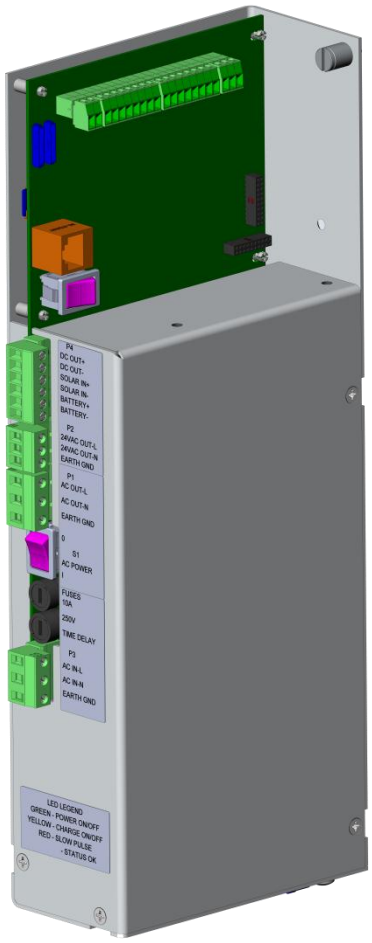
Model 2715
Universal Power and Communication Module



User's Manual

Rev. A

Disclaimer
The information and specifications described in this manual are subject to change without notice.

Latest Manual Version
For the latest version of this manual, see the *Product Manuals* page under *Reference* on our web site at www.allweatherinc.com/.

All Weather, Inc.
1165 National Drive
Sacramento, CA 95834
Tel.: (916) 928-1000
Fax: (916) 928-1165

Contact Customer Service

- **Phone** support is available from 8:00am - 4:30pm PT, Monday through Friday. Call 916-928-1000 and ask for "Service."
- **Online** support is available by filling out a request at www.allweatherinc.com/customer/support.html
- **E-mail** your support request to support@allweatherinc.com

Revision History

Revision	Date	Summary of Changes
A	2013 Feb 24	Initial release.

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1. OVERVIEW

The Model 2715 Universal Power and Communication Module (UPCM) provides a surge-suppressed power supply and communication interface that is used to supply power to weather sensors and to provide a communication interface between the sensor(s) and the data processing system.

The UPCM provides electrical surge suppression circuitry on all power, signal, and communication interfaces to protect against lightning and other line transients. The protection circuit consists of gas discharge tubes, TVS diodes, and current-limiting devices.

The UPCM has AC and DC outputs, which can be turned on/off via on-board switches or via commands sent to the serial and Ethernet interfaces.

The UPCM monitors its own status using current and voltage detection circuits, and it monitors the environment in which it operates using temperature and relative humidity sensors. The temperature information is used to control an optional enclosure heater. Set points for turning the heater on/off are adjustable, and can be set by the user.

The UPCM has two sets of serial ports and one RJ-45 jack. Optional serial port modules may be added to increase the number of sensors connected through a serial port. The following serial and Ethernet protocols are supported.

Serial Protocols Supported
3-wire RS-232 (no flow control)
RS-485 half duplex
RS-485 full duplex*

Ethernet Protocols Supported
TCP/IP 10/100Base-T

The UPCM is configured via a configuration file on a microSD card. The device identity and the serial port parameters are configured via the configuration file on the microSD card. All configuration items are user configurable.

The following power outputs are available to power devices connected to the UPCM.

Power Outputs
Surge-suppressed AC input line voltage
24 V AC
12/24 V DC
+5 V and -12 V DC *(optional)*

* The implementation of RS-485 is electrically equivalent to RS-422.

1.1 ACCESSORIES AND REPLACEABLE PARTS

The following accessories and replaceable parts are available for the Model 2715 Universal Power and Communication Module.

Part Number	Description
M404893-00	Serial Port Module
M404895-00	+5 V and –12 V DC Output Module
M406306-00	256MB microSD Card
M442089-00	10 A 250 V, 5x20 mm Slow Blow Fuse
M438130-00	Backup Battery

MicroSD cards up to 4GB may be used.

2. FUNCTIONAL DESCRIPTION

Figure 1 shows a block diagram the Model 2715 Universal Power and Communication Module. The UPCM has a power supply section and a communication module, each with surge suppression

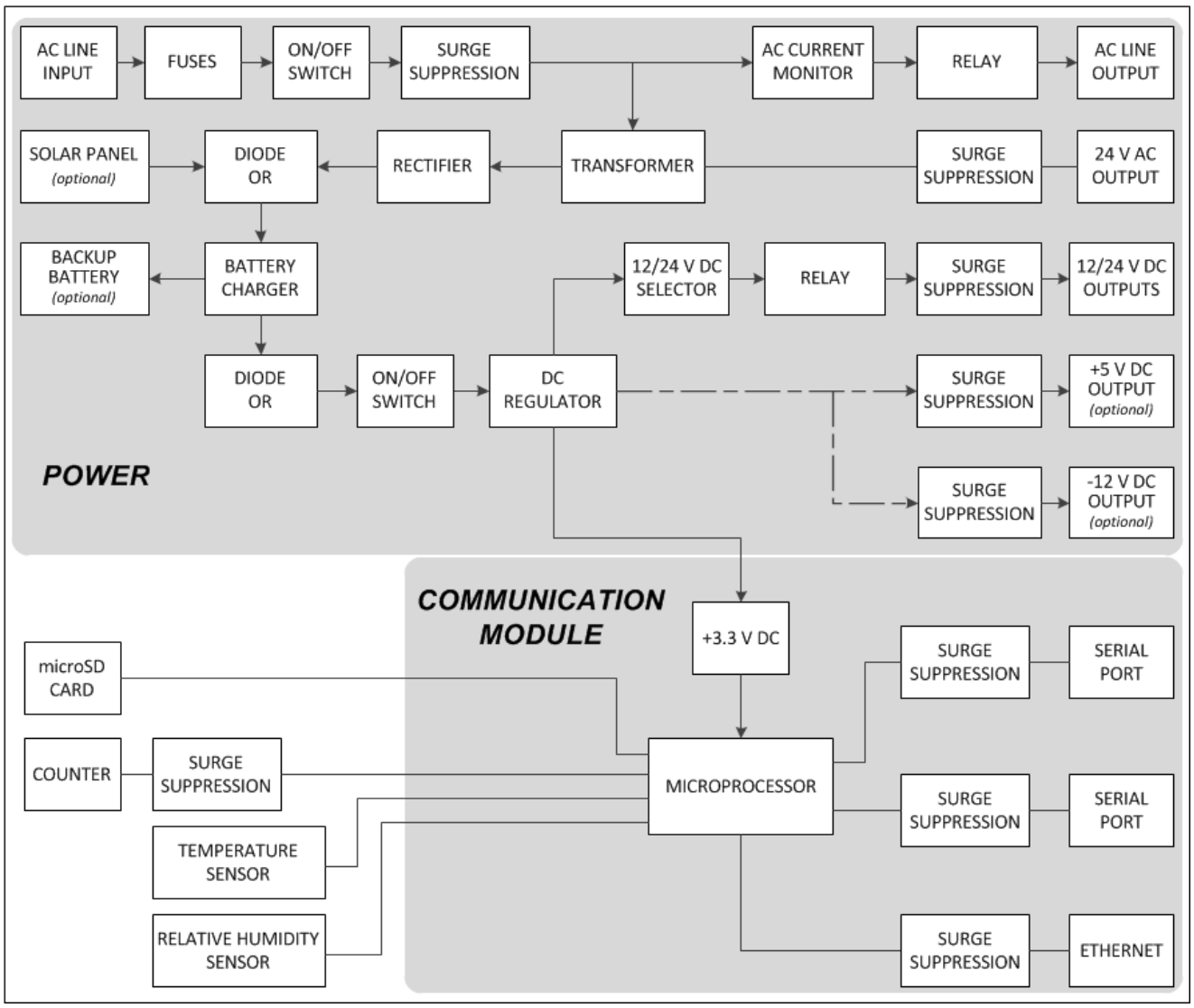


Figure 1. Model 2715 Universal Power and Communication Module

2.1 POWER

The primary AC input power, 85–265 V AC at 47–63 Hz may be wired through a plug or directly from a junction box. The wiring must be able to support up to 10 A.

An AC line output is available to provide power to optional heaters located inside the enclosure that will come on under thermostat control when the temperature inside the enclosure drops below a user-defined value, which is 0°C by default. A relay under software control does the actual on/off switching of the AC line output. The AC line output may be used to supply AC power if there are no enclosure heaters.

There is a 24 V AC output that operates at the same frequency as the primary AC input voltage.

Backup DC power is available from an optional backup battery. The backup battery is normally charged through a charger connected to the transformer and the DC rectifier, or via a connection to an optional solar panel, as determined by an OR diode between the optional solar panel and the DC rectifier. The solar panel must supply 8–37 V DC, and the voltage must be at least 15 V DC to charge the backup battery. A second OR diode determines whether DC power is supplied to the DC regulator through the battery charger or from the backup battery.

An interlock prevents the battery from being charged when the temperature inside the enclosure drops below the user-defined set point.

The main 12/24 V DC output may be set manually to either 12 V DC or 24 V DC. Once set, the same voltage level applies to all the 12/24 V DC outputs, which are available on the serial ports. These outputs may be turned on/off by the microprocessor in the communication module.

The table below summarizes the power inputs/outputs.

<table>
<tr><th colspan="2">Voltage Inputs</th><th>Voltage Outputs</th></tr>
<tr><td colspan="2" rowspan="2">AC line voltage</td><td>Switched AC line voltage</td></tr>
<tr><td>24 V AC</td></tr>
<tr><td rowspan="5">Rectified AC input
or
Solar Panel
or
Backup Battery</td><td rowspan="5">Regulated DC voltages</td><td>+5 V DC for current monitors and relays (available internally only)</td></tr>
<tr><td>+3.3 V DC for microprocessor (available internally only)</td></tr>
<tr><td>+12/24 V DC</td></tr>
<tr><td>+5 V DC (optional add-on module)</td></tr>
<tr><td>-12 V DC (optional add-on module)</td></tr>
</table>

2.2 COMMUNICATION MODULE

The UPCM has two sets of serial ports and one RJ-45 jack. Optional serial port modules may be added to increase the number of sensors connected. The following serial protocols are supported.

