

Weather Station

Obvius, LLC

Installation and Operation Manual

Model A89WS
(3rd generation, systems manufactured after July 2010)

Date Jan 18, 2011

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<ul style="list-style-type: none">● Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.● This equipment must only be installed and serviced by qualified electrical personnel.● Read, understand and follow the instructions before installing this product.● Turn off all power supplying equipment before working on or inside the equipment. Use properly rated voltage sensing device to confirm power is off. DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION● Only install this product on insulated conductors.
Failure to follow these instructions will result in death or serious injury.

NOTICE
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Overview

The Obvius weather station is designed to provide measurement options for environmental data points related to Solar/PV generation sites. The weather station can provide readings for wind speed, direction, solar radiation, air temperature, humidity, and solar panel temperature.

Installation Checklist

The installation of the Obvius weather station requires a number of tools and supplies to complete the installation. The following list provides a representative sample of what may be required for installation, however site specific issues may require additional tools or supplies.

The weather station power and communications connections require a licensed electrician or similarly qualified installer.

Required:

- Adjustable Crescent wrench
- Screw Drivers: Philips and flat-head, small and medium sizes.
- Weatherproof conduit for power and communications to the weather station control box.
- Drill and bit to install conduit connectors into the control box.
- Power: 120 ~ 240VAC, and appropriate wire.
- Communications RS485 wiring: twisted pair with shield.
- Compass or GPS to align wind sensor true North.
- Mounting screws or bolts to attach the tripod to the mounting location, such as nine 2”X1/4” bolts.

Markings and Symbols

WARNING: A potential risk exists if the operating instructions are not followed



General Warning Symbol: This symbol indicates the need to consult the operating instructions provided with the product.



This symbol indicates the presence of electric shock hazards.



This symbol indicates: Do not apply to or remove from hazardous live conductors.

== Direct Current symbol.

Hardware Overview

weather station Package Kits

The Weather station may be ordered using the following kit part numbers. These kits include a number of components that are listed below, to build a complete weather station.

A89WS-1	weather station with Pyranometer, Temperature, Humidity, and Cell Temperature. Includes: A89WS-PY1 Pyranometer kit (Li-cor) A89WS-TH1 Temperature Humidity kit (Veris) A89WS-TC1 Cell Temperature kit (Veris) YWX0482 NEMA 4x control box with 120v power supply, UCLC amplifier, Flex IO, and sensor connectors. Does not include mounting kit.
A89WS-2	weather station with Pyranometer, Temperature Only, and Cell Temperature. Includes: A89WS-PY1 Pyranometer kit (Li-cor) A89WS-TO1 Temperature only kit (Veris) A89WS-TC1 Cell Temperature kit (Veris) YWX0482 NEMA 4x control box with 120v power supply, UCLC amplifier, Flex IO, and sensor connectors. Does not include mounting kit.
A89WS-3	weather station with Pyranometer, Temperature, Humidity, Cell Temperature and Anemometer. Includes: A89WS-PY1 Pyranometer kit (Li-cor) A89WS-AN1 Anemometer kit (NovaLynx) A89WS-TH1 Temperature Humidity kit (Veris) A89WS-TC1 Cell Temperature kit (Veris) YWX0483 NEMA 4x control box with 120v power supply, UCLC amplifier, Anemometer Amplifier, Flex IO, and sensor connectors. Does not include mounting kit.
A89WS-4	weather station with Pyranometer, Temperature, Cell Temperature and Anemometer. Includes: A89WS-PY1 Pyranometer kit (Li-cor) A89WS-AN1 Anemometer kit (NovaLynx) A89WS-TO1 Temperature Only kit (Veris) A89WS-TC1 Cell Temperature kit (Veris) YWX0483 NEMA 4x control box with 120v power supply, UCLC amplifier, Anemometer Amplifier, Flex IO, and sensor connectors. Does not include mounting kit.

Note: Weather station kits do not include a mounting kit (mast, tripod, etc). If a mounting kit is required, be sure to order the weather station mounting kit package A89WS-MK1.

Note: The pyranometer kit is intended to be mounted vertically on the weather station. The optional kit A89WS-MP1 should be ordered separately for sites that require the pyranometer to be mounted on the solar panel to match the panel's angle.

List of sub-assemblies

Weather station sub-assemblies may be ordered from the following list of components. Each section of this manual will deal with these sub-assemblies separately as well.

A89WS-AN1	Anemometer kit. Includes: wind speed and direction, 40' cable, and plug. (NovaLynx 200-WS-02)
A89WS-AN2	Anemometer kit. Includes: wind speed and direction, custom length 105' cable, and plug. (NovaLynx 200-WS-02)
A89WS-MK1	weather station Mounting kit. Includes: Tripod, Mast and Arm
A89WS-MP1	PV Mounting Bracket - Pyranometer
A89WS-PY1	Pyranometer kit. Li-Cor LI-200SZ sensor with leveling mounting plate, screws, calibration certificate, 50' cable and plug adapter.
A89WS-TC1	Cell Temperature kit Includes: 10k type 2 thermistor with 50' cable and plug adapter (Veris TRASPC01331)
A89WS-TC2	Cell Temperature kit Includes: 10k type 2 thermistor with 150' cable and plug adapter (Veris TRASPC01331)
A89WS-TH1	Temperature/Humidity Probe kit. 4-20mA output, -40F to 122F range, 0-100% RH range, with 9ft cable, plug, and mounting screws. (Veris HO2XMSTA1-02)
A89WS-TO1	Temperature only probe kit. 4-20mA output, -40F to 122F range, with 9ft cable, plug, and mounting screws. (Veris TOAM10-02)
YWX0482	Weather station control box- NEMA 4x, 24VDC power supply, UCLC amplifier, 2 plug receptacles- Pyranometer control box, Cell temperature, water tight gasket.
YWX0483	Weather station- NEMA 4x, 24VDC power supply, UCLC amplifier, 3 plug receptacles- Pyranometer, Anemometer, water tight gasket.

Features and Specifications

List of sub-assemblies

A89WS-AN1, AN2	Anemometer kit
Direction Sensor range:	0 – 360 degrees. Azimuth: 360° mechanical, 355° electrical (5° open) 360°/0°=North 90°=East 180°=South 270°=West
Direction Accuracy:	+/- 3°
Speed Sensor range:	0 – 100 MPH. Gusts up to 220 MPH
Speed Accuracy:	1 mph or +/- 3%
Operating temperature:	-50C ~ +50C
A89WS-PY1	Pyranometer kit
Sensor range:	0 ~ 1400W/m ²
Accuracy:	+/- 5%
Operating temperature:	-40 ~ +65C
A89WS-TC1, TC2	Cell Temperature Kit
Sensor range:	-13 ~ +221F. 10K Type 2 resistive sensor.
Accuracy:	+/- 1.8°C typical; +/- 3.0°C max. over 0° to 70°C
Operating temperature:	-25 ~ +125C
A89WS-TH1	Air Temperature and Humidity Probe.
Temp Sensor range:	-40 ~ +122 degrees Fahrenheit
Temp Accuracy:	+/-1 degree F
Humidity Sensor range:	0 ~ 100 % Relative Humidity
Humidity Accuracy:	+/- 2% (replaceable sensor)
Operating temperature:	-40 ~ +122
A89WS-TO1	Air Temperature Probe.
Sensor range:	-40 ~ +122 degrees Fahrenheit
Accuracy:	+/-1 degree F
Operating temperature:	-40 ~ +122
YWX0431, YWX0432	weather station Control Box
Control Box	
Operating Temperature:	-30 ~ +50c, 0-95% RH, non-condensing.
Power Supply:	Weidmuller 8739140000
Power input:	120-240VAC, 24W, 50-60Hz
Operating temperature:	-10 ~ +70c
IO module:	A8332-8F2D
Accuracy:	+/- 0.25% (4-20mA mode inputs) +/- 1% for cell temperature sensor (resistive mode inputs)
Operating temperature:	-30 ~ +70c
Protocol:	Modbus/RTU, RS-485, 9600, N81

Hardware Installation

Overview

The weather station assembly takes several steps, and should be performed in the following order.

- 1) Assemble the mounting kit. Tripod, mast, and arm.
- 2) Attach the weather station control box. Run appropriate conduit for power and communications to the control box.
- 3) Attach individual sensors to the weather station.
- 4) Using a computer or laptop, configure the weather station and the AcquiSuite (or other Modbus data acquisition server).

The following sections of the manual cover hardware installation and component details for each of the steps listed above.



