Transportable Automated Meteorological Station

TAMS

User's Manual

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INTRODUCTION

TAMS (Transportable Automated Meteorological Station) is a compact and rugged, self-contained system designed for use in hazardous materials response situations, fire fighting, or any application where quick setup and accurate data collection are required.

A complete TAMS system consists of a Met Station--the data collecting portion of TAMS--in combination with a handheld Control/Display or one of several Transmitter/Receiver combinations. The Met Station mounts to a 10' self-guying aluminum tripod, an optional 6' camera tripod, or a standard 1" pipe (using the optional Pipe Adapter, Model 96008). The Met Station's built-in sensors collect weather data for a wide array of parameters, which it then transmits via cable to a computer or handheld Control/Display, or via a UHF Radio Transmitter Station to a Handheld Receiver or Receiver Station. The Met Station can be outfitted with an electronic compass that automatically adjusts wind measurements to North, eliminating the need for orienting the Met Station each time it is deployed.

There are three general TAMS system configurations, each of which itself offers further options for data transfer, power input, and sensor configuration:

- Met Station direct to Control/Display or computer (via cable)
- Transmitter Station to Receiver Station (via UHF radio)
- Transmitter Station to Handheld Receiver (via UHF radio)

The Control/Display, Handheld Receiver, Transmitter Station, and Receiver Station are all equipped with RS-232 serial ports to enable direct transfer of data to a computer. In addition, the Transmitter Station has a built-in RS-485 port for on-site viewing of data with a Control/Display.

To enable plug-in use with plume modeling software, output data is available in formats compatible with CAMEO/ALOHA, EIS, RMP, SAFER Real Time Systems, and Radian Corporation's CHARM software. Transmitter and Receiver Stations include rechargeable battery packs and battery chargers for remote operation. When not in use, the batteries can be recharged through the case's built-in DC power input.

The base Model 9600 contains the fundamental array of sensors. Other models add a barometric pressure sensor and/or an electronic compass to the basic array. **Table 1** shows the full list of available models and the parameters monitored by each. In addition to the measured parameters, Air Stability Class and Wind Standard Deviation can be calculated and output along with the normal weather data. For a complete list of TAMS models and options, refer to **Table 5** at the back of this manual.

	TAMS Model Number			
	9600	9601	9602	9603
wind speed	X	X	X	X
wind direction	X	X	X	X
temperature	X	X	X	X
relative humidity	X	X	X	X
barometric pressure		X		X
electronic compass (3-axis)			X	X
rain	OPTION	OPTION	OPTION	OPTION
solar radiation	OPTION	OPTION	OPTION	OPTION

Table 1 TAMS Models

BUILDING A TAMS SYSTEM

System Possibilities

TAMS is more than simply a portable weather station. Because of its modular design, it is the ideal solution to a vast array of monitoring needs, from single remote monitoring stations to large radio-linked data collection networks.

A variety of sensor configurations, power options, and data communication arrangements allow a practically limitless variety of monitoring systems to be built using TAMS' basic building blocks. This flexibility allows the TAMS to be adapted to many situations, but it also requires that some thought be given to the design of a TAMS system. Narrowing the numerous possibilities down to a single, ideal system may seem overwhelming at first glance, but the careful design of TAMS makes this seemingly daunting job a straightforward process.

Communication Options

The first step in constructing a TAMS system is deciding on the type of communication link required to retrieve, view, and use TAMS' collected data with a given application. TAMS communication links are divided into two basic types:

- Local (hardwire) links are used when data is to be retrieved and/or viewed at the monitoring site; cables connect the Met Station to a computer or Control/Display
- Radio links are used when data collected at a monitoring site is to be transferred to a remote computer or data processing center beyond the practical limits of a local link

The type of communication link used will in large part determine the makeup of the system, the choice of radio or local link dictating to some extent which of the major TAMS componenets will be required.

System Components

TAMS systems are built using combinations of six major components:

- **The Met Station**—the data collecting portion of TAMS
- **Y-Adapter**—used with local links, the Y-Adapter provides a power input to the Met Station and a direct RS-232/RS-485 connection between the Met Station and a computer
- **Control/Display**—a handheld data display and control device used with local links
- **Transmitter Station**—a portable radio transmitting station for TAMS radio link systems, housed in a weathertight carrying case with a battery and charger
- **Receiver Station**—one of two receiver options, the Receiver Station is a portable, radio receiving station for TAMS radio link systems, housed in a weathertight carrying case with a battery and charger
- **Handheld Receiver—**the second radio receiving option, the Handheld Receiver combines a radio receiver with many of the features of the Control/Display

These components can be used together in many different configurations to form systems tailored to the specific needs of any application. The following sections explain each of the components in detail and how they fit into a complete TAMS system.

Met Station

The Met Station is the data collecting portion of TAMS. It consists of the sensors, processing circuitry, optional magnetic compass, and tripod.

Sensors

The sensors used with TAMS are miniaturized sensors built into the Met Station. Several TAMS models are available that each include a different combination of sensors. The Model 9600 contains the fundamental array, with successive models adding sensors to this combination to increase the monitoring capabilities of the station. **Table 1** shows the full list of available models and the parameters included with each. In addition to the standard sensors, solar radiation and rainfall sensors are available as add-on options. Air Stability Class and Wind Stan-

dard Deviation can also be calculated from measured parameters and output along with the normal weather data.

Signal Processing

Sensor measurements are processed by the Met Station, then sent via the Met Station cable to the Transmitter. The data includes measured and calculated parameters used in the standard ALOHA packet, plus relative humidity and barometric pressure.

Internal memory within the Met Station allows over 1500 records (each including data fields for 10 measured or calculated properties plus date and time) to be stored automatically at an interval specified by the user. The data storage interval is set through the Setup menu, which also includes options for downloading and erasing the stored data, and for enabling timed output. Once the memory is filled, new data is written over the oldest stored record. A lithium backup battery within the Met Station ensures that stored information will be retained even after power is removed.

Stored data can be output directly from the Control/Display's RS-232 port to an external computer or printer. The most recent record can also be sent automatically to a computer or printer at user-specified intervals.

Magnetic Compass

The optional magnetic compass mounts on the Met Station and provides direction information so that wind direction is reported relative to North regardless of the orientation of the Met Station. This eliminates the need to orient the Met Station to North each time it is set up, speeding up and simplifying installation when time is critical. The Handheld Receiver, Control/Display, and interface software all provide the capability to enter magnetic declination, thus providing wind direction data relative to true North.

Tripod

The tripod is an aluminum tripod with an adjustable extension leg for levelling and stability. The Met Station mounts to the tripod mast using a supplied adapter. The Met Station cable is routed through a slot in the adapter, then down along the tripod to the transmitter. One or more booms can be easily attached to the tripod for mounting of an antenna, rain gauge, solar radiation sensor, or solar panel. The tripod legs terminate in wide, metal feet, which can be used to secure the tripod either by staking them to the ground or by weighting them with rocks, sandbags, or any other available weight. With the feet secure, the tripod is capable of withstanding high winds without tipping or damage.

Control/Display

The Control/Display provides a portable, convenient method of viewing collected data locally. It is normally used at the data collecting site, with a cable connecting it directly to the Met Station. It can, however, also be connected to the RS-485 port on a Transmitter Station case.

The Control/Display has three functions: it displays current weather conditions, governs Met Station operation, and houses the keypad used for accessing weather data and performing the setup procedure. During the setup procedure, the user cycles through a series of menus and enters values that will govern how the TAMS processes, displays, and outputs weather data. The *Setup* chapter walks you through the necessary steps to ensure TAMS' proper operation.