Serial Protocols Supported
3-wire RS-232 (no flow control)
RS-485 half duplex
RS-485 full duplex†

Ethernet Protocols Supported
TCP/IP 10/100Base-T

The default configuration for the serial ports is set at the factory based on what sensors and devices are used with a particular UPCM. The configuration may be modified or updated in the field using a microSD card containing the new configuration file.

† The implementation of RS-485 is electrically equivalent to RS-422.

2.3 OTHER INPUTS

The UPCM has a counter/tachometer input. The counter input is used to measure actual counts, such as bucket tips in a tipping-bucket rain gauge. The tachometer input can measure rotations such as a fan motor.

The UPCM has one active low digital input, which can be used to monitor a door switch.

2.4 OTHER SENSORS

A temperature sensor and a relative humidity sensor are located inside the UPCM enclosure to monitor the environment.

3. CONNECTIONS

Figure 2 shows the key connections to the Model 2715 Universal Power and Communication Module. They are explained in detail in this section.

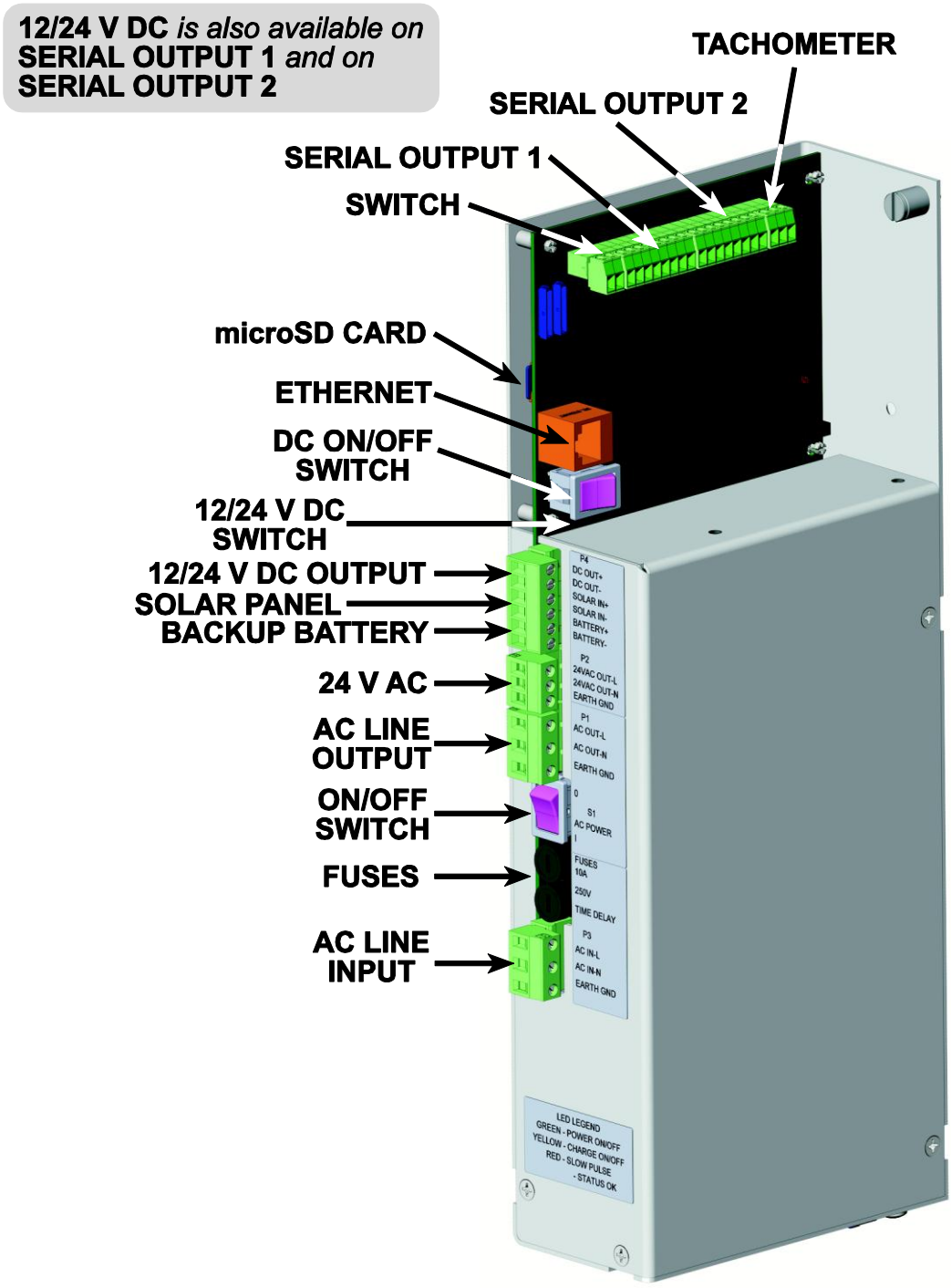


Figure 2. UPCM Connections

3.1 DETAILED DESCRIPTIONS AND PINOUTS

All the connections are via pluggable terminal blocks. The pitches of each set of terminal blocks are different to facilitate connected the terminal blocks correctly once they are wired. Therefore, it is imperative that the terminal blocks be wired correctly.

- Connect the primary AC input power, 85–265 V AC at 47–63 Hz to the **AC LINE INPUT**. The AC line may be wired through a plug or directly from a junction box. The wiring must be able to support up to 10 A.

  Terminal Block Wiring Summary

  - BLACK wire to AC-IN-L
  - WHITE wire to AC-IN-N
  - GREEN wire to EARTH GND

Figure 3. UPCM AC Line Input Pinout

- Two 10 A, 250 V slow-blow **FUSES** protect the hot and neutral AC input lines, one fuse for each line.

  Remember to turn the **ON/OFF SWITCH** *to OFF and disconnect the AC line input before replacing a fuse.*

- The **ON/OFF SWITCH** turns the AC POWER on/off.

- The **AC LINE OUTPUT** supplies the surge-suppressed AC line input voltage for use by other devices such as heaters used to warm up the enclosure. This line has a relay on it, which may be controlled in software to turn the heaters on/off.

  Terminal Block Wiring Summary

  - BLACK wire to AC-OUT-L
  - WHITE wire to AC-OUT-N
  - GREEN wire to EARTH GND

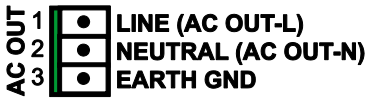


Figure 4. UPCM AC Line Output Pinout

- The **24 V AC** output provides a surge-suppressed 24 VAC output voltage for use by other devices.

  Terminal Block Wiring Summary

  - BLACK wire to 24VAC-OUT-L
  - WHITE wire to 24VAC-OUT -N
  - GREEN wire to EARTH GND

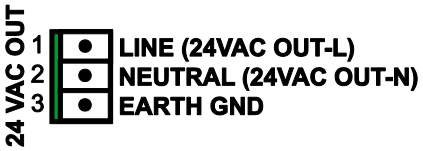


Figure 5. UPCM 24 V AC Line Output Pinout

- The **BACKUP BATTERY** portion of the terminal block plug is wired as follows.
  - RED wire to BATTERY+
  - BLACK wire to BATTERY-

- The **SOLAR PANEL** portion of the terminal block plug is wired as follows.
  - Positive output from solar panel to SOLAR IN+
  - Negative output from solar panel to SOLAR IN -
- The **DC OUT** output of the terminal block plug outputs surge-suppressed 12/24 V DC for use by other sensors or devices.

  Terminal Block Wiring Summary
  - Positive connection to DC OUT+
  - Negative output to DC OUT -

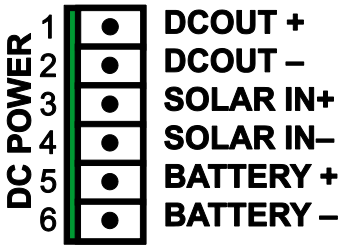


Figure 6. UPCM DC Power Pinout

- Use the **12/24 V DC SWITCH** to select whether the DC output will be 12 V *or* 24 V DC. *Note that this selection affects the DC output voltages on the* **DC OUT** *output of the terminal block and the DC outputs on the serial outputs*.
- The **DC ON/OFF SWITCH** turns the DC outputs on/off. Whether done manually or under software control, this is a convenient way to reboot any sensor or device connected without having to do the power cycling at the device itself.

  Note that this operation affects the DC output voltages on the **DC OUT** *output of the terminal block and the DC outputs on the serial outputs*.
- The **ETHERNET** jack allows a Cat5/6 Ethernet cable to connect the UPCM to a 10/100Base-T network.
- The **SWITCH** terminal block plug may be wired to a switch that opens when the door to the enclosure containing the UPCM is opened. It may also be used to monitor any other location where an active low monitoring needs to be done.

Figure 7. UPCM Switch Pinout

- The **microSD CARD** contains a configuration file for the UPCM serial setup. You may remove this card to edit the configuration settings using a text editor such as Notepad.

  Once you replace the microSD card, you will have to power cycle the UPCM microprocessor using the **DC ON/OFF SWITCH** for the new settings to take effect.
- Connect the **SERIAL OUTPUT 1** and **SERIAL OUTPUT 2** terminal block plugs to serial cables. One serial cable typically goes to the sensor or other device, and the other serial cable is typically connected to a computer or other data processor.

  Figure 8 provides the pinouts for the serial output terminal block plugs.

  Additional serial port modules may be added if more serial outputs are needed.

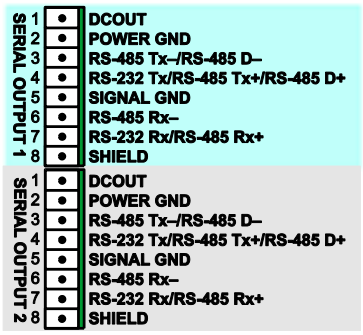


Figure 8. UPCM Serial Output Pinouts

- Connect the **TACHOMETER** terminal block plug to the device whose frequency or counts you will be measuring.

  Figure 9 provides a typical pinout to use this feature with a fan motor. Note that only the INPUT pin is used and that 12/24 V DC power is also supplied.

  Similarly, only the INPUT pin would be connected for counting as long as the device has a ground connection to the UPCM.

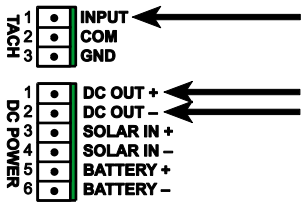


Figure 9. Fan Tach Connector Pinout

Appendix A lists the sensors and other devices supported by the UPCM and provides detailed wiring recommendations.

