# Installation Instructions
# Weather Station

Anemometer, Pyranometer, & Temperature/Humidity

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## Copyright Information



## Limited Warranty

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### Product Application Limitation

Obvius strongly believes in continuous improvement, therefore we must reserve the right to change specifications and product offerings without notice. Where possible, we will substitute products with equivalent functionality when necessary.

**DANGER**

Hazard of Electric Shock, Explosion or Arc Flash

- 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

- This product is not intended for life safety applications.
- Do not install this product in hazardous or classified locations.
- The installer is responsible for conformance to all applicable codes.
- Mount this product inside a suitable fire and electrical enclosure.

FCC Part 15 Information

Note: This equipment has been tested by the manufacturer and found to comply with the limits of a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Modifications of this product without the express authorization of Obvius nullify this statement.

***Easy Installation***

- Simple U-bolt attachments makes for quick and easy installation
- Comes with pre-wired weather resistant enclosure, making attachment of sensors both simple and straightforward
- Easy to use quick connect plugs allow for seamless integration into the AcquiSuite network

***Applications***

- Solar Applications- Inverters, Solar Current Monitors…etc
- Processes dependent on external weather conditions
- Monitoring performance of building systems when used in conjunction with Acquisuite (e.g., chillers, boilers, fans)

# *Operation*

The Weather Station is a weather sensing device designed to monitor varying meteorological conditions. Designed specifically for solar applications, the Weather Station provides efficiency verifications for photovoltaic cells, by allowing users to chart and note varying meteorological conditions and the particular effect each has on solar DC power generation. For instance, the introduction of rain to solar arrays can minimize production as a result of both associated cloud cover and water accumulation on the cells themselves. For a more direct comparative measure, the pyranometer works in a similar fashion as the solar arrays themselves, generating a number representative of solar radiation per square meter.

The standard Weather Station A89WSW includes the following:

- Weather resistant Nema 6P/12 enclosure w/panel
- One I/O Module (Built-In)
- One Mast and Tri-pod
- Four U-bolt mast attachments
- One metal support arm
- Temperature and Humidity Sensor (Analog x 2)
- Wind Speed and Direction (Analog x 2)
- Pyranometer (Analog)

Optional Weather Station attachments:

- Temperature Sensor (Analog)
- Cell Temperature Probe (Analog)

The Weather Station is a rather flexible and scalable product in terms of the possible mix of sensor configurations; thus, making it a customizable product allowing for adaptation to almost any environmental application. Most applications dependent on external weather conditions can use the weather station for both measurement and verification of processes.

## *Location*

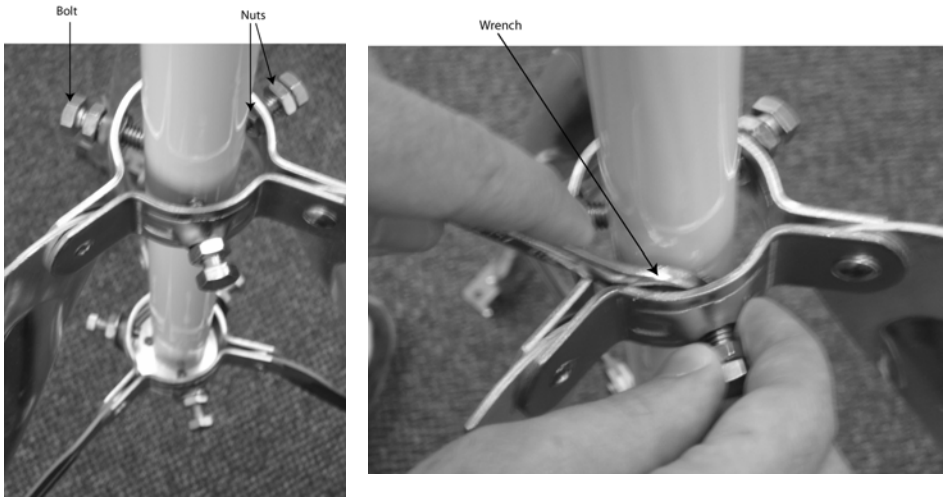
As there are many variables which could affect the accuracy of the Weather Station's readings, there are certain things to take into consideration when installing. Use the following as a guide for factory recommended assembly:

- Ensure that the device is located in as open and unobstructed area as possible (i.e. roofs). Each of the sensors requires certain directional and spatial alignments when installing.
- As the Pyranometer records solar radiance, the main concern during installation is an unobstructed view of the sky; this means to avoid bushes, trees, or other objects which might cast a shadow over the sensor effectively limiting the validity of the readings.
- The Temperature and Humidity sensors must be installed inverted, with the protruding tube pointing down. Also to avoid direct contact with the thermal variances caused by the sun, place the sensor in a Northerly direction.
- Other thermal variances can be caused by exhaust from other mechanical equipment, thus the device should be spaced accordingly.
- As for the Wind Direction and Speed sensors, the main concern is an area that allows for free flowing air circulation. Often this is attained by locating the device on the highest possible location, and if not available, ensuring that the distance from such obstructions is maximized. As a general rule, air flow around a structure is distributed to twice the height of the structure upwind, six times the height downwind, and up to twice the height of the structure above ground.

## *Installation*

**Mast and Tri-pod assembly** (See diagram below)

1) Remove tri-pod and antenna from packaging
2) Expand tri-pod legs and insert antenna mast through hole at the top and secure using nuts and bolts attached to tri-pod




(Use ½" Wrench to secure inner nut while tightening)

3) Place NEMA enclosures flush against the antenna mast, with the bottom resting on the top supports of the tri-pods legs. Secure the top using one of the four U-bolts provided, tighten to ensure stability
4) Attach the support arm directly above the weatherstation enclosure using two of the U-bolts provided.
5) Remove the Temperature/Temperature and humidity device and using screws and bolts provided, attach the device in an inverted position to the longest of the adjacent sides of the support arm.
6) (SEE ARM DIAGRAM BELOW FOR REFERENCE) Approximately 5” from the top of the enclosure is the optimum placement for the bottom of the support arm. Use the other two U-bolts provided to secure the arm directly to the mast via the longer of the adjacent sides (the same side the temperature sensor is attached to, only mounted internally within the enclosure)
7) Next attach the Pyranometer to the top of the support arm, assuring alignment with the three mounting holes on the arm and the sensor itself. Attach using bolts and nuts provided
8) The final step for installation is simply placing the wind direction and speed sensor over the top of the mast, using attached fastening screws to secure.

## *Configuration*

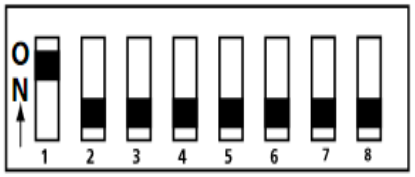
1) It is important that each Modbus device on a single network must have a unique address before the device is connected to the Modbus RS485 network.
2) In the case of the Weather Station, the I/O modules come preconfigured with a Modbus address of 51 and 52 if a second module is needed. As these are somewhat unique addresses there should be little if any instances where a change in addressing is needed. If however Modbus addresses 51 or 52 are already in use, follow step 3 below for alteration.
3) The Modbus address given is important to remember as this is the way to initially identify the device via the master. Therefore use the following guide for altering the addresses via a dip switch:

The Dip Switches are activated by moving them into the ON position as noted on the devices. The sum of the value of the dipswitches is the address. In the below examples Modbus address 1 is set by simply turning switch 1 to the ON position, whereas Modbus address 40 is set by placing switch 4 and 6 to the ON position.

The values of each dip switch are as follows;

1=1
2=2
3=4
4=8
5=16
6=32
7=64
8=128

*or*

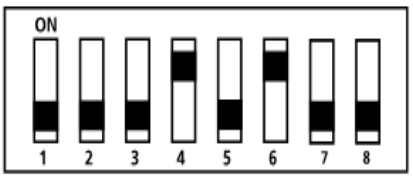



=1

VALUE

To determine an address you simply add the values of any switch that is on.