The Control/Display shows current sensor readings on a lighted LCD display. It is equipped with an RS-232 serial port for connection to a computer, with data output available in formats compatible with CAMEO/ALOHA, EIS, RMP, SAFER Real Time Systems, and Radian Corporation's CHARM software.

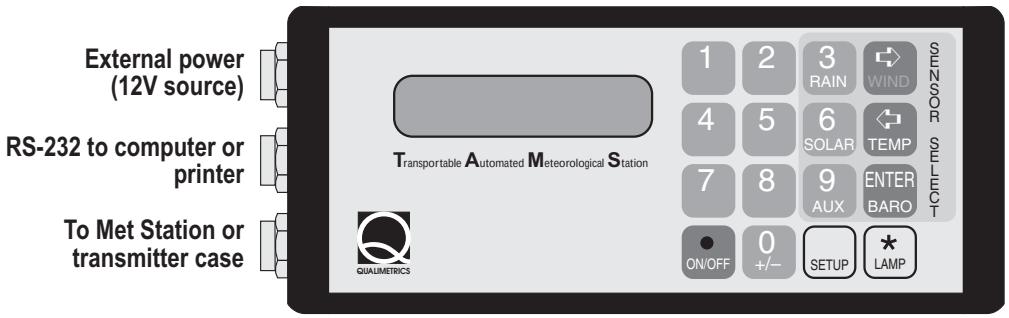


Figure 1. Control/Display

The Met Station and Control/Display can both be powered by "AA" batteries installed in the Control/Display's battery compartment, or by an external 12VDC source connected to the top connector on the Control/Display's end panel. Twelve "AA" batteries installed in the internal compartment will power the Met Station and Control/Display for up to 24 hours at 70° F. Installed batteries are not used when an external power source is connected.

Connectors

There are three connectors on the Control/Display's end panel. The top connector is provided for use with a 12V external source; the middle connector allows connection to a computer or printer (RS-232); and the bottom connector is the Met Station cable connection. (*See* **Figure 1** *for connector designations*.)

Transmitter Station

The Transmitter Station is used in TAMS radio link configurations, and consists of a radio transmitter, interface module, and rechargeable battery (*see* **Figure 9**). These components are housed within a portable weathertight case, which has connectors built into its front panel to allow the entire Transmitter package to be left outdoors when necessary. There are five connectors in all:

***Met Station**—Connects to the Met Station cable (routed from the Met Station through the mast and out the bottom)*

***Antenna**—Connects to the antenna cable (routed from the antenna, along the boom, and down the outside of the mast)*

***RS-485**—RS-485 interface for optional connection of a Control/Display or RS-485 line*

***RS-232**—RS-232 interface for connection to a standard computer serial port*

***DC Power**—For auxiliary DC power and battery charging*

The radio transmitter is a UHF radio with a frequency matched to the radio in the Receiver Station. This frequency (467.75 MHz) is licensed to All Weather Inc. as a Private Carrier.

The battery is a rechargeable 5 amp hour battery. It can be used as the sole power source for short periods (up to 48 hours) when an external source (such as solar power) is not available. When an external source is connected to the DC Power input, the Interface Module recharges the battery.

The Interface Module processes the Met Station data for output over the radio and via the RS-485 and RS-232 ports. It also distributes power to the components and charges the Transmitter battery when an external source is connected.

The Transmitter case is also available without a radio for use as a portable power source in systems where the Met Station is connected via cable directly to a computer or Control/Display.

Antenna

The UHF antenna included with the Transmitter mounts to the tripod boom. The antenna cable is then connected to the "ANTENNA" connector on the Transmitter case's front panel.

Caution: Always connect the antenna cable to the Transmitter case before connecting the Met Station cable or applying power.

Transmitter Operation

Operation of the Transmitter is automatic, controlled by the Interface Module and the remote receiver.

Receivers

Two types of receivers are available for use with TAMS, a Receiver Station and a Handheld Receiver.

- The **Receiver Station** (**Figure 12**) uses a case-housed radio receiver, with supporting power and processing circuitry built into the case.
- The **Handheld Receiver** (**Figure 14**) is a portable display/receiver that receives transmitted data over a built-in radio receiver and displays sensor data on an LCD screen.

Receiver Station

The Receiver Station is used on the receiving end of a TAMS radio link, and consists of the radio receiver and antenna. The Receiver Station is normally connected to a computer running the TAMS interface software, which enables the data to be displayed graphically, and to be stored or sent on to other computers.

Receiver

The TAMS Receiver is made up of a case similar to the Transmitter case, and houses a radio receiver, interface module, and rechargeable battery. The case is a portable weathertight case, with external connectors built into its front panel to allow the Receiver to be left outdoors when necessary. There are three connectors on the Receiver case.

Antenna—*Connects to the antenna cable*
RS-232—*RS-232 interface for connection to a computer's serial port*
DC Power—*For auxiliary DC power and battery charging*

The radio receiver is a UHF radio with a frequency matched to the Transmitter Station's radio. This frequency (467.75 MHz) is licensed to All Weather Inc. as a Private Carrier.

The battery is a rechargeable 5 amp hour battery. It can be used as the sole power source for up to 6 days when an external source is not available. When an external source is connected to the DC Power input, the Interface Module recharges the battery.

The Interface Module processes the data received from the Transmitter and outputs it via the RS-232 port to the laptop computer. It also distributes power to the components and charges the Receiver battery when an external source is connected.

Antenna

The Receiver antenna is a swiveling UHF antenna with a magnetic mounting base. It can be mounted to any convenient surface within cable range of the Receiver, with best reception provided when it is mounted as high as possible. Keep in mind that, while the magnetic base can be mounted in any position, the antenna itself must always be vertical.

Caution: Always connect the antenna cable to the connector on the Receiver case before applying power to the Receiver.

Handheld Receiver

The Handheld Receiver combines many of the features of the Control/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 radio in the Transmitter Station. This frequency (467.75 MHz) is licensed to All Weather Inc. as a Private Carrier.

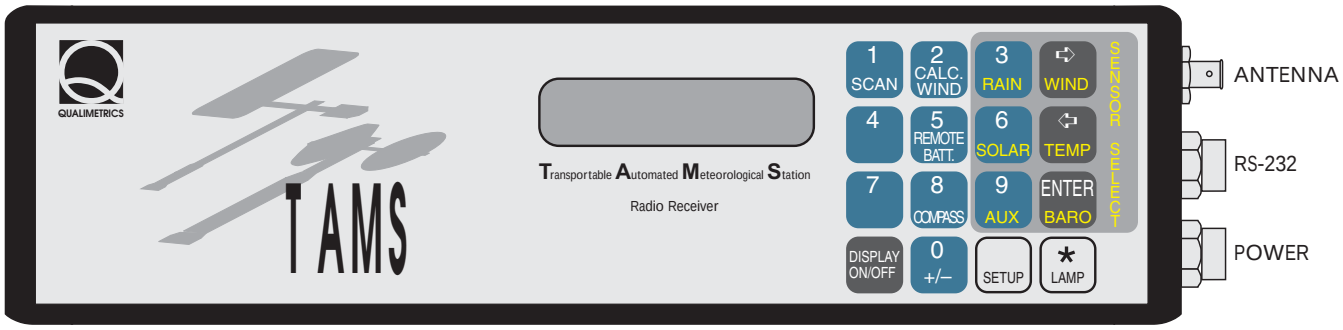
The Handheld Receiver can be used with or without an accompanying carrying case. In this configuration, the case serves as a portable power supply for the Handheld Receiver, and there are three connectors on the front of the case.