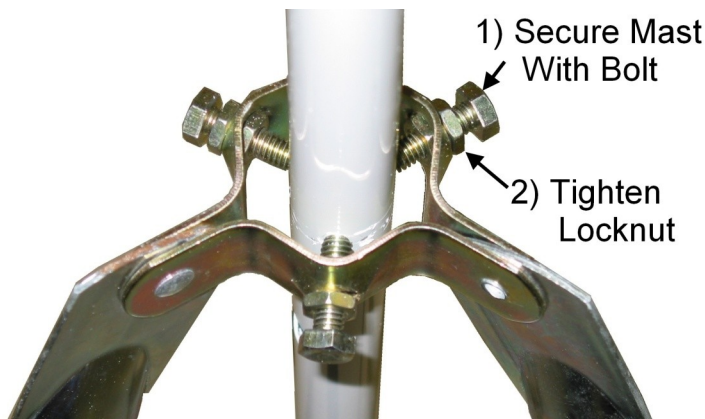
A89WS-MK1: weather station Mounting kit

Kit contains: Tripod, Mast, and Arm.

Location: Before installing the weather station, a suitable location for the sensors must be selected. Ensure that the weather station is located in an open and unobstructed area as possible such as a rooftop location or a parking lot shade structure. Use extreme care to prevent contact with electrical power lines while installing the weather station.

- The pyranometer measures solar radiation. The main concern during installation is an unobstructed view of the sky, clear of all walls, trees, or other objects which might cast a shadow over the sensor.
- The wind speed and direction sensor must be installed in a location away from walls or other objects that can obstruct the flow of the wind. Vertically position the sensor twice the height above adjacent obstructions, and horizontally position the sensor away from adjacent obstructions six times the height of the obstruction. For best performance, position the wind sensor approximately 33 feet (10 meters) above the highest obstacle within a 990 foot (300 meter) radius of the mounting location.
- It is critical to avoid placing the weather station near HVAC units, or exhaust systems from other mechanical equipment to avoid interference with the sensors.

Tripod: Remove the tripod from the packaging. Expand the tripod legs until the legs are fully extended.



Mast: Install the mast in the hole in the center of the tripod, and secure using the bolts in the tripod collars. Tighten the bolt into the mast, and secure the bolt by tightening the lock nut against the collar. The nut and bolt require a 1/2" wrench.



Arm: The arm of the weather station should be positioned on the mast about 8" from the top, and pointing towards the equator to prevent the mast from casting a shadow on the pyranometer.

Use the two u-bolts provided to attach the arm to the mast. Place the u-bolt around the back of the mast, then add the metal adapter bracket. Next, pass the bolts through the back of the arm. Add the lock washer and nut on the inside of the arm.



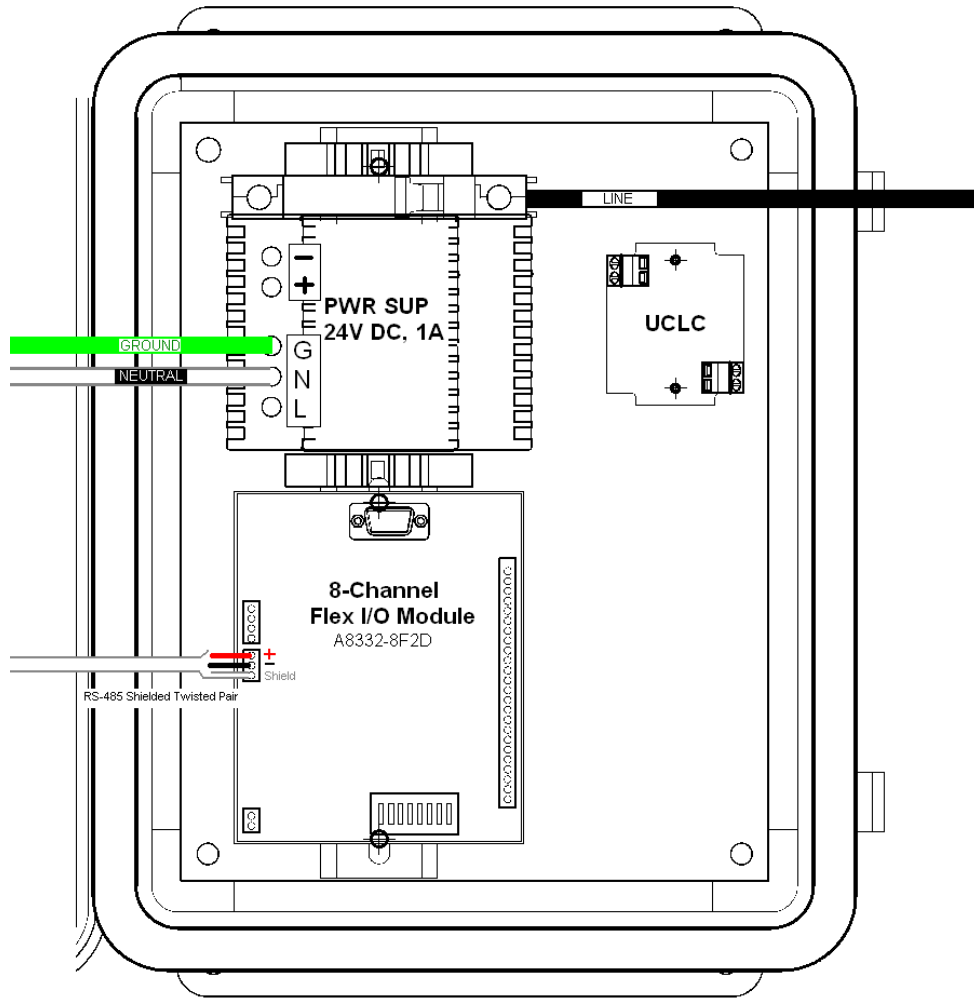
 The mast and tripod should be electrically grounded to minimize the probability of any lightning damage.

YWX0482: weather station Control Box

Kit includes: control box, 2 u-bolts.

The weather station control box mounts on the back of the mast using the two u-bolts provided in the kit. The box should be mounted with the connectors on the bottom.

Separate holes will need to be drilled into the side or bottom of the box by the installer, to provide an attachment point for a weatherproof conduit or cable for power and communications. (power and communications wire and conduit are not included with the weather station.)



With the mains off, connect the Line, Neutral and Ground wires to the screw terminals provided. Proper grounding is required.

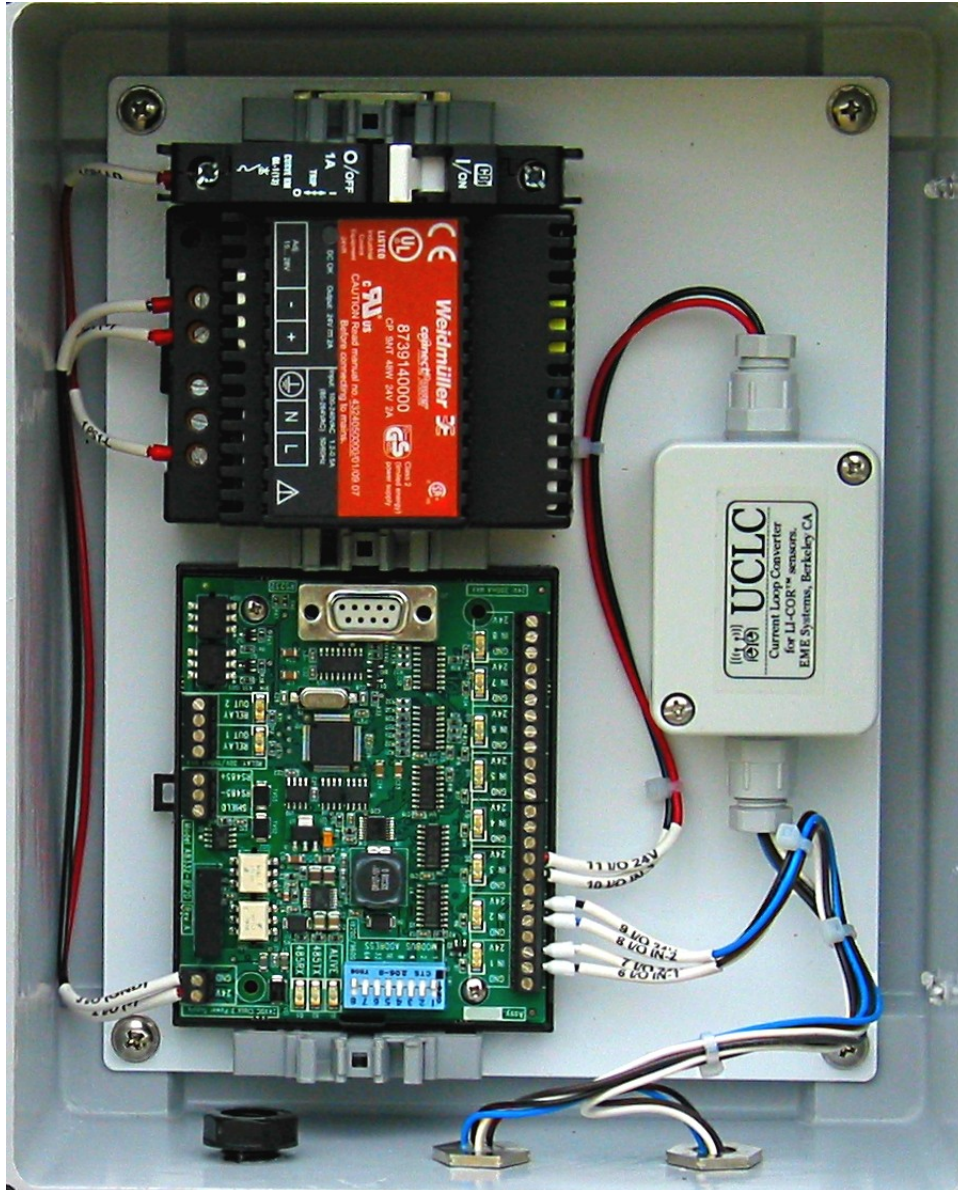


It is important to observe all electrical codes and safety practices when wiring the weather station.

