

# Met Pac

## User's Manual

CE



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# Getting Started

## Overview

The METPAC is a flexible, fixed weather station designed for intermediate-sized weather systems. It supports a variety of sensors, and can be configured easily by the user with either of two interfaces: *TAMSTerm* or the Handheld Display. *TAMSTerm* operates from a computer (such as a laptop), which plugs directly into the METPAC's main board, while the Handheld Display has configuration software built into it.

The METPAC enclosure normally mounts to the sensor tower, and sensor signal and power lines are routed into the enclosure through strain reliefs on the enclosure's underside. A series of terminal blocks on the main board provide connections for the incoming lines.

Communications between the METPAC and a host computer can be accomplished using RS-232, RS-422, or radio communications. An optional Handheld Display is also available for configuring the METPAC and for viewing data. The Handheld Display connects to the METPAC's RS-422 port.

## Supported Sensors

The MetPac supports the All Weather Inc. sensors shown in **Table 1**, and is also equipped with two auxiliary channels for connecting suitable voltage or current output sensors.

## Communications

Several communication methods are available for viewing METPAC data or transferring the data to a remote computer.

For short distance communication (<100 feet), the RS-232 port can be used to view weather data on a laptop computer running *TAMSTerm* or *MetView*, or for connecting to a nearby host computer.

For longer runs (100' to 1 mile), an RS-422 port is available for making a hardwire link to a host computer. This port can also be used to connect an optional Model 9604 Handheld Display to view data and make configuration changes on site.

**Table 1**  
**METPAC Supported Sensors**

| Table 1<br>METPAC Supported Sensors     |   |
|---|---|
| Wind Speed                              |   |
|   | Model 2030 Low Threshold Anemometer         |
|   | Model 2033 Anemometer                       |
|   | Model 2100 Skyvane                          |
|   | Ultrasonic Wind Sensor                      |
| Wind Direction                          |   |
|   | Model 2020 Low Threshold Vane               |
|   | Model 2021 Vane                             |
|   | Model 2100 Skyvane                          |
|   | Ultrasonic Wind Sensor                      |
| Temperature and Humidity                |   |
|   | Model 5190 Temperature/Humidity Probe       |
|   | Model 5140 Temperature/Humidity Probe       |
|   | Model 98006 Temperature/Humidity Sensor     |
| Temperature Only                        |   |
|   | Model 4510 Temperature Probe                |
| Motor Aspirated Radiation Shield (MARS) |   |
|   | Model 8190 MARS                             |
| Barometric Pressure                     |   |
|   | Model 98001 Barometric Pressure Sensor      |
|   | Model 98002 Barometric Pressure Sensor      |
| Precipitation                           |   |
|   | Model 6011 Tipping Bucket Rain Gauge        |
|   | Model 6021 Heated Tipping Bucket Rain Gauge |
| Solar Radiation                         |   |
|   | Model 3120 Silicon Cell Pyranometer         |
| Auxiliary Sensors                       |   |
|   | Voltage (0-5V)                              |
|   | Current (4-20mA)                            |

Radio communications can be used to communicate over long distances to a remote computer. The Model 9805 Radio Transmission kit mounts easily into the METPAC enclosure. With the Model 9806 Radio Receiver kit installed at the host computer, data can be transferred over long distances where a hardwire link is not practical. The Model 9607 Handheld Receiver can also be used. The Model 9607 contains a radio receiver, and also includes the display features of the Model 9604 Handheld Display.

### Kits

A number of kits are available to add special features to the METPAC, including solar power and battery backup. These kits are explained in detail in the *Kits* chapter of this manual.

### MetPac Checklist

A startup checklist for installing and setting up a METPAC is provided at the bottom of this page. The steps shown are explained in detail on the manual pages cited in the *Page* column of the table. The checklist should provide a convenient guide for getting your METPAC up and running the first time.

| <b>Table 2<br/>METPAC Checklist</b>  |             |
|--|-------------|
| <b>Steps</b>   | <b>Page</b> |
| <input type="checkbox"/> Unpack METPAC, sensors, and accessories.  | n/a         |
| <input type="checkbox"/> Decide on mounting method. If mounting horizontally, remove main board and move brackets. Ensure that bracket holes are weathertight. | 3           |
| <input type="checkbox"/> Check that jumpers are set properly for system configuration (sensors, communication, etc.).  | 6, 7-16     |
| <input type="checkbox"/> Install any optional kits inside METPAC enclosure.  | 32          |
| <input type="checkbox"/> Install METPAC enclosure..  | 3           |
| <input type="checkbox"/> Install sensors on tower.   | n/a         |
| <input type="checkbox"/> Wire sensors to main METPAC board, observing ESD precautions.   | 7-13        |
| <input type="checkbox"/> Wire power to main METPAC board, observing safety and ESD precautions.  | 13-15       |
| <input type="checkbox"/> Wire communications to main METPAC board, observing ESD precautions.  | 15-16       |
| <input type="checkbox"/> If using AC power, turn METPAC power switch ON.   | 14          |
| <input type="checkbox"/> Close enclosure door and screw down tightly for weatherproofing. Tighten all strain reliefs, and plug unused cable openings.          | 7           |
| <input type="checkbox"/> Apply power.  | n/a         |
| <input type="checkbox"/> Configure METPAC using TAMSTerm or Handheld Display.  | 17-26       |
| <input type="checkbox"/> Start MetView software (or equivalent) and verify that data is being received and displayed properly.                                 | 27          |

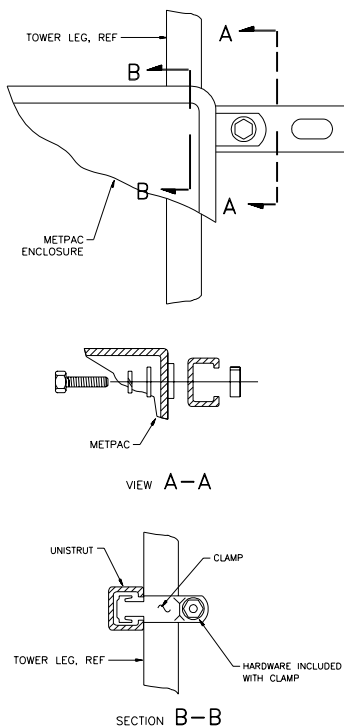
# METPAC Installation

The METPAC mounts to the tower using a Unistrut mounting kit (20520). This hardware kit includes:

- (4) 1" Unistrut clamps with hardware
- (2) 24" Unistrut brackets
- (4) hex head screws
- (4) lock washers
- (4) flat washers
- (4) nuts

## Mounting

(Note: If mounting to other than a standard All Weather Inc. tower, additional hardware may be required.)



- 1 Four mounting brackets are included with the mounting kit. They are rounded on one end (Unistrut end) and square on the other (METPAC end). Attach these four mounting brackets to the four corners of the METPAC enclosure with a single screw in each so that the rounded ends of the brackets protrude out from the sides of the enclosure.
- 2 Insert two Unistrut clamps into the center channel of one 24" Unistrut bracket.
- 3 Holding the Unistrut bracket at the height desired for the top of the enclosure and centered on the tower, slide the clamps over the tower legs and tighten.
- 4 Mount the second Unistrut bracket in the same way to the tower legs at the approximate height of the bottom of the enclosure. Do not tighten the clamps; leave them loose enough that they can be moved up or down the legs of the tower.
- 5 With an assistant holding the METPAC in position against the upper Unistrut bracket, align the METPAC's upper mounting brackets with available holes in the Unistrut bracket.
- 6 Attach each of the upper METPAC brackets to the Unistrut bracket by sliding a nut into the Unistrut channel, then inserting a hex head screw with a lock washer and flat washer attached through the METPAC and Unistrut brackets into the nut. Tighten the nuts.
- 7 Slide the lower Unistrut bracket up or down the tower legs until it aligns with the lower METPAC brackets; tighten the Unistrut clamps.
- 8 Attach each of the lower METPAC brackets to the Unistrut bracket as described in Step 5. Tighten the nuts.
- 9 When installation is complete, tighten all hardware.

# Jumpers

The METPAC is adaptable to several system configurations, the exact makeup of which is determined by jumper settings on the motherboard. **Table 3** shows the function of each of these jumpers.

Jumpers should be set and double-checked to ensure their placement matches the required system configuration before proceeding with wiring of the system.

*Note: The digital board must be removed to gain access to jumpers JP5-JP9.*

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**CAUTION:**

*Always use static electricity precautions when changing jumpers or touching any of the printed circuit boards.*



| <b>Table 3<br/>MetPac Jumper Settings</b> |                                       |   |   |
|---|---------------------------------------|---|---|
| <b>Jumper</b>                             | <b>Function</b>                       | <b>Configurations</b>   | <b>Default Configuration</b>                                    |
| JP1 & JP2                                 | RS485                                 | <b>Installed:</b> End of line termination<br><b>Removed:</b> No end of line termination | Not Used<br>Don't Care<br>(shipped installed for extra jumpers) |
| JP3 & JP4                                 | Auxiliary Inputs 2 & 1 (respectively) | <b>Shunt 1&amp;2:</b> Voltage In (0-5V)<br><b>Shunt 2&amp;3:</b> Current In (4-20 mA)   | Not Used<br>(shipped installed between 1&2)                     |
| JP5                                       | Wind Speed                            | <b>Shunt 1&amp;2:</b> Ultrasonic, 2100<br><b>Shunt 2&amp;3:</b> 2030, 2033              | 2&3 Shunted   |
| JP6                                       | Relative Humidity                     | <b>Installed:</b> 5190 sensor<br><b>Removed:</b> 4510, 5140, 98006                      | Removed   |
| JP7                                       | Relative Humidity                     | <b>Installed:</b> 98006<br><b>Removed:</b> 4510, 5140, 5190                             | Removed   |
| JP8                                       | Temperature                           | <b>Shunt 1&amp;2:</b> 98006, 4510, 5140<br><b>Shunt 2&amp;3:</b> 5190                   | 1&2 Shunted   |
| JP9                                       | Wind Direction                        | <b>Shunt 1&amp;2:</b> 2100, 2020, 2021<br><b>Shunt 2&amp;3:</b> Ultrasonic              | 1&2 Shunted   |
| JP10                                      | RH/Temp.                              | <b>Shunt 1&amp;2:</b> 98006<br><b>Shunt 2&amp;3:</b> 4510, 5140, 5190                   | 2&3 Shunted   |

# Wiring

In the sections below, wiring diagrams for a given sensor or other connection are shown in the left column alongside the text describing the required connections. Necessary jumper settings are also shown, when applicable. Jumpers that should be removed are shown connected to a single pin, with the other half of the jumper hanging off to the side, unconnected. This convention is used because this is the most convenient method of storing jumpers that are not installed. (Note: The digital board must be removed to gain access to jumpers JP5-JP9.)

When looking at the terminal blocks from an angle, a parallax effect can sometimes occur, causing the label on the surface of the PCB for a given pin to appear to be associated with a different pin. To avoid this, try to look at the terminals straight on, and always double-check all wiring before applying power.

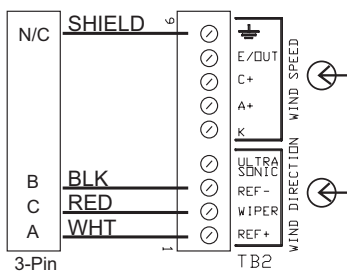
Some of the strain reliefs can accommodate more than one sensor cable. These have two or four cable channels cut into the rubber grommet, sealed with plastic dowels. You can use some or all of these channels, depending on cable thickness. Be sure to replace the plastic dowel in any unused channels, and tighten down the strain reliefs to compress the grommets and ensure a tight seal. After all wiring is completed, screw the METPAC cover down tight to ensure it is fully sealed.

When wiring up the METPAC, refer to Figure 1 on the next page for the locations of jumpers, terminal blocks, and other components on the METPAC's main board.

## Wind Sensors

Wind direction and wind speed sensors connect to TB2 and TB3 on the METPAC motherboard. Two wind direction models are supported: the Model 2020 Micro Response Vane, and the Model 2021 Wind Vane. Two wind speed models are supported: the Model 2030 Micro Response Anemometer, and the Model 2033 Anemometer. The Model 425A and 425AH Ultrasonic Wind Sensor and the Model 2100 Skyvane combine wind direction and wind speed measurement in a single sensor.

### Models 2020 and 2021

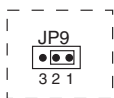


The Models 2020 and 2021 are wired identically to TB2 as follows:

- 1 Connect the WHITE wire to TB2, pin 1 (REF +).
- 2 Connect the RED wire to TB2, pin 2 (WIPER).
- 3 Connect the BLACK wire to TB2, pin 3 (REF -).
- 4 Connect the shield wire to TB2, pin 9 (≡).

### Jumpers

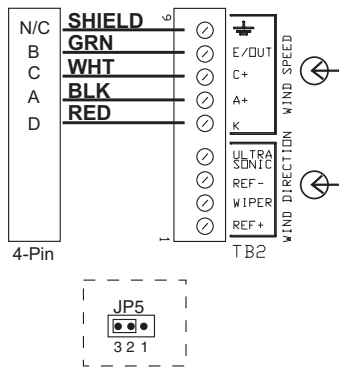
Use the following jumper configuration when a Model 2020 or Model 2021 Vane is used.



**JP9** Install on pins 1 and 2



*Models 2030 and 2033*



The Models 2030 and 2033 are wired identically as follows:

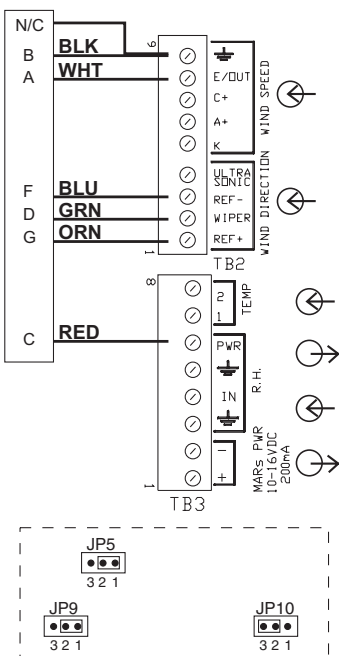
- 1 Connect the RED wire to TB2, pin 5 (K).
- 2 Connect the BLACK wire to TB2, pin 6 (A+).
- 3 Connect the WHITE wire to TB2, pin 7 (C+).
- 4 Connect the GREEN wire to TB2, pin 8 (E/OUT).
- 5 Connect the shield wire to TB2, pin 9 ( $\equiv$ ).

**Jumpers**

Use the following jumper configuration when a Model 2020 or Model 2021 Vane is used.

**JP5** Install on pins 2 and 3

*Model 2100 Skyvane*



The Model 2100 Skyvane measures both wind speed and wind direction. The signal lines connect to TB2, pins 1-3, 8, and 9 on the METPAC motherboard. Power to the sensor is obtained at TB3, pin 6.

- 1 Connect the ORANGE wire to TB2, pin 1 (REF +).
- 2 Connect the GREEN wire to TB2, pin 2 (WIPER).
- 3 Connect the BLUE wire to TB2, pin 3 (REF -).
- 4 Connect the WHITE wire to TB2, pin 8 (E/OUT).
- 5 Connect the BLACK wire to TB2, pin 9 ( $\equiv$ ).
- 6 Connect the RED wire to TB3, pin 6 (PWR).

**Jumpers**

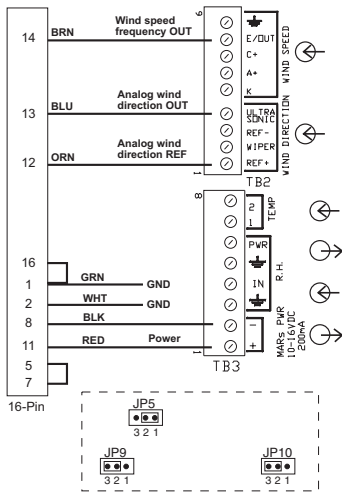
Use the following jumper configuration when a Model 2100 Skyvane is used.

**JP5** Install on pins 1 and 2

**JP9** Install on pins 1 and 2

**JP10** Install on pins 2 and 3

### Ultrasonic Wind Sensor



The Ultrasonic Wind Sensor measures both wind speed and wind direction. The signal lines connect to TB2. Power to the sensor is obtained at TB3, pin 6.

- 1 Connect the wind speed frequency out wire to TB2, pin 8 (E/OUT).
- 2 Connect the analog wind direction out wire to TB2, pin 4 (ULTRASONIC).
- 3 Connect the analog wind direction reference wire to TB2, pin 1 (REF+).
- 4 Connect the power wire to TB3, pin 6 (PWR).
- 5 Connect the 3 ground wires to any available ground terminals ( $\equiv$ ).

#### Jumpers

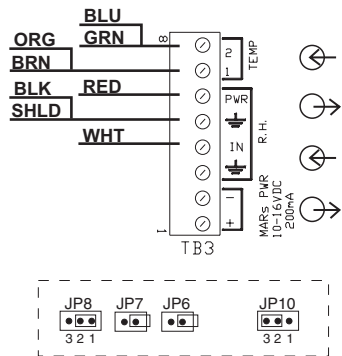
Use the following jumper configuration when an Ultrasonic Wind Sensor is used.

- JP5** Install on pins 1 and 2
- JP9** Install on pins 2 and 3
- JP10** Install on pins 2 and 3

### Temperature/Humidity

#### Model 5140

The METPAC system supports the Model 5140, Model 5190, and Model M403324 Temperature/Humidity Probes, as well as the Model 4510 Temperature Probe. These probes connect to TB3 on the METPAC motherboard.



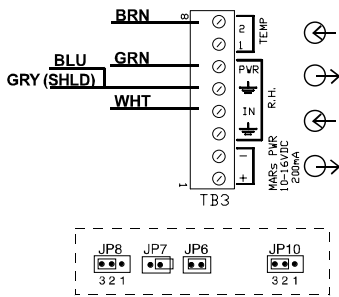
- 1 Connect the WHITE wire to TB3, pin 4 (R.H. IN).
- 2 Connect both the BLACK and SHIELD wires to TB3, pin 5 ( $\equiv$ ).
- 3 Connect the RED wire to TB3, pin 6 (PWR).
- 4 Connect both the BROWN and ORANGE wires to TB3, pin 7 (TEMP 1).
- 5 Connect both the GREEN and BLUE wires to TB3, pin 8 (TEMP 2).