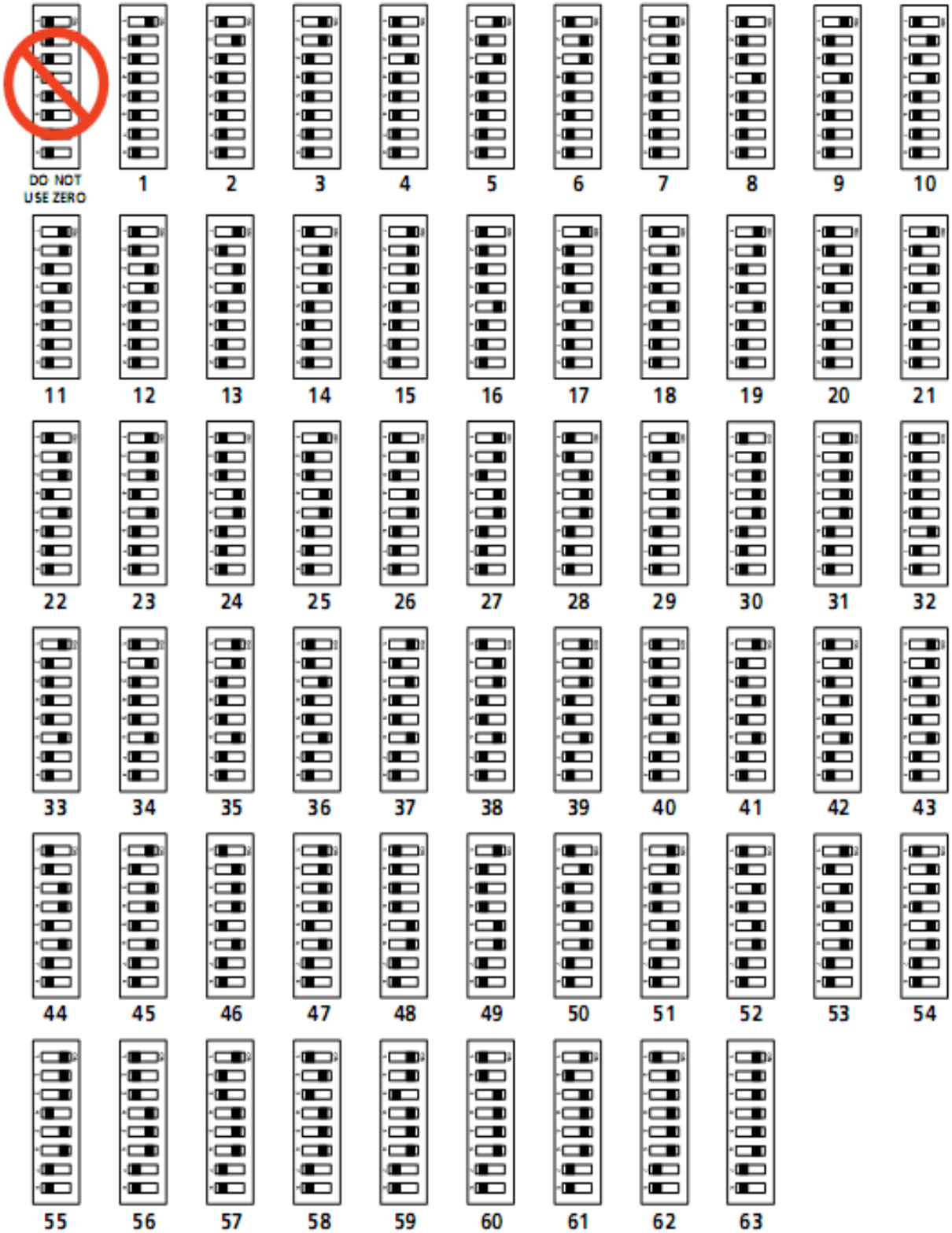
For example:




**40**

Switch number 4 has an ON Value of 8 and switch number 6 has an ON Value of 32. (8+32 = 40)

## ADDRESS SELECTION EXAMPLES



4) The following are the default factory settings for the Modhoppers:
   - Modbus Address Dip Switch 1,3,6, and 7 ON
   - Modbus Address Dip Switch 2,4,5, and 8 OFF
   - Modbus Channel 1,2, and 3 OFF -Channel 0 (If integrating with an existing Modhopper subsystem ensure that both devices are on the same channel to ensure communication).
   - All other dipswitches should be left in the off position

   The A8332-8F2D module only has 7 dipswitches which allow up to 128 possible Modbus addresses.

