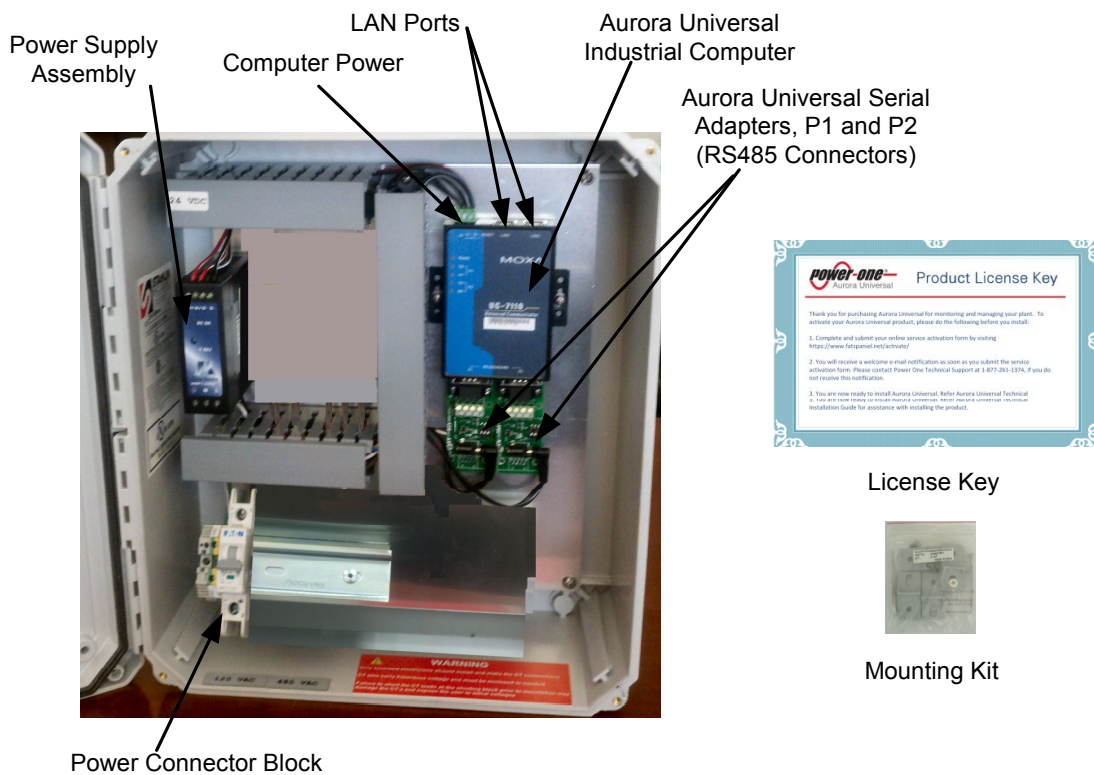


# Aurora Universal Industrial Installation Guide

This installation document covers the details for installing the Aurora Universal Industrial hardware to work directly with inverters and other balance-of-system equipment. Through Aurora Universal Industrial, the Management System (for example, Aurora Vision or Fat Spaniel Prime Edition) collects and analyzes energy generation and usage data for your inverters and other equipment. Once the hardware is installed, you will need to login to the Management System website to verify the Internet is connected properly and verify that the data is being received.

## Aurora Universal Industrial Installation Overview



## Installation Steps

- 1 Select Location and Mount the Aurora Universal Enclosure
- 2 Make Power Connections
- 3 Make Connections to Devices to be Monitored and the Internet
- 4 Verify and Validate the Installation via the Internet

## Equipment and Supplies

We supply:	You supply:
Aurora Universal Industrial, which includes: Aurora Universal Industrial Computer with two Aurora Universal Serial Adapters attached Power Supply Assembly Power Connector Block Product License Key Mounting Adapter Kit	Inverter and other balance-of-system equipment Mounting Hardware, including cable ties and conduit 120V wall outlet or 120/230/208/240Vac circuit power Twisted Pair RS485 Signal cable from inverter to Aurora Universal Industrial Computer (CAT-5 meets requirement) CAT-5 Network cable (straight-through wiring) to LAN port or a Cellular Router

## Site Selection and Mounting

### Site Location Planning

Site selection depends on how many inverters you are connecting to the Aurora Universal Industrial (AU Industrial) and if other devices are being connected to the system. For multiple inverters, inverters are “daisy-chained” together using twisted pair signal cable with the first inverter in the chain connected to the Aurora Universal Serial Adapter #2 (on the right). Balance-of-system devices are likewise daisy-chained — with the first device connected to AU Serial Adapter #1. The AU Industrial is connected to the Internet using Ethernet-compatible cabling.