#### Jumpers

Use the following jumper configuration when a Model 5140 Temperature/Humidity Probe is used.

- JP6** Remove
- JP7** Remove
- JP8** Install on pins 1 and 2
- JP10** Install on pins 2 and 3

Model 5190



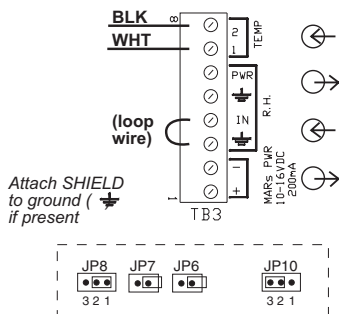
- 1 Connect the WHITE wire to TB3, pin 4 (R.H. IN).
- 2 Connect both the BLUE and GRAY wires to TB3, pin 5 ( $\equiv$ ).
- 3 Connect the GREEN wire to TB3, pin 6 (PWR).
- 4 Connect the BROWN wire to TB3, pin 8 (TEMP 2).

**Jumpers**

Use the following jumper configuration when a Model 5190 Temperature/Humidity Probe is used.

|             |                         |
|-------------|-------------------------|
| <b>JP6</b>  | Install                 |
| <b>JP7</b>  | Remove                  |
| <b>JP8</b>  | Install on pins 2 and 3 |
| <b>JP10</b> | Install on pins 2 and 3 |

Model 4510



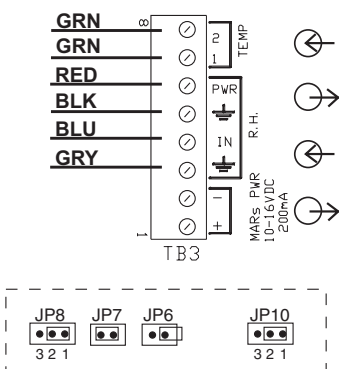
- 1 Connect the WHITE wire to TB3, pin 7 (TEMP 1).
- 2 Connect both the BLACK wire to TB3, pin 8 (TEMP 2).
- 3 Connect a short loop of wire between TB3, pins 3 ( $\equiv$ ) and 4 (R.H. IN).
- 4 If a shield wire is included, connect it to any available ground terminal ( $\equiv$ ).

**Jumpers**

Use the following jumper configuration when a Model 4510 Temperature Probe is used.

|             |                         |
|-------------|-------------------------|
| <b>JP6</b>  | Remove                  |
| <b>JP7</b>  | Remove                  |
| <b>JP8</b>  | Install on pins 1 and 2 |
| <b>JP10</b> | Install on pins 2 and 3 |

Model 98006



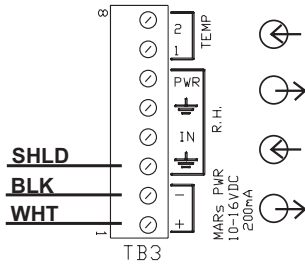
- 1 Connect the GRAY wire to TB3, pin 3 ( $\equiv$ ).
- 2 Connect the BLUE wire to TB3, pin 4 (R.H. IN).
- 3 Connect the BLACK wire to TB3, pin 5 ( $\equiv$ ).
- 4 Connect the RED wire to TB3, pin 6 (R.H. PWR).
- 5 The sensor's two GREEN wires are interchangeable. Connect one GREEN wire to TB3, pin 7 (TEMP 1), and the other GREEN wire to TB3, pin 8 (TEMP 2).

**Jumpers**

Use the following jumper configuration when a Model 98006 Temperature/Humidity sensor is used.

|             |                         |
|-------------|-------------------------|
| <b>JP6</b>  | Remove                  |
| <b>JP7</b>  | Install                 |
| <b>JP8</b>  | Install on pins 1 and 2 |
| <b>JP10</b> | Install on pins 1 and 2 |

## Motor Aspirated Radiation Shield (MARS)



A Motor Aspirated Radiation Shield, or MARS, is often used with temperature and humidity probes to minimize the effects of wind, precipitation, and solar heating. If a MARS is used, wire it as follows.

- 1 Connect the WHITE wire to TB3, pin 1 (+).
- 2 Connect both the BLACK wire to TB3, pin 2 (-).
- 3 Connect the SHIELD wire to TB3, pin 3 (-).

## Barometric Pressure

The METPAC system supports the Models 98001 and 98002 Barometric Pressure sensors. These sensors are fitted with connectors that plug into mating connectors on the METPAC motherboard.

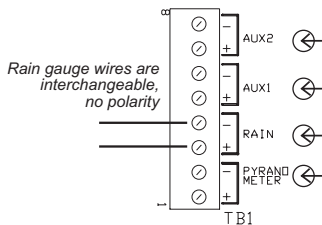
### Model 98001

The connector from the Model 98001 Barometric Pressure sensor plugs into connector J3 (B.P. MODEL 98001) on the METPAC motherboard.

### Model 98002

The connector from the Model 98002 Barometric Pressure sensor plugs into connector J4 (B.P. MODEL 98002) on the METPAC motherboard.

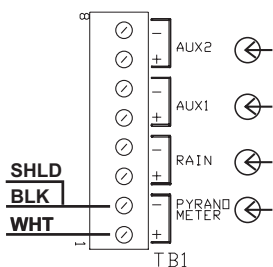
## Rain Gauges



The METPAC supports the 6011 series of tipping bucket rain gauges, as well as the 6021 series of heated tipping bucket rain and snow gauges. These sensors have two-wire cables that connect to TB1 on the METPAC motherboard. There is no polarity to these lines, so the two wires can be connected interchangeably to the (RAIN +) terminal (TB1, pin 3) and (RAIN -) terminal (TB1, pin 4).

## Solar Radiation

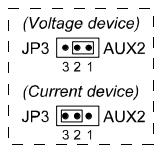
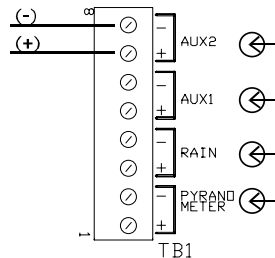
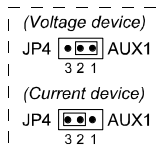
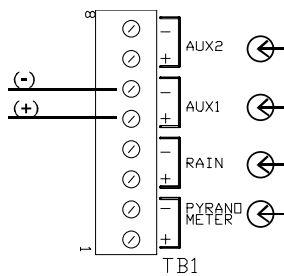
### Model 3120



The Model 3120 Silicon Cell Pyranometer can be used with a METPAC to measure global solar radiation. The three wires from the sensor connect to TB1, pins 1 and 2.

- 1 Connect the WHITE wire to the (PYRANOMETER -) terminal (TB1, pin 1).
- 2 Connect the BLACK and SHIELD wires to the (PYRANOMETER +) terminal (TB1, pin 2).

## Auxiliary Sensors



Inputs for two auxiliary voltage (0-5V) or current (4-20mA) sensors are available at TB1 on the METPAC motherboard. There is a (+) and (-) terminal for each of these inputs: When connecting auxiliary sensors, observe polarity as necessary.

Jumpers JP4 (AUX 1) and JP3 (AUX 2) must be set to agree with the type of sensor (voltage or current) connected to the auxiliary inputs.

- For voltage output sensors, install the appropriate jumper (JP4 for AUX 1, JP3 for AUX 2) between pins 1 and 2.
- For current output sensors, install the appropriate jumper (JP4 for AUX 1, JP3 for AUX 2) between pins 2 and 3.

## Power Connections

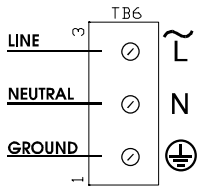
The METPAC can operate from AC or DC power, or from an optional solar panel or backup battery. AC power connects to terminal block TB6, while the DC, solar, and battery power connections are all made at TB4.

### AC Power

To connect AC power to the METPAC, connect as described below to terminal block TB6 only.

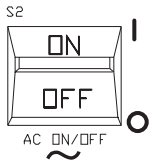
#### CAUTION:

- **Never connect live power to the unit. Make sure main power is OFF before connecting.**
- **When AC power is connected, terminal block TB6 is always "hot", regardless of the state of power switch S2 or fuse F1.**
- **Return the safety cover plate after connecting power.**
- **Power to the unit (AC/DC) should be OFF when servicing or connecting sensors.**
- **Make sure the line voltage switch (S1) is set for the correct input voltage (115V or 230V) before proceeding.**
- **Replace fuses only with those of the same type.**



- 1 Connect the incoming hot wire to TB6, pin 3 (L).
- 2 Connect the incoming neutral wire to TB6, pin 2 (N).
- 3 Connect the incoming ground wire to TB6, pin 1 (≡).

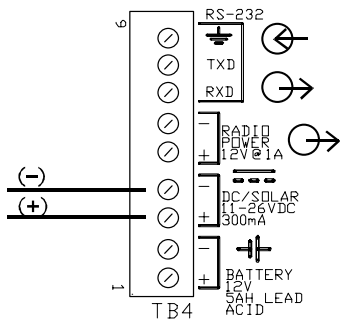
**Power On/Off Switch**



The power on/off switch is used in AC applications only. When operating from AC power, power is ON when the lever is up. This switch has no effect when using a DC power source.

**Note:** Turn power switch on before closing and fastening door.

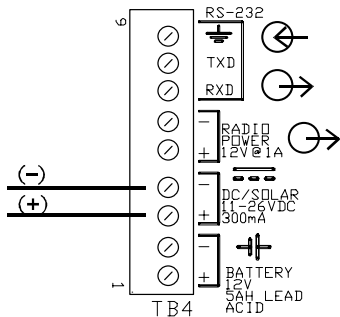
**DC Power**



The DC power input (TB4, pins 3 and 4) accepts an input voltage of 11-26VDC. (The input is reverse polarity protected, to prevent damage to the circuitry from miswiring.) To connect DC power to the METPAC:

- 1 Connect the incoming (+) line to TB4, pin 3 on the METPAC's motherboard.
- 2 Connect the incoming (-) line to TB4, pin 4 on the METPAC's motherboard.

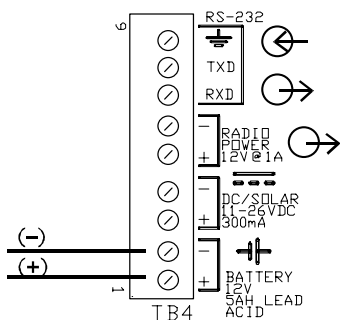
**Solar Power**



Optional solar power kits are available for the METPAC for installations where operating from solar power is practical (see **Kits** for details). When using solar power, a rechargeable backup battery is also used to power the system when solar power is not available (at night, for instance). This input accepts a 11-26VDC (peak) input voltage. Connect solar power to the METPAC as follows.

- 1 Connect the incoming (+) line to TB4, pin 3 on the METPAC's motherboard.
- 2 Connect the incoming (-) line to TB4, pin 4 on the METPAC's motherboard.

**Battery Backup Power**



An optional battery backup kit is available for the METPAC to power AC- or DC-powered systems during short power outages (see **Kits** for details). The battery kit is required in solar power applications to power the system when solar power is not available (at night, for instance), and when an optional radio kit (9805) is used. Connect battery power to the METPAC as follows.

- 1 Connect the incoming (+) line to TB4, pin 1 on the METPAC's motherboard.
- 2 Connect the incoming (-) line to TB4, pin 2 on the METPAC's motherboard.

## Radio Power

Power to the optional Model 9805 radio transmitter is obtained at TB4 on the METPAC's motherboard. Complete instructions for wiring the radio are provided in the next section, *Communications*.

## Communications

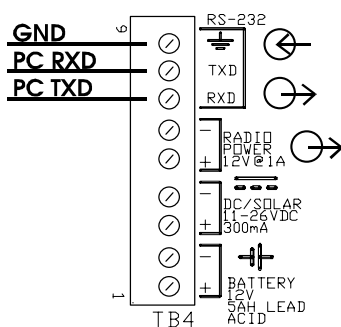
Several communication methods are available for viewing METPAC data or transferring the data to a remote computer.

For short distance communication (<100 feet), the RS-232 port can be used. This can be used to view the data on a laptop computer running *TAMS-Term* or *MetView*, or for connecting to a nearby host computer.

For longer runs (100' to 1 mile), an RS-422 port is available. This can be used for making a hardwire link to a host computer. In this arrangement, a Model 20547 (115V) or 20548 (230V) RS-422-to-RS-232 converter is required to make the transition between RS-422 and RS-232, the standard input for computer serial ports (see the *Kits* chapter of this manual for details). The METPAC's RS-422 port can also be used to connect an optional Model 9604 Handheld Display for viewing data and making configuration changes on site.

Radio communications can be used to communicate over long distances to a remote computer. The Model 9805 Radio Transmission kit mounts easily into the METPAC enclosure. With the Model 9806 Radio Receiver kit installed at the host computer, or using the Model 9607 Handheld Receiver, data can be transferred over long distances where a hardwire link is not practical.

## RS-232

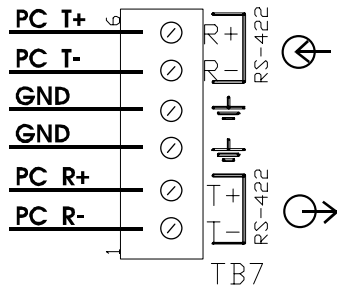


*Note: The DTR-DSR and CTS-RTS connections may need to be looped back at the PC end. See wiring diagram in **Drawings** chapter.*

The RS-232 communications connection is made at TB4 on the METPAC's motherboard. The computer end of the cable can be fitted with either a DB-25 or DB-9 connector. Wiring for both types of connector are shown on the **RS-232 Wiring Diagram** in the *Drawings* chapter of this manual. Refer to that drawing while following the instructions below.

- 1 The connection designations on the motherboard's RS-232 terminal block (TB4) refer to the pin functions on the METPAC end of the connection. In other words, TXD refers to the METPAC's transmit line; the line designated as receive (RXD) at the PC end of the connection should be connected to this terminal (TB4, pin 8).
- 2 Connect the line designated as transmit (TXD) at the PC end of the connection to the terminal on the METPAC's motherboard labeled RXD (TB4, pin 7).
- 3 Connect the RS-232 cable's ground wire to TB4, pin 9 (labeled  $\equiv$ ).

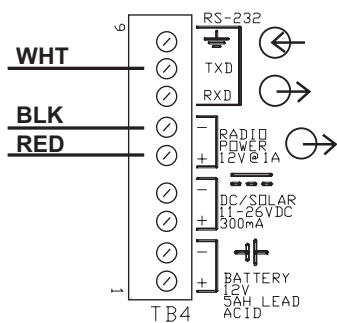
**RS-422**



The RS-422 communications connection is made at TB7 on the METPAC's motherboard.

- 1 The connection designations on the motherboard's RS-422 terminal block (TB7) refer to the pin functions on the METPAC end of the connection. In other words, T refers to the METPAC's transmit lines; the lines designated as receive at the PC end of the connection should be connected here.
- 2 Connect the line designated as Transmit (+) at the PC end of the connection to the terminal on the METPAC's motherboard labeled R+ (TB7, pin 6).
- 3 Connect the line designated as Transmit (-) at the PC end of the connection to the terminal on the METPAC's motherboard labeled R- (TB7, pin 5).
- 4 Connect the line designated as Receive (+) at the PC end of the connection to the terminal on the METPAC's motherboard labeled T+ (TB7, pin 2).
- 5 Connect the line designated as Receive (-) at the PC end of the connection to the terminal on the METPAC's motherboard labeled T- (TB7, pin 1).
- 6 Connect the RS-422 cable's ground wires to TB7, pins 3 and 4 (labeled  $\equiv$ ).
- 7 For long cable runs (>1,000 feet), install the end-of-line termination jumpers at JP1 and JP2.

**Radio**



The optional Model 9805 radio transmitter comes with a combined power and data cable (M491535). The radio end of the cable is fitted with a DB9 connector, while the METPAC end is unterminated. There are four wires on the unterminated METPAC end—two data wires (TXD and RXD) and two power wires (V+ and GND). The data wires connect to the RS-232 terminals at TB4 on the METPAC motherboard, and the power wires to the RADIO POWER terminals at TB4.

- 1 Connect the WHITE wire (TXD) to TB4, pin 8 (RS-232 TXD).
- 2 Connect the RED (V+) wire to TB4, pin 5 (RADIO POWER 12V @ 1A, +).
- 3 Connect the BLACK (GND) wire to TB4, pin 6 (RADIO POWER 12V @ 1A, -).
- 4 Leave the GREEN wire unconnected.

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# TAMSTerm

*TAMSTerm* is a setup, viewing, and configuration program that allows the user to change METPAC settings from a remote computer communicating over a hardwire link, or from an on-site computer (such as a laptop) connected directly to terminal block TB7 on the METPAC's main board. *TAMSTerm* can also be used to view current weather data as explained in the chapter titled *Viewing METPAC Data*.

## Installing TAMSTerm

*TAMSTerm* comes on a single floppy disk. If you are using *MetView*, *TAMSTerm* is installed automatically with *MetView*. To install *TAMSTerm* from floppy disk:

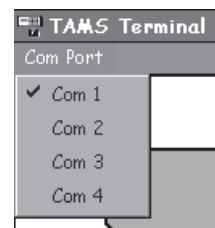
- 1 Insert the *TAMSTerm* disk.
- 2 Double-click the **Setup** icon, or select Run from the Windows File or Start menu, then type “A:\setup”.

## Using TAMSTerm to Configure a System

*TAMSTerm* simulates operation of the optional Handheld Display (Model 9604), and can be used to configure a system when a Handheld Display is not part of a system. On the *TAMSTerm* keypad, a key press is accomplished by clicking the mouse on that key. For complete instructions in configuring a MetPac using *TAMSTerm*, see the chapter titled *Configuring A METPAC*.