Radio Display Power—*Supplies power to the Handheld Receiver from the internal battery*
DC Power—*For auxiliary DC power and battery charging*

When an external power source is available, the Handheld Receiver can be powered from it directly using a power adapter. When an external source is not available, the Handheld Receiver plugs into the carrying case's Radio Display Power connector, which provides power from the rechargeable battery housed inside the case. The battery can power the Handheld Receiver for up to 36 hours.

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 2. Handheld Receiver



System Configurations

Local (Hardwire) Link

The most basic TAMS system configuration involves only local communication. This type of system uses a direct cable link to either a Control/Display or a computer.

When a Control/Display is used (**Figure 4**), a cable connects it directly to the Met Station. A computer—such as a laptop computer—can then be connected to the Control/Display's RS-232 port, if desired.

The alternate method uses a "Y" adapter cable (Model No. 96023) that allows the Met Station to be connected directly to a computer's serial port without an intervening Control/Display (**Figure 7**). In this arrangement one leg of the "Y" is an RS-232 or RS-485 connection, and the other leg is a DC power connection. The appropriate connecting cables are required to complete the link between the "Y" end connectors and the power supply and computer.

Radio Link

For applications where data is to be collected from a remote monitoring station, a TAMS radio link can be used. A radio link allows communication over long distances, and is ideal for transmitting data from a remote station to a central location. A radio link uses a Transmitter Station (**Figure 9**) in tandem with one of two receiver options: a Receiver Station, or a Handheld Receiver.

Receiver Station Link

A Receiver Station radio link (**Figure 11**) has a UHF radio receiver built into the receiver case. In this configuration, transmitted data is received directly by the receiver in the case via a detachable antenna connected to the "Antenna" connector on the front of the case. Two other connectors on the case provide the Receiver Station with increased flexibility.

- An RS-232 connector allows a computer to be connected directly to the case using a special cable.
- A DC power connector allows external power to be supplied to the Receiver Station, as well as enabling recharging of the internal battery.

Handheld Receiver Link

A Handheld Receiver radio link (**Figure 13**) uses the Handheld Receiver on the receiving end, with or without a receiver case. The case serves as a portable power supply for the Handheld Receiver when another external source is not available. When an external power source is available, the Handheld Receiver can be powered from it directly using an optional power adapter.

The Handheld Receiver also allows further transmission of the collected data via its built-in RS-232 port. A cable is available for connecting a computer directly to this port.

Beyond the Basic System

The system configurations described above form the foundation for all TAMS systems, but the monitoring and data collecting possibilities of TAMS systems go far beyond a single station outputting data to a host computer or Control/Display. TAMS' networking capabilities allow multiple stations to communicate with a central data center, or even with multiple receiving stations. Local links and radio links can be combined, so that data can be viewed on-site as it is received, while simultaneously being transferred to a remote computer. Solar power, vehicle power, and AC power can all be used to provide power to a TAMS station, and the great variety of cable assemblies available increase the connection possibilities dramatically. The ***Options and Accessories*** chapter of this manual describes the many sensor, power, and connection options available with TAMS, and explains their use and installation.

INSTALLATION

Tripod, Met Station, and Antenna Installation

The standard TAMS 10' tripod is ordinarily transported partially disassembled inside its carrying bag. The tripod is lightweight and sets up quickly and easily, and yet will withstand high winds and adverse conditions securely. Install the Tripod, Met Station, and antenna (if used) according to the following instructions while referring to **Figure 3**.

1. Remove the tripod from its carrying bag.
2. Extend the legs and tighten the adjusting knob.
3. If an antenna, solar radiation sensor, or rain gauge is to be used, remove the tripod adapter from the mast and slide the boom(s) over the mast. Tighten the boom adjusting knob(s).
4. Replace the tripod adapter on the mast and tighten the adjusting knob.
5. Install the Met Station onto the tripod adapter, routing the Met Station's cable through the slot in the tripod adapter so that the cable and connector extend out to the side. Tighten the clamp at the base of the Met Station's neck.
6. If auxiliary sensors are used, install the Auxiliary Sensor Cable kit (96026) between the Met Station connector and the main cable as explained in ***Installing Auxiliary Sensors*** later in this chapter.
7. Connect the Met Station's connector to the mating connector on the main cable (or to the auxiliary sensor cable, if one is used), and route the cable down along the tripod. Secure the cable to the tripod using the velcro strap located just below the mast adjustment knob. (Note: During extended installations, or where winds are high, cable ties can be used to further secure the cable to the tripod.)
8. If an antenna is used, install the antenna **vertically** onto the boom by loosening the adjusting knob on the mounting clamp and sliding the entire assembly over the end of the boom. Tighten the adjusting knob, and secure the antenna cable to the boom using the velcro strap located next to the boom mounting fitting.
9. Loosen the mast adjusting knob and extend the mast to the desired height. Tighten the adjusting knob.
10. Adjust the leveling leg to level the tripod. When done, the top of the Met Station case should be level to within ±15°.
11. When the tripod is level, secure the feet by staking or weighting them.

10' Tripod Disassembly

The 10' TAMS tripod must be partially disassembled before being loaded into its carrying bag.

1. Loosen the mast adjusting knob and lower the mast.
2. Disconnect the Met Station from the main cable and remove the Met Station from the mast.
3. If a boom is used: Disconnect the antenna and/or auxiliary sensors and remove the tripod adapter, then remove the boom(s) from the mast, and load the boom(s) into the carrying bag.
4. Loosen the adjusting knob on the leveling leg and retract the leg.
5. Collapse the tripod and load it into the carrying bag.

6' Tripod Installation

The Met Station mounts to the optional 6' tripod using a tripod adapter included with the tripod. The only tool needed for installation is a slot-head screwdriver for tightening the mounting clamp that holds the Met Station base to the tripod adapter (see **Figure 4** for an illustration of a typical setup).

1. Place the tripod on level ground. If the ground is uneven, adjust the legs to level the tripod. (If the TAMS is positioned on a level surface with the legs fully extended, it will withstand wind gusts up to 15 m.p.h. without blowing over. If wind gusts over 15 m.p.h. are anticipated, tether or otherwise secure the tripod to the ground.)
2. Slide the neck of the TAMS Met Station over the tripod adapter.
3. The wind direction vane and anemometer cup assembly attach to the two metal shafts on the top of the Met Station in the positions shown on the Met Station's front and back labels. Attach the wind direction vane to the Met Station by sliding it over the shaft so that the pin in the shaft keys to the slot in the vane base and the vane snaps into place.

