

Integrated Weather Station

Weather Station Planning

Stem standard weather stations have the capability of monitoring module (panel) temperature, ambient (air) temperature, sun intensity with a Pyranometer, and wind speed and direction with the anemometer. Optionally, humidity, barometric pressure and rain gauges can also be added.

Installation Recommendations

- Apogee Pyranometers comes equipped with 20 meters of cable. Make sure the weather station Enclosure is installed within 20 meters of the Pyranometer mounting location.
- Kipp and Zonen, LiCor and Hukseflux Pyranometers come equipped with 10 meters of cable. Make sure the weather station Enclosure is installed within 10 meters of the Pyranometer mounting location.
- Locate the ambient temperature sensor on a north facing location that is never in direct sunlight.
- Locate the module temp sensor in the middle of a cell in the middle of a module on the back side.
- Make sure adhesive used for the sensor module is rated for up to 180° F. Stem recommends high temperature epoxy.
- Outdoor shielded Cat. 5 can be used to extend all sensors maximum of 300ft. All splices need to be made inside a weather tight Enclosure.



For splicing sensors to outdoor shielded Cat. 5, Stem recommends using *filled* 3M Scotchlok Connectors. These will make a liquid tight connection for the very small voltage signals.

Pyranometer Mounting

Depending on the desired use of the Pyranometer data there are two common mounting orientations.

Plane of Array (POA):

For systems with only one Pyranometer, Stem recommends mounting the Pyranometer on top of the north side of the array at the same angle as the panels. This orientation allows for the most accurate calculation of the predicted site power output.

Global Horizontal Irradiance (GHI)

A Pyranometer mounted for GHI should be mounted above any surrounding obstructions so that there will never be a shadow cast on the Pyranometer. It should also be mounted away from any light colored or reflective walls likely to reflect light on it. It should also be mounted completely level in all directions.

Following this mounting the irradiance can be measured and correlated to predicted weather and site production models.

Standard Weather Station

All sensor wires should be brought into the Enclosure through the bottom with a liquid tight strain relief. The weather station communicates to Port 2 of the data logger over Modbus and has a preconfigured address using the DIP switches.

After power up the weather station should have one blinking green. The two yellow lights blink whenever the weather station communicates to the data logger about every three minutes.

Remote Enclosure Mounting and Connecting

If the site requires, the weather station card can be located in a remote enclosure.

Mount the remote enclosure following these guidelines.

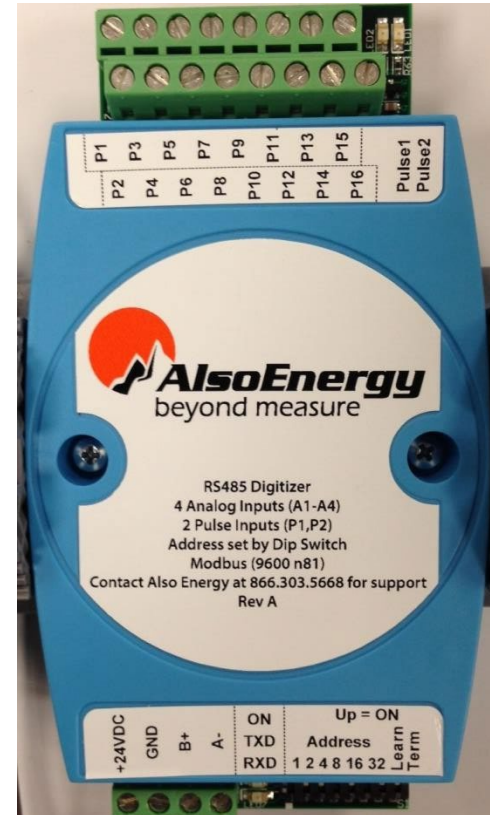
Locate the remote enclosure within the following distances:

- Less than 1000 ft. from the communications enclosure
- Less than 10 ft. from a module
- Less than 20 ft. from the Pyranometer mounting location

The remote enclosure requires the following connections from the main communications enclosure which can all be carried through a single run of outdoor shielded Cat.5 cable. All connections are made on DIN mounted terminal blocks.