## Setting the Com Port

Above the *TAMSTerm* display screen is a menu bar with a single option: **Com Port**.



Clicking on this option opens up a pull-down menu that allows you to specify the serial port through which the computer is connected to the METPAC. The currently selected port is marked with a check mark. To change the active serial port, click the port number on the pull-down menu.

# Configuring a METPAC

Since a number of METPAC configurations are possible (systems with different sensors or communication links, among other things) each METPAC must be programmed with its specific configuration before being put into use. This is accomplished through the METPAC's Setup program using one of two methods: The optional 9604 Handheld Display (shown in **Figure 2**), which connects directly to the METPAC's main board; or *TAMSTerm*, a software program that simulates operation of the Handheld Display. Both interfaces use identical commands, and operate similarly.

## Handheld Display

The Model 9604 Handheld Display consists of a 16-key keypad with LCD and backlight, and is used to configure a METPAC and to view current weather data.

### Connection

The Model 9604 Handheld Display connects to terminal block TB7 on the METPAC's main board using a Model M491537 cable. The cable's round con-

necter plugs into the Handheld Display's RS-485 connector (bottom connector) and the bare leads at the cable's other end connect to TB7 as follows:

- RED wire (R+) to TB7, pin 6
- WHITE wire (R-) to TB7, pin 5
- BLACK wire (GND) to TB7, pin 3 or 4
- BROWN wire (T+) to TB7, pin 2
- GREEN wire (T-) to TB7, pin 1

This cable may be left connected to TB7 and stored inside the MetPac enclosure for periodic use. When not in use, the Handheld Display should be disconnected from the cable to reduce power usage.

### Using the Handheld Display Keypad

The Handheld Display keypad is used to navigate through the Setup program and to switch between the various data displays. When configuring a METPAC using the Handheld Display, the SETUP, ENTER, ARROW, and number keys are used to navigate through the Setup program and to enter configuration values as shown in **Figure 2**.

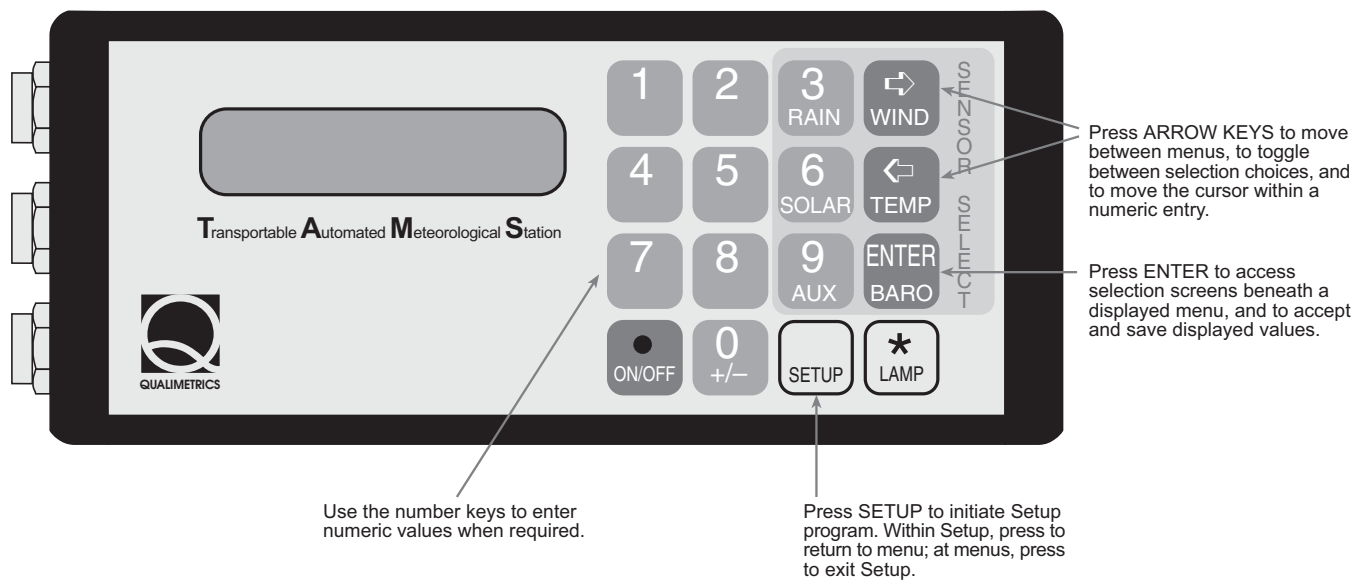


Figure 2  
Setup key functions

## TAMSTerm

*TAMSTerm* simulates operation of the optional Handheld Display (Model 9604), and can be used when a Handheld Display is not part of a system. *TAMSTerm* is included with the *MetView* software package, or it can be purchased separately from All Weather Inc.

## Setup

The *TAMSTerm* and Handheld Display Setup programs are identical, and are navigated through in the same way, as shown below. When using *TAMSTerm*, key presses are accomplished by clicking the mouse on a given key (computer keyboard or keypad entries will have no effect).

*Note: The METPAC is set to a default configuration at the factory based on information provided by the customer, and often will not need reconfiguration.*

## Setup Menu

The Setup program consists of six menus:

- *Change Time/Date*
- *Change Data Output*
- *Change Units*
- *Change Equipment*
- *Diagnostic Tests*
- *Save Configuration*

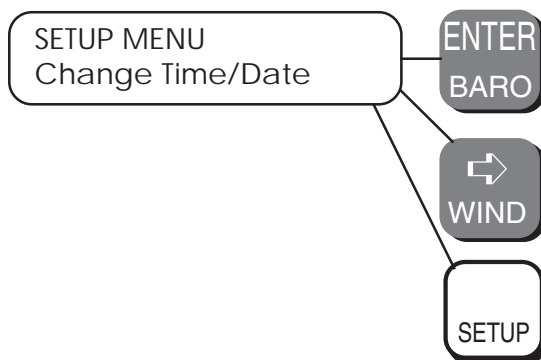
The following section provides a guide for entering Setup data. Each screen is shown in the order in which it appears in the Setup program, along with the keys that can be used at that screen and their respective functions.

### The Setup Program



*Press the SETUP key to enter the Setup program.*

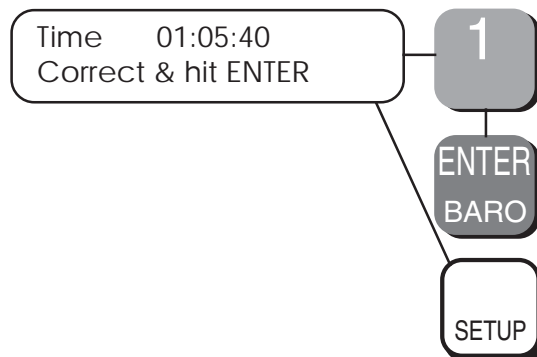
*The Change Time/Date menu lets you adjust the MetPac's clock to read the correct time and date.*



*Press ENTER to change the time or date.*

*Press the RIGHT ARROW KEY to advance to the Change Data Output menu.*

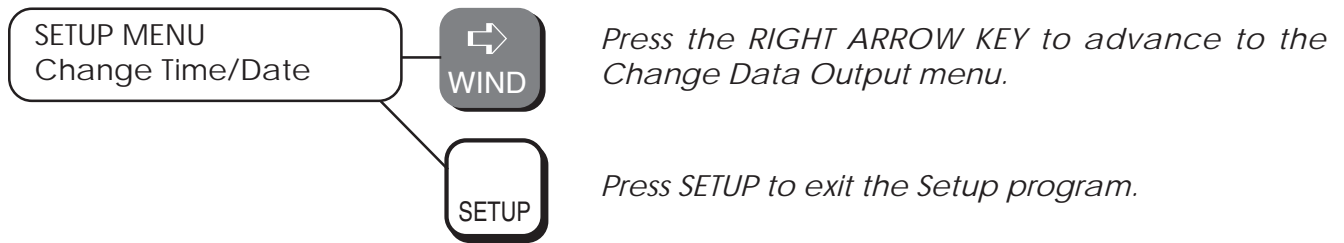
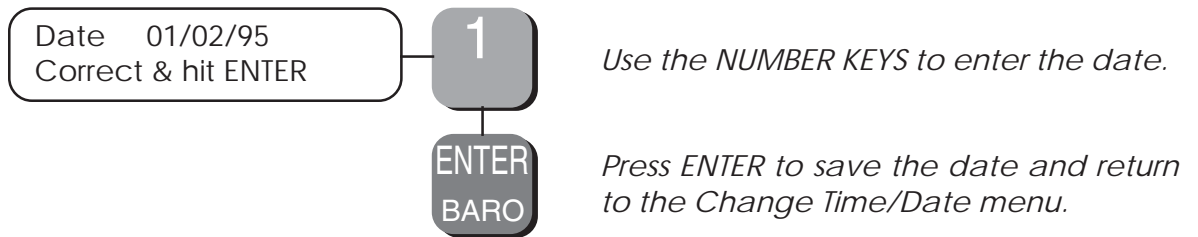
*Press SETUP to exit the Setup program.*



*Use the NUMBER KEYS to enter the time.*

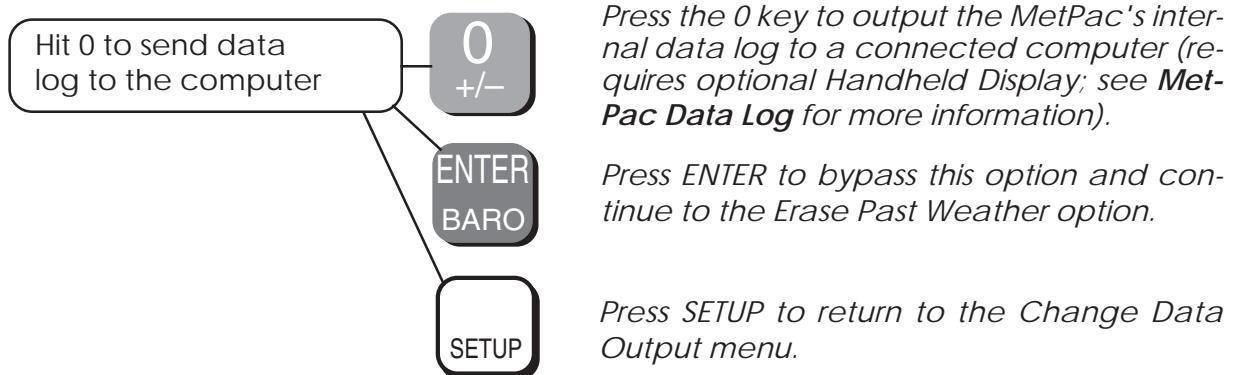
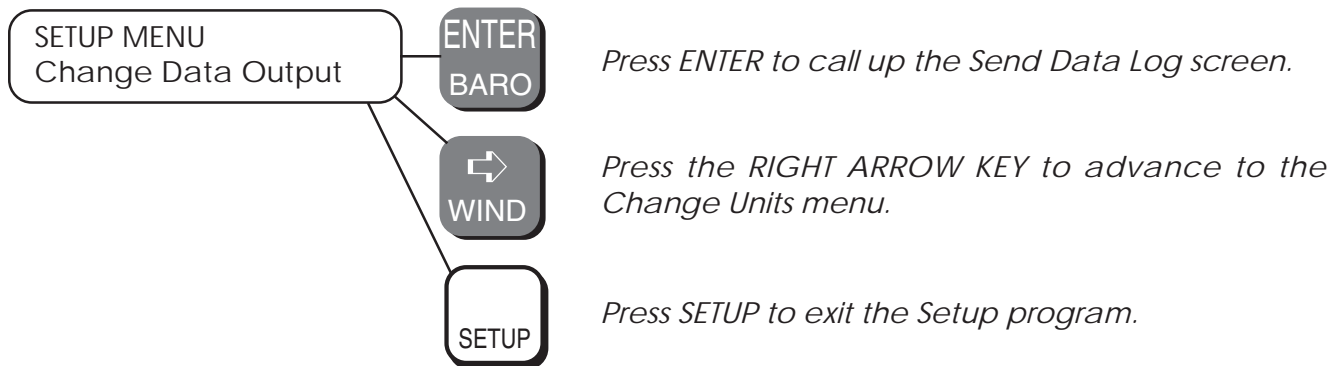
*Press ENTER to save the time and continue to the Date screen.*

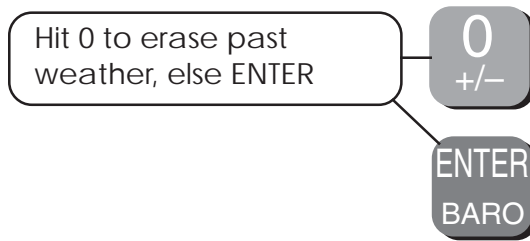
*Press SETUP to return to the Change Time/Date menu.*



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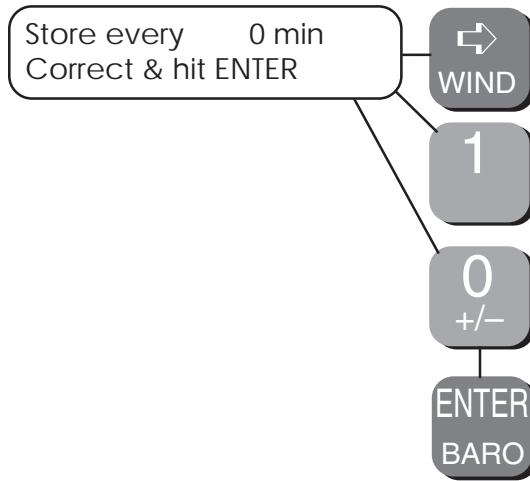
*The Change Data Output menu lets you control the MetPac's automatic data storage and output.*





Press the 0 key to erase the MetPac's internal data log (see **MetPac Data Log** for more information).

Press ENTER to bypass this option and continue to the Storage Timing option.

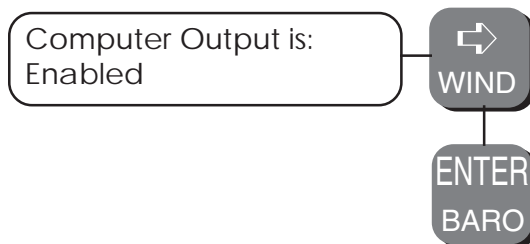


Press the RIGHT or LEFT ARROW KEY to toggle between Minutes and Hours.

Use the NUMBER KEYS to specify how often data will be automatically stored in the MetPac's internal data log .

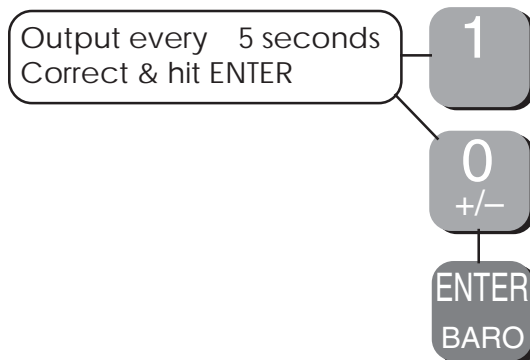
Enter 0 to disable automatic data storage.

Press ENTER to save the displayed value and continue to the Computer Output option.



Press the RIGHT or LEFT ARROW KEY to toggle between Enabled and Disabled.

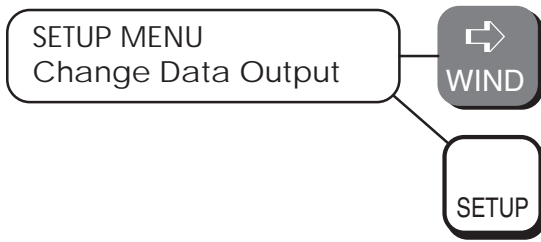
Press ENTER. If Disabled is selected, you will be returned to the Change Data Output menu. If Enabled is selected, the Output Interval screen will appear.



Use the NUMBER KEYS to specify how often, in seconds, data will be automatically output to a connected computer.

Enter 0 to disable automatic data output.

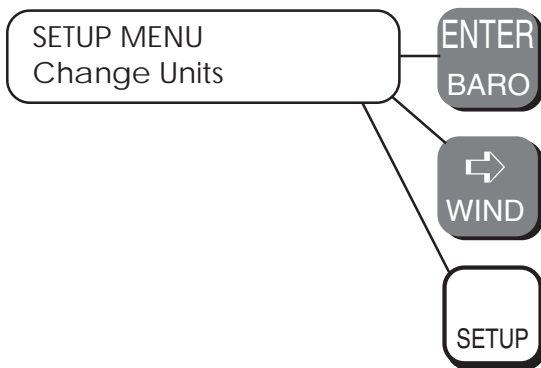
Press ENTER to save the displayed value and return to the Change Data Output menu.



Press the RIGHT ARROW KEY to advance to the Change Units menu.

Press SETUP to exit the Setup program.

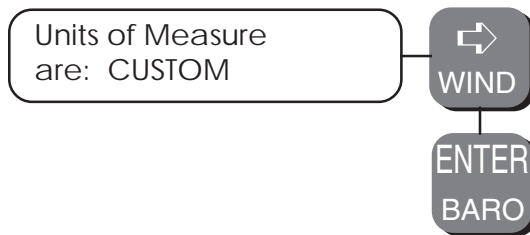
The Change Units menu lets you set the units of measure in which data for each sensor will be displayed and recorded.



Press ENTER to call up the Units of Measure screen.

Press the RIGHT ARROW KEY to advance to the Change Equipment menu.

Press SETUP to exit the Setup program.

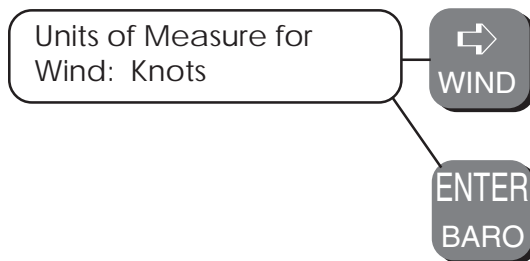


Press the RIGHT or LEFT ARROW KEY to change to: ENGLISH, METRIC, or CUSTOM.