3.2 TERMINAL BLOCK PLUGS

Table 1 identifies the terminal block plugs uses for the various UPCM connections.

Table 1. Terminal Block Plugs

Part Number	Location	Description
FCIconnect 20020004-D021B01LF	Switch	2-position plug 3.81 mm pitch
FCIconnect 20020004-D031B01LF	Fan Tachometer	3-position plug 3.81 mm pitch
FCIconnect 20020004-D081B01LF	Serial Port Output	8-position plug 3.81 mm pitch
FCIconnect 20020007-G061B01LF	DC Power (DC Output, Solar Input, Backup Battery)	6-position plug 5.00 mm pitch
Phoenix 1767012	AC Line Input	3-position plug 7.62 mm pitch
Phoenix 1786187	24 V AC Output	3-position plug 5.08 mm pitch
Phoenix 1828812	AC Line Output	3-position plug 7.62 mm pitch

4. ASSEMBLY AND INSTALLATION

The Model 2715 Universal Power and Communication Module is typically already installed inside an enclosure at the factory along with any optional add-on modules and the backup battery. This chapter will help you if you have to remove the UPCM or any of its add-ons, or if you are planning to install it in your own enclosure.

4.1 ADD-ON MODULES

Figure 10 illustrates how an add-on module is installed on the UPCM.

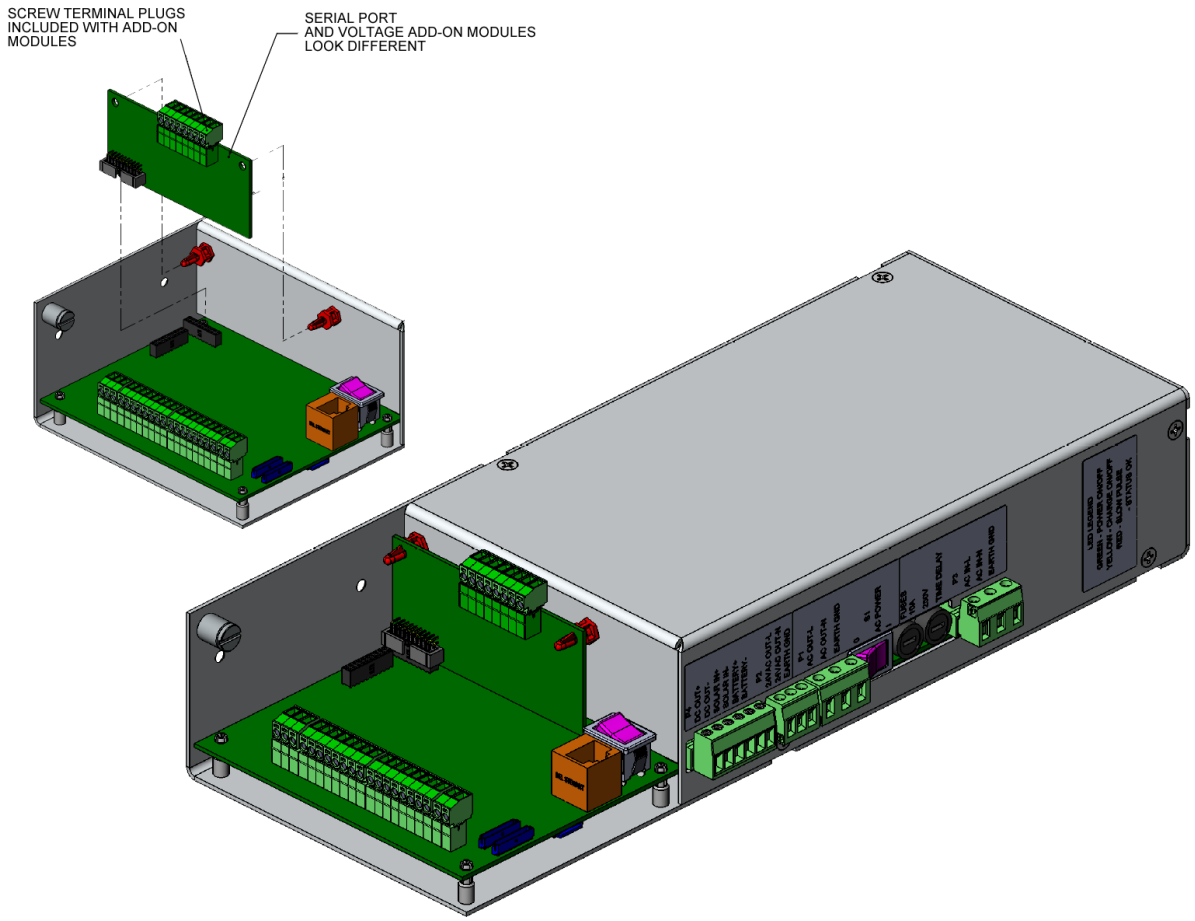


Figure 10. Installing Serial Port or Voltage Add-on Modules

1. The stand-offs (shown in red) should be in place on the UPCM cover. You may have to remove screws and replace them with the stand-offs.
2. Position the connectors at the bottom of the add-on module to mate with the existing connectors on printed circuited board.
3. Line up the add-on module with the stand-offs and snap it in place so that the stand-off holds the top in place.

4.2 BACKUP BATTERY

Figure 11 illustrates how the backup battery is installed on the UPCM.

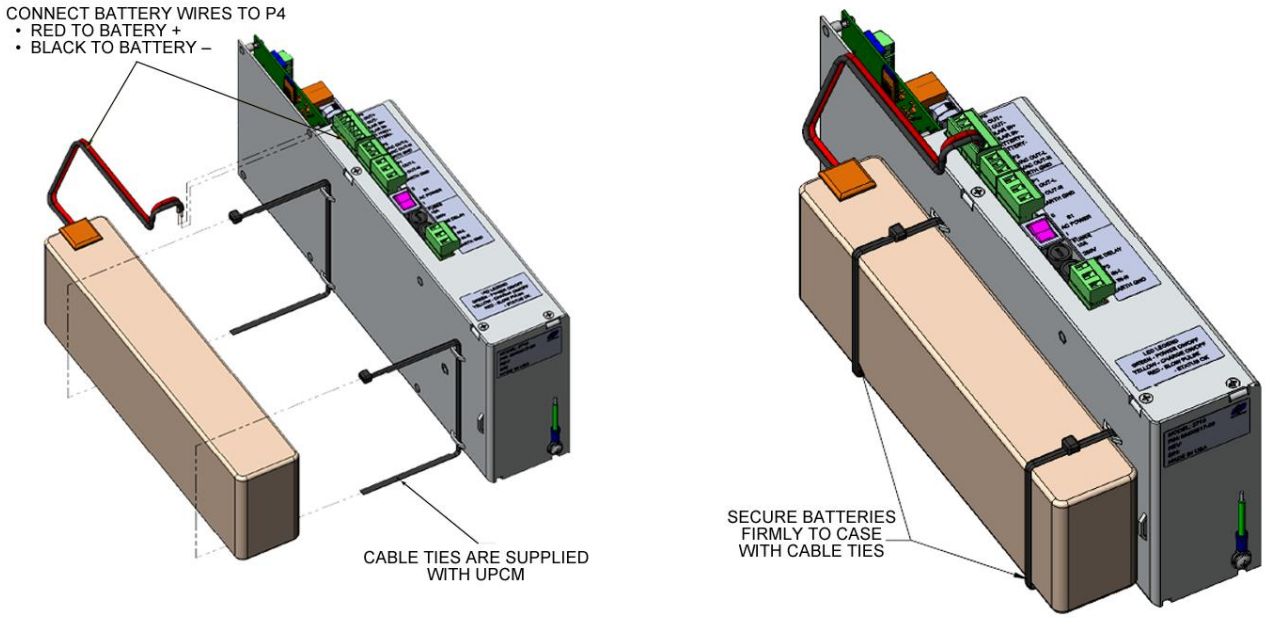


Figure 11. Installing Backup Battery

1. Insert the cable ties into the backup battery mounting slots on the side of the UPCM as shown in Figure 11. The cable ties must have a length of at least 40 cm (16").
2. Position the backup battery and secure it firmly to the side of the UPCM enclosure with the cable ties. You may cut off any excess from the cable ties.
3. Remove the terminal plug, and connect the backup battery wires to the **BACKUP BATTERY** portion of the terminal block plug, which is wired as follows (see Chapter 3 for more information).
   - RED wire to BATTERY+.
   - BLACK wire to BATTERY-.

   Plug the terminal block plug into place.

4.3 MOUNTING INSIDE AN ENCLOSURE

Figure 12 illustrates how to mount the UPCM inside an enclosure.