## *Wiring Instructions*

The devices within (I/O and Power Supply) come pre wired and configured. The installer will need to attach the sensors and power supply, and modify the Modbus addressing as described in the Installations section above.

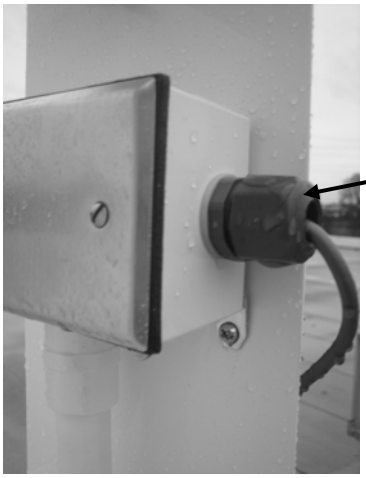
Note: the plugs attached to each of the sensors. These plugs only fit into one of the receptacles on the enclosure eliminating the possibility of incorrect wiring. See the below diagram showing the internal wiring of the enclosure. Users should only have to access the inside of the enclosure when first providing power and running communication lines back to the AcquiSuite.

**I/O-51**
IN1- Wind Speed
IN2- Wind Direction
IN3- Temperature (Orange)
IN4- Humidity (Blue)
IN5- Pyranometer
IN6-Cell Temperature (optional)

# *Internal Wiring*

**Wind Speed & Direction-**
The Wind Speed & Direction Sensor connects to the field wireable 6 pin connector on the bottom left of the nema enclosure.

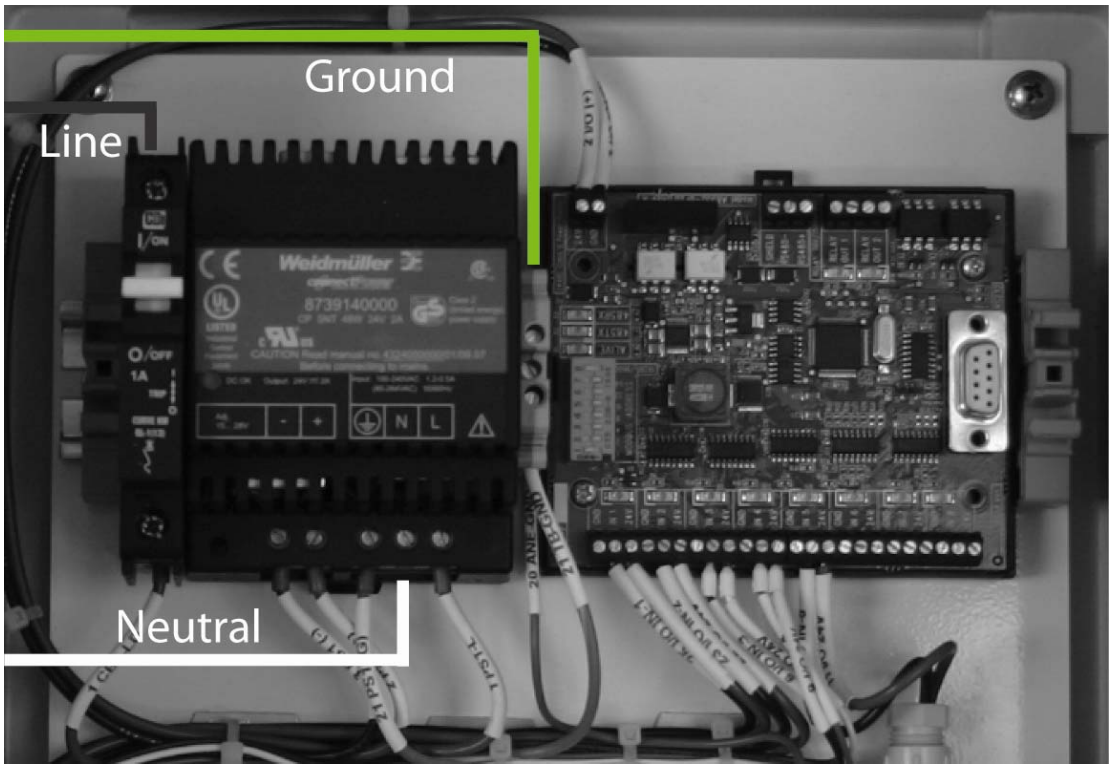
**Temperature/ Temperature & Humidity-**
The Temperature/ Temperature & Humidity sensors share the same field wireable 4 pin connector located on the bottom right of the enclosure.