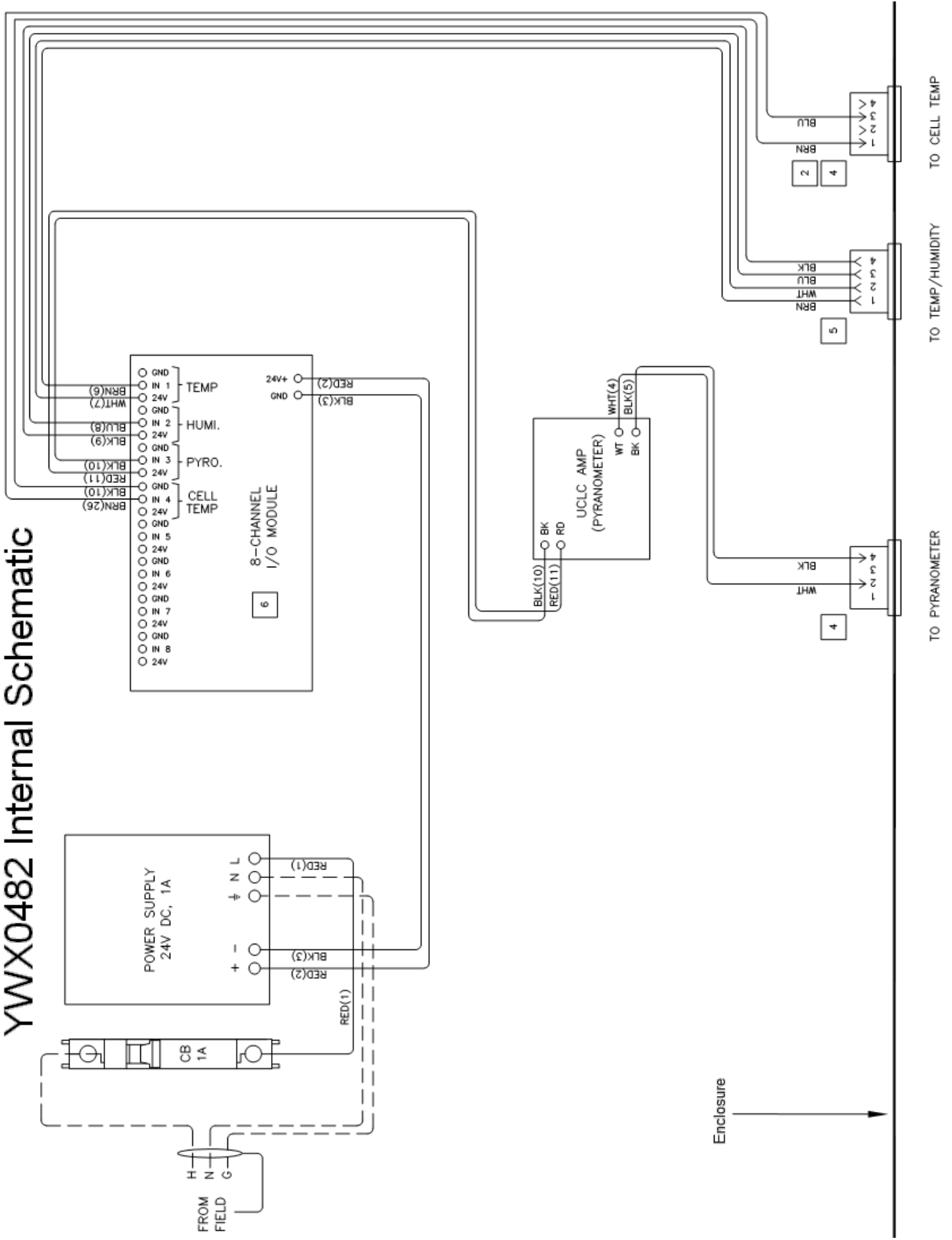


WARNING: After wiring the system, remove all scraps of wire or foil shield from the electrical panel. This could be dangerous if wire scraps come into contact with high voltage wires.

The weather station uses RS-485 Modbus RTU to communicate with a Master device such as an AcquiSuite. Attach a suitable twisted pair cable to the RS-485 connector provided. Observe polarity markings +, - and Shield.



YWX0482 Internal Schematic

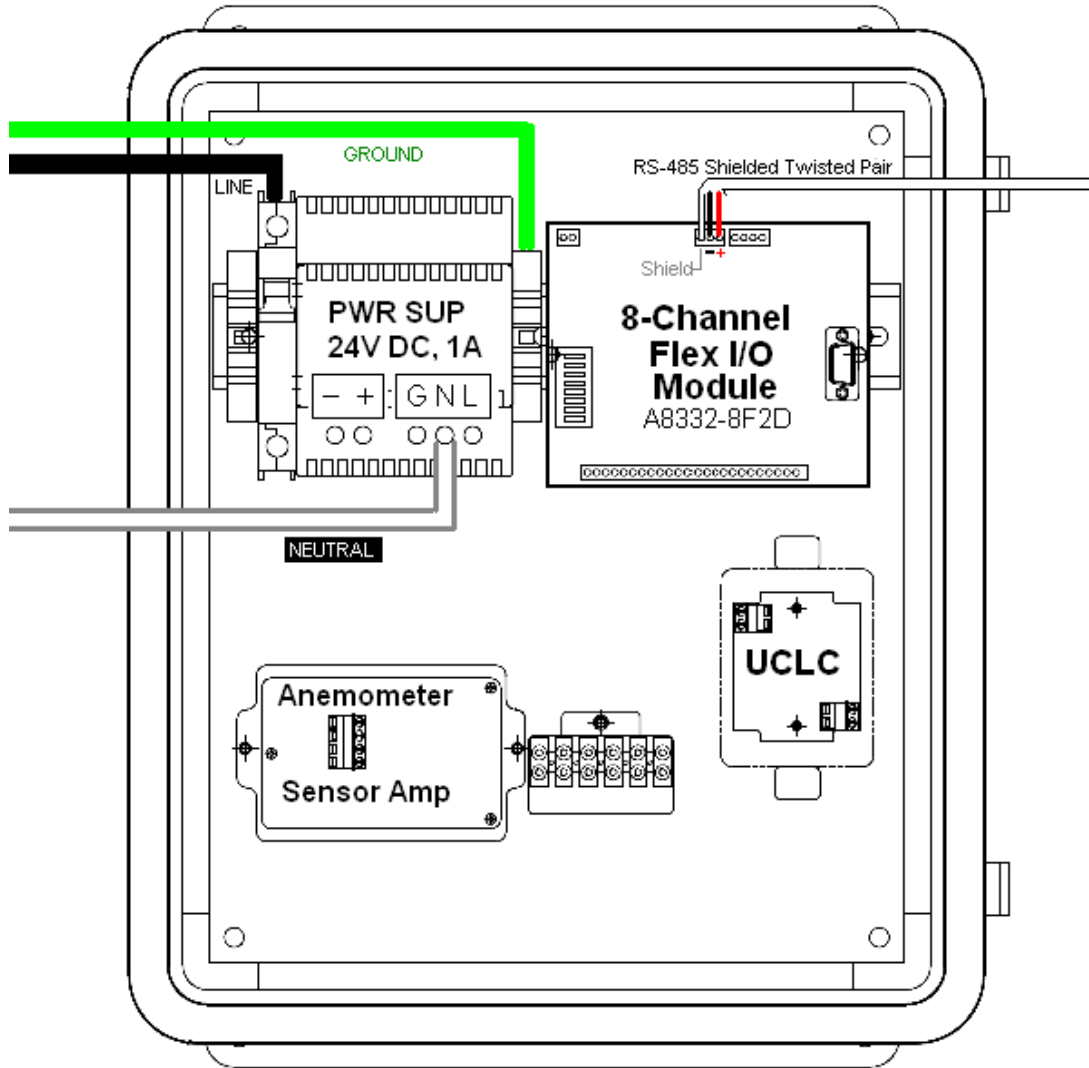


YWX0483: weather station Control Box

Kit includes: control box, 2 u-bolts.