For sites with multiple inverters or long distances between interconnections, it may be useful to draw a map of site installation, so you are sure the selected site is appropriate.

The Internet connection is only limited by the typical restraints and conditions that apply to any data network, as long as the router connected to the Aurora Universal Industrial Computer (AU Computer) is reachable over a public network. The Internet connection point may be a router or switch that is connected to a public network. It may also be a cellular router affixed within the AU Industrial enclosure or a cellular router shared by multiple Aurora Universal systems.

If connecting balance-of-system Modbus devices to the AU Industrial such as an environmental measurement system, these devices are connected through the AU Serial Adapter #1. The AU Serial Adapter #1 always uses the Modbus protocol.

### Cabling Requirements

Below are the rules regarding cable lengths:

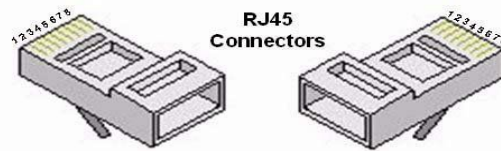
- Maximum 100 m (300 ft) between Aurora Universal and the internet connection point (LAN)
- Maximum 1200 m (4,000 ft) overall length of daisy-chained inverters or Modbus devices

Power plants are “electrically noisy” environments so shielded cable is advised. RS485 signal wiring between inverters is low-voltage wiring and should be shielded from electrical interference, such as high voltage wires or fluorescent light ballasts. If outdoor exposure or proximity to a noise source is a concern, we recommend Belden 9842 shielded wiring or equivalent.

For connection between the AU Industrial and the Internet, ordinary straight through CAT-5 cable works for most applications. However, ordinary CAT-5 is low-voltage wiring and should be shielded from electrical interference. If outdoor exposure or proximity to a noise source is a concern, Cat-5e or equivalent cabling should be used.

It may be necessary for your application to string CAT-5 wire through conduit. It may not be possible to string the wire without cutting off and re-attaching one of the RJ45 connectors. The wiring diagram for RJ45 connectors on CAT-5 cable is provided as a convenience if you are required to re-attach an RJ45 connector.

Pin #	Color
1	Orange/white
2	Orange
3	Green/white
4	Blue
5	Blue/white
6	Green
7	Brown/white
8	Brown



## Device Mounting

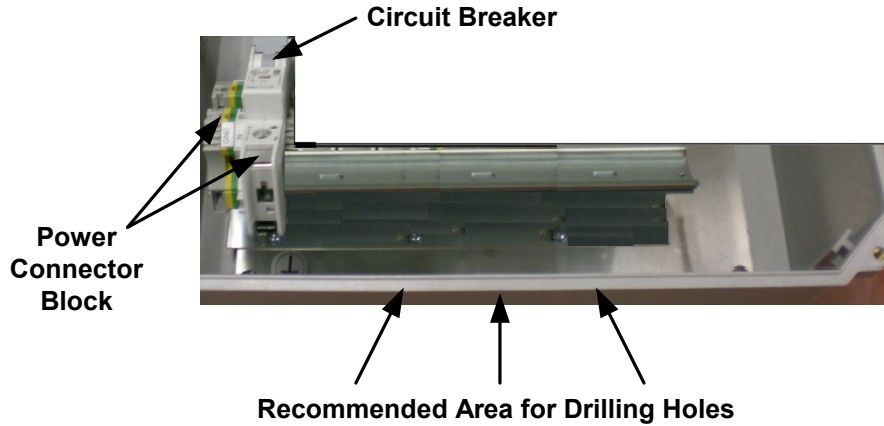
The exact method of mounting the Aurora Universal enclosure is left to the installer. The back of the enclosure has a female-threaded fastener embedded in the body of the enclosure. Here are some tips and best practices:

- The mounting kit included in the box transposes the female-threaded fasteners for forward facing bolts or lags (depending on the material to which the enclosure is being fastened). Typically, the boxes are attached to a metal plate that is setup by the installer.
- Ambient temperature around the box should remain between  $-10^{\circ}\text{C}$  and  $40^{\circ}\text{C}$
- If possible, install the enclosure where the enclosure is shaded from direct summer sunlight.
- Keep in mind that clearance between components in the enclosure and the enclosure wall is at least 2 inches, except on back wall of enclosure.
- Enclosure weighs between 5 and 10 lbs. Bracket mounts supporting up to 50 lbs are recommended.
- Enclosure must be mounted off the ground according to standard electrical codes.
- Enclosure door swings out to the left. Make sure you leave enough room to open the enclosure.
- If mounting outside, drill holes for conduit through the bottom of the enclosure and use conduit or glands to protect the integrity of the enclosure. Aurora Universal is a NEMA 3R rated enclosure. You *must* use appropriate conduit fittings to preserve the NEMA rating and your warranty.
- Wall-mounting or pole-mounting kits are available.

## **Connect the Power Source**

The AU Industrial comes without holes for electrical connections to the enclosure.

1. Drill a hole in the enclosure to string the power supply wire. The power connection point in the AU Industrial is at the lower left of the enclosure. This may also require conduit to house the wire if required for your installation.



2. Make sure power is OFF to the power wires coming into the Aurora Universal enclosure. Attach incoming power wires to the Power Connector Block (connectors farthest to the left) of the Aurora Universal enclosure.
3. Make sure the circuit breaker switch on Power Connector Block is OFF. Connect the power supply wire to 120, 208, 230, or 240VAC.

## **Connect Monitored Devices and Connect to the Internet**

### **Preparing Inverters for Connection to Aurora Universal**

Inverters must be connected to each other in a daisy chain before being connected to Aurora Universal. The RS485 terminal block connects with three individual wires or a three-wire cable. Two wires are for signals and a third one for a ground connection.

1. Install all inverters as per the documentation for the inverter model you are working with. Adhere to all cautions and safety instructions in the Inverter manual and use the proper tools to remove the access panel.
2. **Make sure that all inverters have a unique address.** For detailed information on configuring addresses, refer to the section on “address selection” in the inverter installation manual. Some inverters have special address requirements. For example, for Power-One inverters, the address of the first inverter in the chain must be set to 2 (the default).



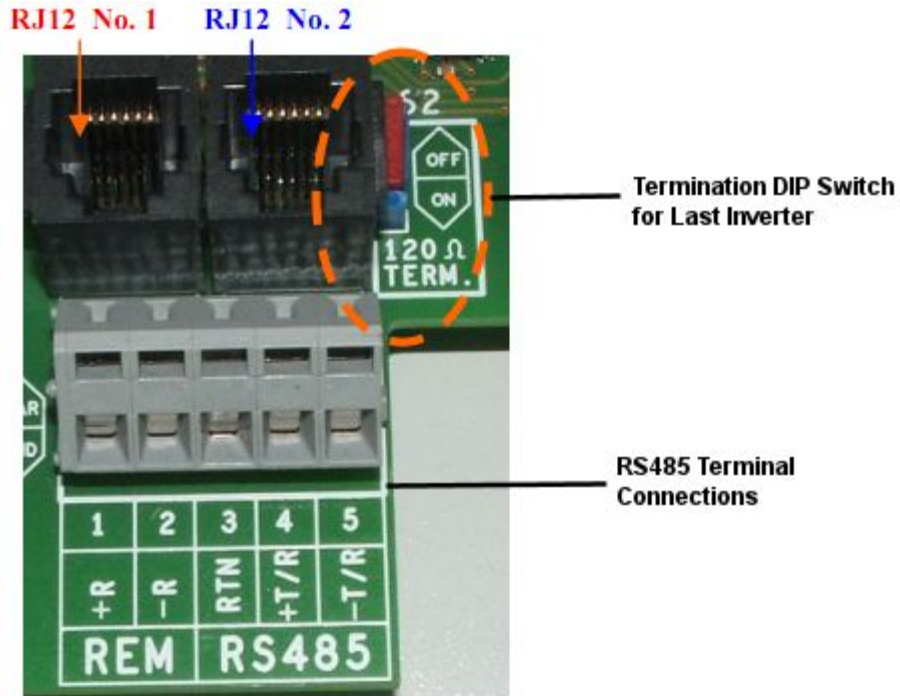
#### **CAUTION!**

Power-One uses the inverter address to track data for each inverter and to establish the Web site view. Once the inverter is connected to the monitoring equipment and is reporting data to the management server, the address cannot be changed without requiring changes to the management system configuration.