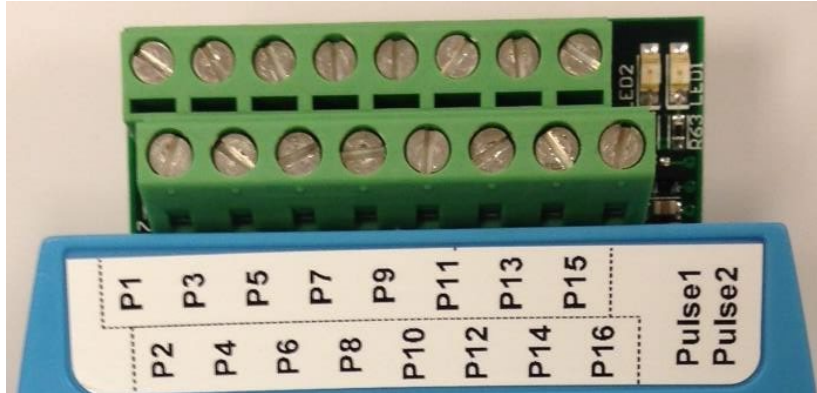
Wire Color	Main Enclosure Terminal	Remote Enclosure Terminal	Function
Orange and Orange/White	6	6	+24V
Green and Green/White	7	7	Ground
Blue/White	15 / 25 / 35	15 / 25 / 35	Data+
Blue	16 / 26 / 36	16 / 26 / 36	Data-
Brown	14 / 24 / 34	14 / 24 / 34	Data Ground

Note: 2x and 3x numbers are used when there are multiple data loggers onsite.



Standard Weather Station Sensor Installation and Connections

For reference, the top of the weather station is enlarged below. The connections will be made on the screw terminals from left to right while following the sections below.



**Counting from Left to Right: P1 to P16
Lower Shelf is Odd Pins**

Anemometer - Wind speed and direction

Follow the directions that come with the anemometer to assemble and mount the sensor. Make sure to position the anemometer mount pointing north. Connect the anemometer to the correct terminals on the weather station with the table below.

Wire Color	Terminals	Function
Green	WDI (P10)	Direction
Red	AGND (P11)	Ground
Yellow	WD REF (P12)	2.5VDC
Black	WSI (P14)	Speed



Module Temperature Sensors: Mounted in the BAPI Enclosure

Mount the BAPI Enclosure and extend the module temperature sensor in the middle of a cell in the middle of a module on the back side. Make sure adhesive used for the sensor module is rated for up to 180° F. Stem recommends high temperature epoxy. Plug any holes in the BAPI Enclosure making it weather tight.

Inside the cover, there are red and black wires, which need to be extended to the weather station Enclosure. Stem recommends using outdoor shielded Cat 5, and splicing with *filled* 3M Scotchlok Connectors. Connect the module temperature sensor to the correct terminals on the weather station with the table below.

Wire Color	Terminals	Function
Red	+24V Out (P1)	+24V
Black	MOD TEMP (P4)	Signal



Ambient temperature sensor mounted in a BAPI Enclosure

This air temperature sensor is designed to be mounted outdoors. The UV-resistant plastic shield keeps the sensor protected from weather and sunlight and allows for excellent air circulation.

Mount the BAPI Enclosure in a north facing, always shaded location with the sensor pointing down. Plug any holes in the Enclosure making it weather tight. Inside the cover, there are red and black wires, which need to be extended to the weather station Enclosure. Stem recommends using outdoor shielded Cat 5, and splicing with *filled* 3M Scotchlok Connectors. Connect temp sensor wires to the correct terminals on the weather station with the table below.



Wire Color	Terminals	Function
Red	+24V Out (P2)	+24V
Black	AMB TEMP (P6)	Signal

CMP Pyranometer with Mounting Bracket

Mount the Pyranometer with the included brackets and mounting hardware. Mount the Pyranometer with the wire pointing north. See Section Pyranometer Mounting for specifics on the mounting location. Connect Pyranometer to the correct terminals on the weather station with the table below.