The weather station control box mounts on the back of the mast using the two u-bolts provided in the kit. The box should be mounted with the connectors on the bottom.

Separate holes will need to be drilled into the side or bottom of the box by the installer, to provide an attachment point for a weatherproof conduit or cable for power and communications (power and communications wire and conduit are not included with the weather station).



With the mains off, connect the Line, Neutral and Ground wires to the screw terminals provided. Proper grounding is required.

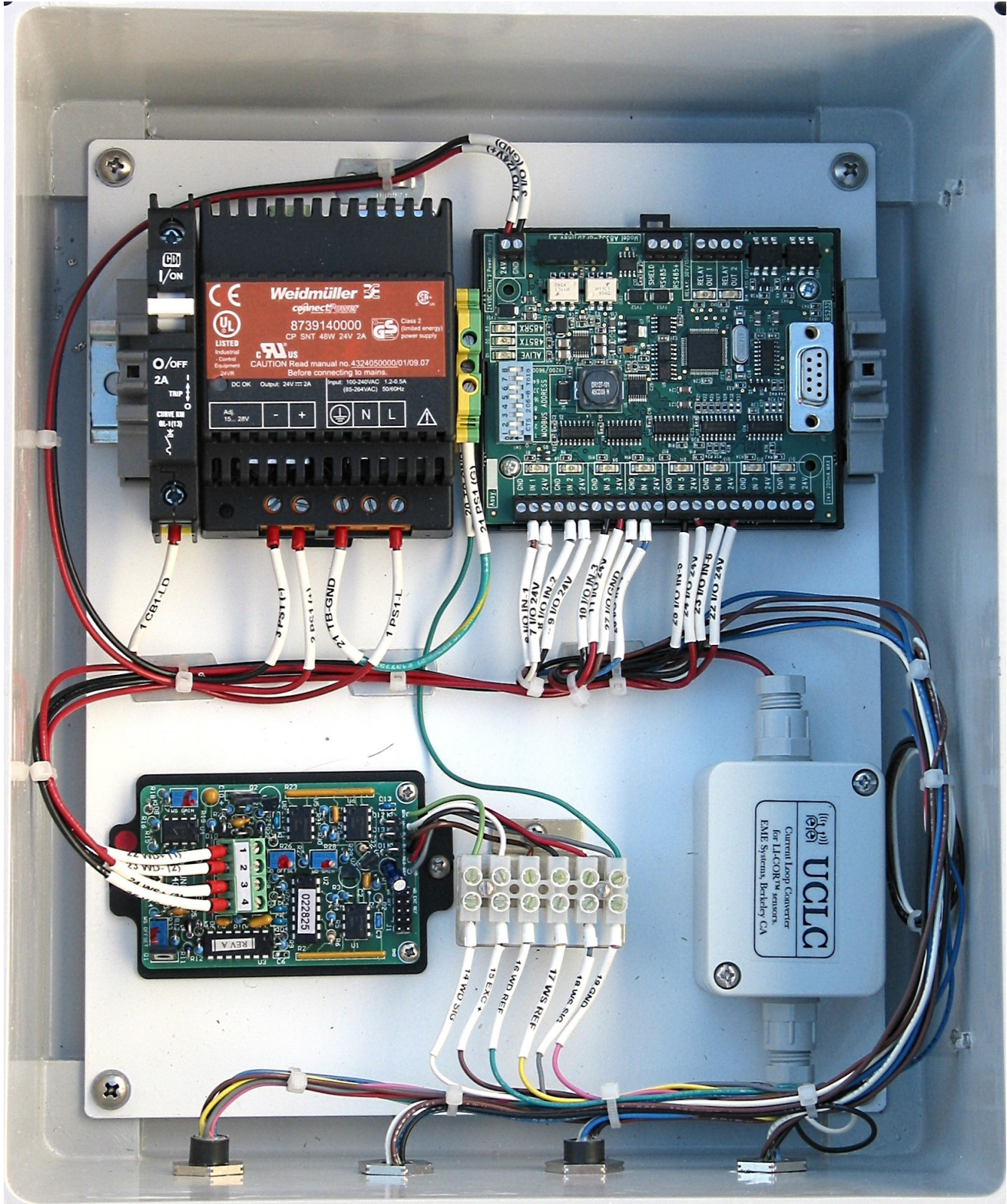


It is important to observe all electrical codes and safety practices when wiring the weather station.

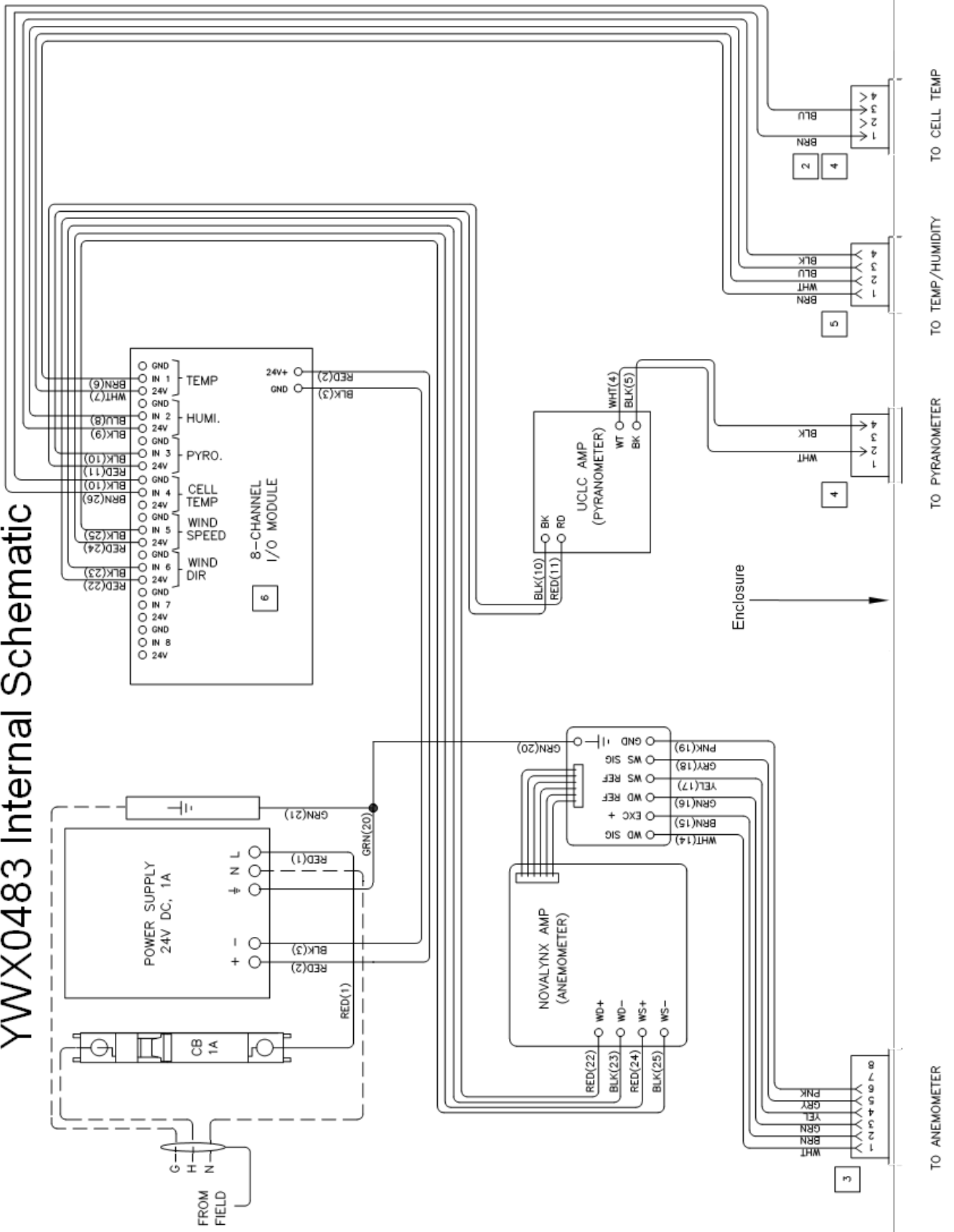


WARNING: After wiring the system, remove all scraps of wire or foil shield from the electrical panel. This could be dangerous if wire scraps come into contact with high voltage wires.

The weather station uses RS-485 Modbus RTU to communicate with a Master device such as an AcquiSuite. Attach a suitable twisted pair cable to the RS-485 connector provided. Observe polarity markings +, - and Shield.



YWX0483 Internal Schematic



A89WS-AN1, A89WS-AN2: Anemometer kit

Kit contains: Anemometer sensor

The A89WS-AN1 and A89WS-AN2 sensor kits are identical except for the cable length. The A89WS-AN1 has a 40' cable. The A89WS-AN2 has a 105' cable. The installation procedure for both kits is the same.

Locate the tail fin for the wind direction sensor. The tail fin must be attached to the sensor using two screws provided. Place the tail fin with the large part of the fin on the top as shown in the following picture.