If the address must be changed at a later time or an inverter is replaced, please contact Power-One Technical Support *before the change is made*.

If for some reason the inverters cannot be configured as specified, please contact Power-One Technical Support *before service is started*.

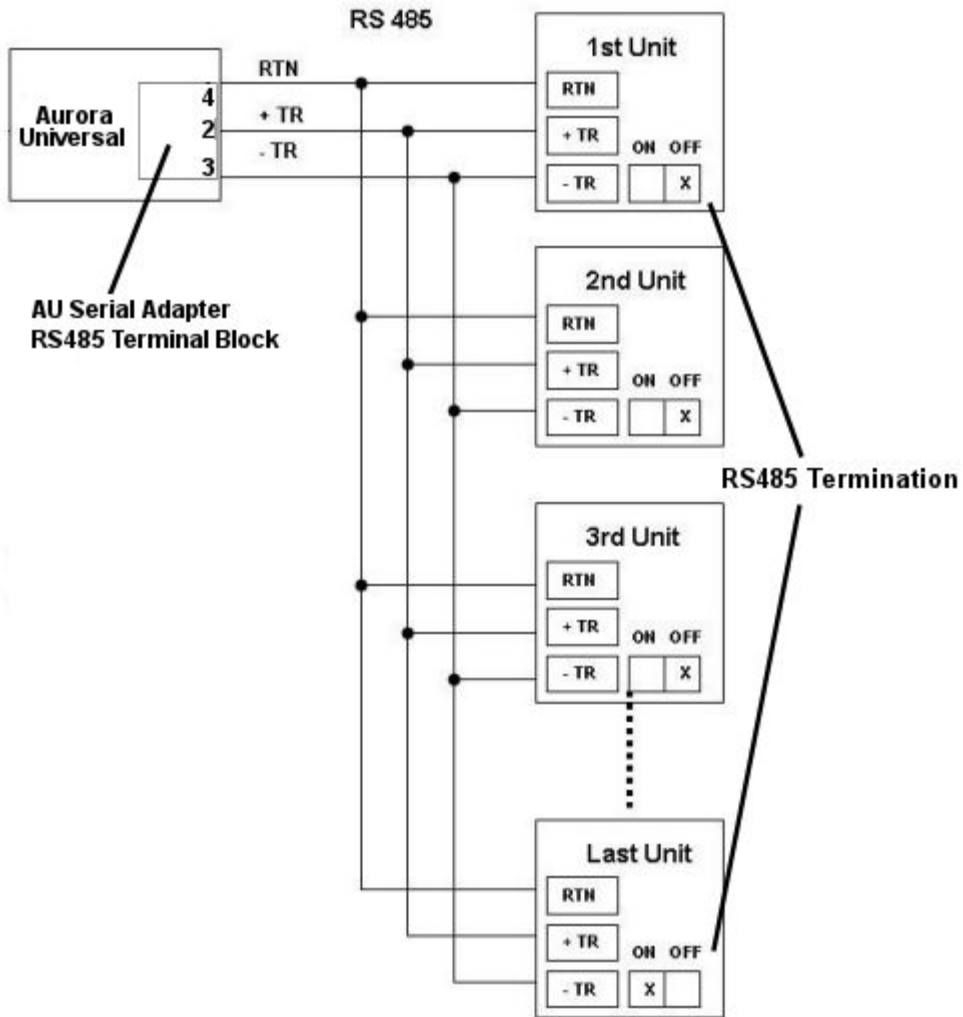
3. **Connect all inverters in the chain** (make a serial link between inverters). Locate the RS485 terminal block for each inverter in the chain. Inverters are connected by twisted pair signal cable from one RS485 terminal block in the inverter to the next inverter in the chain. The RS485 connectors may be a screw terminal block or cage-clamp connector. An example terminal block from an inverter is shown in the next figure.



Inverters typically features two holes so that input and output cables can be separated when multiple units are connected in a daisy chain. Cable is routed through the holes located at the inverter bottom. Holes are sometimes blanked with waterproof plugs, and the inverter manufacturer may supply cable glands for the holes to protect the inverter. After passing through the cable glands, cables are connected inside of the unit to the RS485 terminal blocks. Terminal blocks are protected by a door or covering. Remove the protective cover to access the RS485 terminal block.

Some inverters allow connections between inverters using RJ12 connectors and cabling. Refer to the inverter manual for information on using these ports to daisy chain inverters. However, note that the connection between the first inverter in the chain and the AU Revenue Grade must be made through the RS485 connectors.