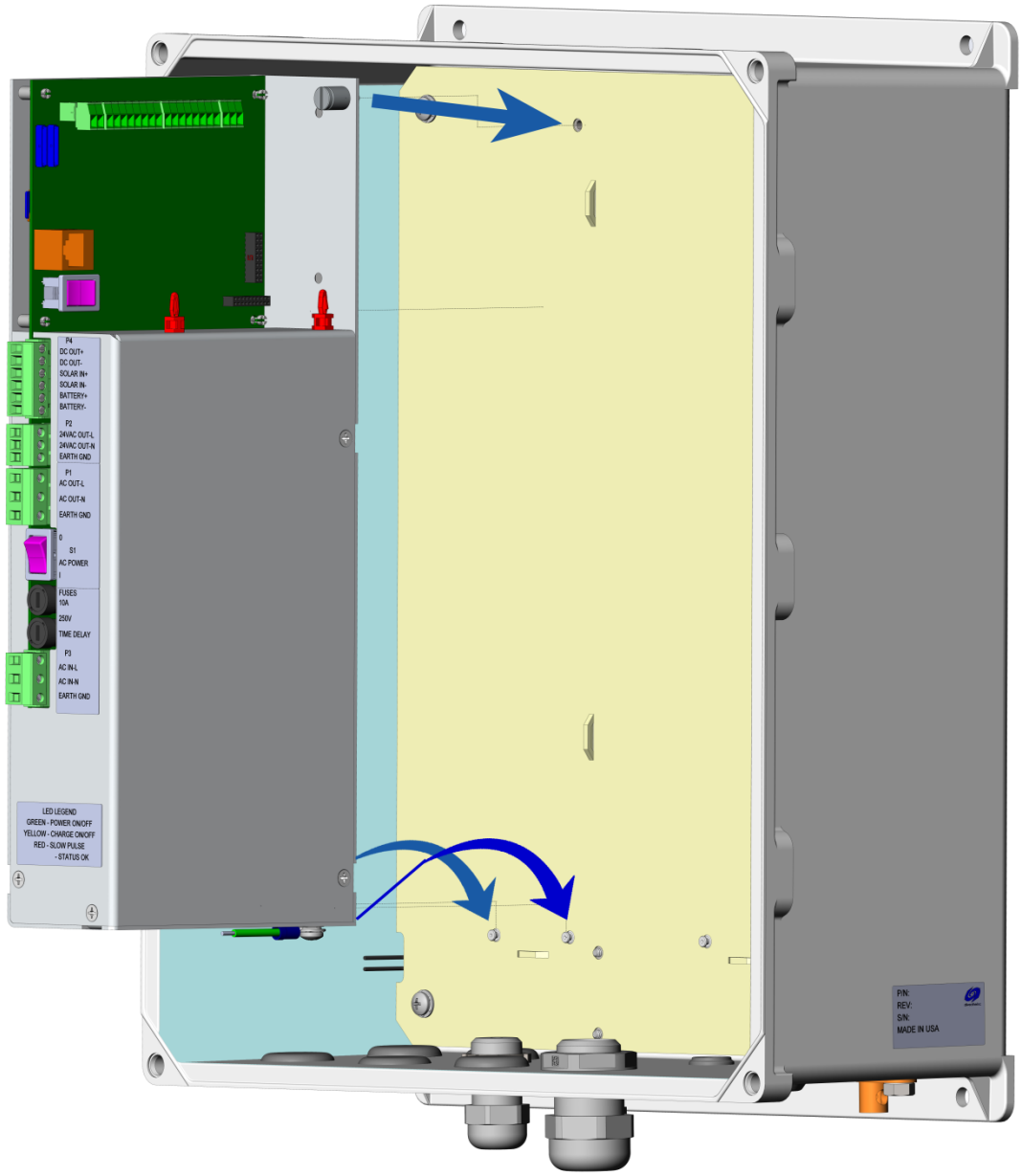


Figure 12. Mounting UPCM Inside an Enclosure

1. Position the mounting slots at the bottom of the back of the UPCM over the mounting screws, and slide it into place so that it rests on the mounting screws.
2. Tighten the #8 spring-load panel screw at top of the UPCM to secure it and the UPCM inside the enclosure.

Figure 13 provides the locations for the mounting screws and the screw position for the #8 spring-load panel screw to help you design your own mounting site.

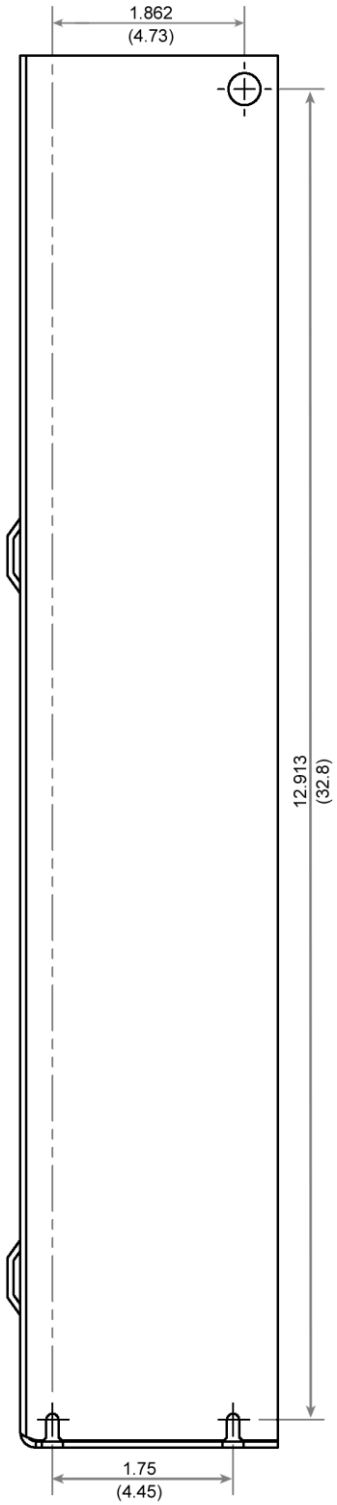


Figure 13. Mounting Screw Placement

5. SOFTWARE REFERENCE

A boot loader is installed on the Model 2715 Universal Power and Communication Module at the factory. The binary firmware is typically installed, and a microSD card containing the serial configuration for the intended use of the UPCM will be in place. Chapter 3 describes where the microSD card is located and shows the on/off switch referred to in this chapter.

The status LEDs are above the microSD card slot. The red status LED should blink slowly (approximately once per second) while the UPCM is operating normally.

5.1 BINARY FIRMWARE

This section explains how to install or update the binary firmware.

1. Turn the DC power supply *off* (DC on/off switch).
2. Remove the microSD card containing the serial configuration file.
3. Insert a microSD card containing the binary firmware to be installed once you have verified that the name of the firmware file is frmw.bin.
4. Turn the DC power supply *on* (DC on/off switch).
5. The red status LED blinks rapidly (approximately ten times per second) for a few seconds after being powered on. Wait until the red status LED begins to blink slowly (approximately once per second).
6. Turn the DC power supply *off* (DC on/off switch).
7. Replace the microSD card containing the serial configuration file.
8. Turn the DC power supply *on* (DC on/off switch).

Once the boot loader detects the binary firmware file on the microSD card, it will compare the currently installed binary firmware against the file and only update if the file differs.

If the red status LED does not blink as expected, check the microSD card.

5.2 SERIAL CONFIGURATION FILE

The microSD card containing the serial configuration file is normally kept in the microSD card slot. If it becomes necessary to change the serial configuration, contact All Weather, Inc., for a microSD card that already has the desired configuration. Alternatively, you may remove the existing microSD card, place it in an adapter or a USB microSD card device, and use your computer to edit the configuration file using a text editor such as Notepad.

This section explains how to remove and replace the microSD card containing the serial configuration file. The serial configuration file name is myfile.txt.

1. Turn the DC power supply *off* (DC on/off switch).
2. Remove the microSD card containing the serial configuration file.
3. Replace the microSD card containing the new serial configuration file.
4. Turn the DC power supply *on* (DC on/off switch).
5. The status LEDs are above the microSD card slot. The red status LED blinks rapidly (approximately ten times per second) for a few seconds after being powered on. Wait until the red status LED begins to blink slowly (approximately once per second).

If the red status LED does not blink as expected, check the microSD card.

5.2.1 Editing a Serial Configuration File

The default configuration for the serial ports is set at the factory based on what sensors and devices are used with a particular UPCM. This section provides the configuration parameters to allow you to edit the serial configuration file. In all cases, the = sign separates the parameter and its configuration value.

All parameters must be specified for a valid serial configuration file.

	Parameter	Configuration
UPCM IP Address Configuration	STATIC_IP	0 = DHCP IP address 1 = static IP address
	IP_ADDR_1 IP_ADDR_2 IP_ADDR_3 IP_ADDR_4	first nibble of IP address, 0–255 second nibble of IP address, 0–255 third nibble of IP address, 0–255 fourth nibble of IP address, 0–255
	SUBNET_1 SUBNET_2 SUBNET_3 SUBNET_4	first nibble of subnet mask, 0–255 second nibble of subnet mask, 0–255 third nibble of subnet mask, 0–255 fourth nibble of subnet mask, 0–255
	GATEWAY_1 GATEWAY_2 GATEWAY_3 GATEWAY_4	first nibble of gateway, 0–255 second nibble of gateway, 0–255 third nibble of gateway, 0–255 fourth nibble of gateway, 0–255

The UPCM may be addressed via an IP address or via an RS-485 serial network address. If you do not intend to access the UPCM over a TCP/IP-based network, assign a nonroutable IP address.

	Parameter	Configuration		Parameter	Configuration
Serial Port 1	SER0_PROT	Protocol 0 – RS-232 1 – RS-485 Full Duplex 2 – RS-485 Half Duplex	Serial Port 2	SER1_PROT	Protocol 0 – RS-232 1 – RS-485 Full Duplex 2 – RS-485 Half Duplex
	SER0_BAUD	Baud rate 0 – 2400 bps 1 – 4800 bps 2 = 9600 bps 3 – 19200 bps 4 = 38400 bps 5 = 57600 bps 6 = 115200 bps		SER1_BAUD	Baud rate 0 – 2400 bps 1 – 4800 bps 2 = 9600 bps 3 – 19200 bps 4 = 38400 bps 5 = 57600 bps 6 = 115200 bps
	SER0_DATA	Data Bits 5, 6, 7, 8, or 9		SER1_DATA	Data Bits 5, 6, 7, 8, or 9
	SER0_PAR	Parity 69 = Even parity 78 = No parity 81 = Odd parity		SER1_PAR	Parity 69 = Even parity 78 = No parity 81 = Odd parity
	SER0_STOP	Stop Bits 1 or 2		SER1_STOP=1	Stop Bits 1 or 2
	SER0_TE	Termination 0 = Off 1 = On		SER1_TE	Termination 0 = Off 1 = On

	Parameter	Configuration
Serial Port 3 (if present)	SER2_CONFIG	1=Serial Port add-on module
	SER2_PROT	Protocol 0 – RS-232 1 – RS-485 Full Duplex 2 – RS-485 Half Duplex
	SER2_BAUD	Baud rate 0 – 2400 bps 1 – 4800 bps 2 = 9600 bps 3 – 19200 bps 4 = 38400 bps 5 = 57600 bps 6 = 115200 bps
	SER2_DATA	Data Bits 5, 6, 7, 8, or 9
	SER2_PAR	Parity 69 = Even parity 78 = No parity 81 = Odd parity
	SER2_STOP	Stop Bits 1 or 2
	SER2_TE	Termination 0 = Off 1 = On

	Parameter	Configuration
Web Interface	USER	User name
	PASSWORD	Password

	Parameter	Configuration
RS-485 Network	PSU_ADDR_H	Power supply address upper nibble
	PSU_ADDR_L	Power supply address lower nibble

Valid RS-485 network addresses range from 0000 0000 to 0110 0011 (0–99).