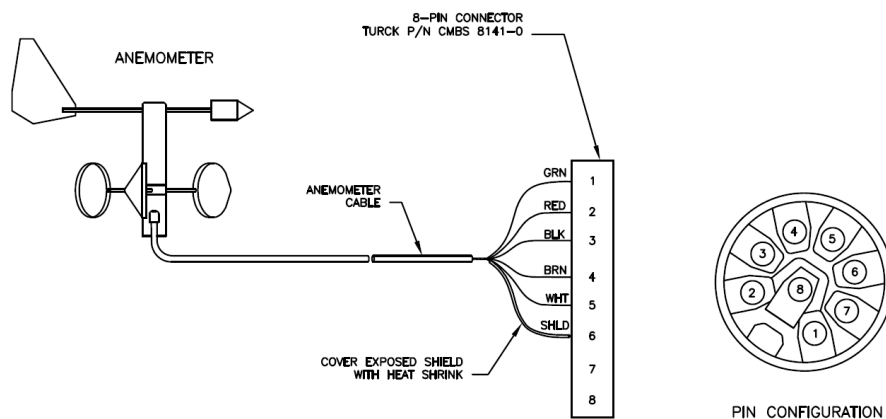
Install the anemometer by placing the sensor on the top of the mast. Locate the label on the side of the sensor labeled "north". Rotate the anemometer on the pole so that label on the anemometer base is facing North. Magnetic North is adequate for most installations. Should a True North alignment be required, the magnetic declination at the sensor location must be known and applied to the compass reading.



Tighten the two screws on the bottom of the sensor to secure it to the mast.

Note: do not adjust the screw in the middle of the label. This is for calibration.

Run the wire from the sensor back to the control box, and attach the wire to the connector labeled "Anemometer."



WIRING DIAGRAM

A89WS-PY1: Pyranometer kit

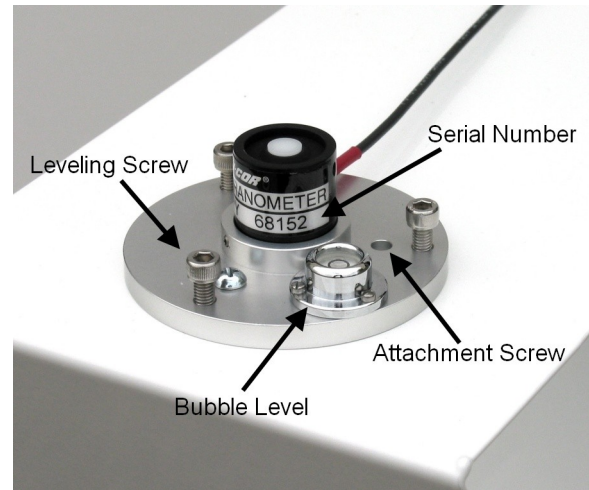
Kit contains: Pyranometer, Leveling base, 3 screws, nuts, calibration certificate.



Attach the pyranometer to the mounting base. Align the wire on the pyranometer to the slot on the mounting base before inserting it in the base. A small hex set-screw is located on the side on the mounting base to secure the pyranometer. Use the Allen wrench provided to tighten the set screw until the pyranometer is secure. Do not over-tighten the set screw or it will crack the pyranometer.

Attach the pyranometer base plate to the top of the weather station arm as shown to the left. Place the three mounting bolts in the holes, and start the bolts, but do not tighten the nuts yet.

Using the leveling screws, adjust the angle of the base plate until the bubble level shows the pyranometer to be level. Once this adjustment has been made, tighten the attachment bolts and nuts to secure the pyranometer in place. Do not over-tighten the leveling screws more than finger tight.

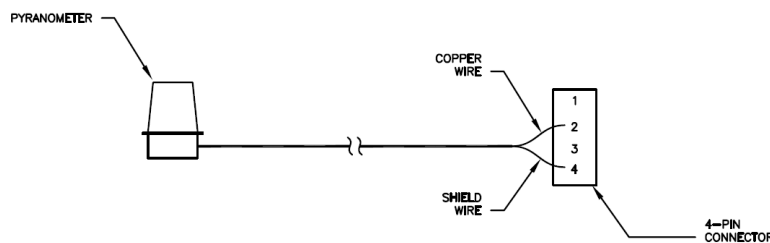


Bring the black cable down the mast and around to the control box. Plug the cable into the connector labeled "pyranometer"

Important: Locate the serial number on the pyranometer. Write this number down ----> _____

The serial number will be required later for calibration purposes.

The pyranometer kit includes a calibration certificate. Do NOT DISCARD THE CALIBRATION CERTIFICATE. Take time to verify the serial number printed on the calibration certificate matches the one on the pyranometer sensor.



WIRING DIAGRAM

A89WS-MP1: PV Mounting Bracket – Pyranometer (Optional)

Kit contains: bracket with thumbscrews.

The A89WS-MP1 mounting bracket allows the pyranometer to be mounted on the side of a solar panel or other flat object. This provides the pyranometer the same angle to the sun as the panel for measuring performance of a system.

Note: the pyranometer is not included with this bracket. The A89WS-PY1 kit is required to use this bracket.

Attach the pyranometer to the mounting base. Align the wire on the pyranometer to the slot on the mounting base before inserting it in the base. A small hex set-screw is located on the side on the mounting base to secure the pyranometer. Use the Allen wrench provided to tighten the set screw until the pyranometer is secure. Do not over-tighten the set screw or it will crack the pyranometer.

Attach the pyranometer base plate to the top of the A89WS-MP1 mounting bracket as shown to the left. Place the three mounting bolts in the holes, and tighten the attachment bolts and nuts to secure the pyranometer in place flush against the bracket. The leveling screws and bubble level are not used with this mounting bracket.

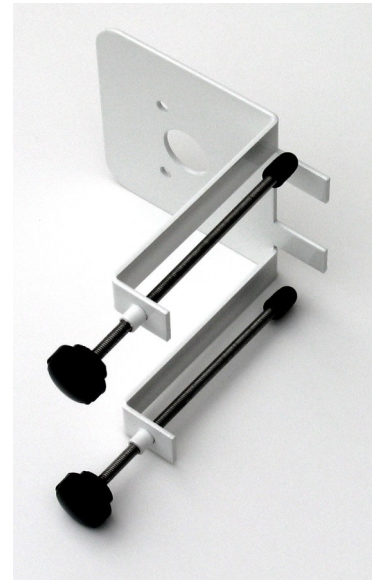
Bring the black cable around to the control box. Plug the cable into the connector labeled “pyranometer”

Important: Locate the serial number on the pyranometer.

Write this number down ----> _____

The serial number will be required later for calibration purposes.

The pyranometer kit includes a calibration certificate. Do NOT DISCARD THE CALIBRATION CERTIFICATE. Take time to verify the serial number printed on the calibration certificate matches the one on the pyranometer sensor.



A89WS-TC1, A89WS-TC2: Cell Temperature Kit

Kit contains: Cell temperature probe with cable and plug.

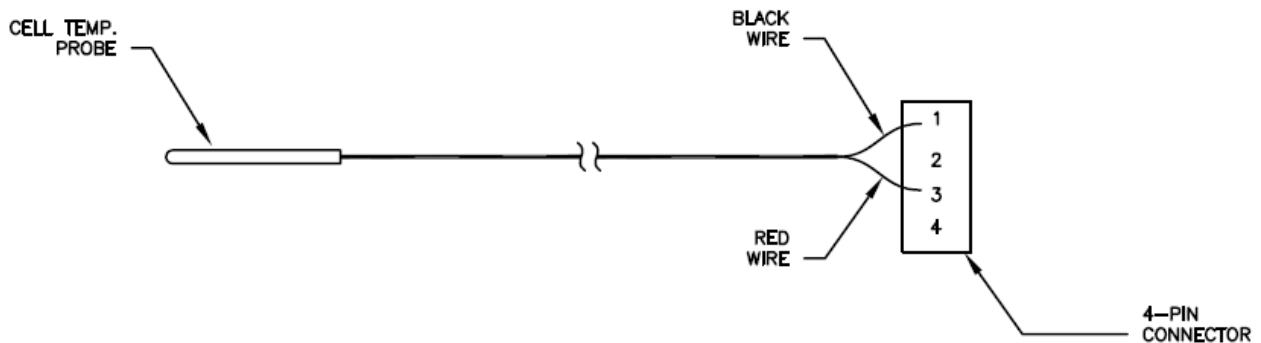
The cell temperature probe is a 10k ohm type 2 thermistor sensor in a bullet probe configuration. The kit comes in two versions:

- TC1 has a 50' cable.
- TC2 has a 150' cable.

The cell temperature probe should be mounted to the back of a solar panel to measure the panel temperature. Care should be taken to not damage the solar panel when installing the sensor.

The bullet probe can be glued to the panel, or attached by securing the probe with a hardware attachment on the panel or panel holding system.