4. **Terminate the last inverter.** Make sure the RS485 connection to the last inverter is terminated as per the inverter documentation. See the figure in the step above for an example of a DIP switch that needs to set to ON to terminate the last inverter. If you have a single inverter, that inverter must be terminated. For detailed information, refer to the section on communications in the inverter installation manual.



## Connect Inverter and Ethernet

The Aurora Universal System comes without holes for electrical connections to the enclosure.

String CAT-5 or CAT-5e compatible cable between the AU Computer and an Ethernet switch or router to complete the physical connection to Ethernet. You can also connect the AU Computer to a cellular router. If using a cellular router, it may be useful to attach the cellular router to the inside right wall of the Aurora Universal enclosure.

1. Drill a separate hole in the enclosure for the low voltage wires. The connection points in the Aurora Universal are on the AU Computer in the right side of the enclosure. This may require conduit to house the wires if required for your installation.
2. Connect the RS485 data wires from the RS485 terminal block on the AU Serial Adapter on the right (P2) to the RS485 terminal block in the first inverter in the chain using the pin callouts in the table below. Refer to the diagram and table below to make the proper connections. Refer to the Inverter installation documentation for details on the RS485 terminal block location. Make sure to use twisted pair wire to pins 2 and 3 on the Aurora Universal Terminal Block.