Parameter		Configuration
Power Supply Hardware Configuration Settings	EN_DCOUT	0 = DC Output disabled at boot 1 = DC Output enabled at boot
	EN_ACOUT	0 = AC Output disabled at boot 1 = AC Output enabled at boot 2 = AC Output used with thermostat at boot
	EN_CHRGR	0 = Battery Charger disabled 1 = Battery Charger enabled
	PORT1_MODE PORT2_MODE	1 = Model 6495 Freezing Rain Sensor 2 = Model 6496 Freezing Rain Sensor 3 = Model 6497 Present Weather and Visibility Sensor 4 = Model 2040/2041 Wind Sensor 5 = Model 6505 Thunderstorm/Lightning Detector 6 = Model 6490 Present Weather Sensor 7 = Model 7150 Barometric Pressure Sensor 8 = Model 5190/5191 Temperature/Relative Humidity Probe 255 = No sensor
	MIN_TEMP	Thermostat turn-on temperature (°C)
	MAX_TEMP	Thermostat turn-off temperature (°C)

5.3 POLL COMMANDS

- All poll commands must be followed by a carriage return (0x0D) and a line feed (0x0A).
- All responses will be terminated with a carriage return and a line feed.
- Default serial port settings are 9600 8N1.
- Verify the serial configuration settings after power-cycling the UPCM.

5.3.1 Regular Poll Commands

Poll Command	Response
PWRaa**STAT<CR><LF>**	**=PWR**aa**STAT**,vdc,idc,dcenable,vac,iac,acenable,t,r,**1**,**1**,**1**,batv,bati,batcharge,batcenable,solarv,pwrsrc,count,rpm,door,protocol,baud,data,parity,stop,protocol,baud,data,parity,stop,protocol,baud,data,parity,stop,p1mode,p2mode,cccc**<CR><LF>**
PWRaa**ENV<CR><LF>**	**=PWR**aa**ENV**,**T**t,**R**r,**D**d,cccc **<CR><LF>**
PWRaa**CONFIG GET IP<CR><LF>**	**=PWR**aa**CONFIG GET IP**,ip.ip.ip.ip,sub.sub.sub.sub,gw.gw.gw.gw,mac-mac-mac-mac-mac-mac,cccc**<CR><LF>**
PWRaa**CONFIG SET IP** ip.ip.ip.ip,sub.sub.sub.sub,gw.gw.gw.gw **<CR><LF>**	**=PWR**aa**CONFIG GET IP**,ip.ip.ip.ip,sub.sub.sub.sub,gw.gw.gw.gw,mac-mac-mac-mac-mac-mac,cccc**<CR><LF>**
PWRaa**CONFIG GET PORT** port**<CR><LF>**	**=PWR**aa**CONFIG GET PORT**,port,protocol,baud,data,parity,stop,cccc**<CR><LF>**
PWRaa**CONFIG SET PORT** port,baud,data,parity,stop**<CR><LF>**	**=PWR**aa**CONFIG GET PORT**,port,protocol,baud,data,parity,stop,cccc**<CR><LF>**
PWRaa**CONFIG GET OUTPUT<CR><LF>**	**=PWR**aa**CONFIG OUTPUT**,1,dcenable,2,acenable,cccc**<CR><LF>**
PWRaa**CONFIG SET OUTPUT** output,acenable **or** dcenable**<CR><LF>**	**=PWR**aa**CONFIG OUTPUT**,1,dcenable,2,acenable,cccc**<CR><LF>**
PWRaa**CONFIG GET ADDRESS<CR><LF>**	**=PWR**aa**CONFIG ADDRESS**,aa,cccc**<CR><LF>**
PWRaa**CONFIG SET ADDRESS** aa**<CR><LF>**	**=PWR**aa**CONFIG ADDRESS**,aa,cccc**<CR><LF>**
PWRaa**GET ID<CR><LF>**	**=PWR**aa**CONFIG ID**,id,cccc**<CR><LF>**
PWRaa**REBOOT<CR><LF>**	**=PWR**aa**REBOOTING<CR><LF>**
PWRaa**VER<CR><LF>**	**=PWR**aa**VER**,ver,cccc**<CR><LF>**

The data fields in the poll responses are described below.

Data Field	Description
ᶜᴿ ᴸᶠ	Carriage return followed by line feed
id	Two-character system ID, ASCII decimal encoded
aa	Two-character address, ASCII encoded decimal, 00-99
cccc	Four-character CRC16, ASCII encoded hexadecimal
port	Port "1", "2", or "modem"
protocol	RS232="2", RS485 Half Duplex="H", RS485 Full Duplex="F", Modem="M"
baud	Baud rate, "2400", "4800", "9600", "19200", "38400", "57600", "115200"
data	Data bits, "7" or "8"
parity	Parity is "N"=None, "E"=Even, or "O"=Odd
stop	Stops bits, "1" or "2"
p1mode	Port 1 sensor mode, 6495="1", 6496="2", 6497="3", 2040="4", 6500="5", 6490="6", 7150="7", 5191="8"
p2mode	Port 1 sensor mode, 6495="1", 6496="2", 6497="3", 2040="4", 6500="5", 6490="6", 7150="7", 5191="8"
ip	One- to three-character IP address octet, ASCII encoded decimal
sub	One- to three-character subnet mask octet, ASCII encoded decimal
gw	One- to three-character gateway address octet, ASCII encoded decimal
mac	Two MAC address octet, ASCII encoded hexadecimal, lower case
n	Number "1", "2", or "3"
output	DC="1", AC="2"
door	Door is open="1", door is closed="0"
vdc	One to five character DC voltage, ASCII encoded decimal
idc	One to five character DC current, ASCII encoded decimal
dcenable	DC output, enabled="1", disabled="0"
vac	One- to five-character AC voltage, ASCII encoded decimal
iac	One- to five-character AC current, ASCII encoded decimal
acenable	AC output, enabled="1", disabled="0"
t	One- to three-character temperature in °C, ASCII encoded decimal
r	One- to three-character relative humidity, ASCII encoded decimal
d	One- to three-character dew point in °C, ASCII encoded decimal
batv	One- to five-character battery voltage, ASCII encoded decimal
bati	One- to five-character battery current, ASCII encoded decimal
batcharge	Battery charging, charging="1", not charging="0"

Data Field	Description
batcenable	Battery charger enabled="1", disabled="0"
solarv	One- to five-character solar input voltage
pwrsrc	Power source, AC="1", Solar="2", Battery="3"
count	Count for fan tach or tipping bucket input, one to five characters, ASCII encoded decimal
rpm	Fan tach, one to five characters, ASCII encoded

5.3.2 Emulated Poll Commands

Emulated Poll Command	Response
WINDaa**<CR><LF>**	**=WIN**aa direction speed status error error error cccc**<CR><LF>**
USWS00<CR><LF>	=aa direction speed error error error cccc**<CR><LF>**
{F00RDD}<CR><LF>	**{F00rdd 001**;rh;**%RH;**halarm;htrend;temp;**°C**;talarm;ttrend;ctype;calc;**°C**;calarm; ctrend;**001**;ver;sn;name;alarm;c**<CR><LF>**
PWVSaa**<CR><LF>**	**=W**xx**P**pppp**S**ssss **X**nnn**L**nnn**K**nnn**H**nnn**T**ttt errorcount msgcount cccc**<CR><LF>** **=Comm_Error Error_in_input_msg** errorcount msgcount cccc**<CR><LF>** **=Timeout_Error Check_power/cables** errorcount msgcount cccc**<CR><LF>**
FRRAaa**<CR><LF>**	=frequency status **0** count cccc**<CR><LF>**
LTXaa**<CR><LF>**	**=LTX**aa**,I**statusmode**,G@E**fault**,V**swversion,seq,bearing,distance**,C**cccc**<CR><LF>**
SEND 0aa**<CR><LF>**	=pressure pressure pressure trend temp sign sss cccc**<CR><LF>**

The data fields in the poll responses to the emulated poll commands are described below.

Data Field Emulated Poll Commands	Description
$_{R}$ $_{F}$	Carriage return followed by line feed
aa	Two-character address, ASCII-encoded decimal, 00-99
direction	ASCII-encoded decimal wind direction
speed	ASCII-encoded floating point wind speed
error	ASCII-encoded decimal error field
cccc	Four-character ASCII-encoded hexadecimal CRC16
C	Single-byte checksum
Rh	Relative humidity or analog value, formatted as: %.2f
halarm	Humidity or analog value alarm="001", no alarm="000"
htrend	Humidity or analog value trend, "+", "-", "=", or " "
temp	Temperature value, formatted as: signed %.2f
talarm	Temperature alarm ="001", no alarm ="000"
ttrend	Temperature trend, "+", "-", "=", or " "
ctype	Calculated parameter type, no calculation="nc", dew point="Dp", frost point ="Fp"
calc	Calculated numerical value, formatted as %.2f
calarm	Calculated parameter alarm="001", no alarm ="000"
ctrend	Calculated parameter trend, "+", "-", "=", or " "
Ver	Firmware version, formatted as: %c%f
Sn	Serial number, ten character ASCII field
name	Sensor name field

Data Field Emulated Poll Commands	Description
alarm	Alarm Byte, out-of-limits value="000", sensor quality="005", humidity simulator="006", temperature simulator="007"
frequency	Probe frequency, 5-char ASCII-encoded unsigned decimal integer
count	Variable-length ice accretion count field, ASCII-encoded unsigned decimal integer
statusmode	Two-character ASCII field, One character for status and one for status mode
fault	Two-character ASCII field for fault code
swversion	Six-character ASCII-encoded software version number
Seq	Variable-length ASCII-encoded start-of-sequence number
bearing	Variable-length ASCII-encoded bearing to lightning strike in degrees
distance	Variable-length ASCII-encoded distance to strike in nautical miles
pressure	Six character fixed point pressure in the format %2.3f (xx.xxx)
trend	Six character fixed point pressure trend in the format %2.3f (xx.xxx), insufficient data="**.***"
temp	Two-character ASCII-encoded decimal integer, temperature in degrees C
sign	Negative temperature="-", a space character represents positive temperature
sss	Three-character status field, one character for each sensor