The probe may also be secured using durable foil tape typically used to seal HVAC systems in outdoor applications. Foil tape can also be used to secure a probe while glue such as epoxy is curing.



WIRING DIAGRAM

A89WS-TH1: Air Temperature and Humidity Probe

A89WS-TO1: Air Temperature Probe

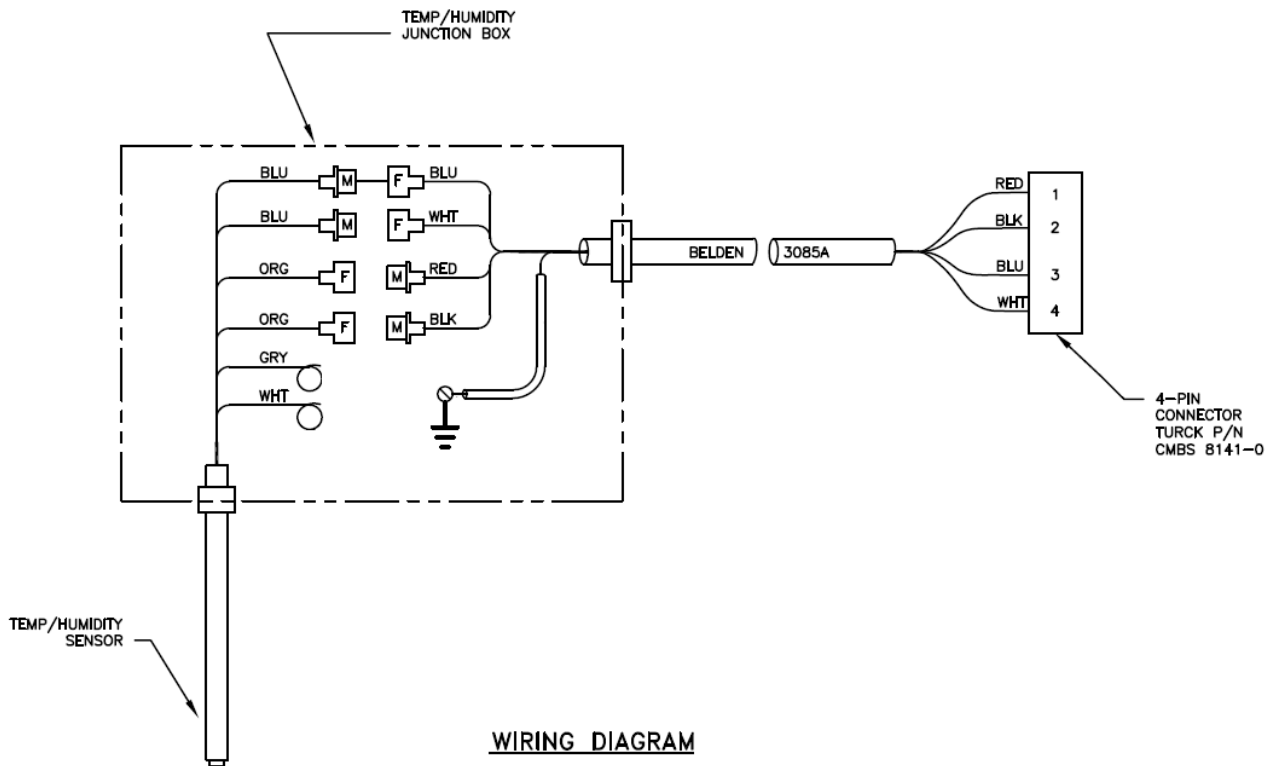
Note: The A89WS-TH1 and TO1 kits have a similar appearance and the hardware mounting is the same. The only difference is that the A89WS-TH1 kit includes a humidity sensor in the air probe, and the A89WS-TO1 air probe does not. For purposes of installation, the hardware assembly is the same.

Kit contains: Air sensor with cable, 2 screws, nuts.

Install the air sensor on the inside of the weather station mounting arm with the probe facing down. The probe should be oriented so that the sensor is in the vented sun shade area of the arm.

Use the two screws provided to attach the sensor to the arm. Secure the screws using the nut on the back of the arm. Tighten the screws until the air sensor box is flush against the back of the mounting arm.

Bring the yellow cable down the mast and around to the control box. Plug the cable into the connector labeled "temp/humidity"



Software setup and configuration

The Obvius A89WS weather station uses an A8332-8F2D I/O Module to convert the sensor data to a Modbus output. The A8332-8F2D must be configured to read each of the sensors. Each input on the A8332-8F2D represents a specific sensor input, and two inputs remain unused.

Note: the default configuration of the weather station I/O Module is Modbus address 51, 9600, N81

Modbus Configuration

Default Input mode configuration:

- Input channel 1: Air Temperature (4-20mA)
- Input channel 2: Air Humidity (4-20mA)
- Input channel 3: Pyranometer (4-20mA)
- Input channel 4: Cell Temperature (resistance)
- Input channel 5: Wind Speed (4-20mA)
- Input channel 6: Wind Direction (4-20mA)
- Input channel 7: (not used)
- Input channel 8: (not used)

Note: Some weather station configurations may not use all the sensors listed above. The input channels associated with these sensors should be disabled if the sensor is not present. Use the OCC software or the AcquiSuite configuration menu to disable channels with no sensor attached.

Note: The YWX0483 (rev A) control box shipped between Aug and Sep 2010 have a different wiring connection list. The inputs are configured as 1= wind speed, 2=direction, 3=temp, 4=humidity, 5=pyranometer, 6=cell temp. For more information on the rev-a model of this control box, please contact technical support at Obvius.

Modbus Address and Dipswitch Configuration

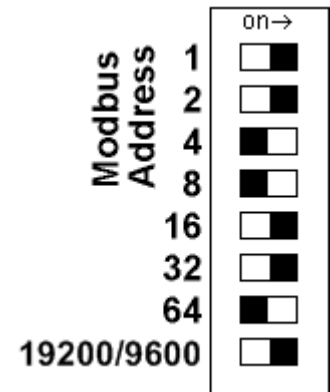
Modbus Address: The default Modbus address of the weather station A8332-8F2D I/O Module is set to 051. The address may be modified by changing the Modbus address dipswitches on the A8332-8F2D I/O Module. This address must be unique among all Modbus devices in the system. The A8332-8F2D supports address 001 through 127.

Select an address, and set the dipswitches to match.

The sum of the value of the switches is the address. In the example to the right, address 51 is set by placing switch 1, 2, 16 and 32 to the on position.

Note: $1 + 2 + 16 + 32 = 51$

Baud Rate: This option sets the serial port speed for the RS-485 port. Set this option to “off” for 19200. Set the switch to “on” for 9600 baud. The default is 9600 (on)



Setup and testing with Obvius Config Console (OCC) (optional)

After the weather station has been installed and powered, the installer should take the time to verify that all the sensors are working properly. One way to do this is to use an AcquiSuite data acquisition server to configure and display the data points from the weather station. If an AcquiSuite is not available, a free software tool can be downloaded from obvius.com that can help with both configuration and confirm the operation of the device.

Using a USB to Serial adapter, connect a laptop computer to the Flex IO module inside the control box. Either an RS-485 or RS232 adapter may be used. Obvius sells two adapters (A89-USB485 or A89-USB232) that may be used. Verify that the I/O Module inside the weather station control box is powered and has a blinking green LED.

Next, run the OCC software. On the connection screen, select your serial port, and specify 9600, N,8,1 serial options, and click Connect. Click the Scan button on the top of the page to scan the serial port for devices. Device #051 (A8332-8F2D) should appear in the list. Double click on the line item for this Flex I/O Module. You should see something like this screen:

Obvius Config Console - v1.9.515

File Options Help

Back New Connection Connected to 192.168.10.133, Port 502 via Modbus/TCP

Modbus Device Details

Device Address: 051 Sent: 80 RTT: N/A
 Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO Received: 80
 Status: OK Errors: 0

Input Channel	Input Type	Reading	Serial number	001EC6040314
Input channel 1:	Current, 4-20mA	15.127 mA	Firmware version:	v1.11
Input channel 2:	Current, 4-20mA	11.084 mA	Hardware revision:	8332
Input channel 3:	Current, 4-20mA	3.976 mA		pcb rev A
Input channel 4:	Resistance	12035.000 ohms		part rev A
Input channel 5:	Current, 4-20mA	4.274 mA		
Input channel 6:	Current, 4-20mA	5.322 mA	Up time:	20m 42s
Input channel 7:	Unconfigured	(invalid)	Power, 24V terminal out:	22.99 Volts
Input channel 8:	Unconfigured	(invalid)	PCB temperature:	80.81 F
Contact closure threshold:	1000 ohms	(default=1000)	PCB 5V supply:	4.97 Volts
Contact open-wire threshold:	65535 ohms	(65535=unused)		
Pulses for instantaneous rate:	5	(default=5)		
	Relay Mode:	Relay State:		
Relay output 1:	Manual	0/open		
Relay output 2:	Manual	0/open		

Save to Device Discard Changes

Transaction Details

Scan finished | 1 found, 3 scanned, 0:02 total

Verify the following options and readings:

Input channel 1	Current 4-20mA
Input channel 2	Current 4-20mA
Input channel 3	Current 4-20mA
Input channel 4	Resistance
Input channel 5	Current 4-20mA
Input channel 6	Current 4-20mA
Input channel 7	Unconfigured
Input channel 8	Unconfigured

Setup with Obvius AcquiSuite

Configure the AcquiSuite Modbus options to allow 9600 baud communications. The default settings in the AcquiSuite should allow the weather station io to communicate directly. Select the Modbus Device List option from the AcquiSuite configuration menu. The following screen should be displayed. Notice the weather station shows up in the list at address 51. The actual device type is that of the io module, an Obvius A8332-8F2D.