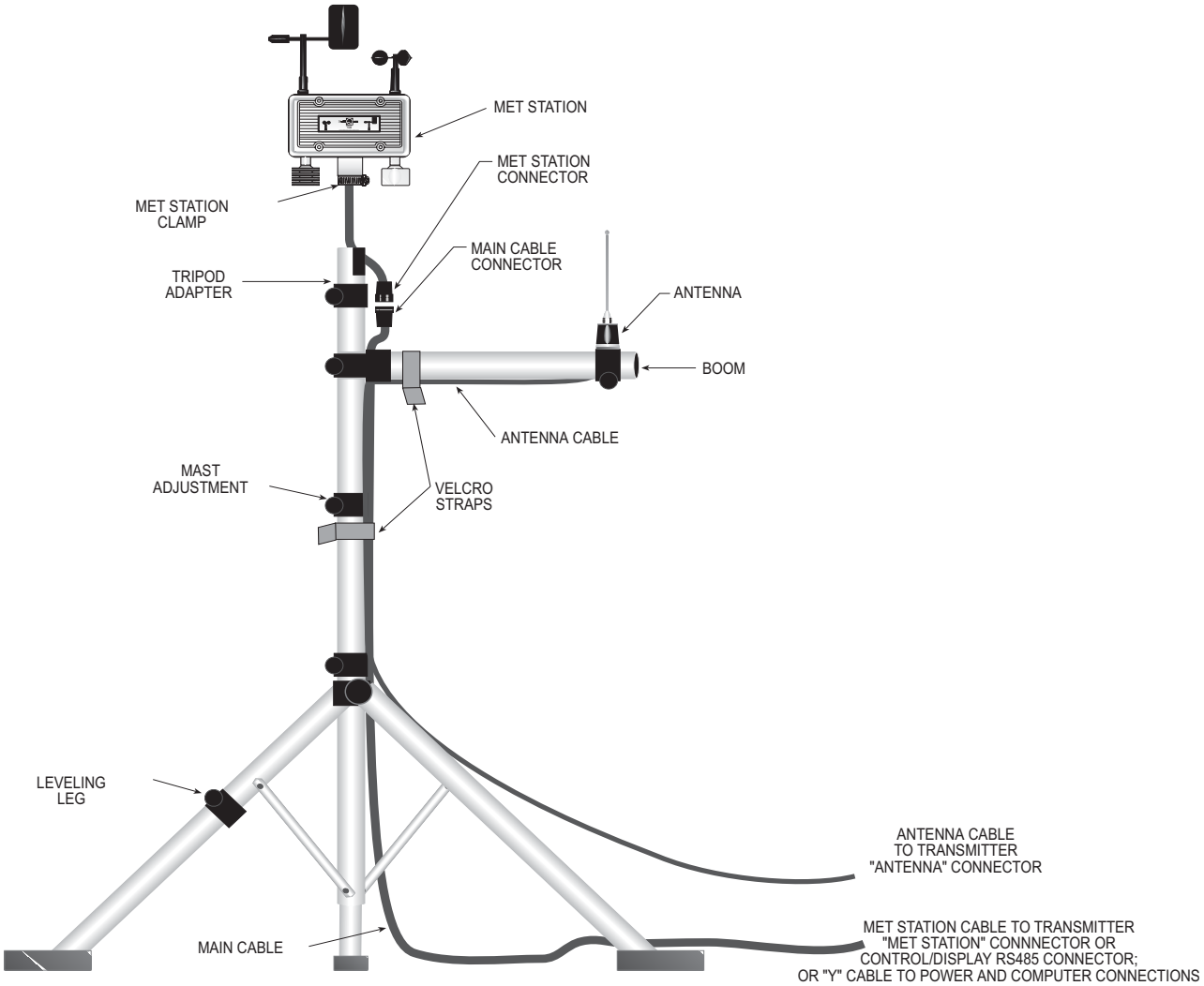


Figure 3. TAMS tripod, Met Station, and antenna installation

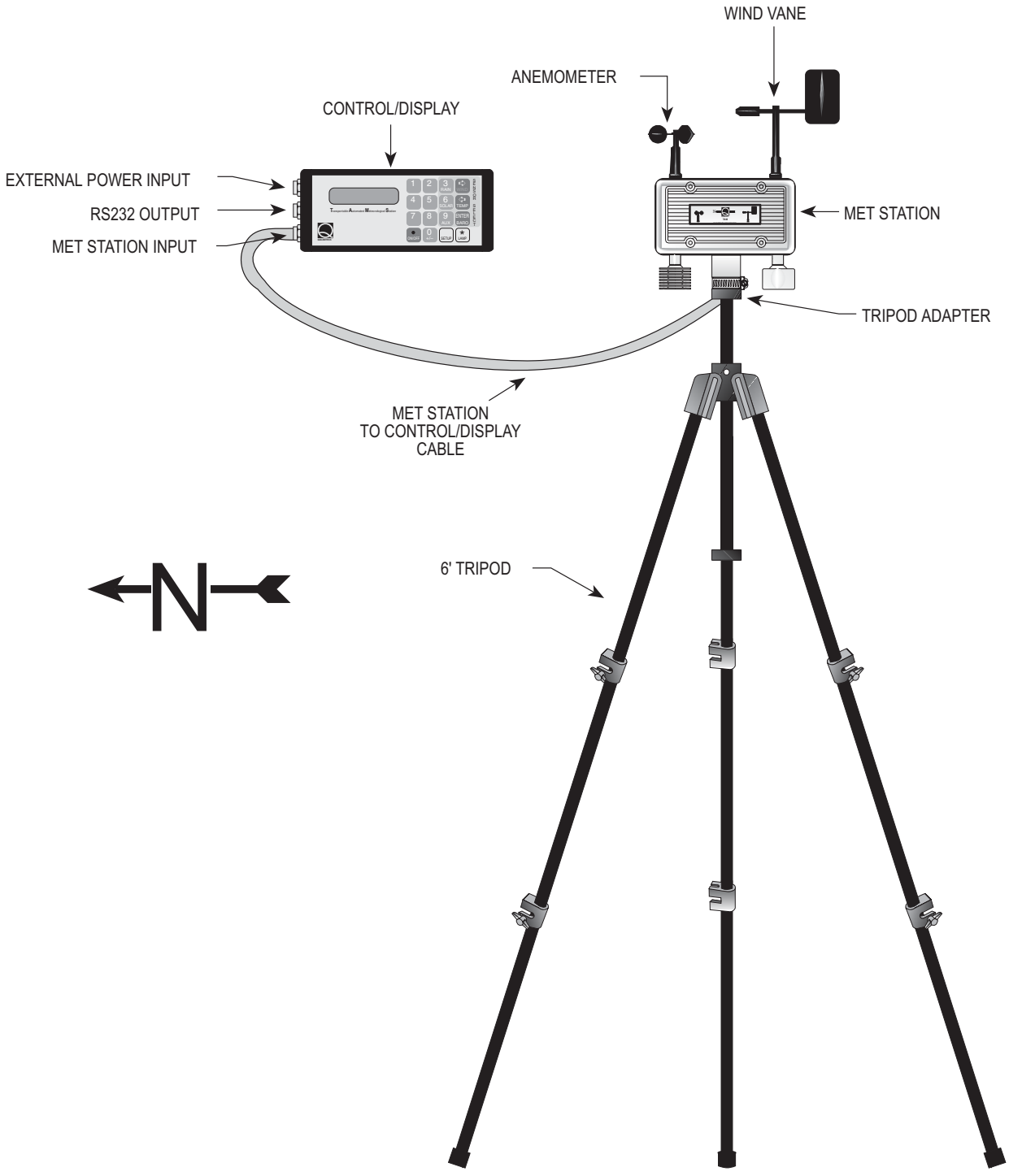


Figure 4. TAMS 6' tripod installation with Control/Display

4 Attach the wind speed cup assembly to the other shaft in the same way.

5 (If a Met Station with magnetic compass is being used, it is unnecessary to orient the Met Station to North, and you may proceed to Step 6. If an electronic compass is not used, orient the Met Station as described in this step.) In addition to the positions of the wind sensors, the Met Station's front and back labels also show the Met Station's required orientation with respect to magnetic north, represented by the **N** symbol. Using a compass as a reference, turn the Met Station housing until it aligns to magnetic north, using the north symbols on the front and back labels as guides. To have wind direction values expressed relative to True North, enter a magnetic declination through the Setup procedure explained in the ***Setup*** chapter of this manual.

6 Tighten the clamp at the base of the Met Station with a screwdriver, making sure that the transmitter remains parallel to the ground.

