifications

Specification	Value
Dimensions (Approximate)	305 mm H x 254 mm W x 127 mm D (12 in H x 10 in W x 5 in D)
Weight (Approximate)	6.4 Kg (14 lbs.)
Ambient Temperature	
Operating	-25°C to 50°C Maximum (-13°F to 122°F)
Storage	-40°C to 85°C Maximum (-40°F to 185°F)
Relative Humidity	100% up to 25°C; Less than 95%, non-condensing
Protection Class	NEMA 4/4X/12 (IP65) – Pollution Degree 3
Altitude	Operate below 3000 m
Markings	cETLus; CE
Safety Standards	UL508A; CAN/CSA-C22.2 No. 14-13
EMC Standards	FCC Part 15 Subpart B, ICES-003, VCCI, EN55022:2010, CISPR22:2008, AS/NZS CISPR 22:2009 +A1:2010, Class A; EN55024:2010; CISPR24:2010; EN61000-3-2:2006 +A1:2009 +A2:2009; EN61000-3-3:2008

## Data logger / Internet gateway specifications

### Ethernet Network Connection

- Primary Physical network connection on 10BaseT Ethernet or 100BaseTX Fast Ethernet networks using RJ45 twisted-pair cable. (Port name - Eth0)
- Secondary Physical network connection on 10BaseT Ethernet or 100BaseTX Fast Ethernet, but limited in speed to 12Mbit/s since it is connected through an internal USB port. (Port name - Eth1)

### Serial Connection

- Two RS-232 serial ports terminated with 9 pin MALE D-SUB connectors. Support baud rates up to 230Kbps.
- Two RS-485 serial ports supported on a single screw terminal block. Supports baud rates up to 115200bps.
- Up to 10 ABB or legacy Power-One string inverters and one ABB or legacy Power-One weather station are supported by the System Monitor. Inverters can be single-phase or three-phase string inverters.

### USB 2.0 Ports

- The USB Ports are currently not used.

### Hardware

- CPU: Atmel AT91SAM9260 @ 400MHz
- DRAM: 64 Mbytes
- Flash memory: 256 Megabytes

### Power Supply

- Power: 9-24 DC ( $\pm 10\%$ )

- Power consumption is typically between 2.8 VA and 3.2 VA. With load on USB bus, power consumption is between 5.0 VA and 7.2 VA

### Operating Environment

- Temperature: -40°C to +85°C
- Humidity: <80% storage, <85% operating (non-condensing)

### Dimension

- Height: 1.2" (31 mm)
- Width: 5.225" (133 mm)
- Length: 5.275" (134 mm)
- Weight: 13 oz. (363 gm.)

### Compliance

- The data logger is compliant with both industrial and light industrial/commercial EMC standards for both emission and immunity.
- FCC Part 15 Class A; CISPR 22, EN 55022 Conducted and Radiated Emission; CISPR 24, EN55024 Immunity

### IP Network Services

Any network connected to the logger must allow traffic to pass on the following ports. Network firewall rules (if present) must allow responses to the logger over existing TCP connections:

Direction	Service/Port	Protocol	Description
Out	SSH/22	TCP	For remote debugging by ABB service personnel, the data logger utilizes encrypted SSH Remote Login Protocol. To allow service personnel remote access to the data logger, this port has to be opened in any firewall and forwarded to the data logger. (preferred)
Out	DNS/53	UDP/TCP	The data logger must be able to resolve domain names, to ensure scalability and dynamic changes on the Internet (DNS). (required)
Out	HTTPS/443	TCP	As an HTTP client, the data logger connects to the Aurora Vision® Plant Management Platform using SSL/TLS for secure communications. The logger uses this port for all services, including data transmission, firmware upgrade, configuration management, and remote command transmission. (required)
Out	DHCP/67, DHCP/68	UDP	If DHCP service is not available, static network information must be assigned to the logger (preferred)
Out	NTP/123	UDP	The logger uses this port for network time services (NTP). (preferred)

### Network Hosts

The logger will connect to the following hosts. Some servers are owned by ABB, and others are customer or ISP servers. Servers listed as owned by "Customer IT/ISP" must be configured in the logger using either DHCP or static network information.

Host	Purpose	Port	Owner/Manager
platform.auroravision.net	Data, configuration	TCP:443	ABB
gw1.auroravision.net and/or apt.fatspaniel.net	Logger firmware upgrade	TCP:443	ABB
Site dependent	DHCP (optional)	UDP:67, UDP:68	Customer IT/ISP
Site dependent	DNS	UDP:53, TCP:53	Customer IT/ISP

### Logger Network Configuration

The logger requires a valid network configuration in order to operate. This information can either be provided by a DHCP server provided by the customer's network (the default), or the logger can be configured with static network information. Regardless of how the logger is configured, the following information is required.

Configuration	Purpose
IP Address	Allows the logger to take part in the local network. This does not need to be a public IP address. In most cases this is a private IP address.
Subnet mask	Used to determine if two computers are on the same network.
Gateway	The IP address of the computer which will forward network traffic from the local network to an external network
DNS Server	The IP address(es) of the computer(s) which resolve domain names.

## Power supply electrical specifications

Specification	Value
Model	TDK-Lambda DSP30-24/277A
VAC Input Range	90 – 304 VAC; 47 - 63Hz; 1.5A at 90VAC Input
Max. DC Current Output	1.25 A
Nominal DC Voltage Output	24V
Safety Standards	UL60950-1, EN60950-1, Evaluated to NEC NFPA70 Class 2 output per UL1310, CE
EMC Emission	EN55022 (CISPR22) Class A; EN61000-3-2,-3
EMC Immunity	EN61000-4-2,3,4,5,6,8,11; EN55024 (CISPR 24); light industry level, criteria A

## Conduit entry specification

It recommended that conduit entry come in through the bottom of the box. Drill holes at least 2" from any edge. Remove any metal shavings and treat bare metal with rust inhibitors. The use of UL 514B type conduit fittings are required to maintain the NEMA 4/4x/12 rating of the enclosure. The maximum size conduit that may be used on a System Monitor product is 1 inch.

## Weather station power wire sizing

If you are connecting a weather station to the System Monitor for power, this table will help you determine the minimum recommended wire size for the remote device power cable based on the one way distance along the wire run.

One way wire length to the weather station (feet)	VSN800-12/14 weather stations AWG size for stranded copper wire	SM48XX weather stations AWG size for stranded copper wire
0 to 100'	#22	#22
100' to 150'	#22	#20
150' to 250'	#22	#18
250' to 400'	#22	#16
400' to 650'	#22	#14
650' to 1000'	#22	#12
1000' to 1800'	#22	Use separate supply
1800' to 2800'	#20	
2800' to 4000'	#18	

## Terminal wire size and torque specifications

Terminal name	Acceptable Wire Size (in AWG) USE COPPER CONDUCTORS ONLY 60°C and 300V Insulation rating	Torque value (Nm)
Protective Earth Ground	#22 - #10	0.5
Power Supply (L, N)	#22 - #12	0.65
Citel Surge Protectors	#22 - #16	0.79
Data Logger screw terminal	#24 - #16	0.4
24+ (VDC+)	#22 - #12	0.5
24- (VDC-)	#22 - #12	0.4

Contact us

[www.abb.com/solar](http://www.abb.com/solar)