Press ENTER to select the units of measure system shown on the display.

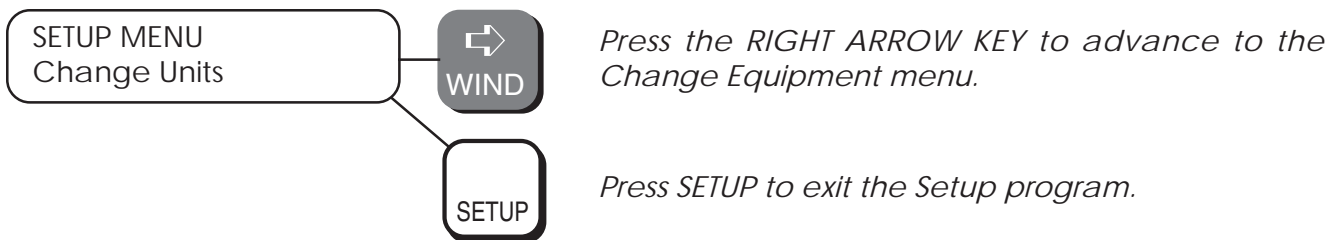
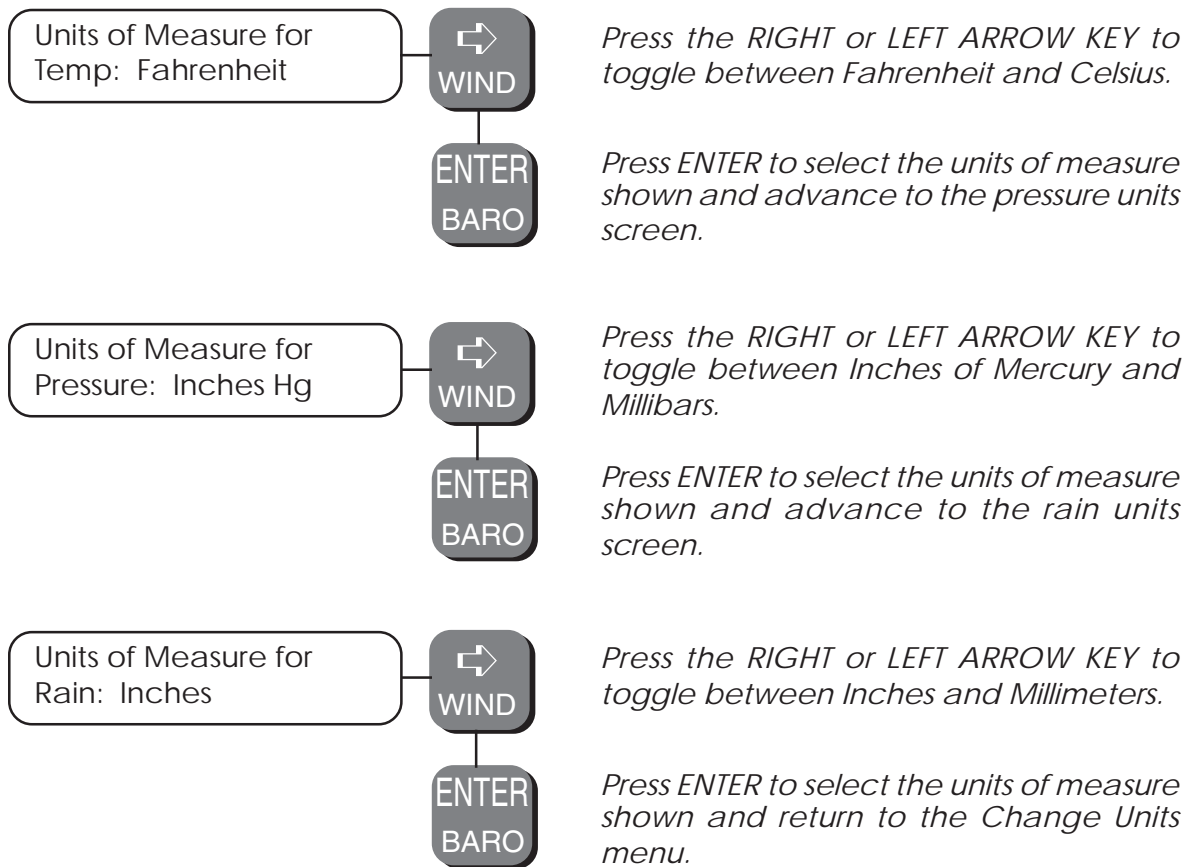
If ENGLISH or METRIC is selected, the corresponding units will be assigned to all parameters automatically, and you will be advanced to the wind units screen.

If CUSTOM is selected, you will be taken through a series of screens at which you specify units of measure for each parameter individually.

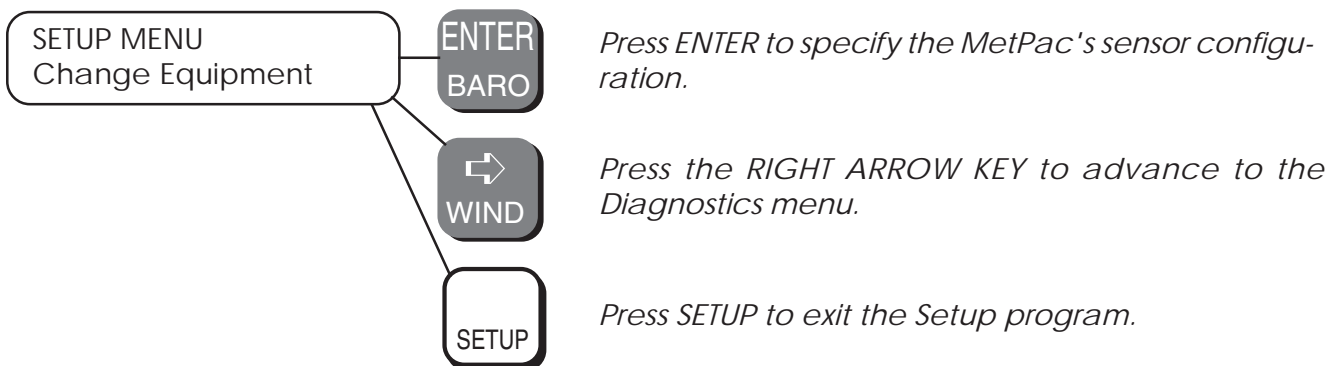


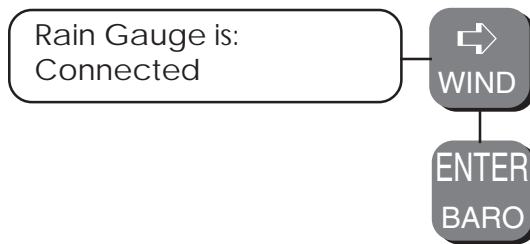
Press the RIGHT or LEFT ARROW KEY to change to: Knots, Miles per Hour, Meters per Second, or Kilometers per Hour.

Press ENTER to select the units of measure shown. If ENGLISH or METRIC was chosen above, you will be returned to the Change Units menu. If CUSTOM was selected, the temperature units screen will appear.



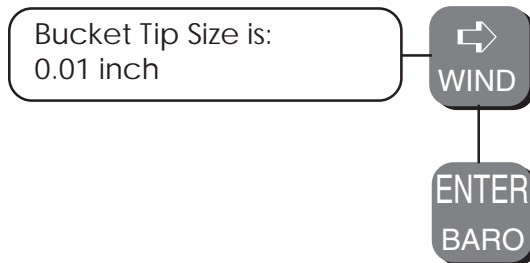
The Change Equipment menu lets you specify the exact sensor configuration of the MetPac. In the first set of options, the types of sensors connected are specified (rain gauge, solar radiation, etc.). You are then presented with a series of screens at which you specify the individual sensors' model numbers.





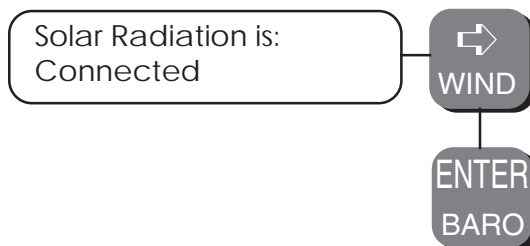
*Press the RIGHT or LEFT ARROW KEY to toggle between Connected and Not Connected.*

*Press ENTER. If Not Connected is selected, you will be advanced to the solar radiation screen. If Connected is selected, you will be asked to specify the rain gauge's bucket tip size.*



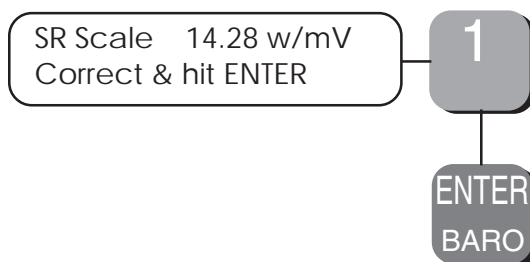
*Press the RIGHT or LEFT ARROW KEY to change the selected tip size to: 0.01 inch, 0.01 mm (Drip Counter), 0.1 mm, 0.25 mm, or 1.0 mm.*

*Press ENTER to save the selection and advance to the solar radiation screen.*



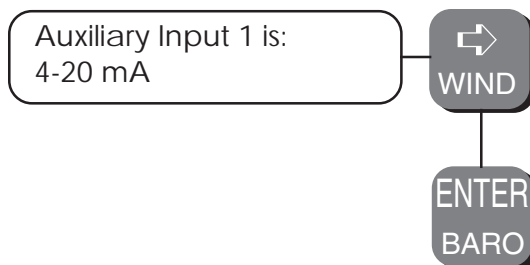
*Press the RIGHT or LEFT ARROW KEY to toggle between Connected and Not Connected.*

*Press ENTER. If Not Connected is selected, you will be advanced to the auxiliary input screen. If Connected is selected, you will be asked to specify the solar radiation scaling.*



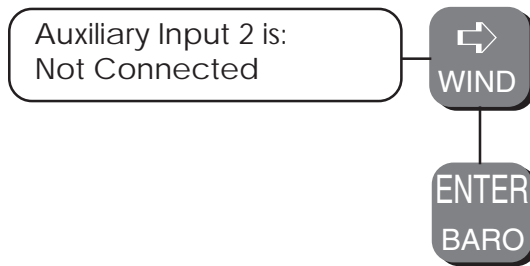
*Use the NUMBER KEYS to enter the scaling factor (number of watts of solar radiation represented by one millivolt of sensor output).*

*Press ENTER when the scaling factor is correct. This will save the value and advance you to the auxiliary input 1 screen.*



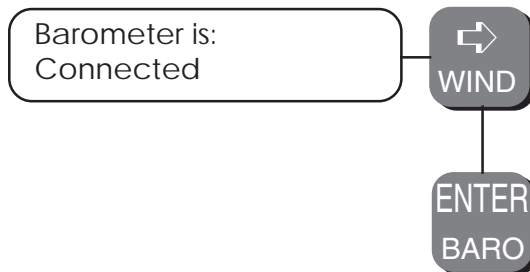
*Press the RIGHT or LEFT ARROW KEY to select the correct output level of a sensor connected to auxiliary input 1 (0-5 Volts, 4-20 mA, or Not Connected).*

*Press ENTER to save the selection and advance to the auxiliary input 2 screen.*



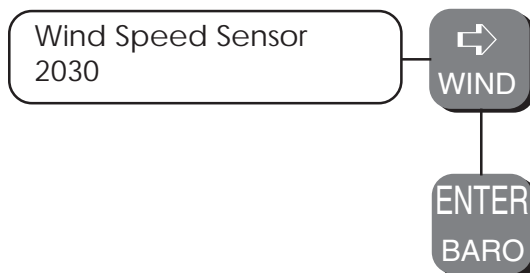
*Press the RIGHT or LEFT ARROW KEY to select the correct output level of a sensor connected to auxiliary input 2 (0-5 Volts, 4-20 mA, or Not Connected).*

*Press ENTER to save the selection and advance to the barometric pressure screen.*



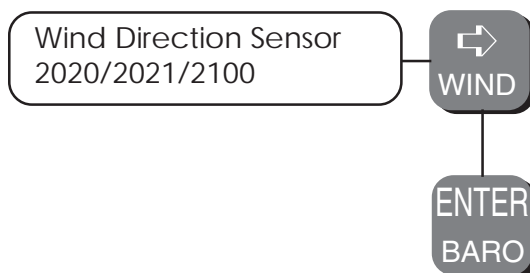
*Press the RIGHT or LEFT ARROW KEY to toggle between Connected and Not Connected (sensor type will be specified later).*

*Press ENTER to save the selection and advance to the wind speed sensor screen.*



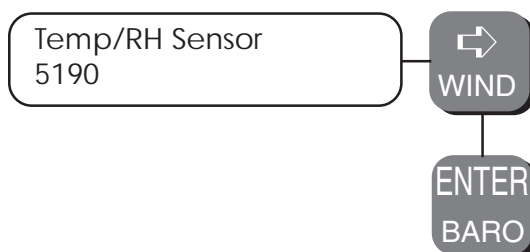
*Press the RIGHT or LEFT ARROW KEY to change the selected wind speed sensor model to: 2030, 2033, 2100, or Ultrasonic.*

*Press ENTER to save the selection and advance to the wind direction sensor screen.*



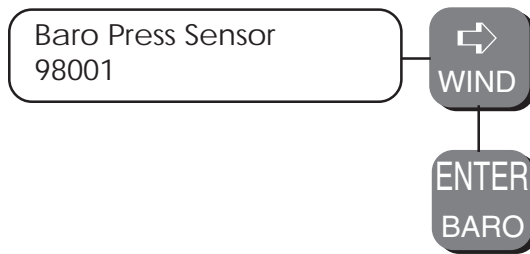
*Press the RIGHT or LEFT ARROW KEY to change the selected wind direction sensor model to: 2020/2021/2100 or Ultrasonic.*

*Press ENTER to save the selection and advance to the temperature/RH sensor screen.*



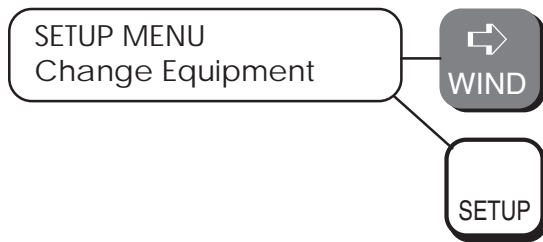
*Press the RIGHT or LEFT ARROW KEY to change the selected Temperature/RH sensor model to: 4510, 5140, 5190, or TAMS sensor (Model 98006).*

*Press ENTER to save the selection and advance to the barometric pressure sensor screen.*



Press the RIGHT or LEFT ARROW KEY to change the selected barometric pressure sensor model to: 98001 or 98002.

Press ENTER to save the selection and return to the Change Equipment menu.

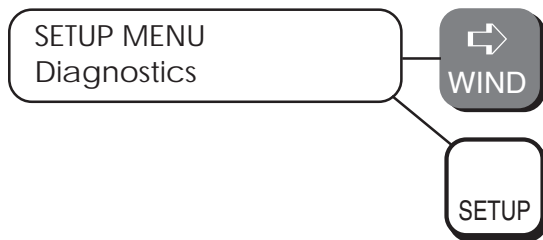


Press the RIGHT ARROW KEY to advance to the Diagnostics menu.

Press SETUP to exit the Setup program.

---

The Diagnostics menu is for future incorporation of diagnostic tests of the MetPac circuitry. No tests are currently available.

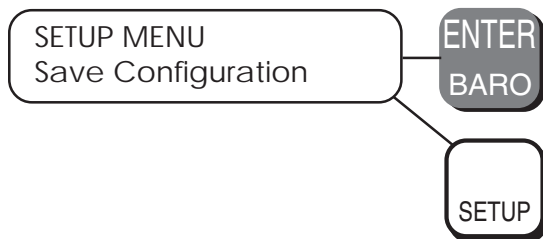


Press the RIGHT ARROW KEY to advance to the Save Configuration menu.

Press SETUP to exit the Setup program.

---

The Save Configuration option lets you save any changes you have made through the Setup program, or to exit the Setup program without saving the changes.



Press ENTER to save configuration changes.

Press SETUP to exit the Setup program without saving any configuration changes.

# Viewing METPAC Data

## MetView

Data collected by the METPAC can be viewed, printed, and output to other programs using All Weather Inc.'s *MetView* graphic software. *MetView* provides a graphic interface for the METPAC, and can be installed on any 486 or better PC running Windows® 3.1 or later. Detailed instructions for using *MetView* can be found in the *MetView User's Manual*.

## TAMSTerm

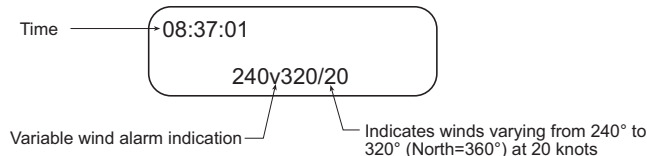
In addition to its setup and control functions, *TAMSTerm* contains six weather keys—found within the gray outlined section of the numeric keypad—that, when clicked, call up current data for the indicated parameters.

## Weather Displays

The following examples of data screens do not fully illustrate the array of units of measure in which weather information can be displayed. Refer to the **Setup** chapter for instructions on changing the displayed units of measure.

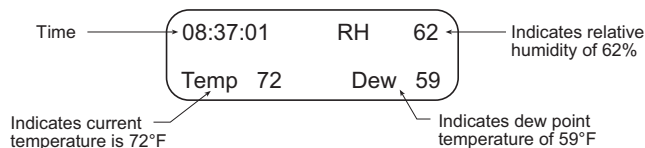
### Wind Screen

The WIND screen displays time, wind speed, and wind direction. Variable wind direction (“v”) is reported if the average wind speed exceeds six knots and wind direction readings observed over the last three minutes differ by 60° or more.