Stowing the Met Station

In addition to housing the battery, battery charger, and optional radios, each TAMS carrying case is fitted with pre-cut foam inserts to secure and protect the Met Station components during transport. **Figure 5** shows the inside of a case with cutouts. To stow the TAMS Met Station:

1 Remove the wind vane and cup assemblies and slide them into their designated pockets.

2 Stow the Met Station body in its designated pocket.

3 Cutouts are also provided for a Control/Display, power adapter, and antenna. Stow them in the locations shown in **Figure 5.**

Local Link Installation

Control/Display Installation

(*See **Figure 4***) When a Control/Display is used for a local display of data, it connects directly to the Met Station, with power supplied by "AA" batteries installed in the Control/Display, or via a power adapter.

1 Attach one end of the Met Station-to-Control/Display connecting cable to the bottom of the three connectors on the Control/Display's end panel. Connect the other end to the cable extending from the base of the Met Station.

2 If using an external 12 VDC source, connect it to the top connector on the Control/Display's end panel.

3 If using "AA" batteries, insert them into the Control/Display's internal battery compartment located behind the end cap at the opposite end of the Control/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 6**.

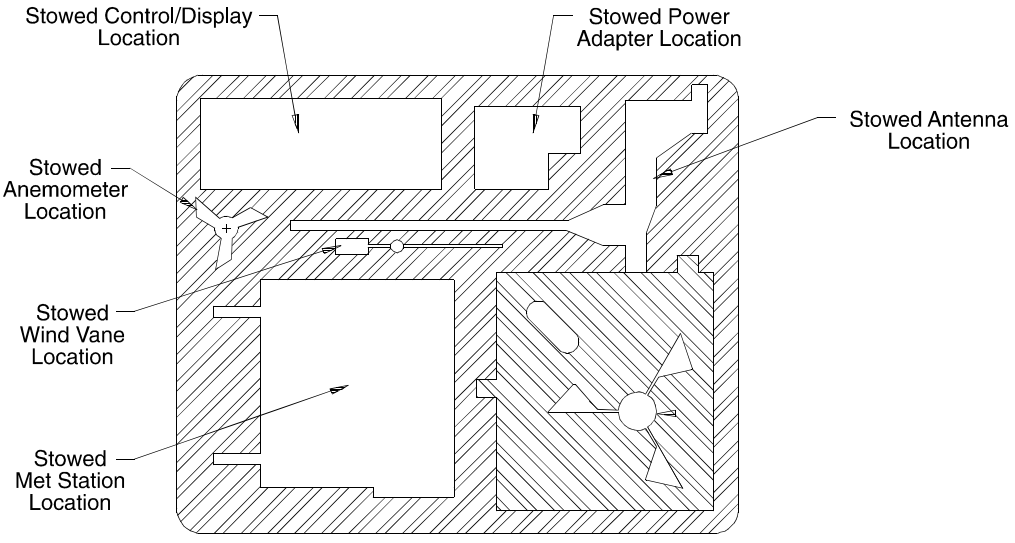


Figure 5.
Met Station components storage locations

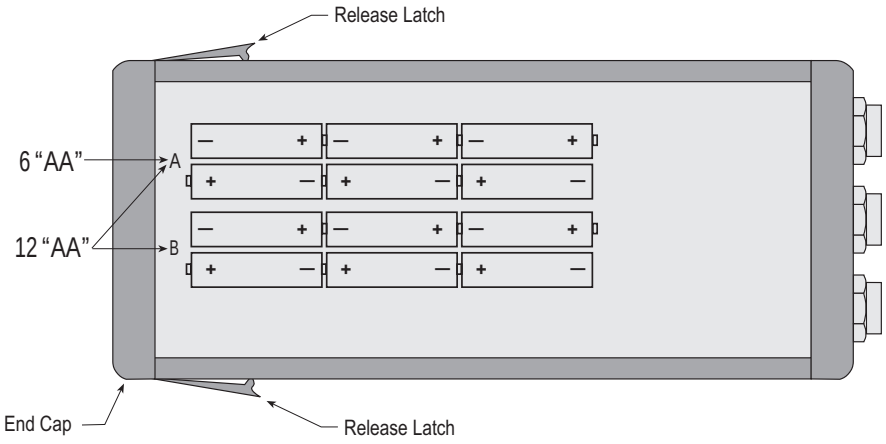


Figure 6. TAMS battery loading

4 If connecting to an external computer, connect one end of the optional cable to the middle connector on the Control/Display's end panel, and the other end to your computer's serial port.
5 Activate the unit by pressing the POWER key on the Control/Display keypad, then proceed to the Setup procedure.

"Y" Adapter Installation

(*See **Figure 7***) When a Control/Display is not used with a local link, a connection to a host computer can be established using the optional Y-Adapter Cable (Model 96023). The main trunk of the Y- adapter connects to the Met Station, with one leg of the "Y" connecting to the host computer (or compatible cable), and the other to a power source.

1 Connect the Y-Adapter's blue-banded Met Station connector (the single connector at the base of the "Y") to the mating Met Station connector at the end of the short cable extending from the base of the Met Station.
2 Connect the power source to the Y-Adapter's red-banded power connector using a compatible power adapter cable.
3 Connect the blue-banded leg of the "Y" to the mating blue-banded connector on a compatible RS-232 adapter cable (such as the 96021).
4 Connect the other end of the RS-232 adapter cable to the serial port of the host computer.

Radio Link Installation

Radio Kit Installation

Before the Transmitter Station is put into use, the Radio Kit must first be installed in the transmitter case (*see **Figure 8***). Installation of the Radio Kit should be done before taking the Transmitter Station into the field. Once it is installed, it can be left installed in the case. Future installations then involve simply connecting the external cables.

1 Remove the top two layers of foam inserts and the TAMS components from the transmitter case.
2 Remove the hole plug from the front of the case at the position labeled "ANTENNA".
3 Remove the top nut from the male BNC connector on the antenna cable (M491493).
4 From inside the case, insert the male BNC connector through the "ANTENNA" hole and replace the nut. Tighten the nut to secure the cable to the case.
5 Connect the other (female) end of the antenna cable to the RF jack on the radio modem (M489110).
6 Connect the small plug-in connector on the Radio-to-Interface Module cable (M491483) into the Interface Module connector labeled "RADIO".
7 Connect the Radio-to-Interface Module cable's larger "D" connector to the mating connector on the radio modem.
8 Fit the radio modem into the cutout provided.
9 Replace the foam inserts and TAMS components.