5.3.3 Check Sum Calculation

The CRC is calculated using a standard crc-16 formula. The algorithm is as follows.

```
U32 crc = 0;


   // CRC values for crc16 routine
   static unsigned int  crc_vals[] =
      {
         0x0000, 0xc0c1, 0xc181, 0x0140, 0xc301, 0x03c0, 0x0280, 0xc241,
         0xc601, 0x06c0, 0x0780, 0xc741, 0x0500, 0xc5c1, 0xc481, 0x0440,
         0xcc01, 0x0cc0, 0x0d80, 0xcd41, 0x0f00, 0xcfc1, 0xce81, 0x0e40,
         0x0a00, 0xcac1, 0xcb81, 0x0b40, 0xc901, 0x09c0, 0x0880, 0xc841,
         0xd801, 0x18c0, 0x1980, 0xd941, 0x1b00, 0xdbc1, 0xda81, 0x1a40,
         0x1e00, 0xdec1, 0xdf81, 0x1f40, 0xdd01, 0x1dc0, 0x1c80, 0xdc41,
         0x1400, 0xd4c1, 0xd581, 0x1540, 0xd701, 0x17c0, 0x1680, 0xd641,
         0xd201, 0x12c0, 0x1380, 0xd341, 0x1100, 0xd1c1, 0xd081, 0x1040,
         0xf001, 0x30c0, 0x3180, 0xf141, 0x3300, 0xf3c1, 0xf281, 0x3240,
         0x3600, 0xf6c1, 0xf781, 0x3740, 0xf501, 0x35c0, 0x3480, 0xf441,
         0x3c00, 0xfcc1, 0xfd81, 0x3d40, 0xff01, 0x3fc0, 0x3e80, 0xfe41,
         0xfa01, 0x3ac0, 0x3b80, 0xfb41, 0x3900, 0xf9c1, 0xf881, 0x3840,
         0x2800, 0xe8c1, 0xe981, 0x2940, 0xeb01, 0x2bc0, 0x2a80, 0xea41,
         0xee01, 0x2ec0, 0x2f80, 0xef41, 0x2d00, 0xedc1, 0xec81, 0x2c40,
         0xe401, 0x24c0, 0x2580, 0xe541, 0x2700, 0xe7c1, 0xe681, 0x2640,
         0x2200, 0xe2c1, 0xe381, 0x2340, 0xe101, 0x21c0, 0x2080, 0xe041,
         0xa001, 0x60c0, 0x6180, 0xa141, 0x6300, 0xa3c1, 0xa281, 0x6240,
         0x6600, 0xa6c1, 0xa781, 0x6740, 0xa501, 0x65c0, 0x6480, 0xa441,
         0x6c00, 0xacc1, 0xad81, 0x6d40, 0xaf01, 0x6fc0, 0x6e80, 0xae41,
         0xaa01, 0x6ac0, 0x6b80, 0xab41, 0x6900, 0xa9c1, 0xa881, 0x6840,
         0x7800, 0xb8c1, 0xb981, 0x7940, 0xbb01, 0x7bc0, 0x7a80, 0xba41,
         0xbe01, 0x7ec0, 0x7f80, 0xbf41, 0x7d00, 0xbdc1, 0xbc81, 0x7c40,
         0xb401, 0x74c0, 0x7580, 0xb541, 0x7700, 0xb7c1, 0xb681, 0x7640,
         0x7200, 0xb2c1, 0xb381, 0x7340, 0xb101, 0x71c0, 0x7080, 0xb041,
         0x5000, 0x90c1, 0x9181, 0x5140, 0x9301, 0x53c0, 0x5280, 0x9241,
         0x9601, 0x56c0, 0x5780, 0x9741, 0x5500, 0x95c1, 0x9481, 0x5440,
         0x9c01, 0x5cc0, 0x5d80, 0x9d41, 0x5f00, 0x9fc1, 0x9e81, 0x5e40,
         0x5a00, 0x9ac1, 0x9b81, 0x5b40, 0x9901, 0x59c0, 0x5880, 0x9841,
         0x8801, 0x48c0, 0x4980, 0x8941, 0x4b00, 0x8bc1, 0x8a81, 0x4a40,
         0x4e00, 0x8ec1, 0x8f81, 0x4f40, 0x8d01, 0x4dc0, 0x4c80, 0x8c41,
         0x4400, 0x84c1, 0x8581, 0x4540, 0x8701, 0x47c0, 0x4680, 0x8641,
         0x8201, 0x42c0, 0x4380, 0x8341, 0x4100, 0x81c1, 0x8081, 0x4040
      };

   while(*strPtr != 0)
   {
      crc = crc_vals[(*strPtr ^ crc) & 0xff] ^((crc >> 8) & 0xff);
      strPtr++;
   }
   return crc;
```

6. SPECIFICATIONS

Parameter		Specification
Electrical		
Supply Voltage	AC	85–265 V AC, 10 A 47–63 Hz
		Protected by two 10 A slow-blow fuses, surge-suppressed AC line voltage is also available to power other devices up to 500 W
		Pluggable Terminal Blocks, 7.62 mm pitch
	Solar	8–37 V DC (must be at least 15 V DC to charge backup battery)
AC Output Voltage		24 V AC, 8 A 47–63 Hz
	Connectors	Pluggable Terminal Blocks, 5.08 mm pitch
DC Output Voltage		Switch-selectable for 12 V DC or 24 V DC, 100 W max. (same selection applies to all DC voltage outputs)
	Connectors	Pluggable Terminal Blocks, 5.00 mm pitch and on Serial Port connectors
DC Output Module *(optional)*		-5 V DC, 2A +12 V DC, 1A
	Connectors	Pluggable Terminal Blocks, 3.81 mm pitch
Backup Battery *(optional)*		12 V DC, 5 A•h
Individually Configurable Serial Ports		
Number of Serial Ports		3 (including one optional serial port)
Serial Protocols		RS-485 (half duplex) RS-485 (full duplex)‡ 3-wire RS-232 (no flow control)
Serial Baud Rates		1200 to 115200 bps
Maximum Packet Size		1 kB
Serial Port Parameter Settings	Data Bits	5, 7, or 8
	Parity	Odd Even None
	Stop Bits	1 or 2
Serial Port Connectors		Pluggable Terminal Blocks, 3.81 mm pitch

‡ The implementation of RS-485 is electrically equivalent to RS-422.

Parameter		Specification
Ethernet Port		
TCP/IP		10/100Base-T
Connector		RJ-45 Jack
Fan Tachometer		
Frequency Range		0 to 10,000 Hz
Maximum Voltage		5 V DC
Connector		Pluggable Terminal Blocks, 3.81 mm pitch
Counter		
Count Range		0 to 10,000 s^{-1}
Maximum Voltage		5 V DC
Connector		Pluggable Terminal Blocks, 3.81 mm pitch
Environmental		
Operating and Storage Temperature	without enclosure heater	-40 to +70ºC (-40 to +158ºF)
	with enclosure heater	-70 to +70ºC (-94 to +158ºF)
Humidity		0–100% (noncondensing)
Mechanical		
Mounting		Two mounting slots at bottom of enclosure, diameter = 0.11" (0.29 cm), held in place by #8 spring-load panel screw at top of enclosure
Enclosure		Aluminum
Dimensions	Enclosure	2.50" W × 13.50" H × 5.23" D (33.7 cm × 34.3 cm × 13.3 cm)
	Backup Battery	1.94" W × 10.63" H × 3.10" D (4.9 cm × 27.0 cm × 7.9 cm)
Weight		5.5 kg (12 lb)
Shipping Weight		7.5 kg (17 lb)

7. EMISSIONS AND CONFORMANCE

The Model 2715 Universal Power and Communication Module conforms to the following standards.

- FCC Part 15 B

  This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

  1. This device may not cause harmful interference, and
  2. This device must accept any interference received, including interference that may cause undesired operation.

  This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

  To comply with the limits for an FCC Class B computing device, always use shielded signal cords.

8. WARRANTY

Unless specified otherwise, All Weather Inc. (the Company) warrants its products to be free from defects in material and workmanship under normal use and service for one year from date of installation or a maximum of two years from date of shipment, subject to the following conditions:

(a) The obligation of the Company under this warranty is limited to repairing or replacing items or parts which have been returned to the Company and which upon examination are disclosed, to the Company's satisfaction, to have been defective in material or workmanship at time of manufacture.

(b) The claimant shall pay the cost of shipping any part or instrument to the Company. If the Company determines the part to be defective in material or workmanship, the Company shall prepay the cost of shipping the repaired instrument to the claimant. Under no circumstances will the Company reimburse claimant for cost incurred in removing and/or reinstalling replacement parts.

(c) This warranty shall not apply to any Company products which have been subjected to misuse, negligence or accident.

(d) This warranty and the Company's obligation thereunder is in lieu of all other warranties, express or implied, including warranties of merchantability and fitness for a particular purpose, consequential damages and all other obligations or liabilities.

No other person or organization is authorized to give any other warranty or to assume any additional obligation on the Company's behalf, unless made in writing and signed by an authorized officer of the Company.

APPENDIX A — SENSORS SUPPORTED BY THE UPCM

Table A-1 lists the sensors and ancillary devices supported by the Model 2715 Universal Power and Communication Module.

Table A-1. Sensors and Ancillary Devices Supported by the UPCM

Sensor	Power Supplies				Tach	Serial
	110/220 V AC	24 V AC	12 V DC	24 V DC		
Barometric Pressure 7150 7190			✓			RS-485 (half duplex)
Freezing Rain 6495	May use UPCM AC line output if there are no internal enclo-sure heaters			✓		RS-232
Freezing Rain 6496 M482221-00				✓		RS-485 (receive only, full duplex)
MARS 8191			✓		✓	Not applicable
Present Weather 6490 6490-I			✓			RS-232
Present Weather and Visibility 6497 M482230-00			✓			RS-232
Rain Gauge 6030			✓			RS-232
Runway Surface Sensor 6900			✓			RS-485 (half duplex)
Temperature/Relative Humidity Probe 5191			✓			RS-485 (half duplex)
Thunderstorm/Lightning 6505			✓			RS-232
Wind 2040			✓			RS-485 (full duplex)
Wind 2040H 2040HH 2041HH		✓	✓			RS-485 (full duplex)

A.1 SENSOR WIRING REFERENCE DIAGRAMS

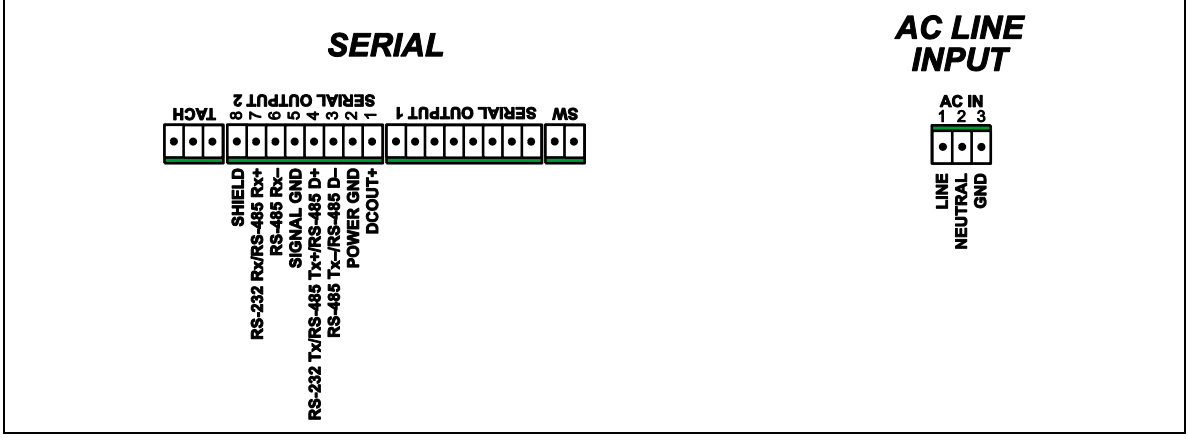
All sensors and other devices typically receive AC power via the AC line input. It is possible for more than one sensor or device to be used with one UPCM, in which case the one AC line input will power all the devices associated with that UPCM.