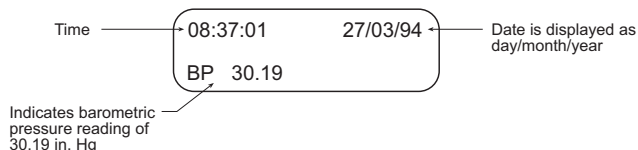
### Temperature Screen

The TEMP screen displays Time, Relative Humidity (RH), Temperature, and Dew Point.



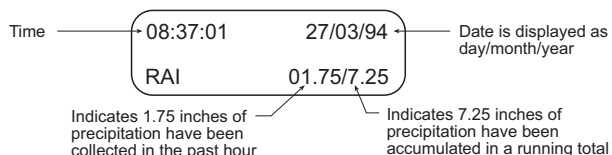
### Barometric Pressure Screen

The BARO screen displays Time, Date, and Barometric Pressure (BP). The pressure field will show zeros without an optional barometric pressure sensor installed.



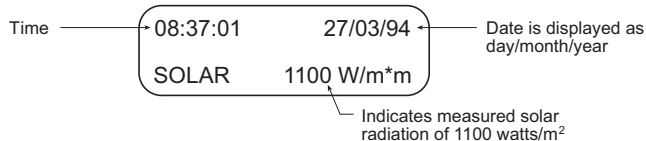
### Rain Screen

The RAIN screen displays Time, Date, and—if a rain gauge is connected—measured hourly and cumulative precipitation (up to 10 inches, or 254 mm). Once 10 inches (or 254 mm) of precipitation has been accumulated, the cumulative precipitation value will be reset.



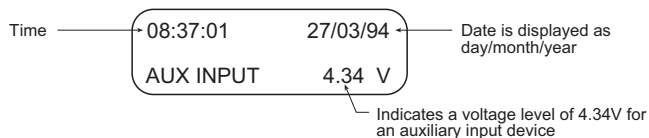
### Solar Radiation Screen

The SOLAR screen displays Time, Date, and Solar Radiation (if installed) as watts/m<sup>2</sup> of output.



### Auxiliary Input Screen

The AUX screen displays Time, Date, and the voltage of any attached auxiliary equipment.



---

# METPAC Data Log

The METPAC automatically stores an ongoing log of measured and calculated data in its internal memory at a regular interval set by the user via the Setup program. This accumulated data can then be retrieved using a computer link and optional Handheld Display. Incoming data can also be saved directly to a computer's hard drive at a specified interval by programming the METPAC for automatic output through the Setup program, which can be accessed using either the Handheld Display or TAMSTerm software.

## Logged Data

### *Retrieving Logged Data Using a Handheld Display*

The METPAC's internal data log can be retrieved in a single, bulk package via an optional Handheld Display and saved to a computer connected to the Handheld Display's RS-232 connector (middle connector). To retrieve the data log:

- 1 Connect a Handheld Display to the METPAC as explained in the *Kits* chapter of this manual (*9604 Handheld Display--Installation*).
- 2 Connect a computer to the Handheld Display's RS-232 connector (middle connector).
- 3 Initiate the Setup program by pressing the SETUP key on the Handheld Display's keypad.
- 3 At the *Change Time/Date* menu, press the RIGHT ARROW KEY to call up the *Change Data Output* menu.
- 4 Press ENTER at the *Change Data Output* menu. The message "Hit 0 to send data log to the computer" will be displayed.
- 5 Press the 0 key on the Handheld Display's keypad to send the internal data log to the computer.

*(Note: Logged data is not automatically erased after being downloaded. To erase the data log, follow the steps in the next section.)*

### *Erasing Logged Data*

The METPAC's internal data log can be erased at any time using the Setup program's "erase past weather" command. This is useful for clearing the contents of the internal memory after they have been downloaded. *(Note: Data downloading requires an optional Handheld Display. The Setup program is available from both the Handheld Display and TAMSTerm software.)*

- 1 Enter the Setup program via a Handheld Display or TAMSTerm.
- 2 Scroll through the screens using the arrow keys until you reach the Change Log/Output screen, then press ENTER.
- 3 The message "Hit 0 to send data log to the computer" will appear. Press ENTER to proceed to the next screen:  
"Hit 0 to erase past weather, else ENTER".
- 4 Press the 0 key to erase the stored data.

Erasing the stored data will not affect data being output through the timed output option.

### *Storage Interval*

How often data records are stored in the METPAC's internal memory can be set using the "Storage Interval" option within the Setup program. This option follows immediately after the "erase past weather" option.

- 1 Press ENTER at the "erase past weather" screen to advance to the Storage Interval screen.
- 2 To store data automatically in the internal log, enter a storage interval in minutes.
- 3 To disable automatic data logging, enter 0 for the storage interval.

## Timed Output

The timed output option enables automatic output of collected data to a computer at regular intervals. This interval can be set through the Setup program using either a Handheld Display or *TAMSTerm*. (When using *TAMSTerm*, this command works in tandem with the *Log to file* command on the *TAMSTerm File* menu, and involves two steps. First, computer output must be enabled and an output interval specified through the Setup procedure as explained in the steps below. Then, to initiate automatic output to a computer, the *Log to file* command on the *TAMSTerm File* menu must be selected and a filename specified.)

- 1 Press ENTER at the “Storage Interval” screen within Setup to advance to the “Output Timing” screen.
- 2 The first screen under this option lets you enable or disable timed output. Pressing the right or left arrow key will toggle the output state between enabled and disabled. When ENABLED is shown, press ENTER.
- 3 You will then be asked to specify an output interval. Enter the interval, in seconds, at which you want the METPAC to transmit its most recent set of data to a computer. Press ENTER to save the output interval setting. (Note: If the output interval is set to 0, timed output will be disabled.)
- 4 Exit Setup by clicking the SETUP key. If using a Handheld Display, the procedure is complete with this step. When using *TAMSTerm*, continue to step 5.
- 5 From the *TAMSTerm File* menu, select *Log to file*.
- 6 Navigate to the desired directory and enter a filename for the logged data.
- 7 Click OK.

# Data Format

Each packet of METPAC data contains a full complement of weather data, along with control characters and two checksums for error checking. The easiest and most convenient way to handle the data is with the TAMSView software package. TAMSView provides a graphic interface for viewing METPAC data, and allows the user to control the way the data is displayed.

For advanced data manipulation and evaluation, collected METPAC data can be imported into a database or spreadsheet program, such as Microsoft Excel. To do so successfully, you must first know the format of the collected data. **Figure 1** shows a typical data packet broken into its various components, and the function of each component is explained in the paragraphs below.

## Data Output

The METPAC's data output is in the form of a free-field, comma-delimited data packet that includes all the measured and calculated data generated by the METPAC. The full data packet is shown in **Figure 1**. Each of the fields in the full data packet is explained below.

## Errors and Missing Data

Whenever an error is detected for a particular parameter, or if the associated sensor is not connected, two commas will be shown for that parameter. In the data packet shown in **Figure 1**, for example, the four commas preceding the julian date indicate that no auxiliary sensors are connected to AUX1 or AUX2.

## Data Fields

**Figure 1** shows the position within the data packet of each of the data fields, and the list below explains each field.

|      |   |
|------|---|
| <cr> | carriage return (ASCII character code 13)                             |
| <lf> | line feed (ASCII character code 10)                                   |
| ID   | station identification number   |
| VS   | vector mean wind speed, averaged over 5 minutes, in meters per second |
| WD   | mean wind direction, averaged over 5 minutes, in degrees true         |
| SD   | standard deviation of the wind direction (sigma-theta) in degrees     |
| TA   | mean air temperature, averaged over 5 minutes, in degrees Celsius     |
| SP   | instantaneous wind speed in meters per second                         |
| DI   | instantaneous wind direction in degrees true                          |
| TI   | instantaneous air temperature in degrees Celsius                      |

```

ID      WD      TA      DI      B      #P      BP      CMP      SC      HR      SEC  WDMAX  DP      RT  AUX2  CHK2
|      |      |      |      |      |      |      |      |      |      |      |      |      |      |
200,0.6,170,12.5,10,0,160,11,9,1514,19,74,1021,71,241,2,4,0,9,39,9,0,150,180,6,0,0,,220,4277,
      |      |      |      |      |      |      |      |      |      |      |      |      |      |
      VS      SD      SP      TI      CHK      RH      SR      DU  MD  MIN  WG      WDMIN  RHR  AUX1  JUL
  
```

Figure 3  
MetPac Data Format

|     |  |       |   |
|-----|--|-------|---|
| B   | instantaneous battery voltage in volts   | SEC   | time of report: second  |
| CHK | checksum computed by summing the ASCII values of all preceding characters in the data line, including the carriage return and line feed characters, but excluding the final comma character    | WG    | wind gust, maximum measured over the last 2 minutes, in meters per second   |
| #P  | number of parameters to follow, not including the final checksum   | WDMIN | minimum wind direction; lowest wind direction value (from 1-360°) measured over the last 2 minutes, in degrees  |
| RH  | relative humidity, in percent  | WDMAX | maximum wind direction; highest wind direction value (from 1-360°) measured over the last 2 minutes, in degrees   |
| BP  | barometric pressure, in millibars  | DP    | dew point, in degrees Celsius   |
| SR  | solar radiation, in watts/m <sup>2</sup>   | RHR   | rainfall measured over the last hour, in inches   |
| CMP | compass heading, in degrees, as measured by an optional electronic compass   | RT    | total rainfall measured over last 24 hours, in inches   |
| DU  | display units; number representing units of measure entered by the user for all parameters   | AUX1  | voltage level of a sensor connected to auxiliary input 1  |
| SC  | stability class; this is a value, determined from measured wind data, that expresses the stability of the air as a number between 0 and 7, with 0 being very stable, and 7 being very unstable | AUX2  | voltage level of a sensor connected to auxiliary input 2  |
| MD  | magnetic declination, in degrees, as entered by the user   | JUL   | julian date   |
| HR  | time of report: hour   | CHK2  | checksum computed by summing the ASCII values of all preceding characters in the data line, including the carriage return, line feed, basic data, and first checksum, but excluding the final comma character |
| MIN | time of report: minute   |       |   |

# Kits

Several kits are available to extend a METPAC's capabilities to include: barometric pressure measurement, solar power, radio communication, and other functions. While most of the kits can be installed in the field by the user, several require factory installation. The available kits are listed in **Table 4**, which also indicates which kits require factory installation. A brief description of each of the kits, along with installation instructions, is provided below.

| <b>Part Number</b> | <b>Description</b>                              | <b>User Installable</b> |
|--------------------|---|-------------------------|
| 9604               | Handheld Display                                | Yes                     |
| 98001              | Barometric pressure sensor                      | No                      |
| 98002              | Barometric pressure sensor                      | Yes                     |
| 98003              | Barometric pressure sensor heater kit (115 VAC) | No                      |
| 98004              | Barometric pressure sensor heater kit (230 VAC) | No                      |
| 98005              | Battery backup kit                              | Yes                     |
| 98006              | Temperature/humidity sensor kit                 | Yes                     |
| 9805               | UHF radio transmitter kit                       | Yes                     |
| 9806               | UHF radio receiver kit                          | Yes                     |
| 9607               | UHF handheld radio receiver kit                 | Yes                     |
| 98036              | 10W solar panel kit                             | Yes                     |
| 98037              | 20W solar panel kit                             | Yes                     |
| 20547              | RS-422-to-RS-232 converter (115 VAC)            | Yes                     |
| 20548              | RS-422-to-RS-232 converter (230 VAC)            | Yes                     |

## 9604 Handheld Display

The Model 9604 Handheld Display consists of a 16-key keypad with LCD and backlight. It supports RS-485 from the METPAC and RS-232 to a computer. Power to the display can be provided from on-board batteries or through an optional power adapter. The Handheld Display performs four main functions:

- Local display of METPAC weather data
- Control/Setup interface (via keypad) to the METPAC
- RS-485 to RS-232 conversion
- Power interface

The display is a 2 line by 20 character LCD display that displays current weather data and, in setup mode, provides a series of user menus for configuring the METPAC. A key-activated backlight allows easy viewing in the dark or in dim light.

The 16-key keypad can be used to select a weather parameter for display or to configure the METPAC through the Setup program. A successful key depression is acknowledge by an audio tone, and all keys—as well as the display—are moisture resistant.

The Handheld Display's end cap is fitted with three connectors that are used for auxiliary power connection, RS-232 output to a computer, and RS-485 connection to the METPAC or Radio Transmitter Case. The internal battery compartment accommodates six or twelve 1.5V AA batteries to power the Handheld Display, or a DC power adapter can be connected to the power connector on the end cap.

## Installation

(See **Figure 4**)

- 1 The Model 9604 Handheld Display connects to terminal block TB7 on the METPAC's main board using a Model M491537 cable. Connect the cable's round connector to the RS-485 connector (bottom connector) on the Handheld Display's end cap.

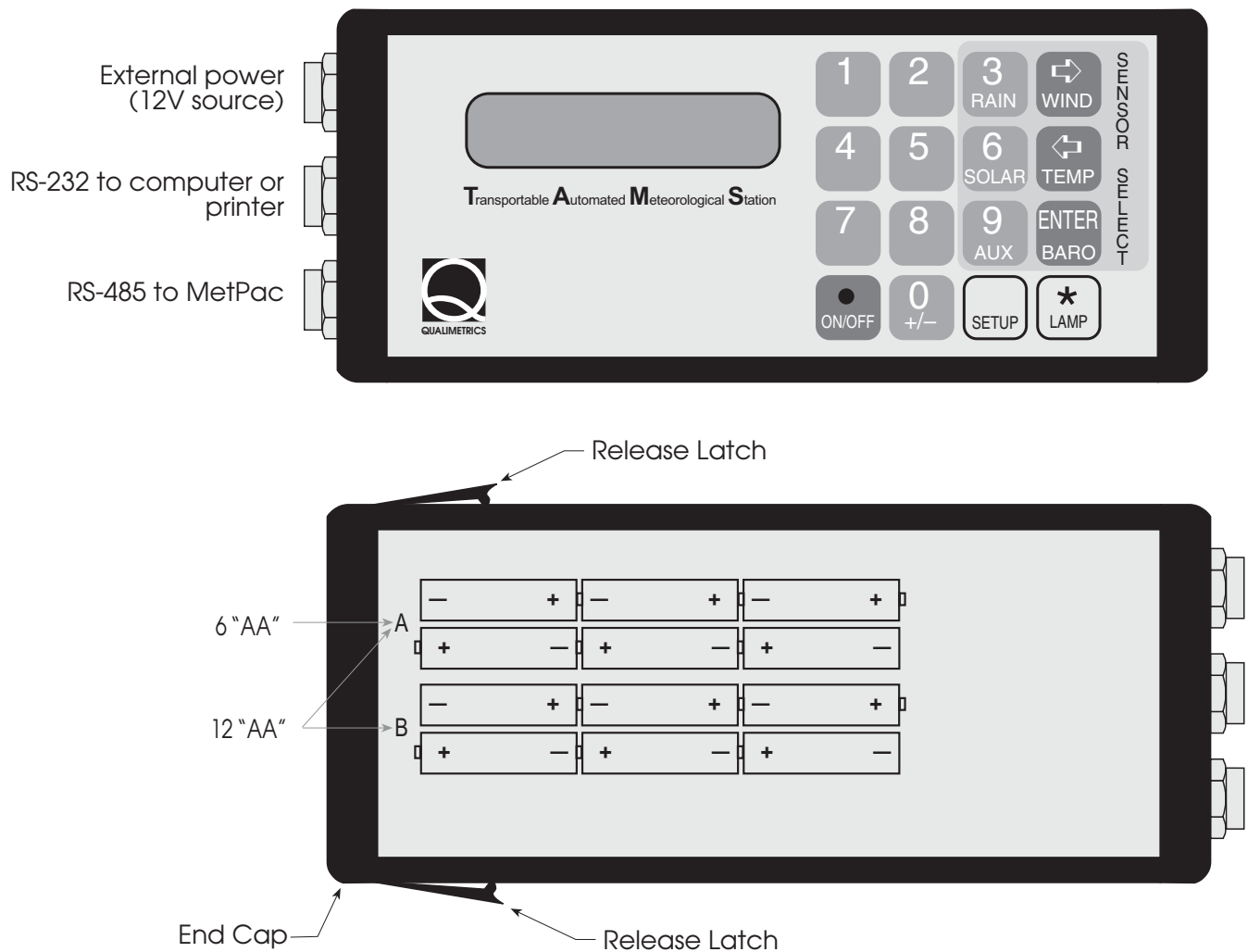


Figure 4  
Handheld Display

- 2 Connect the bare leads at the cable's other end to TB7 as follows:

RED wire (R+) to TB7, pin 6  
WHITE wire (R-) to TB7, pin 5  
BLACK wire (GND) to TB7, pin 3 or 4  
BROWN wire (T+) to TB7, pin 2  
GREEN wire (T-) to TB7, pin 1

This cable may be left connected to TB7 and stored inside the METPAC enclosure for periodic use. When not in use, the Handheld Display should be disconnected from the cable to reduce power usage.

- 3 If using an external 12 VDC source, connect it to the top connector on the Handheld Display's end panel.
- 4 If using "AA" batteries, insert them into the Handheld Display's internal battery compartment located behind the end cap at the opposite end of the Handheld Display from the connectors. To open the compartment, lift the two release latches holding the end cap in place and remove the end cap. TAMS will operate with either six batteries loaded into Compartment A *or* B, or twelve batteries (for longer operating time) loaded into Compartments A *and* B. Load the batteries as shown in **Figure 3**.
- 4 If connecting to an external computer, connect one end of the optional cable to the middle connector on the Handheld Display's end panel, and the other end to the computer's serial port.
- 5 Activate the unit by pressing the POWER key on the Handheld Display keypad.

---

### 98001 Barometric Pressure Sensor

The Model 98001 Barometric Pressure Sensor uses a laser trimmed piezoresistive sensing element to convert a change in atmospheric pressure to an analog voltage. This voltage is processed by the METPAC's on-board analog-to-digital convertor and by its microcomputer to compute atmospheric pressure in the range 600 mb to 1100 mb (17.72-32.43 in.Hg). The wide response of the sensor allows operation at elevations ranging from sea level to 14,000 feet without adjustments to the sensor.