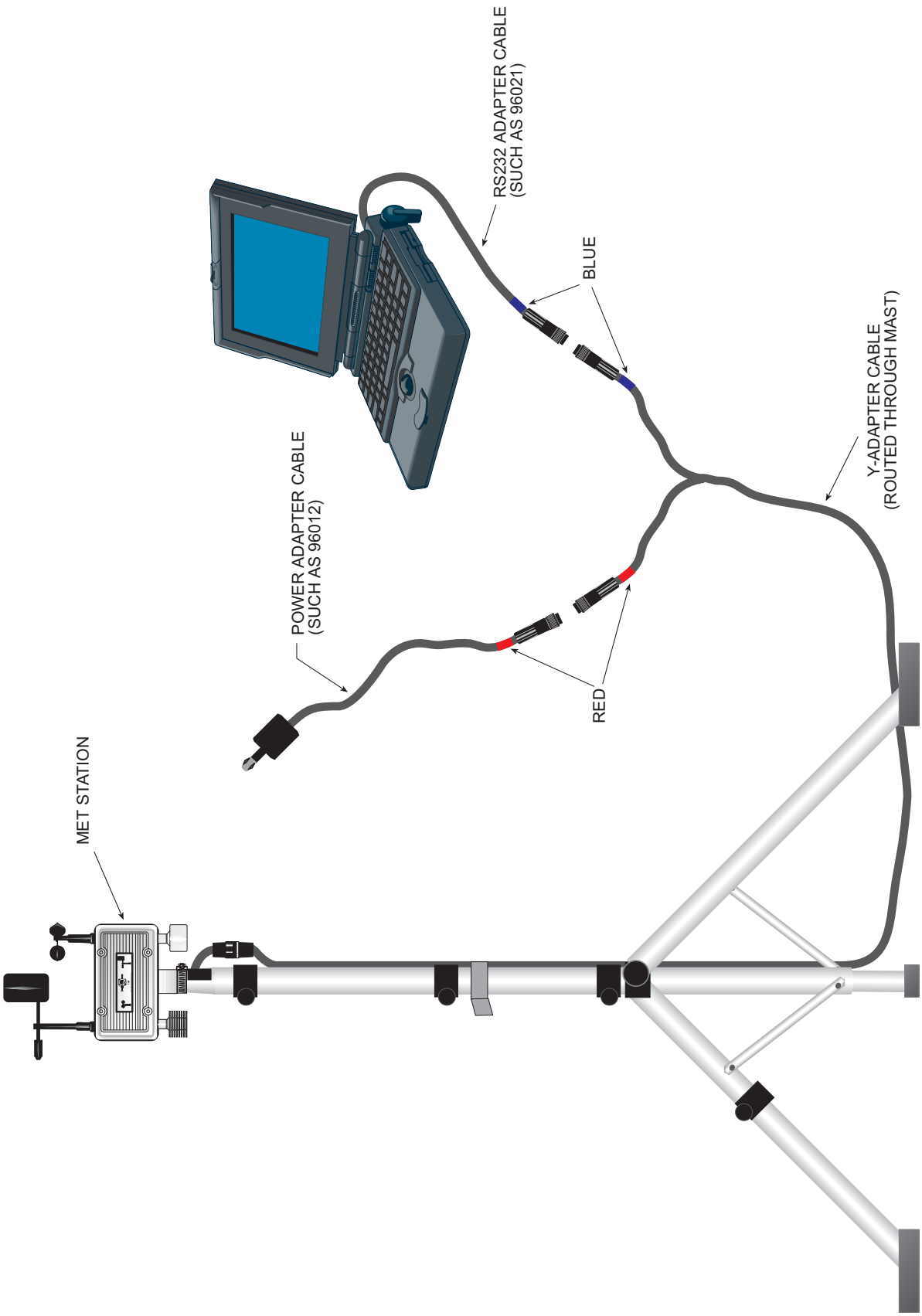


Figure 7. Y-Adapter installation

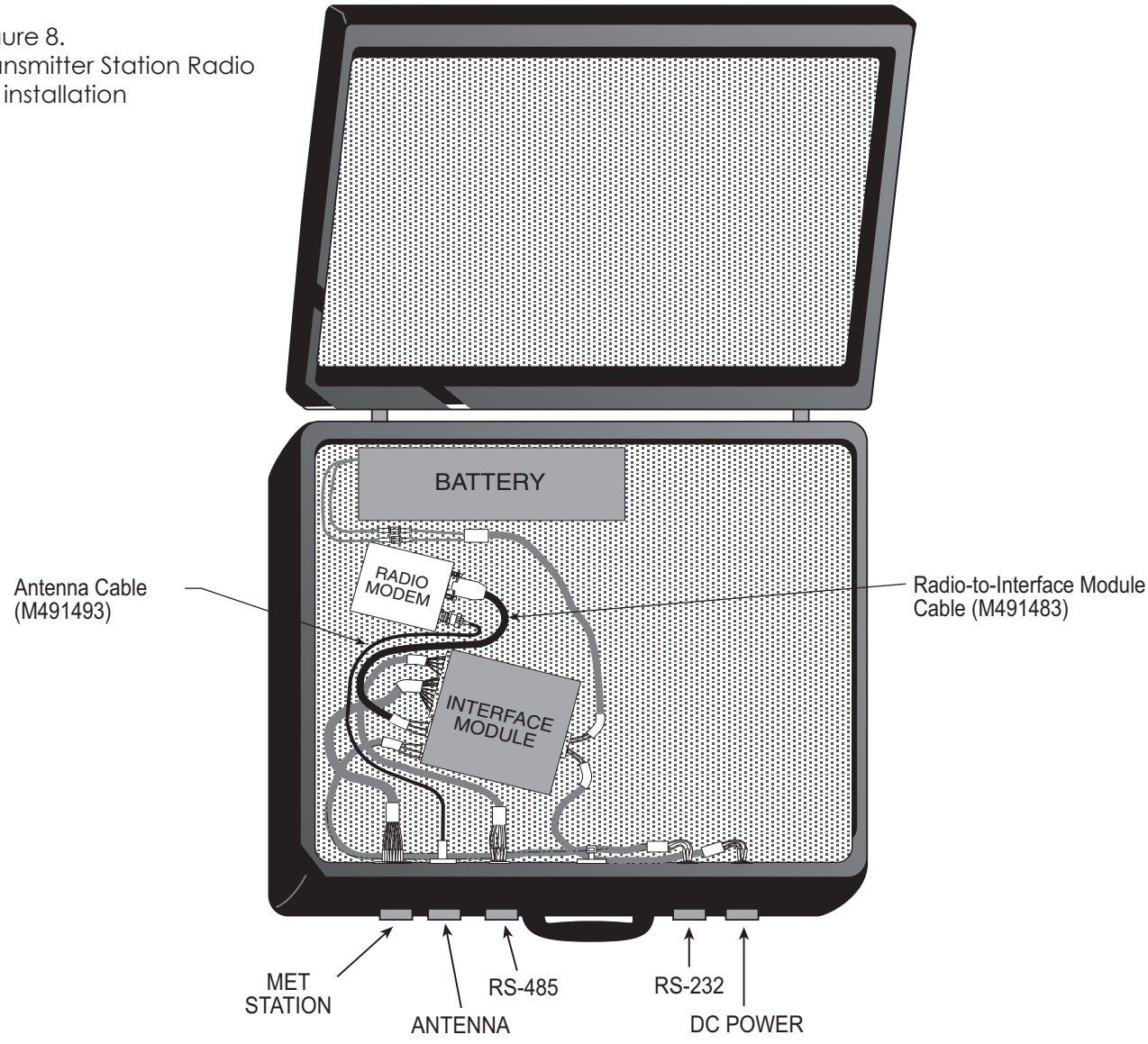
Transmitter Station Installation

(*See* ***Figure 9***) The Transmitter Station is installed near the Met Station. The transmitter case is weathertight—as are all the connectors—and so serves as an enclosure for the transmitter components, protecting them from the elements in outdoor installations. Once the tripod, Met Station, antenna, and Radio Kit have been installed, connect the cables to the Transmitter case's external connectors in the following order.

Caution:
It is very important to connect the antenna cable before connecting the Met Station cable. Failure to do so may result in damage to the radio.

1. Connect the antenna cable to the connector labelled "ANTENNA".
2. Connect the Met Station cable to the connector labelled "MET STATION".
3. If using external power, connect the connector labelled "Power 12-18 Vdc".
4. The "RS-485" connector is provided for use with a Control/Display. The "RS-232" connector is provided for optional connection to any standard computer serial port.