**Pyranometer- Solar Irradiance-**
The Pyranometer sensor connects to the field wireable 4 pin connector located at the bottom middle of the enclosure.

## *Internal Wiring*

**No power cable is provided** for providing power to the weather station. To power the device, the user needs to supply the device with a 110-120VAC




The Weather Station communicates internally with an RS485 Modbus RTU loop, to bring communication back to a wireless device such as the Modhopper or to an AcquiSuite, simply connect the RS485 + and RS485 – on the IO module (shown above upper right) to the RS485 + and RS485 – of the mating device.

## *Alignment*

The Wind Speed & Direction and Pyranometer both require slight aligning to ensure proper readings.

**Wind Speed & Direction Alignment-**
Align the front of the wind vain (the propellers) facing direct north. Rotate the base of the sensor, keeping the vain aligned northerly, until the values are reading close to north which is approximately 360 degrees/0 degrees (A 5 degree variance will suffice for most applications… i.e. 355-360 degrees or 0-5 degrees). As a reference point, for alignment purposes there is a sticker on the sensor labeled North, ensure this is faced in a northerly direction.

**Pyranometer Alignment-**
Once removed from packaging, note the built in leveling system attached to the device. This allows you to ensure the device is level to ensure proper sun exposure. After mounted to the arm support, use the adjustment screws to level the device. A Pyranometer is level when the bubble is in the center, or as close as possible, of the leveling gauge.

## *Configuration and Scaling*

When using the Acquisuite as a master Modbus device, the following configurations can be entered by accessing the Acquisuite directly then proceeding to select the device, in this case the I/O module in question. Click on the 'configure' button at the bottom of the page, once the page refreshes select the option 'Config Point', this will allow you to enter the following values for each device.

**Wind Direction**
Min Range 0
Max Range 360
Make and Model as Custom
Preconfigured Units as Custom
Engineering units Degrees
(for your use only, not to be entered on the Acquisuite)
Azimuth: $360^{o}$ mechanical, $355^{o}$ electrical ($5^{o}$ open)
$360^{o}/0^{o}$=North $90^{o}$=East $180^{o}$=South $270^{o}$=West

**Wind Speed**
Min Range 0
Max Range 100
Make and Model as Custom
Preconfigured Units as Custom
Engineering units MPH
(for your use only, not to be entered on the Acquisuite)
Gusts up to 220 MPH