The Model 98001 mounts inside the METPAC, which provides all the power and signal conditioning for the sensor. Mounting hardware attaches the sensor to the METPAC's printed circuit board, and plastic tubing ports the sensor to an external sintered filter (included in the kit). The Model 98001 requires calibration, and must be installed at the factory.

Heater Options are available for the 98001 to extend its operational temperature to -40°C. The Model 98003 heater kit is designed for use with 115VAC and the Model 98004 heater kit is designed for use with 230 VAC.

**Note: Options must be factory installed; integration is required.**

## 98002 Barometric Pressure Sensor

The Model 98002 Barometric Pressure Sensor uses a digitally compensated sensing element to convert a change in atmospheric pressure to a digital bit stream. This digital value is processed by the METPAC's micro-computer to compute atmospheric pressure in the range 20 to 32 in Hg. (677 mb to 1084 mb).

The Model 98002 mounts inside the METPAC, which provides all the power and interface lines to the sensor. Mounting hardware attaches the sensor to the MetPac's printed circuit board, and plastic tubing ports the sensor to an external sintered filter (included in the kit).

Heater Options are available for the 98002 to maintain its accuracy below  $-20^{\circ}\text{C}$ . The Model 98003 heater kit is designed for use with 115VAC, and the Model 98004 heater kit is designed for use with 230 Vac.

**Note: Heater options must be factory installed; integration is required.**

### Installation

(See **Figure 5**)

The Model 98002 Barometric Pressure Sensor installs within the MetPac enclosure as explained below. Installation of this sensor requires removal of the safety shield and METPAC motherboard. All power should be disconnected from the system before removing the safety shield.

- 1 Open the enclosure and remove the clear plastic safety shield from above the motherboard.
- 2 Remove the METPAC motherboard by removing the four corner screws.

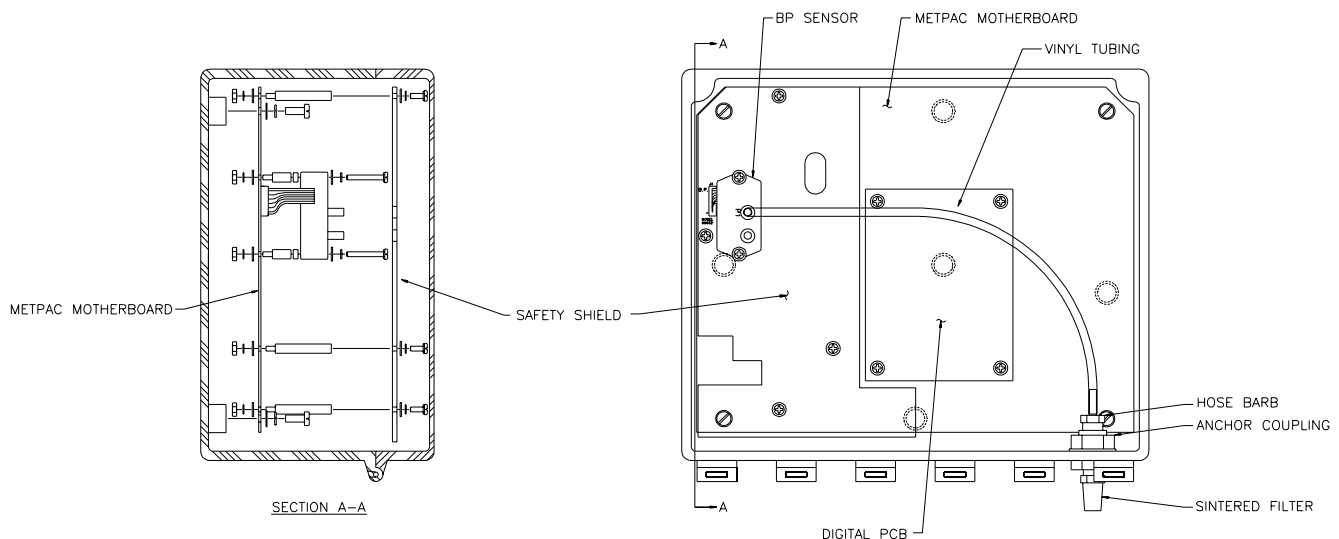


Figure 5  
98002 BP Sensor Installation

- 3 The BP sensor mounts to two holes in the motherboard located to the right of J4. Attach the BP sensor to the motherboard using the two provided Phillips-head bolts--with a flat washer and lock washer on each--inserted through the sensor and into the motherboard. Fasten with a nut, lock washer, and flat washer on each on the underside of the motherboard.
- 4 Insert the sintered filter and hose barb assembly through the rightmost hole in the enclosure's underside from below (after removing the plastic hole plug, if necessary).
- 5 From inside the enclosure, install the large flat washer over the portion of the filter-hose barb assembly extending into the enclosure.
- 6 Thread the anchor coupling onto the filter-hose barb assembly from inside the enclosure and tighten.
- 7 Connect the length of vinyl tubing between P1 on the sensor and the hose barb. Work the tubing over the hose barb until it is flush against the nut at the base of the hose barb.
- 8 Plug the signal cable extending from the side of the sensor into J4 on the motherboard.

---

#### *98003 and 98004 Barometric Pressure Sensor Heater Kits*

The Model 98003 and Model 98004 Barometric Pressure Sensor Heater kits are designed for use with either the Model 98001 or 98002 Barometric Pressure Sensor, to keep the sensors above 0°C in order to maintain their accuracy (+/-1 mb). The Model 98003 is used with 115 Vac systems, and the Model 98004 with 230 Vac systems. Both kits require the METPAC to be powered by AC power.

Both kits include a thermostat that turns the current to the power resistor on or off as dictated by ambient air temperature. The thermostat has 30°C of hysteresis to avoid rapid on and off switching at the threshold points. The heater dissipates around 7 to 8 Watts (approx. 24-27 btu/hr) when operating.

***Note: Heater options must be factory installed; integration is required.***

---

#### *98005 Battery Backup Kit*

The Model 98005 Battery Backup kit consists of a sealed rechargeable lead acid battery with extended leads and velcro strips for mounting to the inside of the METPAC enclosure door.

The cells are considered "dry" by the US Department of Transportation, and by the International Air Transport Association. In float, the battery will typically last 8-10 years at 23°C before falling to 80% of rated capacity. In cyclic applications, it will provide 200 to 2,000 cycles, depending on the state of discharge. It can be stored for up to 3 years at room temperature without recharging or damage to the cells.

The battery is ideal for use as a backup power source for solar panels, and for providing the transmit current with radio telemetry options. It is also useful as a temporary backup power source for the MetPac's main AC or DC power.

## Installation

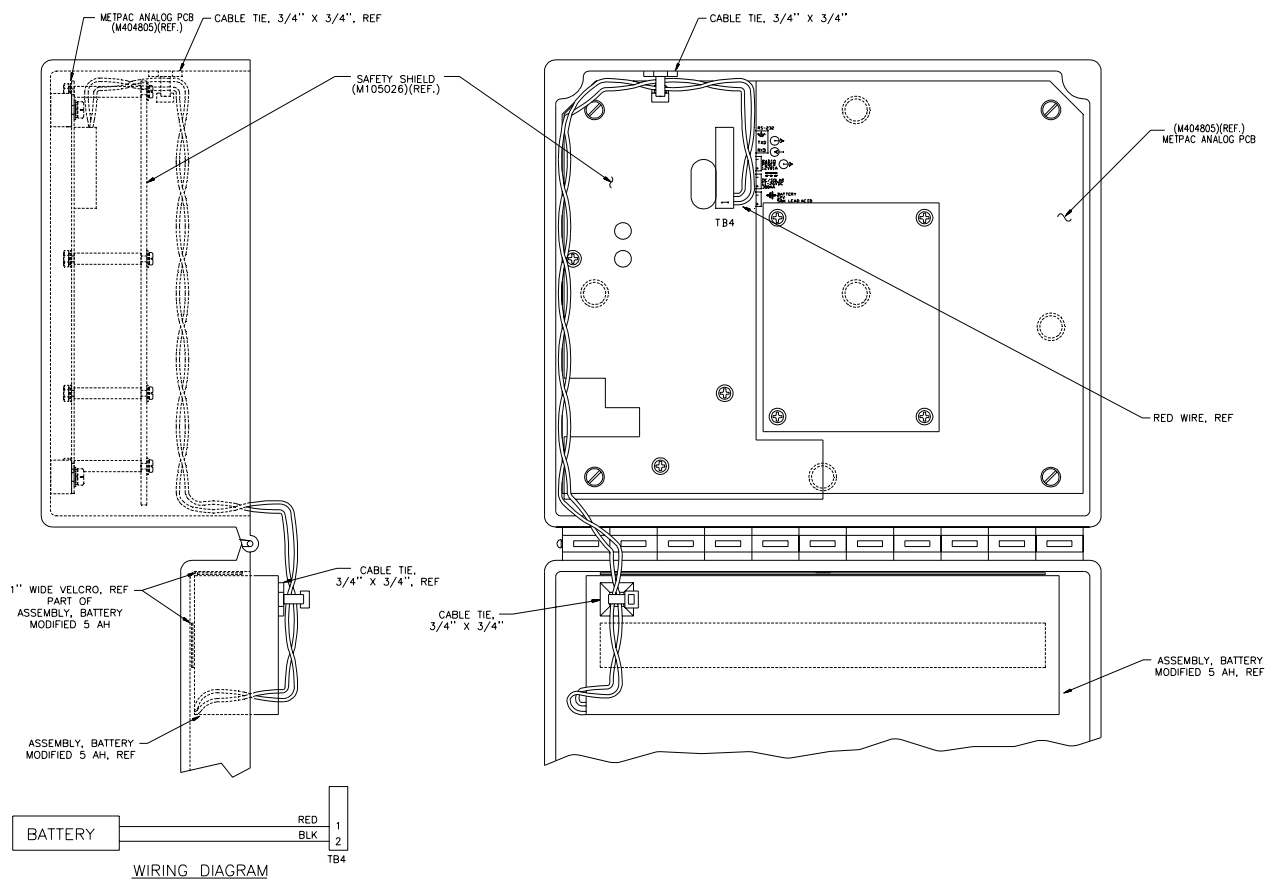
(See **Figure 6**)

The Model 98005 Battery Backup kit installs within the METPAC enclosure as explained below.

- 1 With the enclosure door open, attach one velcro strip (loop type) to the top edge of the door (bottom edge when closed) and one to the door's back panel (front panel when closed) as shown in **Figure 5**.
- 2 Attach the mating velcro strips (hook type) to corresponding positions on the battery so that the battery will rest on the lower edge of the door with the door closed.
- 3 Press the battery into place so that it is held snugly by the velcro strips.
- 4 Route the battery power cable through the two cable ties (one on the battery and one at the top of the enclosure) and connect to TB4 as follows:

RED wire to TB4, pin 1

BLACK wire to TB4, pin 2



*Figure 6*  
*Battery Backup Kit Installation*

98006 Temperature/Humidity Sensor Kit

The 98006 Temperature/Humidity Sensor kit provides a compact, low-cost, and self-contained temperature/humidity monitoring option. The dual temperature/relative humidity sensor is housed in a small self-aspirated radiation shield (SARS) that mounts simply to the underside of the MetPac enclosure. This simple and effective system eliminates the need for a separate SARS or MARS (motor-aspirated radiation shield) and their accompanying mounting requirements.

Installation

(See **Figure 7**)

- 1 Route the sensor wires and SARS stem through a knockout in the underside of the MetPac enclosure and secure the SARS in place by threading the provided nut onto the SARS stem.
- 2 Connect the sensor wires to TB3 on the MetPac motherboard as follows (see **Figure 7**):
  - GRAY wire to TB3, pin 3 ( $\equiv$ ).
  - BLUE wire to TB3, pin 4 (R.H. IN).
  - BLACK wire to TB3, pin 5 ( $\equiv$ ).
  - RED wire to TB3, pin 6 (R.H. PWR).

The sensor's two GREEN wires are interchangeable.

Connect one GREEN wire to TB3, pin 7 (TEMP 1)

Connect the other GREEN wire to TB3, pin 8 (TEMP 2).

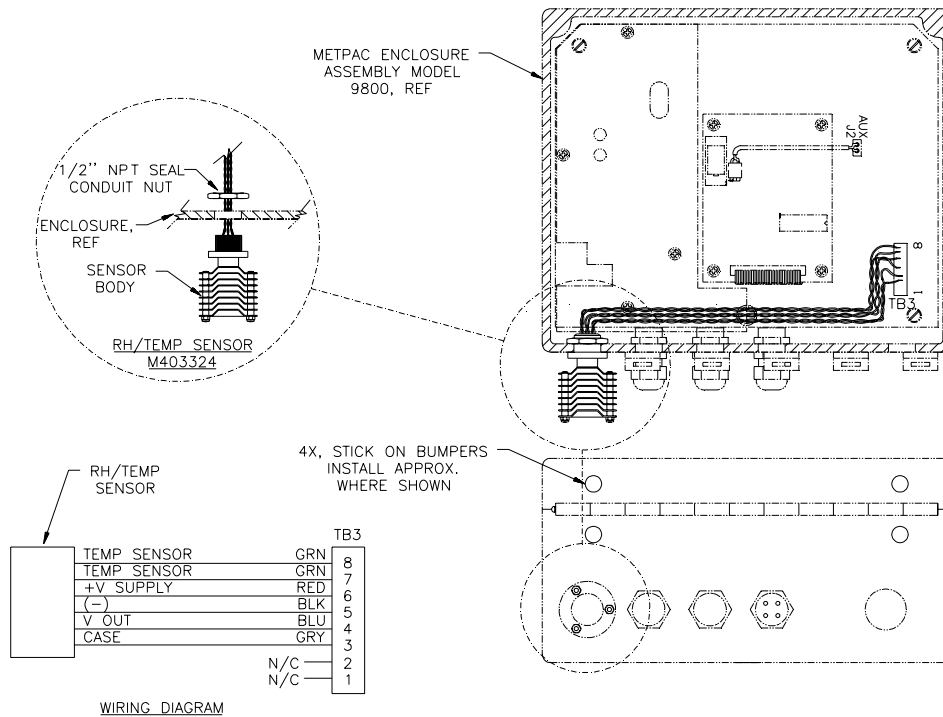


Figure 7  
98006 Temperature/Humidity Kit Installation

- 3 Set the motherboard jumpers as follows:
  - JP6** Remove
  - JP7** Install
  - JP8** Install on pins 1 and 2
  - JP10** Install on pins 1 and 2
- 4 Attach the four stick-on bumpers to the MetPac enclosure door and the underside of the MetPac enclosure in the positions shown in **Figure 7** to prevent the door from damaging the sensor when opened.

### 9805 Radio Transmitter Kit

The Model 9805 Radio Transmitter kit consists of a 2W UHF radio modem. This synthesized radio supports frequencies between 450-470 MHz, and is tuned and tested at the factory to customer-specified (licensed) frequencies.

The simplex radio link established with this kit consists of periodic transmission of meteorological data from the MetPac to a remote receiver. The radio is turned off most of the time to save power, and is turned on by the MetPac during transmission only. The transmission interval is user-programmable using a Handheld Display or *TAMSTerm* software to intervals ranging from every 5 seconds to every 4 minutes.

Randomization is programmed in the MetPac to allow multiple MetPacs to be placed within a receiver's range and all be received on the same frequency. (It is recommended that the transmission interval be set to no shorter than every 15 seconds when using the randomized feature.)

Data is transmitted over the radio link at 4800 baud using a robust error-checking protocol to ensure data integrity. The transmission period is less than one second.

The transmitter kit attaches via removable velcro strips to the safety guard within the MetPac housing, and comes with all the necessary cable. The radio antenna connection is a female BNC, requiring a male BNC on the antenna's coaxial cable. A special strain relief is provided to enable the coaxial cable (RG58A/U) to be routed into the MetPac enclosure without removing the connector. The transmitting antenna and antenna cable are ordered separately in order to accommodate customer installation and transmission requirements.

The radio kit includes a 5 A/h battery, which provides the necessary power surge required for transmission. The MetPac keeps this battery charged as long as another power source (AC, DC, or solar) is connected.

## Installation

(See **Figure 8**)

The Model 9805 UHF Radio Transmitter kit installs within the METPAC enclosure as explained below.

- 1 Attach two velcro strips (loop type) to the plastic safety shield within the METPAC in the approximate location shown in **Figure 8**.
- 2 Attach the mating velcro strips (hook type) to corresponding positions on the back of the radio modem.

- 3 Press the radio modem into place so it is held securely by the velcro strips.
- 4 Attach the radio cable's DB9 connector to the radio modem. Connect the bare leads at the other end of the cable to TB4 as follows:
  - RED wire (V+) to TB4, pin 5
  - BLACK wire (GND) to TB4, pin 6
  - WHITE wire (TXD) to TB4, pin 8
  - leave the GREEN wire unconnected
- 5 Install a battery backup kit as explained in the preceding section.
- 6 Route the antenna cable through the 1/2" strain relief, and connect it to the radio's BNC antenna connector.