One serial port is typically connected to a computer or other data processing system. That leaves the second serial port for the serial interface to the sensor or other device. Another sensor or device would use the serial port on a Serial Port add-on module.

A.1.1 Barometric Pressure Sensors

Table A-2. Model 7150 and 7190 Signal and Power Wiring

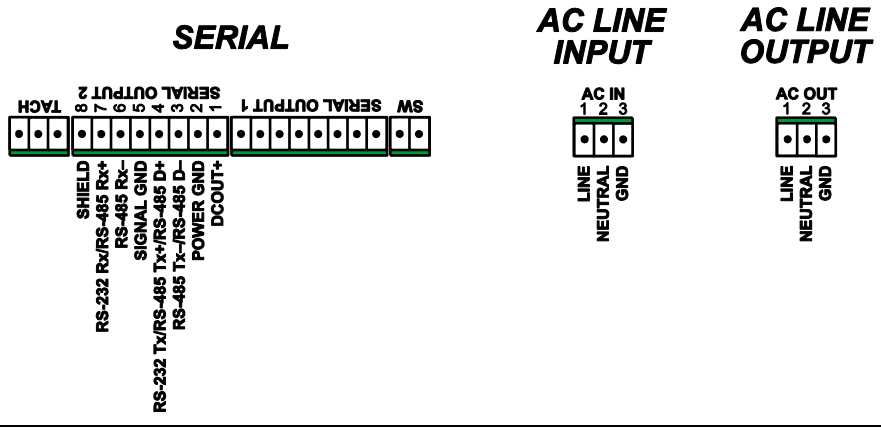
Serial Output 2 Pin	Function	Color
1	DCOUT+	BLUE
2	POWER GND	WHITE
3	RS-485–	ORANGE
4	RS-485+	GREEN
5	SIGNAL GND	RED
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.2 Freezing Rain Sensors

Table A-3. Model M482221-00 and Model 6496 Signal and Power Wiring

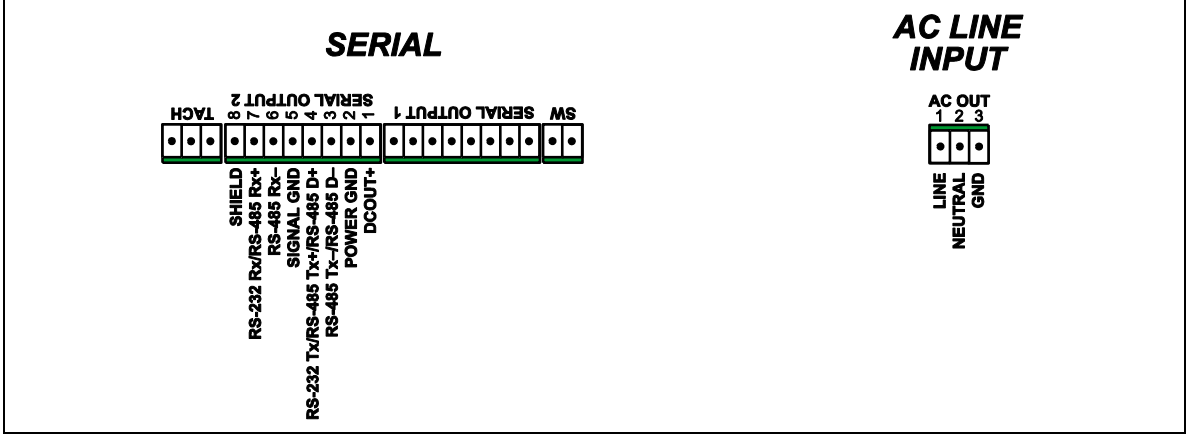
Serial Output 2 Pin	Function	Color
4	RS-232 Tx	WHITE
5	SIGNAL GND	BLACK
7	RS-232 Rx	RED
8	SHIELD	SHIELD
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



Note that the Model 6466 Freezing Rain Sensor may use the UPCM AC line output only if there are no internal enclosure heaters.

Table A-4. Model 6496 and M482221-00 Signal and Power Wiring

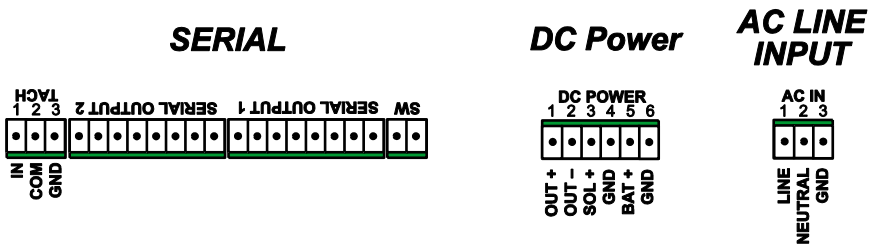
Serial Output 2 Pin	Function	Color
1	DCOUT+	RED
2	POWER GND	BLACK
5	SIGNAL GND	GREEN
6	RS-485 Rx–	BROWN
7	RS-485 Rx+	WHITE
8	SHIELD	SHIELD
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.3 Motor-Aspirated Radiation Shield (MARS)

Table A-5. Model 8191 Signal and Power Wiring

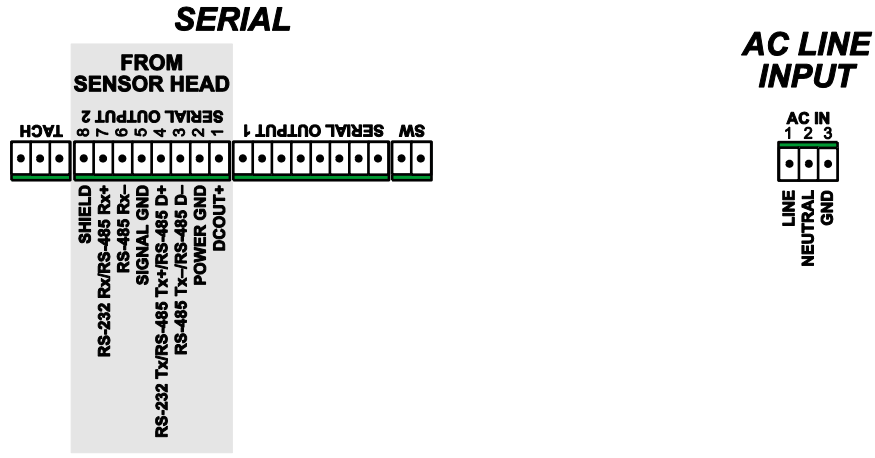
DC Power Pin	Function	Color
1	DCOUT+	RED
2	DCOUT–	BLACK
Tach Pin	**Function**	**Color**
1	IN	WHITE
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.4 Present Weather Sensors

Table A-6. Model 6490 and 6490-I Signal and Power Wiring

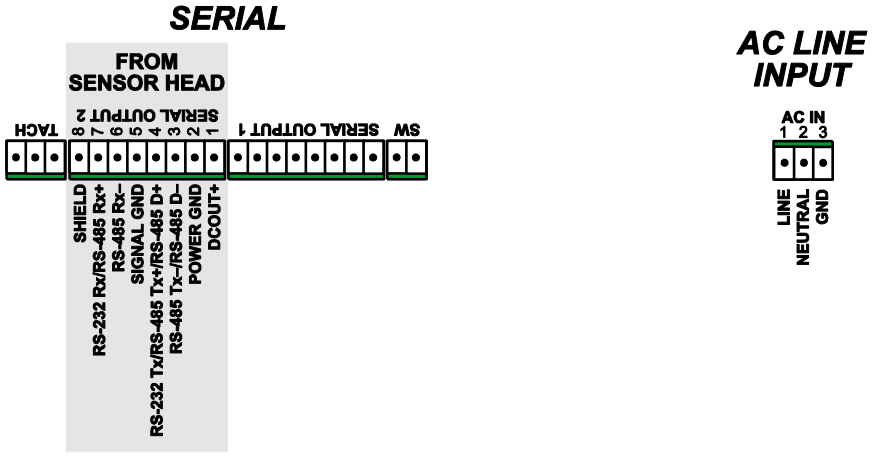
Serial Output 2 Pin	Function	Color
1	HTR + 12 V + 12 V DC	YELLOW RED
2	POWER GND	BLACK
4	SNS Rx	GREEN
5	Tx/Rx RTRN	BLACK
7	SNS Tx	WHITE
Not connected	—	BLUE BLACK
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.5 Present Weather and Visibility Sensors