**Temperature**
Min Range -40
Max Range 122
Preconfigured Units as Custom
Engineering units Degrees F

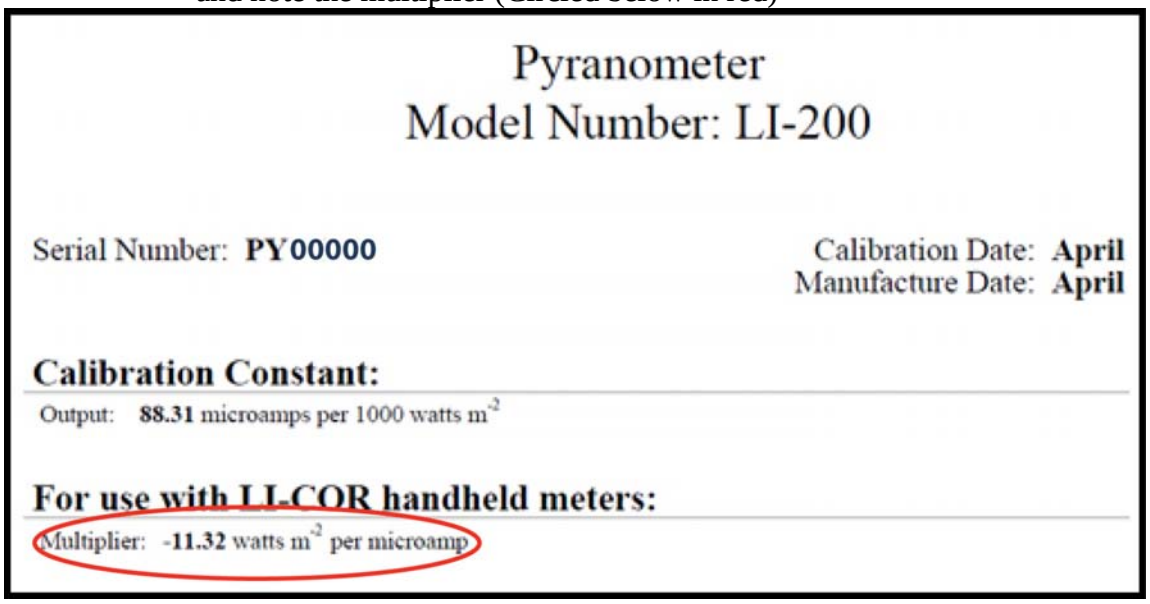
**Humidity**
Min Range 0
Max Range 100
Make and Model as HW Humidity
Preconfigured Units as Custom
Engineering Units %RH

**Veris Cell Temperature Probe**
Input Mode as Resistance
Make and Model as Custom
Curve Scale select Veris 10K Type 2 (ohms→ degrees F)
Engineering Units Degrees F

**Pyranometer**
Min Range 0
Max Range See below for calculation
Make and Model as Custom
Preconfigured Units as Custom
Engineering Units Watts

Pyranometer Max Range:

1. Locate the Certificate of Calibration form provided with the Pyranometer and note the multiplier (Circled below in red)


Pyranometer
Model Number: LI-200

Serial Number: **PY00000**

Calibration Date: **April**
Manufacture Date: **April**

**Calibration Constant:**

Output: **88.31** microamps per 1000 watts $m^{-2}$

**For use with LI-COR handheld meters:**

Multiplier: **-11.32** watts $m^{-2}$ per microamp

Sample Li-Cor Certificate of Calibration

2. Multiply the Multiplier by 125, and the result is the Maximum Range for that particular Pyranometer (see example below)

Maximum Light Level = 125 * LICOR Multiplier

Example

LICOR Multiplier = -11.33 watts m^2/µA

Maximum Light Level = 125 * 11.33

Maximum Light Level = 1,416.25 watts m^2

**Powering the station**
As previously discussed there is no power cord included for providing external power to the devices. Therefore the user has two options for powering the device. The first option is to install a power transformer as seen in the pictures above, in which case all the user will be required to do is provide 110-120VAC using a power cable rated for outdoor conditions to the transformer directly. The second option is to utilize a terminal strip, in which case the user would need to provide 24VDC to the strip, supplying the necessary voltage to the respective devices.

# Recommended Maintenance of third party devices

Some of the sensors utilized in the Weather Station require either replacement or re-calibration after deployment.

Li-Cor recommends the LI-200SZ Pyranometers be calibrated every two years to maintain the sensor accuracy. This requires the device to be sent back to Li-Cor (402) 467-3576 for recalibration.

Veris recommends 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.