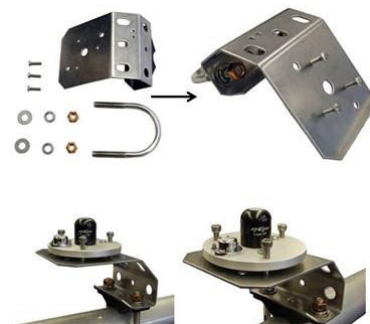
Wire Color	Terminals	Function	Mounting
Black	Chassis Ground	Shield	POA
Blue	AGND (P7)	Return	POA
Red	PYR (P8)	Signal	POA
Black	Chassis Ground	Shield	GHI
Blue	AGND (P11)	Return	GHI
Red	WDI (P10)	Signal	GHI



Apogee Pyranometer with Mounting Bracket

Mount the Pyranometer with the included brackets and mounting hardware See Section Pyranometer Mounting for specifics on the mounting location. Connect Pyranometer to the correct terminals on the weather station with the table below.

Wire Color	Terminals	Function	Mounting
Clear	Chassis Ground	Shield	POA
Black	AGND (P7)	Return	POA
Red	PYR (P8)	Signal	POA
Clear	Chassis Ground	Shield	GHI
Black	AGND (P11)	Return	GHI
Red	WDI (P10)	Signal	GHI



LI-COR Pyranometer with Mounting Bracket

Mount the Pyranometer with the included brackets and mounting hardware. Mount the Pyranometer with the wire pointing north. See Section Pyranometer Mounting for specifics on the mounting location. Connect Pyranometer to the correct terminals on weather station with the table below.

Wire Color	Terminals	Function	Mounting
Black	AGND (P7)	Return	POA
Red	PYR (P8)	Signal	POA
Black	AGND (P11)	Return	GHI
Red	WDI (P10)	Signal	GHI



Hukseflux Pyranometer with Mounting Bracket

Mount the Pyranometer with the included brackets and mounting hardware. Mount the Pyranometer with the wire pointing north. See Section Pyranometer Mounting for specifics on the mounting location. Connect Pyranometer to the correct terminals on weather station with the table below.

Wire Color	Terminals	Function	Mounting
Black	Chassis Ground	Shield	POA
Green	AGND (P7)	Return	POA
White	PYR (P8)	Signal	POA
Black	Chassis Ground	Shield	GHI
Green	AGND (P11)	Return	GHI
White	WDI (P10)	Signal	GHI



Relative Humidity sensor mounted in a BAPI Enclosure

This relative humidity sensor is designed to be mounted outdoors. The UV-resistant plastic shield keeps the sensor protected from weather and sunlight and allows for excellent air circulation.

Mount the BAPI Enclosure with the sensor pointing down. Plug any holes in the Enclosure making it weather tight. Inside the cover, there are red and black wires, which need to be extended to the weather station Enclosure. Stem recommends using outdoor shielded Cat 5, and splicing with *filled* 3M Scotchlok Connectors. Connect humidity sensor wires to the correct terminals on the weather station with the table below.



Wire Color	Terminals	Function
Red	+24V Out (P1)	+24V
Black	MOD TEMP (P4)	Signal

Barometric Pressure

This barometric pressure sensor is designed to be mounted indoors, and is usually mounted and wired in the remote weather station enclosure prior to shipping.

If the barometric pressure sensor is field installed, shut off power to the weather station and remove the back plate. Use a 9/16" metal drill bit and drill a hole in the back plate – make sure there is room to attach the Barometric Pressure sensor. Thread one of the brass lock-nuts onto the sensor, insert the sensor through the back plate and secure with the second brass lock-nut. Connect pressure sensor wires to the correct terminals on the weather station with the table below.



Wire Color	Terminals	Function
Red	+24V Out (P2)	+24V
White	AMB TEMP (P6)	Signal

Rain Collector

This rain collector is designed to be mounted outdoors on a level surface away from overhead obstructions and any object that is attracted to a magnet. An unobstructed path for water runoff from the drain screens is also needed.

Connect rain collector wires to the correct terminals on the weather station with the table below.



Wire Color	Terminals	Function
Red	D1 (P16)	N/O
Green	AGND (P15)	Ground

Reference Cell

The reference cell has two tongues which can be used to mount to a module in the array. See pictures below for examples.

During installation, the pressure compensation element near the electrical connection must not be damaged. If the cap of the element loosened, it can be snapped on again.

Wire Color	Terminals	Function
Red	18	+24V
Black	19	Ground
Brown	28	Data +
Orange	29	Data -
Black (Large Profile)	Chassis Ground	Shield