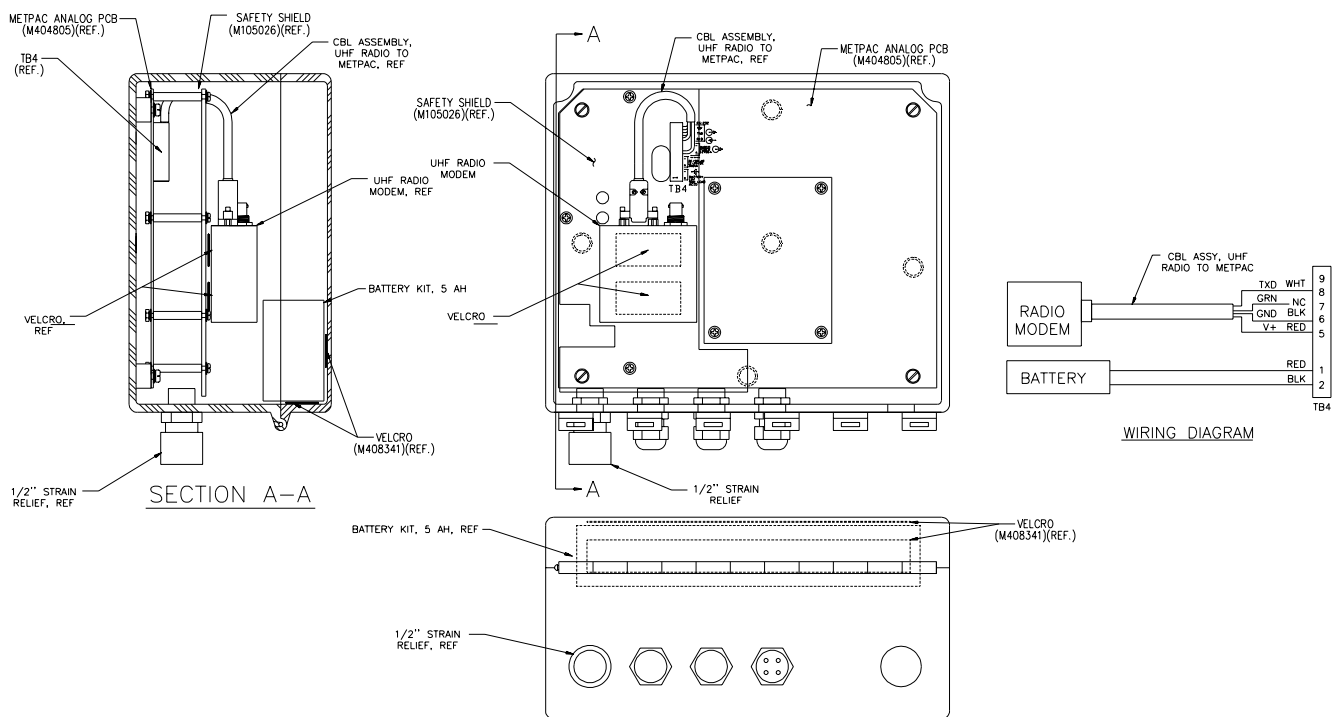


Figure 8  
UHF Radio Transmitter Installation

9806 Radio Receiver Kit

The Model 9806 Radio receiver kit consists of a 2W UHF radio modem. This synthesized radio supports frequencies between 450-470 MHz, and is tuned and tested at the factory to customer-specified (licensed) frequencies.

The simplex radio link established with this kit consists of periodic transmission of meteorological data from the MetPac to this remote receiver. The radio is left on all the time in order to receive the periodic randomized transmissions from the MetPac. The transmission interval is user-programmable using a Handheld Display or TAMSTerm software to intervals ranging from every 5 seconds to every 4 minutes.

Randomization is programmed in the MetPac to allow multiple MetPacs to be placed within a receiver's range and all be received on the same frequency. (It is recommended that the transmission interval be set to no shorter than every 15 seconds when using the randomized feature.)

Data is transmitted over the radio link at 4800 Baud using a robust error-checking protocol to insure data integrity. The transmission period is less than one second.

The radio kit is typically placed near the host computer, and comes with the necessary cable to wire it to the computer. The radio antenna connection is a female BNC, requiring a male BNC on the coaxial cable. The receiving antenna is ordered separately in order to accommodate customer installation and transmission requirements

The receiver kit includes a wall-mount power supply, which provides the necessary power for reception.

## Installation

(See **Figure 9**)

- 1 Connect the UHF communications cable assembly between the DB9 connector on the back of the radio modem and a computer's serial port.
- 2 Connect one of the antenna options (direct connect swivel antenna, or cable-connected magnetic mount antenna) to the radio modem's BNC antenna connector.
- 3 Connect the radio's power adapter to a suitable AC source.

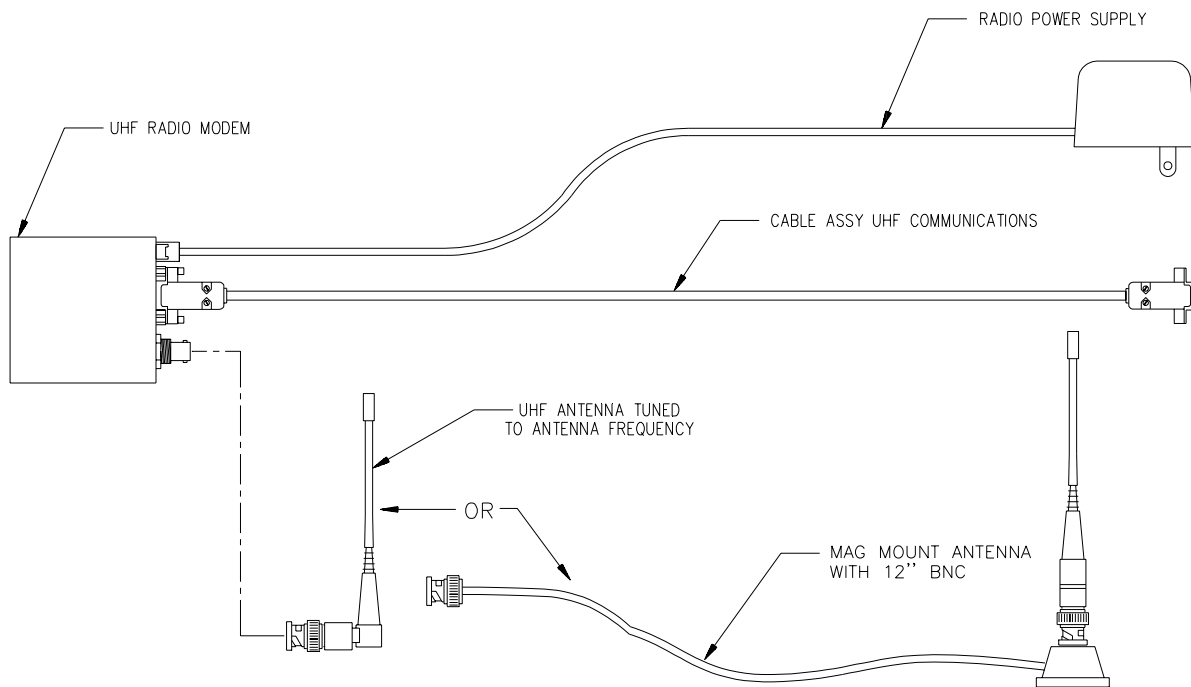


Figure 9  
UHF Radio Receiver Installation

9607 Handheld Receiver Kit

The Model 9607 Handheld Receiver (**Figure 10**) combines many of the features of the Model 9604 Handheld Display with a built-in UHF radio. Real-time measurements can be viewed on the receiver's LCD screen, or output to a host computer via the built-in RS-232 port. The radio receiver is a UHF radio with a frequency matched to the MetPac radio transmitter.

The Handheld Receiver can be powered from an external source using any of the following power adapters:

- 96010 110VAC power adapter, 1000mA (for 115V applications)
- 96011 220VAC power adapter, 1200mA (for 130V applications)
- 96012 cigarette lighter adapter with 25' cable
- 96013 unterminated power adapter with 50' cable

When an external source is not available, the Handheld Receiver can be powered by the optional 96004 Deluxe Receiver Case, which provides power from the rechargeable battery housed inside the case. The battery can power the Handheld Receiver for up to 36 hours. (*Note: This option also requires the model 96025 cable kit*).

A pivoting antenna mounts directly to the Handheld Receiver's antenna connector, or a magnetic mounting antenna can be used, with its cable connected to the Handheld Receiver's antenna connector. All the processing and communication circuitry is built into the Handheld Receiver, making it a self-sufficient and very portable receiving station.

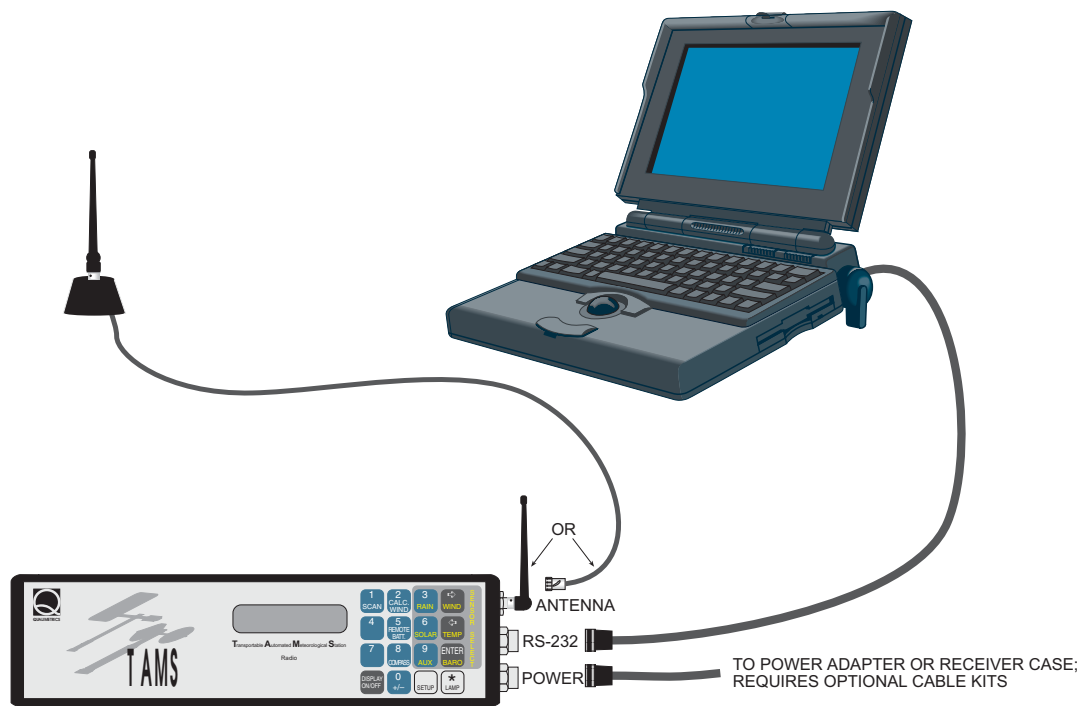


Figure 10  
Handheld Receiver Installation

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## 98036 10W Solar Panel Kit

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The Model 98036 Solar Panel Kit offers a 10W solar panel capable of providing over 0.5 ampere of current at peak power. The panel has an open circuit voltage of 20.6V, which is reduced under load conditions and regulated by the METPAC. Thirty feet of cable is provided to accommodate most tower heights.

This panel is recommended for use with the METPAC when it is operating in a sleep mode with a data logging/output interval of 5 minutes every hour or longer. The panel is suitable for most areas in latitudes of  $< 50^\circ$  N or S. An additional 5 Amp. Hour battery (98005) can be added in parallel to the one included in the kit for those areas with low worst-case equivalent sun hours.

Included in the kit is hardware to mount the panel to cylindrical or square poles. The brackets are heavy-duty aluminum alloy with a clear anodized finish. U-bolts with 1.5" inner diameters are also included. Other size poles can be accommodated using other U-bolts or hose clamps. The bracket assembly offers  $10^\circ$  to  $75^\circ$  continuous tilt angle adjustment.

A 5 ampere hour battery is included in the kit. This battery includes velcro mounting straps to mount it inside the METPAC enclosure door. Additional backup can be provided by adding another battery in parallel (98005). (*Note: Batteries should be charged within 70mV before wiring up in parallel.*)

The METPAC contains a battery charging circuit allowing up to 0.5 amps of charge current, depending on the solar panel input voltage, whether a Motor Aspirated Radiation Shield (MARS) is attached, and on the METPAC's operating mode.

## Installation

(See **Figure 11**)

- 1 Attach the mounting bracket to the back of the solar panel housing.
- 2 With the solar panel oriented toward the equator, mount the solar panel to the tower with two U-bolts through the mounting bracket.
- 3 Adjust the panel's angle as necessary for maximum efficiency at the specific latitude of the tower site, as explained in the instructions included with the panel.
- 4 Route the cable down the tower and in through a strain relief in the underside of the METPAC enclosure.
- 5 Connect the cable to TB4 on the METPAC motherboard as follows:

RED wire to TB4, pin 3

BLACK wire to TB4, pin 4

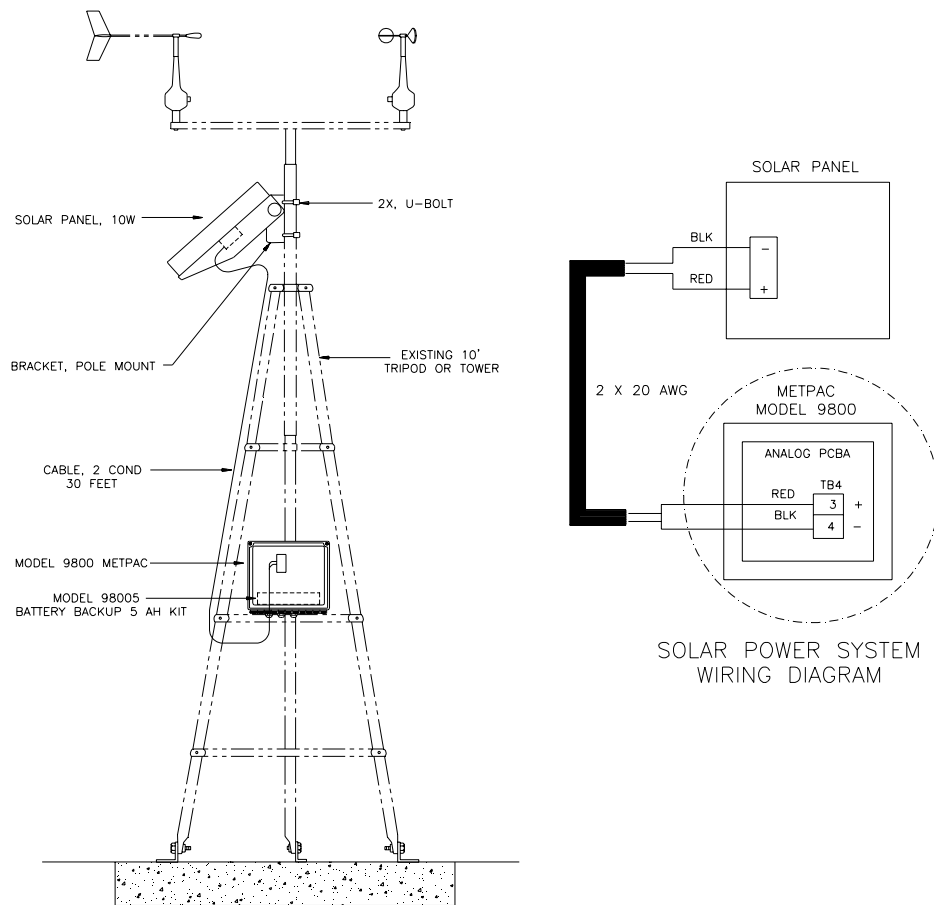


Figure 11  
10W Solar Power Kit Installation

### 98037 20W Solar Panel Kit

The Model 98037 Solar Panel Kit offers a 20 Watt Solar Panel capable of providing over 1 ampere of current at peak power. A shunt regulator which controls battery charging is also included in the kit. This regulator continually monitors the battery voltage and charges as necessary.

A 12V rechargeable 50 Ampere/Hour gel/cell Lead-Acid battery is included in the kit. It is housed in its own external Nema 3R housing (also included) and can be mounted in close proximity to the meteorological instrument. Thirty feet of cable is provided to accommodate mounting the solar panel to most tower heights.

Included in the kit is hardware to mount the 20 Watt Panel to cylindrical or square poles. The brackets are heavy-duty aluminum alloy with a clear anodized finish. U-bolts with 1.5" inner diameters are included. Other size poles can be accommodated using other U-bolts or hose clamps. The bracket assembly offers 0° to 90° continuous tilt angle adjustment.

## Installation

(See **Figures 12-14**)

Before installing the solar panel kit, read all instructions included with the kit.

(See **Figure 12**)

**1** Mount the battery enclosure to the tower as shown in **Figure 12**.

(See **Figure 13**)

**2** Remove the two knockouts from the bottom of the enclosure where shown, and install strain reliefs.

**3** Set the battery in the enclosure.

**4** Mount the charge controller box to the rear of the solar panel. Remove the cover from the charge controller box.

(See **Figures 13 and 14**)

**5** Connect the three wires extending from the charge controller to the solar panel terminal block as follows:

A+ to terminal 2

B+ to terminal 1

C- to terminal 5

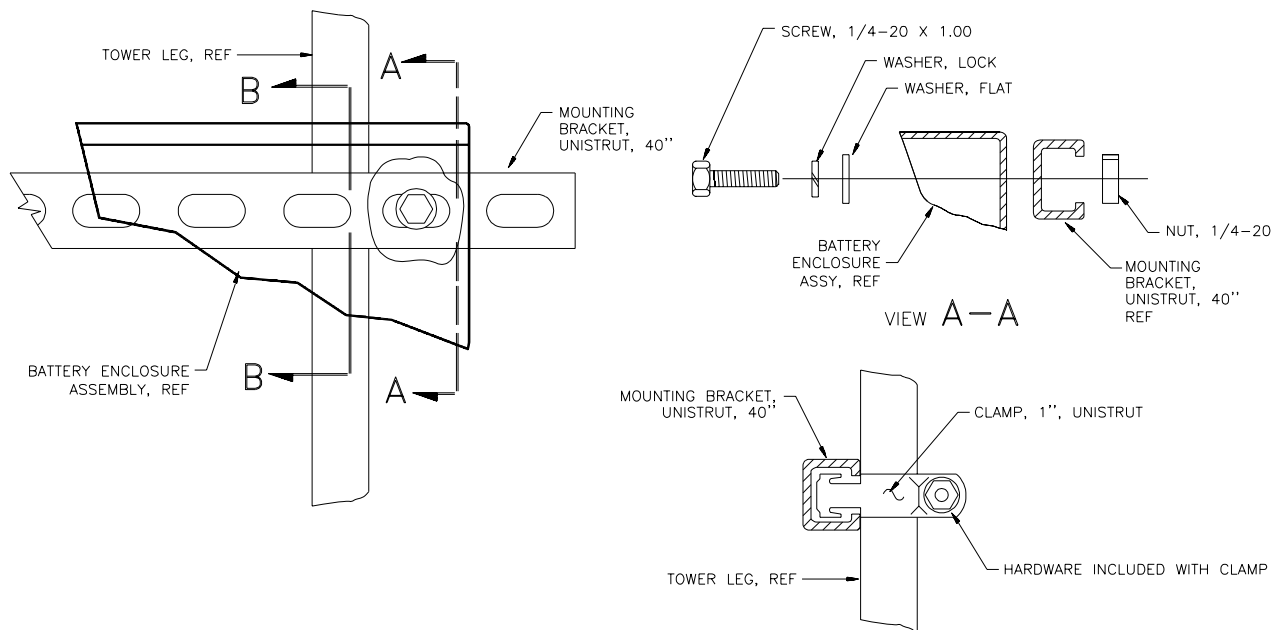
**6** Install ring lugs onto the cable leads at the solar panel end of the solar panel-to-battery cable.