# Modbus Register Listing – A8332-8F2D

Data points:

| Offset | point | type | desc | modes--> | Pulse | Status | Ohms, | mA, | volts |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 40001 | UINT32 | input 1 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 1 | 40002 | UINT32 | input 1 | value LSW | | | | | |
| 2 | 40003 | UINT32 | input 2 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 3 | 40004 | UINT32 | input 2 | value LSW | | | | | |
| 4 | 40005 | UINT32 | input 3 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 5 | 40006 | UINT32 | input 3 | value LSW | | | | | |
| 6 | 40007 | UINT32 | input 4 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 7 | 40008 | UINT32 | input 4 | value LSW | | | | | |
| 8 | 40009 | UINT32 | input 5 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 9 | 40010 | UINT32 | input 5 | value LSW | | | | | |
| 10 | 40011 | UINT32 | input 6 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 11 | 40012 | UINT32 | input 6 | value LSW | | | | | |
| 12 | 40013 | UINT32 | input 7 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 13 | 40014 | UINT32 | input 7 | value LSW | | | | | |
| 14 | 40015 | UINT32 | input 8 | value MSW | (count/NV, | count/NV, | inst, | inst, | inst) |
| 15 | 40016 | UINT32 | input 8 | value LSW | | | | | |

| modes--> | | | | | Pulse | Status | Ohms, | mA, | volts |
|---|---|---|---|---|---|---|---|---|---|
| 16 | 40017 | UINT32 | input 1 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 17 | 40018 | UINT32 | input 1 | ave LSW | | | | | |
| 18 | 40019 | UINT32 | input 2 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 19 | 40020 | UINT32 | input 2 | ave LSW | | | | | |
| 20 | 40021 | UINT32 | input 3 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 21 | 40022 | UINT32 | input 3 | ave LSW | | | | | |
| 22 | 40023 | UINT32 | input 4 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 23 | 40024 | UINT32 | input 4 | ave LSW | | | | | |
| 24 | 40025 | UINT32 | input 5 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 25 | 40026 | UINT32 | input 5 | ave LSW | | | | | |
| 26 | 40027 | UINT32 | input 6 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 27 | 40028 | UINT32 | input 6 | ave LSW | | | | | |
| 28 | 40029 | UINT32 | input 7 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 29 | 40030 | UINT32 | input 7 | ave LSW | | | | | |
| 30 | 40031 | UINT32 | input 8 | ave MSW | (rate-inst, | on-time/NV, | ave, | ave, | ave) |
| 31 | 40032 | UINT32 | input 8 | ave LSW | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| modes--> | | | | | Pulse | Status | Ohms, | mA, | volts |
| 32 | 40033 | UINT32 | input 1 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 33 | 40034 | UINT32 | input 1 | min LSW | | | | | |
| 34 | 40035 | UINT32 | input 2 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 35 | 40036 | UINT32 | input 2 | min LSW | | | | | |
| 36 | 40037 | UINT32 | input 3 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 37 | 40038 | UINT32 | input 3 | min LSW | | | | | |
| 38 | 40039 | UINT32 | input 4 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 39 | 40040 | UINT32 | input 4 | min LSW | | | | | |
| 40 | 40041 | UINT32 | input 5 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 41 | 40042 | UINT32 | input 5 | min LSW | | | | | |
| 42 | 40043 | UINT32 | input 6 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 43 | 40044 | UINT32 | input 6 | min LSW | | | | | |
| 44 | 40045 | UINT32 | input 7 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 45 | 40046 | UINT32 | input 7 | min LSW | | | | | |
| 46 | 40047 | UINT32 | input 8 | min MSW | (rate-min, | dutycycle, | min, | min, | min) |
| 47 | 40048 | UINT32 | input 8 | min LSW | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| modes--> | | | | | Pulse | Status | Ohms, | mA, | volts |
| 48 | 40049 | UINT32 | input 1 | max MSW | (rate-max, | status | max, | max, | max) |
| 49 | 40050 | UINT32 | input 1 | max LSW | | | | | |
| 50 | 40051 | UINT32 | input 2 | max MSW | (rate-max, | status | max, | max, | max) |
| 51 | 40052 | UINT32 | input 2 | max LSW | | | | | |
| 52 | 40053 | UINT32 | input 3 | max MSW | (rate-max, | status | max, | max, | max) |
| 53 | 40054 | UINT32 | input 3 | max LSW | | | | | |
| 54 | 40055 | UINT32 | input 4 | max MSW | (rate-max, | status | max, | max, | max) |
| 55 | 40056 | UINT32 | input 4 | max LSW | | | | | |
| 56 | 40057 | UINT32 | input 5 | max MSW | (rate-max, | status | max, | max, | max) |
| 57 | 40058 | UINT32 | input 5 | max LSW | | | | | |
| 58 | 40059 | UINT32 | input 6 | max MSW | (rate-max, | status | max, | max, | max) |
| 59 | 40060 | UINT32 | input 6 | max LSW | | | | | |
| 60 | 40061 | UINT32 | input 7 | max MSW | (rate-max, | status | max, | max, | max) |
| 61 | 40062 | UINT32 | input 7 | max LSW | | | | | |
| 62 | 40063 | UINT32 | input 8 | max MSW | (rate-max, | status | max, | max, | max) |
| 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) |
| 72 | 40073 | UINT16 | input status bitmap. (pulse/status modes only) |
| 73 | 40074 | UINT16 | input broken wire alarm bitmap. (resistance, current modes only)<br>Restive mode: bit set when resistance is off-scale-high.<br>4-20mA mode: bit is set when current is below 4mA. |
| 74 | 40075 | UINT16 | relay output 1 (r/w) 0=open, 1=closed,<br>defaults to open on power-up.<br>r/w allowed when register 41030 = 0. |
| 75 | 40076 | UINT16 | relay output 2 (r/w) 0=open, 1=closed |