Figure 8.
Transmitter Station Radio Kit installation



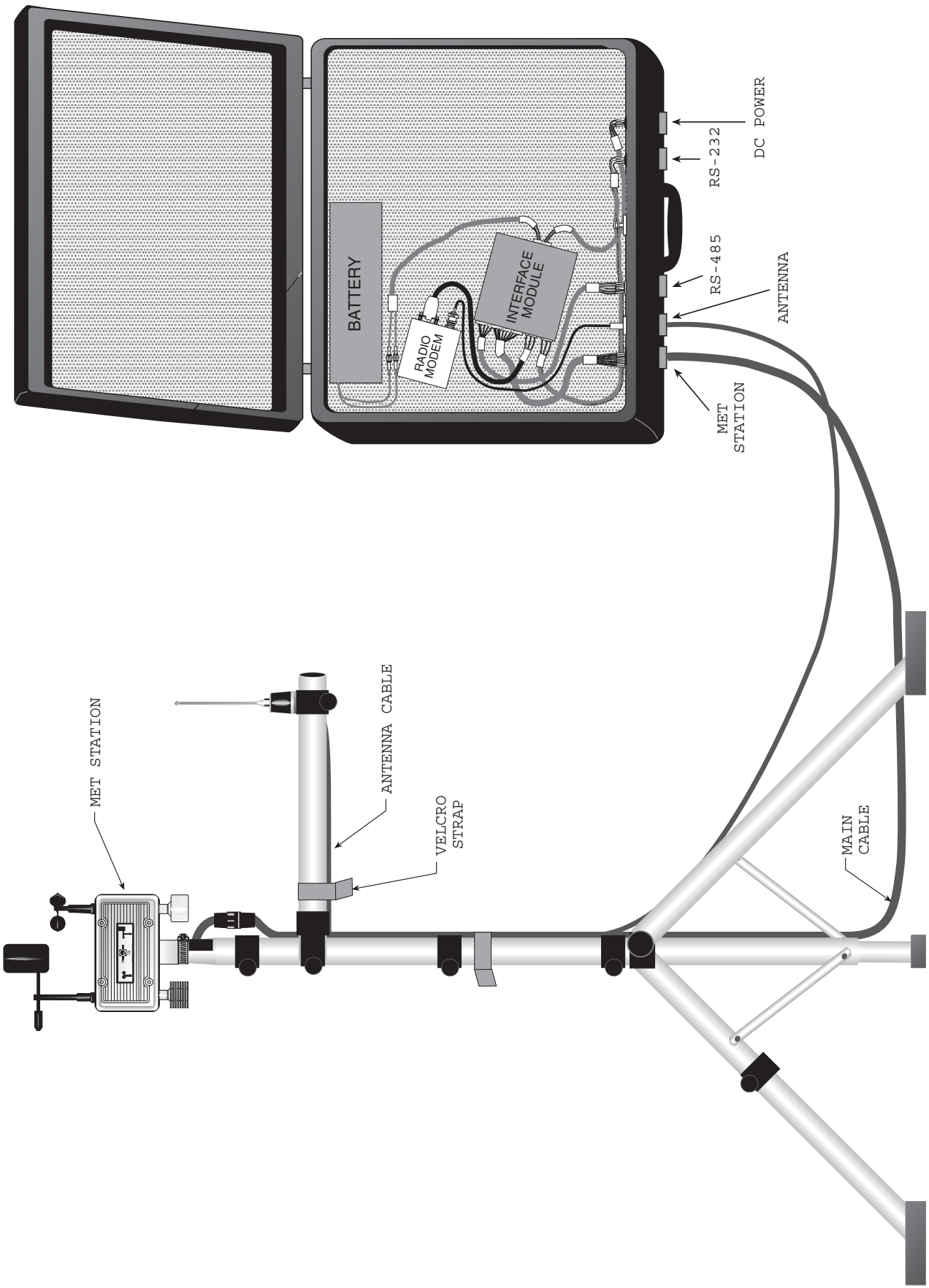


Figure 9. TAMS Transmitter Station installation

Receiver Installation

Receiver Station

Setting up the TAMS Receiver Station consists of installing the Radio Kit, mounting the radio antenna, and connecting the antenna cable and any auxiliary cables (computer and/or DC power). Installation of the Radio Kit should be done before taking the Receiver Station into the field. Once it is installed, it can be left installed in the case. Future installations then involve simply mounting the antenna and connecting the external cables.

Radio Kit Installation

(*See **Figure 10***).

1. Remove the top two layers of foam inserts and the TAMS components from the receiver case.
2. Remove the hole plug from the front of the case at the position labeled "ANTENNA".
3. Remove the top nut from the male BNC connector on the antenna cable (M491493).
4. From inside the case, insert the male BNC connector through the "ANTENNA" hole and replace the nut. Tighten the nut to secure the cable to the case.
5. Connect the other (female) end of the antenna cable to the RF jack on the radio modem (M489110).
6. Connect the small plug-in connector on the Radio-to-Interface Module cable into the Interface Module connector labeled "Radio".
7. Connect the Radio-to-Interface Module cable's larger "D" connector to the mating connector on the radio modem.
8. Fit the radio modem into the cutout provided.
9. Remove the hole plug from the front of the case at the position labeled "RS-232".
10. Remove the top nut and cover from the round connector on the RS-232 cable (M491481).
11. From inside the case, insert the round connector through the "RS-232" hole and replace the cover and nut. Tighten the nut to secure the cable to the case.
12. Connect the plug-in connector on the other end of the cable to the Interface Module connector labeled "RS232".
13. Remove the existing hardware from the side of the case where the Power Switch Assembly (M491497) is to be located. Discard the flat and split washers.
14. Mount the Power Switch Assembly to the side of the case using the hardware removed in step 13 (omitting the flat and split washers).
15. Connect the plug-in connector on the Power Switch Assembly cable to the 4-pin connector on the Interface Module labeled "Power In".
16. Replace the foam inserts and TAMS components.

Receiver Station Installation

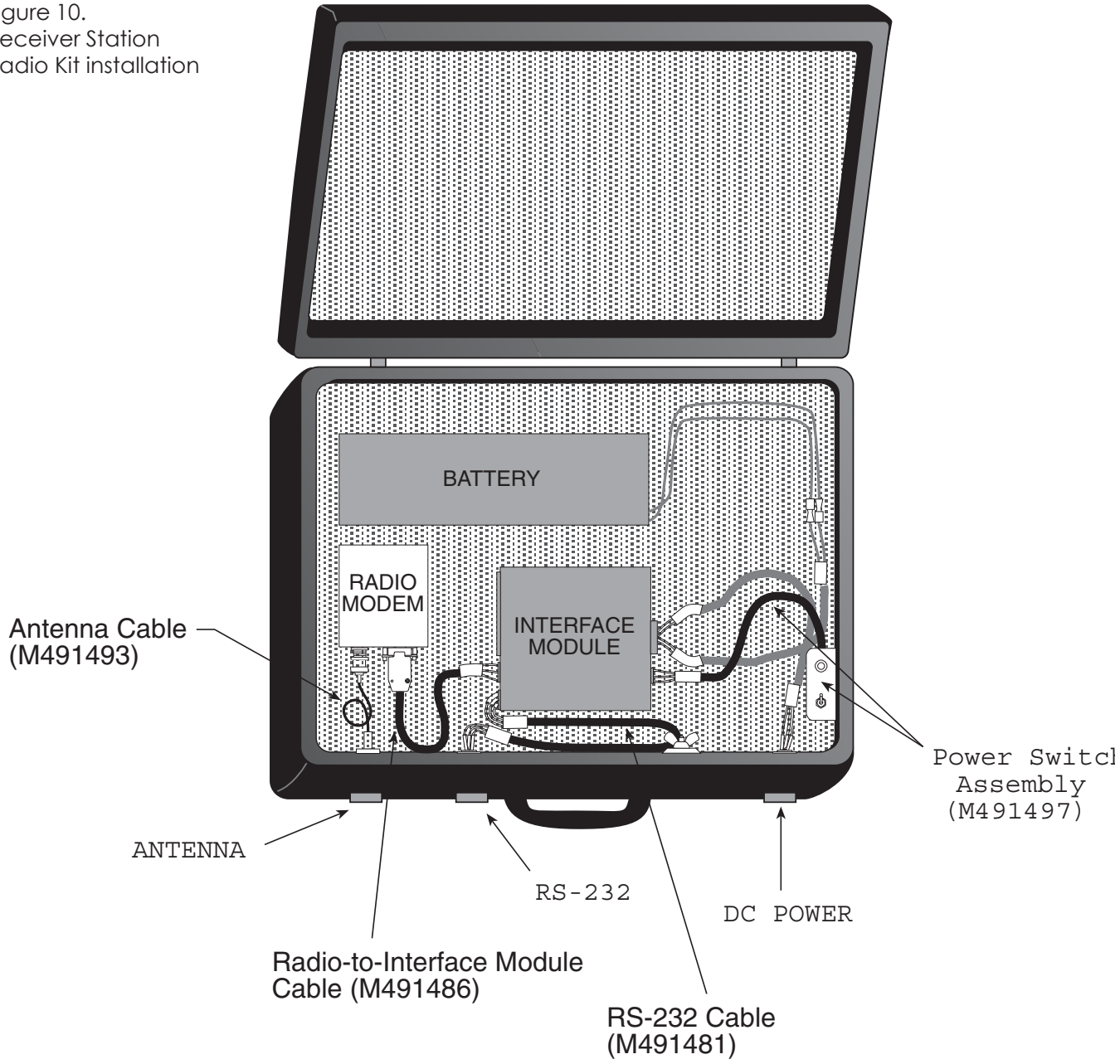
(*See **Figure 11***)