**7** Route the solar panel end of the solar panel-to-battery cable through the strain relief in the charge controller box and connect it to the solar panel terminal block as follows:

*Caution: The solar panel will produce electrical power when exposed to light.*

WHITE wire to terminal 1

BLACK wire to terminal 5



*Figure 12*  
*Battery Enclosure Installation*

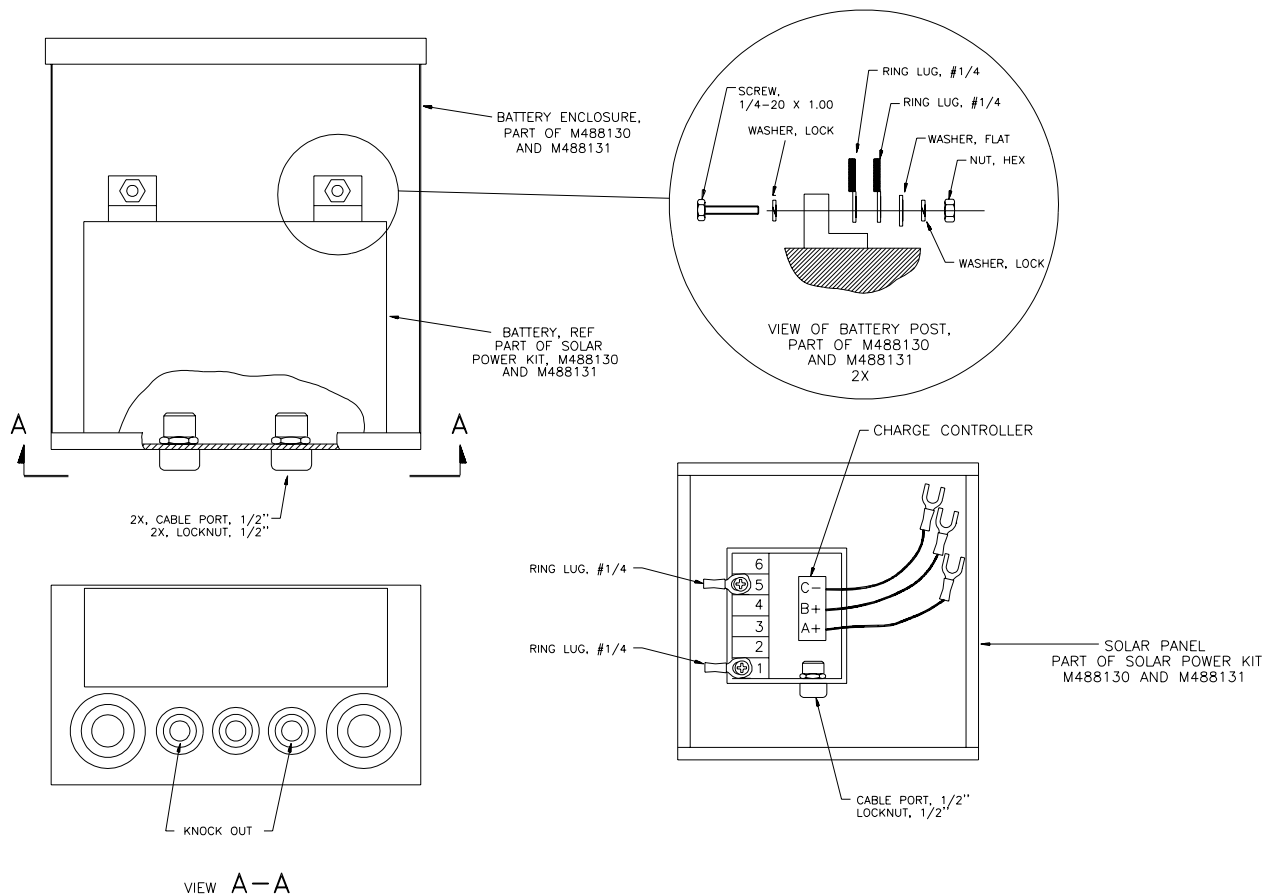


Figure 13  
Battery Installation

- 8 Connect a jumper wire between pins 3 and 4 of the solar panel terminal block
- 9 Replace the cover on the charge controller box.  
(See **Figure 14**)
- 10 Attach the mounting bracket to the back of the solar panel housing.
- 11 With the solar panel oriented toward the equator, mount the solar panel to the tower with two U-bolts through the mounting bracket.
- 12 Adjust the solar panel's angle as necessary for maximum efficiency at the specific latitude of the tower site, as explained in the instructions included with the panel.
- 13 Route the solar panel-to-battery cable down the tower to the battery enclosure.
- 14 Cut the solar panel-to-battery cable to length. It should be left long enough to allow it to be routed through the battery enclosure to the battery, but with minimum excess to prevent voltage loss.
- 15 Install ring lugs onto the cable leads at the battery end of the solar panel-to-battery cable.
- 16 Route the solar panel-to-battery cable through the strain relief in the underside of the battery enclosure and tighten the strain relief.

- 17 Connect the solar panel-to-battery cable's WHITE wire to the battery's positive (+) terminal, and the BLACK wire to the battery's negative (-) terminal as shown in the detail in **Figure 13** ("view of battery post").
- 18 Route the METPAC end of the battery-to-METPAC cable through a strain relief in the underside of the METPAC enclosure and connect as follows to TB4 on the METPAC motherboard:
  - WHITE wire to TB4, pin 3
  - BLACK wire to TB4, pin 4
- 19 Cut the battery-to-METPAC cable to length. It should be left long enough to allow it to be routed through the battery enclosure to the battery, but with minimum excess to prevent voltage loss.
- 20 Install ring lugs onto the battery end of the battery-to-METPAC cable, and route the cable through the strain relief in the underside of the battery enclosure. Tighten the strain relief.
- 21 Connect the battery-to-METPAC cable's WHITE wire to the battery's positive (+) terminal, and the BLACK wire to the battery's negative (-) terminal as shown in the detail in **Figure 13** ("view of battery post").

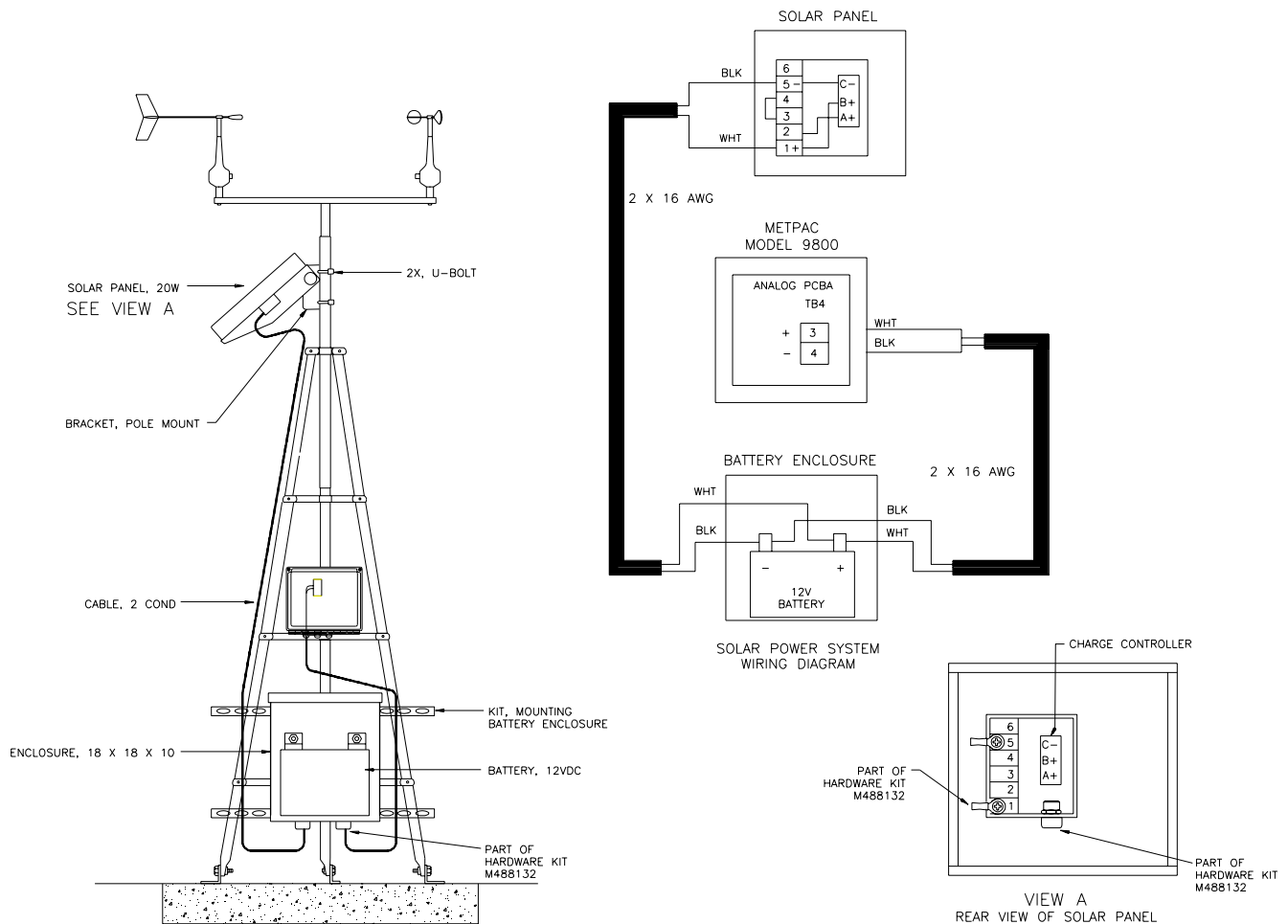


Figure 14  
20W Solar Panel Kit Installation

20547 and 20548 RS-422-to-RS-232 Converters

The Model 20547 (115V) and 20548 (230V) RS-422-to-RS-232 Adapters are installed at the computer end of a link using RS-422 communications with a METPAC. This adapter translates the received METPAC data to RS-232 format, the standard format accepted by computer serial ports.

Both adapter kits come complete with surge suppression (lightning sponge) to protect connected equipment against power surges, such as those induced by lightning. The adapter itself is powered from 115VAC or 230VAC through a power adapter included in the kits.

Installation

(See **Figure 15**)

- 1 Connect the 6' computer cable's 9-pin connector to the serial port of a computer. Connect the 25-pin end to the supplied gender changer, and then to the mating connector on the converter module.
- 2 Connect a low-capacitance cable (such as All Weather Inc. T600302, or equivalent) between the converter module and the lightning sponge's MODEM terminals as follows:  
 converter R- to lightning sponge R-  
 converter R+ to lightning sponge R+  
 converter T- to lightning sponge T-  
 converter T+ to lightning sponge T+

*Note: Keep this cable as short as possible.*

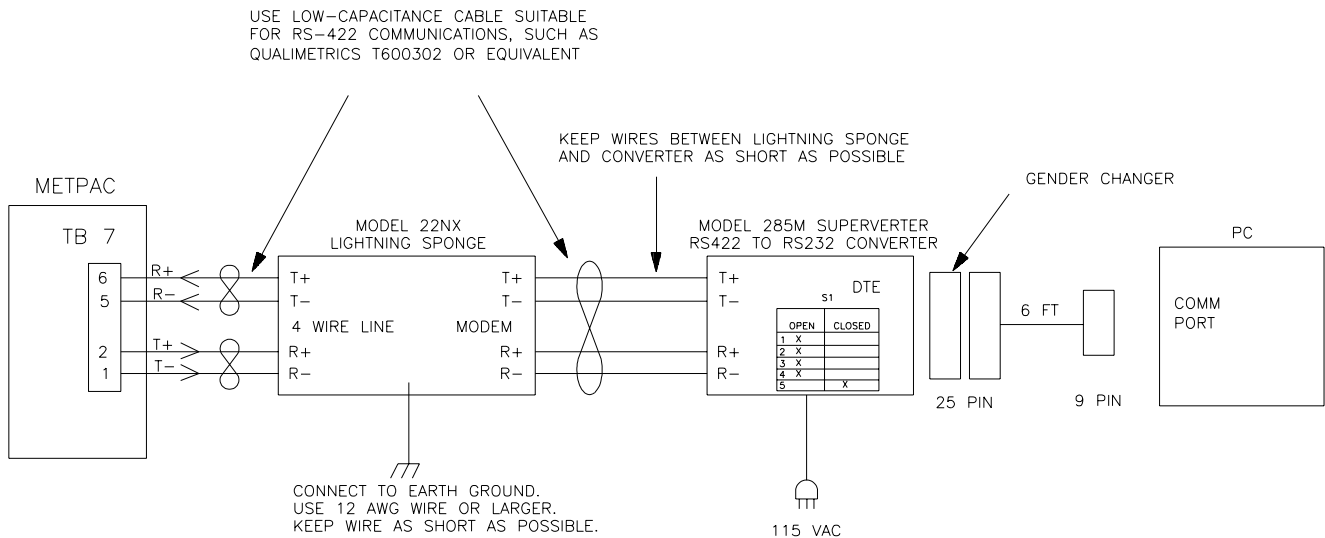


Figure 15  
RS-422-to-RS-232 Converter

- 3 Connect a second low-capacitance cable between the lightning sponge and TB7 on the METPAC motherboard as follows:
  - lightning sponge R- to TB7, pin 1 (T-)
  - lightning sponge R+ to TB7, pin 2 (T+)
  - lightning sponge T- to TB7, pin 5 (R-)
  - lightning sponge T+ to TB7, pin 6 (R+)
- 4 Connect a 12 gauge or larger wire between the lightning sponge ground terminal and earth ground.
- 5 Set dip switch S1 as follows:
  - 1 OPEN
  - 2 OPEN
  - 3 OPEN
  - 4 OPEN
  - 5 CLOSED
- 6 Plug the converter's power adapter into a suitable AC outlet.

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# Maintenance

## Lithium Battery Replacement

The lithium battery used for memory backup should be replaced every two years. The battery is located in the upper left corner of the METPAC's digital board (the small board raised above the main board).

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### **CAUTION:**

**Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used battery according to the manufacturer's instructions.**

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## Sensor Maintenance and Calibration

Follow the instructions for sensor maintenance and calibration provided in the individual sensor manuals shipped with each sensor.

### *Calibration Factors*

The Model 5140 and M403324 Temperature/Humidity Sensors and the Model 3120 Silicon Cell Pyranometer require calibration factors to be entered in order for measured values to be corrected for the individual sensors' characteristics. These values are normally entered at the factory, but will need to be re-entered if a sensor is replaced in the field or the configuration data is lost. Contact All Weather Inc. for details on entering calibration factors.

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# 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 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.

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# Specifications

## General

### Input Power

Voltage ..... 11-26VDC  
110 ±10 VAC/220 ±10 VAC/50 or 60 Hz

Current: ..... 50mA typical (no radio)

Serial Output ..... RS-232 asynchronous, RS-422

baud rate ..... 4800

max. distance

RS-232 ..... 50'

RS-422 ..... 4,000'

## Environmental Parameters

### *Operating Ambient Conditions*

Temperature ..... -40°F (-40°C) to 130°F (55°C)

Humidity ..... 0% to 98% condensing

### *Storage Ambient Conditions*

Temperature ..... -55°F (-48°C) to 135°F (57°C)

Humidity ..... 0% to 98% condensing



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# Drawings

The following pages include reference drawings to assist in installation and maintenance of this instrument.

METPAC  
TB-4

RXD (7)  
TXD (8)  
GND (9)

PC  
D-9

(1)  
RXD (2)  
TXD (3)  
DTR (4)  
GND (5)  
DSR (6)  
RTS (7)  
CTS (8)  
(9)

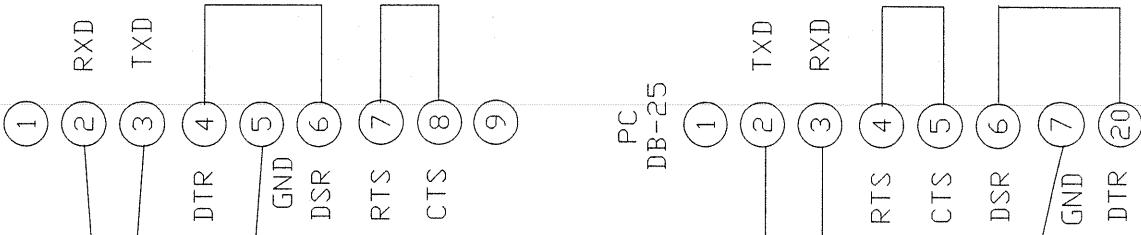
METPAC  
TB-4

RXD (7)  
TXD (8)  
GND (9)

PC  
DB-25

(1)  
TXD (2)  
RXD (3)  
RTS (4)  
CTS (5)  
DSR (6)  
GND (7)  
DTR (20)

# RS-232 WIRING DIAGRAM





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