Modbus device list

Device Status	Name and Purpose	Type	Sent	Received	Errors	RTT
051 Ok	Obvius Weatherstation Roof-Top	Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO	408	407	1	127ms

[Add](#) [Troubleshoot](#) [Rename all devices](#) [List all supported devices](#) Show: [\[none\]](#) [\[setup\]](#) [\[devinfo\]](#) [\[stats\]](#) [XML](#)

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support@obvius.com
Current time: Thursday, October 21 2010 08:42:58 PDT

Select the weather station device 51 from the device list. Next, click the configure button at the bottom of the page. Each data point will now have a “Configure Point” button open to the right of each data point. To configure each input sensor, click each configure point button, and set the options as described in the following sections.

Channel 1: A89WS-TH1, TO1: Air Temperature Probe

Configure the following options

- Sensor Name: “Air Temperature”
- Input Mode: “Current 4-20mA”
- Sensor Make and Model: “A89WS-TH1 (Veris HO2XMSTA1-02)”
- Sensor Minimum Range: “-40”
- Sensor Maximum Range: “122”
- Engineering Units: “Degrees F”

Note: the option for “Sensor make and model” is for reference information only. This field is intended to store information about the physical sensor to assist in record-keeping for identification of the attached sensor.

WeatherStation

Device Address: 51
Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO (id=48)
Status: Ok (cached)

Current 4-20mA

Current Reading: invalid

Sensor Name:

Input Mode:

Sensor Make and Model:

Sensor Minimum range:

Sensor Maximum range:

Pulse Multiplier:

Curve scaling:

Engineering units:

Rate: N/A

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Current time: Tuesday, September 28 2010 09:43:34 PDT

Channel 2: A89WS-TH1: Air Humidity Probe

Configure the following options

- Sensor Name: “Air Humidity”
- Input Mode: “Current 4-20mA”
- Sensor Make and Model: “A89WS-TH1 Veris HO2XMSTA1-02”
- Sensor Minimum Range: “0”
- Sensor Maximum Range: “100”
- Engineering Units: “%RH”

Note: the option for “Sensor make and model” is for reference information only. This field is intended to store information about the physical sensor to assist in record keeping for identification of the attached sensor.

WeatherStation

Device Address: 51
Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO (id=48)
Status: Ok

Current 4-20mA

Current Reading: invalid

Sensor Name: Air Humidity

Input Mode: Current 4-20mA

Sensor Make and Model: A89WS-TH1 (Veris HO2XMSTA1-02)

Sensor Minimum range: 0.000

Sensor Maximum range: 100.000

Pulse Multiplier: 1.000

Curve scaling: (Not Used)

Engineering units: %RH

Rate: N/A

Save Profile Cancel

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Channel 3: A89WS-PY1: Pyranometer

Configure the following options

- Sensor Name: “Solar Radiation”
- Input Mode: “Current 4-20mA”
- Sensor Make and Model: “A89WS-PY1 (Li-Cor LI-200SZ)”
- Sensor Minimum Range: “0”
- Sensor Maximum Range: “xxxx” *
- Engineering Units: “W/m²”

Note: the option for “Sensor make and model” is for reference information only. This field is intended to store information about the physical sensor to assist in record keeping for identification of the attached sensor.

WeatherStation

Device Address: 51
Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO (id=48)
Status: Ok

Current 4-20mA

Current Reading: invalid

Sensor Name: Solar Radiation

Input Mode: Current 4-20mA

Sensor Make and Model: A89WS-PY1 (Li-Cor LI-200SZ)

Sensor Minimum range: 0.000

Sensor Maximum range: 1416.250

Pulse Multiplier: 1.000

Curve scaling: (Not Used)

Engineering units: W/m²

Rate: N/A

Save Profile Cancel

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* Pyranometer max range calculation:

The Sensor Maximum Range setting for the pyranometer is based on the multiplier supplied on the calibration certificate for the sensor. Locate the multiplier on the calibration certificate. If the calibration certificate is not available, use a web browser to access the LI-COR website at <http://envsupport.licor.com>. Choose the Calibration Data option at the bottom of the page and enter the serial number on the Pyranometer. The multiplier is different for each pyranometer.

Using the multiplier from the calibration certificate, multiply the absolute (positive) value by 125. The result is the Sensor Maximum Range. e.g. Maximum Range = 125 * LicorMultiplier.

Example: LI-COR multiplier of -11.33
Maximum Range = 125 * 11.33
Maximum Range = **1416.25** w/m²

Channel 4: A89WS-TC1,TC2: Cell Temperature

Configure the following options

- Sensor Name: “Cell Temperature”
- Input Mode: “Resistance”
- Sensor Make and Model: “A89WS-TC1 (Veris TRASPC01331)”
- Curve Scale: “Veris 10K Type 2”
- Engineering Units: “Degrees F”

Note: the option for “Sensor make and model” is for reference information only. This field is intended to store information about the physical sensor to assist in record keeping for identification of the attached sensor.

WeatherStation

Device Address: 51
Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO (id=48)
Status: Ok (cached)

Resistance

Current Reading: invalid
Sensor Name: Cell Temperature
Input Mode: Resistance
Sensor Make and Model: A89WS-TC1 (Veris TRASPC01331)
Sensor Minimum range: 0.00
Sensor Maximum range: 100.00
Pulse Multiplier: 1.00
Curve scaling: Veris 10K Type 2 (Ohms -> Degrees F)
Engineering units: Degrees F
Rate: N/A

Save Profile Cancel

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The Curve Scale option has a provision for converting 10K Type 2 to either Degrees F or C. You may select either conversion depending on your project needs. Be sure to set the Engineering Units field to match the unit of measure for your conversion.

Channel 5: A89WS-AN1,AN2: Anemometer / wind speed

Configure the following options

- Sensor Name: “Wind Speed”
- Input Mode: “Current 4-20mA”
- Sensor Make and Model: “A89WS-AN1 (NovaLynx 200-WS-02)”
- Sensor Minimum Range: “0”
- Sensor Maximum Range: “100”
- Engineering Units: “MPH”

Note: the option for “Sensor make and model” is for reference information only. This field is intended to store information about the physical sensor to assist in record keeping for identification of the attached sensor.

WeatherStation

Device Address: 51
Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO (id=48)
Status: Ok

Current 4-20mA

Current Reading: invalid
Sensor Name: Wind Speed
Input Mode: Current 4-20mA
Sensor Make and Model: A89WS-AN1 (NovaLynx 200-WS-02)
Sensor Minimum range: 0.000
Sensor Maximum range: 100.000
Pulse Multiplier: 1.000
Curve scaling: (Not Used)
Engineering units: MPH
Rate: N/A

Save Profile Cancel

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Channel 6: A89WS-AN1,AN2: Anemometer / wind direction

Configure the following options

- Sensor Name: “Wind Direction”
- Input Mode: “Current 4-20mA”
- Sensor Make and Model: “A89WS-AN1 (NovaLynx 200-WS-02)”
- Sensor Minimum Range: “0”
- Sensor Maximum Range: “360”
- Engineering Units: “Degrees”

Note: the option for “Sensor make and model” is for reference information only. This field is intended to store information about the physical sensor to assist in record keeping for identification of the attached sensor.

WeatherStation

Device Address: 51
Device Type: Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO (id=48)
Status: Ok

Current 4-20mA

Current Reading: invald

Sensor Name:

Input Mode:

Sensor Make and Model:

Sensor Minimum range:

Sensor Maximum range:

Pulse Multiplier:

Curve scaling:

Engineering units:

Rate: N/A

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Channel 7, Channel 8

Channels 7 and 8 are not used in the weather station. Set these channels to be unconfigured:

- Input Mode: “Unconfigured”

Setup with 3rd party Modbus master

Flex I/O Module Modbus information, specific to the Weather Station

(For complete details such as reserved or pulse input registers or values not listed here, refer to the latest Obvius documentation regarding the A8332-8F2D Modbus Flex IO Module Installation and Operation Manual).