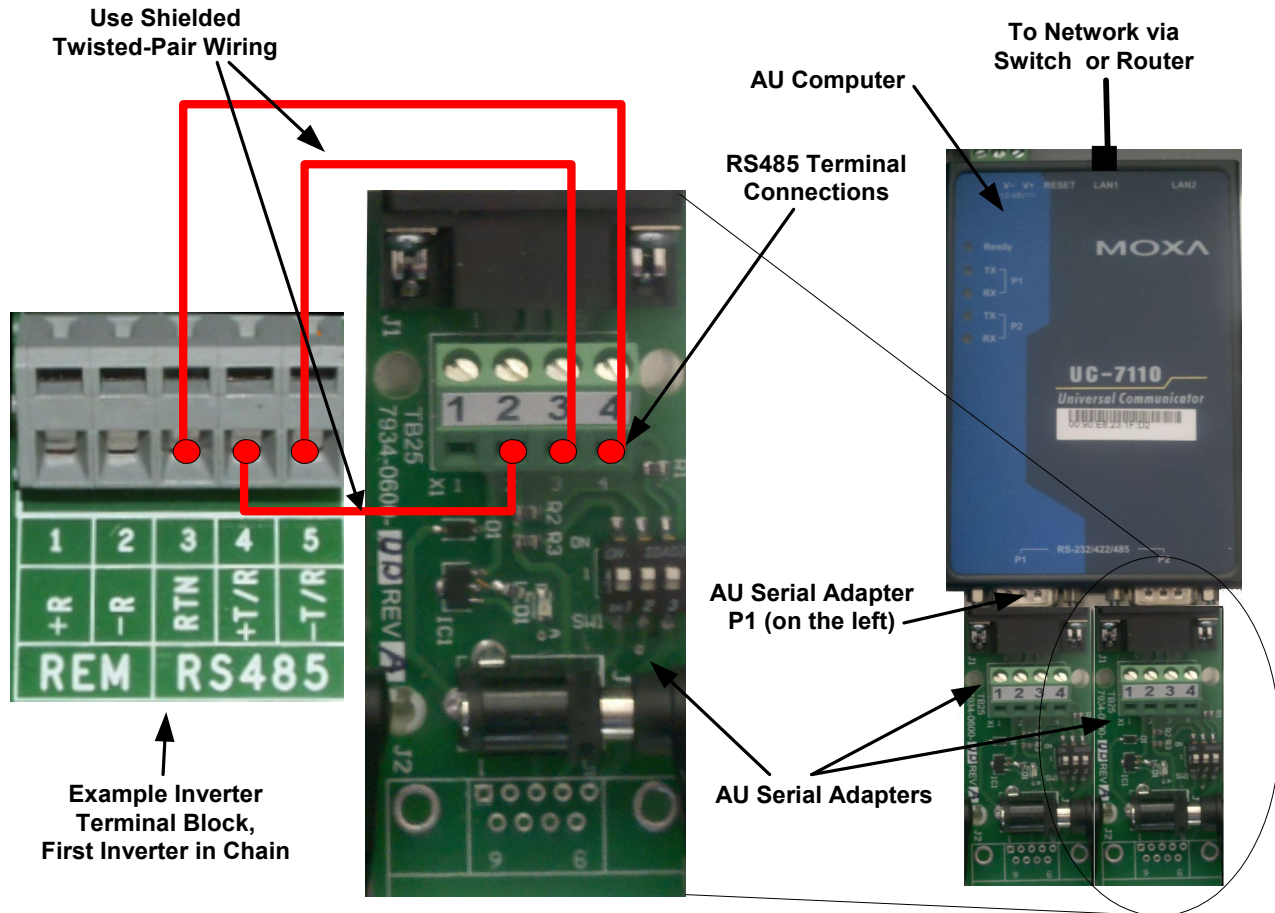
**Table 1: RS485 Connections**

Inverter RS485 Terminal Block Connection	Aurora Universal RS485 Terminal Block Connection	Aurora Inverter Pin Numbers
RTN	4 (white)	3
+TR	2 (red)	4
-TR	3 (black)	5
	<b>DO NOT USE CONNECTOR 1!!!</b>	



### **WARNING!**

Connector 1 on the Aurora Universal RS485 Terminal Block is 24 VDC for devices that require 24 VDC power, such as certain weather stations. **DO NOT** connect any inverter's RS485 port to connector 1 on the AU RS485 Terminal Block. This may seriously damage the inverter's RS485 terminal block.



3. Connect any additional devices. Connect the device's RS485 terminal block to the Serial Adapter on the left (P1).<sup>1</sup> The pin callouts are the same for this connection as for the inverter chain (see the pin callouts in Table 1). Make sure to use twisted pair wire to pins 2 and 3 on the AU Serial Adapter Terminal Block.

<sup>1</sup> It is recommended to connect devices/inverters as in the procedures above; however, devices/inverters can be chained together in any order to either AU Serial Adapter, as long as some restrictions are followed:

1. Each device in a chain must have a unique address.
2. Only one protocol can be used for one AU Serial Adapter. Modbus or proprietary protocols MUST be isolated on a single chain.
3. The last device in the chain MUST be terminated.
4. Some inverters require a unique AU Serial Adapter that replaces the AU Serial Adapter on the right (e.g., Fronius, Xantrex).
5. In addition to Modbus, currently supported protocols are Power-One, Fronius, Solectria, SMA, SMA Webbox, and Kaco. Support for new protocols may be added at any time.

4. If you do not have a cellular router, skip to step 4. If you have a cellular router, connect the cellular router cable (RJ45) to the D port labeled **LAN1** on top of the AU Computer. If this is your permanent means of connecting to Ethernet, it is not necessary to run the CAT-5 cable described in step 4. If the cellular router is being used for a temporary connection for installation verification or diagnostics, run the CAT-5 cable as described in step 4. Switch the Cellular router ON.
5. Run the CAT-5 or CAT-5e equivalent cable to an Ethernet access point, usually a switch or router. Refer to the Cabling Requirements section of this document if you need to need to cut and re-attach an RJ45 connector. Connect the CAT-5 cable (RJ45) to the AU Computer port labeled **LAN1**. Leave the cable temporarily disconnected if a cellular router is already connected.
6. You're now ready to test power and the physical connections. A cellular router, LAN switch, or LAN router must be connected through the LAN1 port of the AU Computer. Turn on the power to the Aurora Universal using the breaker on the Power Connector Block.
7. Check the power connection. You should see a green light on the power supply indicating that the power supply is operating properly. If no light is present, make sure the power to the power supply wires is ON, and check your wiring to the Power Connector Block.
8. Check the AU Computer power. There are 4 LED lights on the front of the AU Computer. The Ready LED should be ON.
9. Check the AU Computer Ethernet connection. Look at the top of the AU Computer; you should see a green light above the LAN1 port.

### ***System Activation and Validation***

If you acquired the Aurora Universal System as part of an Aurora Universal/Aurora Vision product bundle, please refer to the Product License Key that came with your Aurora Universal package. This License Key provides more information about the next steps for product installation and system validation.

If you are using Aurora Universal in conjunction with Fat Spaniel Prime Edition, go to <https://partnerportal.fatspaniel.net/display/pub/Home> and log in to Fat Spaniel Prime Edition with your account name and password. Using your product license key, set up the connection to Aurora Universal.