--- system settings and information ---

| | | | |
|---|---|---|---|
| 999 | 41000 | UINT16 | contact closure threshold (NV/r/w) in ohms, default 1000 = 1kohm. (minimum value 100 ohms, maximum value 5000 ohms) |
| 1000 | 41001 | UINT16 | contact open wire threshold (NV/r/w) in ohms,<br>default/unused = 0xFFFF, limit 100 to 10,000 ohms. |
| 1001 | 41002 | UINT16 | number of pulses for inst rate (NV/r/w) default 5.<br>limit 2 to 20. |
| 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) |
| 1007 | 41008 | UINT32 | Reserved |
| 1008 | 41009 | UINT32 | Reserved |
| 1009 | 41010 | INT16 | Reserved |
| 1010 | 41011 | INT16 | Reserved |
| 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.<br>value 1=Rev_A, 2=Rev_B, etc. |
| 1015 | 41016 | UINT32 | hardware Date of Manufacture (MSW) |
| 1016 | 41017 | UINT32 | hardware Date of Manufacture (LSW)<br>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. |
| 1021 | 41022 | UINT8 | reserved |
| 1022 | 41023 | UINT8 | reserved |
| 1023 | 41024 | UINT8 | reserved |
| 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. |
| 1029 | 41030 | UINT16 | relay output 1 mode. (R/W, NV) 0=manual, 1=follow pulse input #1. Note: input must be in pulse or status mode. |
| 1030 | 41031 | UINT16 | relay output 2 mode. (R/W, NV) 0=manual, 1=follow pulse input #2. Note: input must be in pulse or status mode. |

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

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

### *Register Functions*

**Pulse Count:** The pulse count is stored as an unsigned 32bit integer. This allows for 2^32 pulses (4.2billion) to be counted before rollover. On Modbus systems that do not allow you to read 32bit values, you can calculate the pulse count as follows:

count = (MSW * 65536) + LSW or count = (MSW << 16) | LSW [bit shift high order word by 16 bits and xor against low order word ]

Pulse count registers accumulate a total number of pulses received on each pulse input. The pulse count totals always increment and can not be cleared or set to an arbitrary value to prevent tampering. All pulse count totals are stored in non-volatile memory to preserve counts during power failure. The unsigned 32 bit counter values can accumulate up to 4.29 billion (2^32) pulses before rollover.

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 pulse count to increment in the middle of the two Modbus queries, and will cause intermittent data readings that are incorrect.

For example, a pulse input has a count 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 between the two readings, the pulse input counts 2 more pulses, 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.