Weather Station Modbus Register Listing

Data points

offset	point	type	description and modes
--------	-------	------	-----------------------

Values (instantaneous Ohms or mA)

0	40001	UINT32	input 1 value MSW
1	40002	UINT32	input 1 value LSW
2	40003	UINT32	input 2 value MSW
3	40004	UINT32	input 2 value LSW
4	40005	UINT32	input 3 value MSW
5	40006	UINT32	input 3 value LSW
6	40007	UINT32	input 4 value MSW
7	40008	UINT32	input 4 value LSW
8	40009	UINT32	input 5 value MSW
9	40010	UINT32	input 5 value LSW
10	40011	UINT32	input 6 value MSW
11	40012	UINT32	input 6 value LSW
12	40013	UINT32	input 7 value MSW
13	40014	UINT32	input 7 value LSW
14	40015	UINT32	input 8 value MSW
15	40016	UINT32	input 8 value LSW

Average (Ohms or mA)

16	40017	UINT32	input 1 ave MSW
17	40018	UINT32	input 1 ave LSW
18	40019	UINT32	input 2 ave MSW
19	40020	UINT32	input 2 ave LSW
20	40021	UINT32	input 3 ave MSW
21	40022	UINT32	input 3 ave LSW
22	40023	UINT32	input 4 ave MSW
23	40024	UINT32	input 4 ave LSW
24	40025	UINT32	input 5 ave MSW
25	40026	UINT32	input 5 ave LSW
26	40027	UINT32	input 6 ave MSW
27	40028	UINT32	input 6 ave LSW

28	40029	UINT32	input 7 ave MSW
29	40030	UINT32	input 7 ave LSW
30	40031	UINT32	input 8 ave MSW
31	40032	UINT32	input 8 ave LSW

Minimum (Ohms or mA)

32	40033	UINT32	input 1 min MSW
33	40034	UINT32	input 1 min LSW
34	40035	UINT32	input 2 min MSW
35	40036	UINT32	input 2 min LSW
36	40037	UINT32	input 3 min MSW
37	40038	UINT32	input 3 min LSW
38	40039	UINT32	input 4 min MSW
39	40040	UINT32	input 4 min LSW
40	40041	UINT32	input 5 min MSW
41	40042	UINT32	input 5 min LSW
42	40043	UINT32	input 6 min MSW
43	40044	UINT32	input 6 min LSW
44	40045	UINT32	input 7 min MSW
45	40046	UINT32	input 7 min LSW
46	40047	UINT32	input 8 min MSW
47	40048	UINT32	input 8 min LSW

Maximum (Ohms or mA)

48	40049	UINT32	input 1 max MSW
49	40050	UINT32	input 1 max LSW
50	40051	UINT32	input 2 max MSW
51	40052	UINT32	input 2 max LSW
52	40053	UINT32	input 3 max MSW
53	40054	UINT32	input 3 max LSW
54	40055	UINT32	input 4 max MSW
55	40056	UINT32	input 4 max LSW
56	40057	UINT32	input 5 max MSW
57	40058	UINT32	input 5 max LSW
58	40059	UINT32	input 6 max MSW
59	40060	UINT32	input 6 max LSW
60	40061	UINT32	input 7 max MSW
61	40062	UINT32	input 7 max LSW
62	40063	UINT32	input 8 max MSW
63	40064	UINT32	input 8 max LSW

Mode setting options (see above for value details)

64	40065	UINT16	input 1 mode (NV/r/w)
65	40066	UINT16	input 2 mode (NV/r/w)
66	40067	UINT16	input 3 mode (NV/r/w)
67	40068	UINT16	input 4 mode (NV/r/w)
68	40069	UINT16	input 5 mode (NV/r/w)
69	40070	UINT16	input 6 mode (NV/r/w)
70	40071	UINT16	input 7 mode (NV/r/w)
71	40072	UINT16	input 8 mode (NV/r/w)
73	40074	UINT16	input broken wire alarm bitmap. (resistance, current modes only) Resistive mode: bit set when resistance is off-scale-high. 4-20mA mode: bit is set when current is below 4mA.
74	40075	UINT16	relay output 1 (r/w) 0=open, 1=closed, defaults to open on power-up. r/w allowed when register 41030 = 0.
75	40076	UINT16	relay output 2 (r/w) 0=open, 1=closed

System settings and information

1002	41003	UINT16	serial number bytes 1,2
1003	41004	UINT16	serial number bytes 3,4
1004	41005	UINT16	serial number bytes 5,6
1005	41006	UINT16	firmware version (major)
1006	41007	UINT16	firmware version (minor)
1011	41012	UINT32	uptime MSW number of seconds since IO module booted.
1012	41013	UINT32	uptime LSW
1013	41014	UINT16	hardware version (major) for example: 8332
1014	41015	UINT16	hardware version (minor) MSB = pcb rev, LSB = part rev. value 1=Rev_A, 2=Rev_B, etc.
1015	41016	UINT32	hardware Date of Manufacture (MSW)
1016	41017	UINT32	hardware Date of Manufacture (LSW) time, UTC, unix epoch, seconds past 1970.
1017	41018	UINT16	RS485 Stats: Good RX (all packets received)
1018	41019	UINT16	RS485 Stats: Total TX
1019	41020	UINT16	RS485 Stats: TX failed
1020	41021	UINT16	clear min/max/ave (r/w) read returns 0, write any value to clear min/max/ave for all channels.
1024	41025	UINT8	reason for reboot. 0x01=POR, 0x02=EXTR 0x04=WDTR 0x08=BODR,0x8000=WDTOF
1025	41026	UINT16	power supply voltage monitor. scale: x100, volts
1026	41027	INT16	pcb temperature monitor. scale: x100, degrees F.
1027	41028	UINT16	5V internal power supply voltage monitor. scale: x100, volts
1028	41029	UINT16	RS485 baud rate. 2=9600, 3=19200.

Modbus function 0x11 Slave ID response will report the following:

"Obvius, A8332-8F2D, IO Module, 8-Flex, 2-DO", id=48

Register Functions

All 32 bit data point values are encoded in 2 Modbus registers (16bits each). Modbus master systems should always query the A8332-8F2D using a single query to read an entire block of registers. Never use two queries to read one register and then combine the two results into a single 32 bit value. Doing so will allow the input value to increment in the middle of the two Modbus queries, and will cause intermittent data readings that are incorrect.

For example, an input has a decimal value of 65534. This is represented as a 32 bit hex number 0x0000FFFE. The first 4 digits are the MSW register, the second 4 digits are the LSW register. The Modbus Master reads the first (MSW) register and gets 0x0000. In the moment between the two readings, the input raises 2 more digits (in decimal), making the total 65536 or 0x00010000 in hex. Next the Master reads the second (LSW) register and gets 0x0000. When the two registers are combined, the result is 0x00000000. The proper way to handle this situation is to simply read both registers in a single Modbus query.

Data Conversion

Knowing the register values and types, and expected ranges of resultant values, calculate to derive the sensor readings from the Modbus register values listed above.

Example

Registers 40001 and 40002 typically describe an Air Temperature reading from a 4-20mA sensor on Input 1. The expected minimum sensor value (in degrees F) is -40° F and the maximum is 122° F.

The minimum value is two unsigned 32-bit integers, MSW=0, LSW=0, and the maximum is MSW=65535, LSW=65535. To calculate a single value x from those by combining each register $R_{[address]}$, shift the higher word register value in order to add it the lower register value, as follows.

$$x = (R_{40001}) * 10000 + (R_{40002})$$

Calculate the slope m for y as follows.

$$m = (x_2 - x_1) / (y_2 - y_1) = (6553565535 - 0) / (122 - -40) \approx 39960765.457$$

So the approximate temperature T value is as follows.

$$T = (((register\ 40001) * 10000 + (register\ 40002)) / 39960765) - 40$$

If register 40001 was 32767, and register 40002 was 32767, then the resulting value would be interpreted as approximately 41.9° F, which is about half of the Air Temperature range listed above.

Use similar formulae to derive the values for the other sensors based on the register values for those types. Resistive measurements may require curve scales.

Recommended Maintenance of third party devices

Some of the sensors included in the weather station require either replacement or re-calibration after deployment.

A89WS-PY1: LI-COR recommends that the LI-200SZ Pyranometers be calibrated every two years to maintain the sensor accuracy. This requires the device to be sent to LI-COR (402) 467-3576 for recalibration.

A89WS-TH1: Veris recommends that the humidity element on the HO2XMSTA1-O2 Temperature/Humidity sensors be tested every year and replaced accordingly. This element is field-replaceable, and can be obtained by contacting Veris Industries (503) 598-4564 directly.

A89WS-AN1,AN2: NovaLynx recommends that you apply several drops of light weight (3-in-1) machine oil or lightly spray WD40 onto the anemometer bearing located just below the cups. Always look at the wind vane alignment to North. If the alignment is critical, do the check with a compass. Make corrections to the alignment as needed. Always check the alignment after a severe storm with high velocity winds.