Table A-7. Model 6497 and M482230-00 Signal and Power Wiring

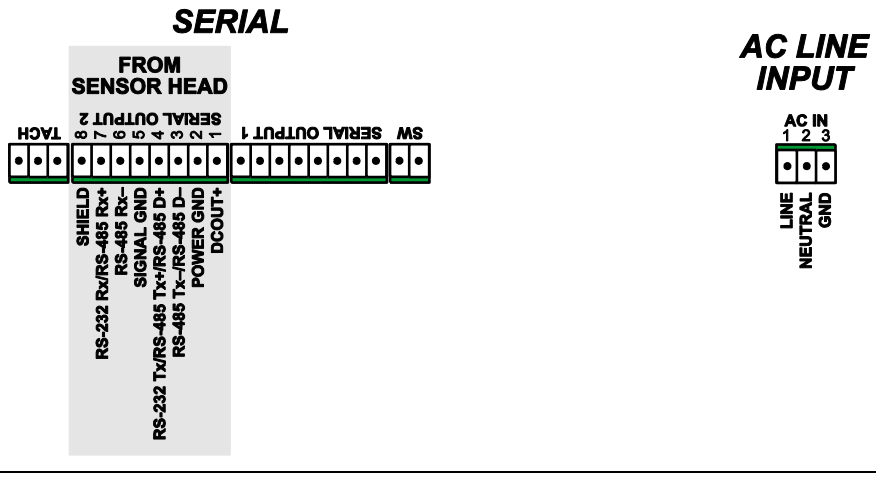
Serial Output 2 Pin	Function	Color
1	HTR + 12 V + 12 V DC	YELLOW RED
2	POWER GND	BLACK
4	SNS Rx	GREEN
5	Tx/Rx RTRN	BLACK
7	SNS Tx	WHITE
Not connected	—	BLUE BLACK
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.6 Rain Gauge

Table A-8. Model 6030 Signal and Power Wiring

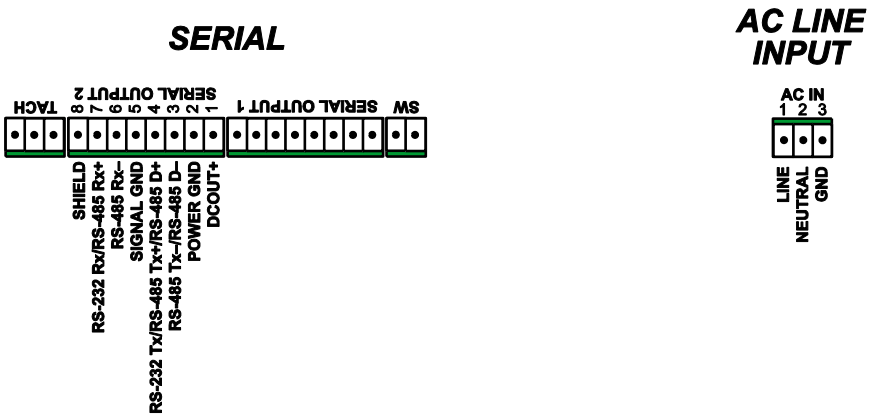
Serial Output 2 Pin	Function	Color
1	+ 12 V DC	RED
2	POWER GND	BLACK
4	SENSOR Rx	BLUE
5	SIGNAL GND	BLACK (2 wires)
7	SENSOR Tx	GREEN
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.7 Runway Surface Sensor

Table A-9. Model 6900 Signal and Power Wiring

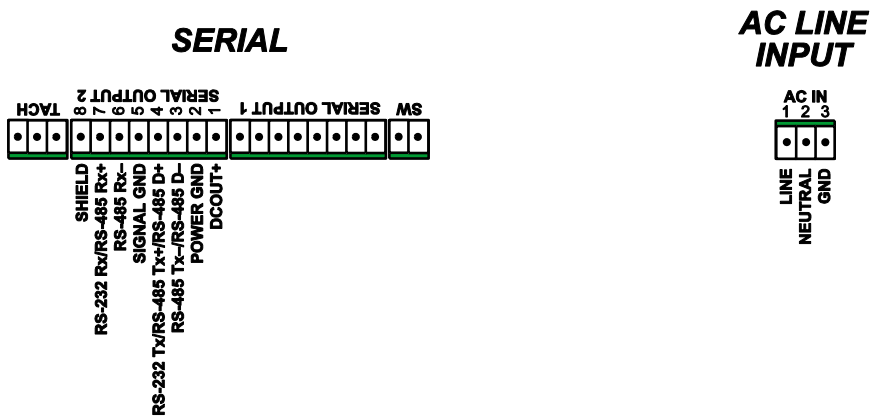
Serial Output 2 Pin	Function	Color
3	RS-485 D–	BLACK
4	RS-485 D+	WHITE
5	SIGNAL GND	RED
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.8 Temperature/Relative Humidity Probe

Table A-10. Model 5191 Signal and Power Wiring

Serial Output 2 Pin	Function	Color
1	+12 V DC	GREEN
2	POWER GND	GRAY
3	RS-485 D–	BLUE
4	RS-485 D+	RED
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



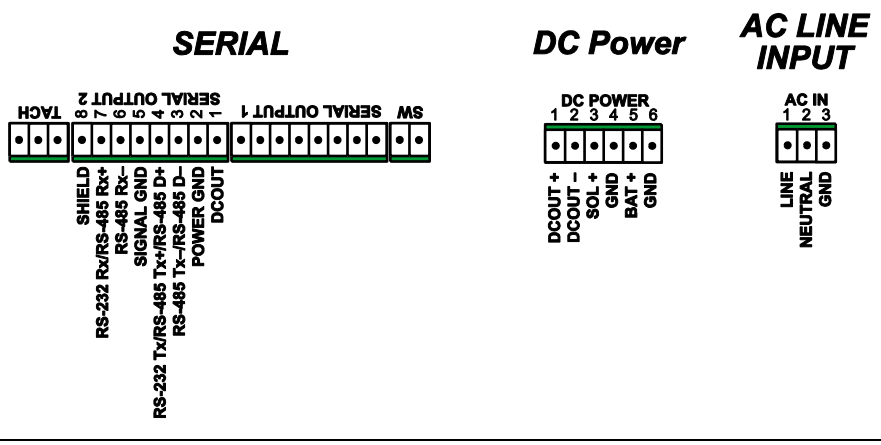
A.1.9 Thunderstorm/Lightning Detector

Table A-11. Model 6505 Signal and Power Wiring

Serial Output 2 Pin	Function	Color
3	RS485 D–	Any colors may be used as long as they match the signals on each end of the connection.
4	RS485 D+	
5	SIGNAL GND	

DC Power Pin	Function	Color
1	DCOUT +	RED
2	DCOUT –	BLACK

AC Line Input	Function	Color
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



A.1.10 Ultrasonic Wind Sensors

Table A-12. Model 2040 (No Heaters) Signal and Power Wiring

Serial Output 2 Pin	Function	Color
1	+24 V DC	RED
2	POWER GND	BLACK
3	RS-485 Rx–	BLACK
4	RS-485 Rx+	WHITE
5	SIGNAL GND	BLUE
Not connected	—	BLACK
6	RS-485 Tx–	BLACK
7	RS-485 Tx+	GREEN
8	SHIELD	SHIELD
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN

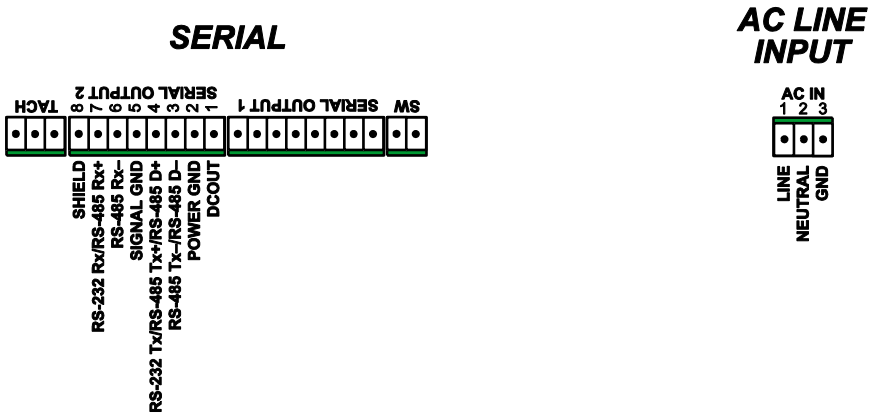
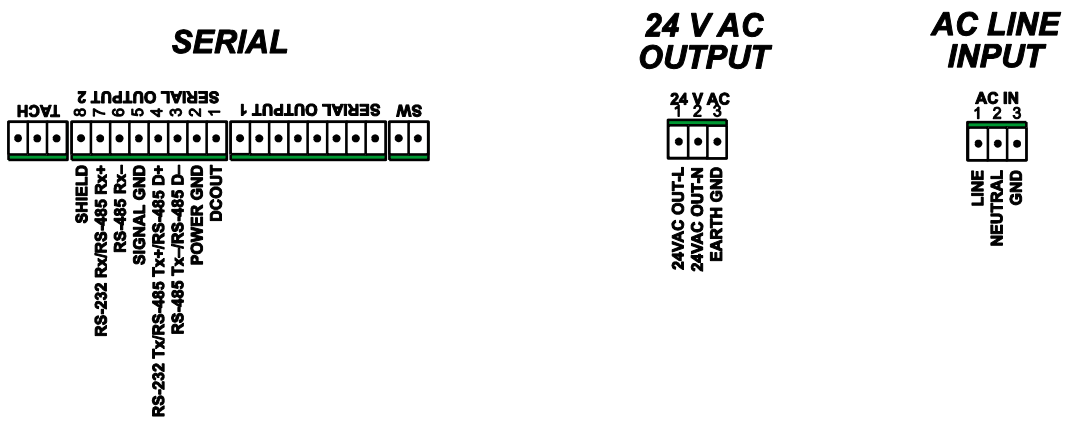


Table A-13. Model 2040/2041 with Heaters Signal and Power Wiring

Serial Output 2 Pin	Function	Color
1	+24 V DC	RED
2	POWER GND	BLACK
3	RS-485 Rx–	BLACK
4	RS-485 Rx+	WHITE
5	SIGNAL GND	BLUE
Not connected	—	BLACK
6	RS-485 Tx–	BLACK
7	RS-485 Tx+	GREEN
8	SHIELD	SHIELD
24 V AC Output	**Function**	**Color**
1	24VAC OUT-L	ORANGE BROWN YELLOW
2	24VAC OUT-N	BLACK
3	POWER GND	SHIELD
AC Line Input	**Function**	**Color**
1	HOT	BLACK
2	NEUTRAL	WHITE
3	GROUND	GREEN



All Weather Inc.
1165 National Drive
Sacramento, CA 95818
Fax: 916.928.1165
Phone: 916.928.1000
Toll Free: 800.824.5873

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