1. The base of the antenna is a magnetic mount. Mount the antenna vertically to any convenient surface. For best reception, it should be mounted as high as possible.
2. Connect the antenna cable to the connector on the receiver case labelled "ANTENNA".

Caution:
It is very important to connect the antenna cable before applying power. Failure to do so may result in damage to the radio.

3. If a computer is used, connect the serial cable between the computer and the external connector on the receiver case labelled "RS-232".
4. If using external power, connect the DC adapter to the connector labelled "Power 12-18 Vdc".
5. Turn the power switch inside the case to ON. When power is applied, the red LED above the power switch will light, and the radio modem's "Power" LED will be on. (***Note: Be sure to turn the power switch OFF when the radio is not in use to avoid draining the battery.***)
6. Set the magnetic declination for your position. See ***USING TAMS*** for details on setting the magnetic declination.

Figure 10.
Receiver Station
Radio Kit installation



Handheld Receiver Installation

The Handheld Receiver can be used with or without a receiver case. In addition to the convenience of a case for transporting the unit, the rechargeable battery within the case provides a convenient portable power source. If the Handheld Receiver is used without a case, power must be supplied from an auxiliary source. Several power adapters are available for this purpose, including a DC adapter for using standard AC power, a cigarette lighter adapter, and an unterminated cable.

Power Kit Installation

(*See **Figure 12**)* When the Handheld Receiver is dependent on a receiver case for its power, the 96025 Handheld Receiver Power Cable Kit must be installed. This kit includes two cables: an internal cable that routes power from the Interface Module to the RADIO DISPLAY POWER connector, and an external cable that connects the Handheld Receiver to the RADIO DISPLAY POWER connector. To install the kit, follow the steps below.

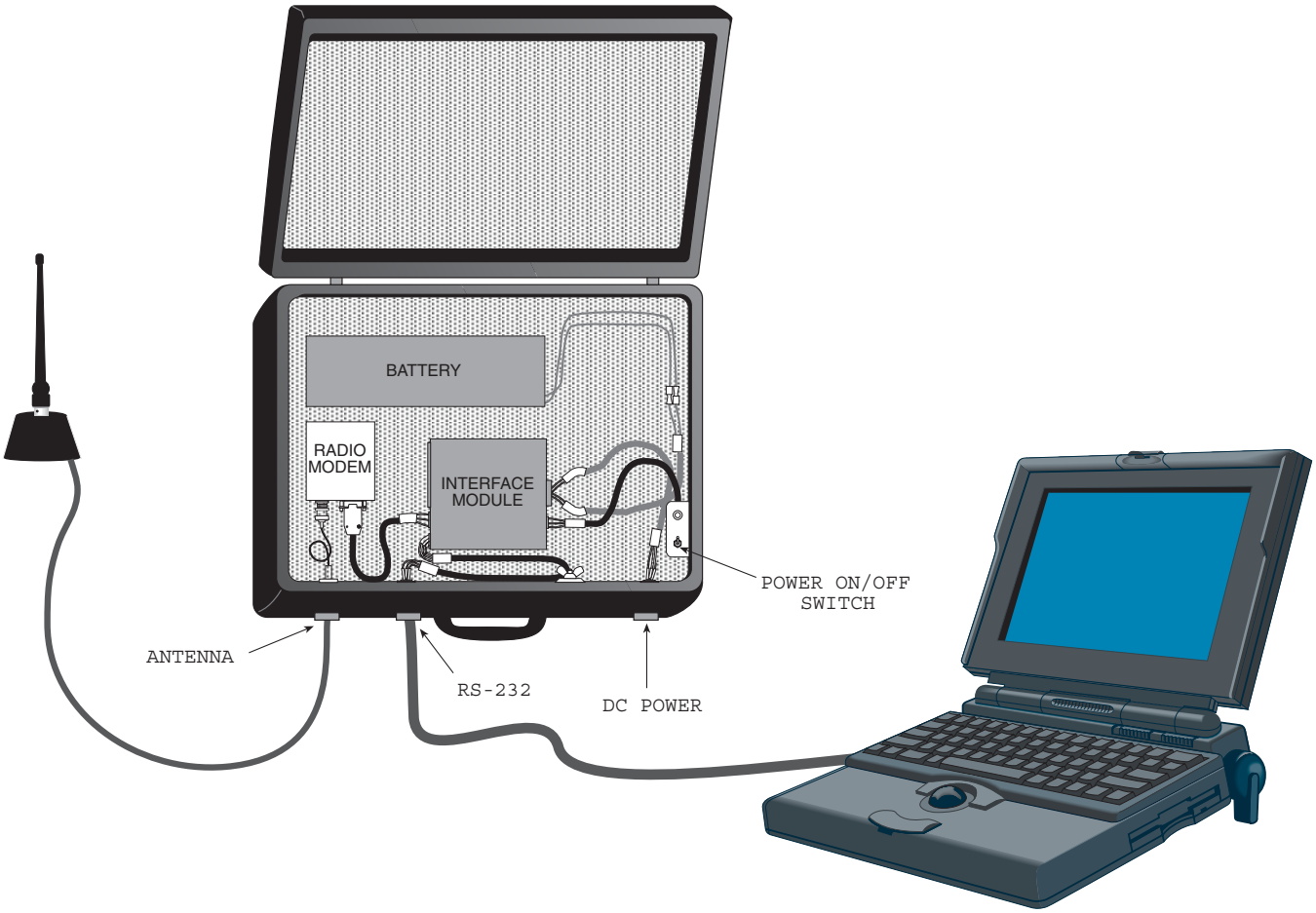


Figure 11. TAMS Receiver Station installation

1 Remove the top two layers of foam inserts and the TAMS components from the transmitter case.
2 Remove the hole plug from the front of the case at the position labeled "RADIO DISPLAY POWER".
3 Remove the top nut and cover from the round connector on the Handheld Receiver internal power cable (M491495).
4 From inside the case, insert the round connector through the "RADIO DISPLAY POWER" hole and replace the cover and nut. Tighten the nut to secure the cable to the case.
5 Connect the plug-in connector on the other end of the cable to the Interface Module connector labeled "Hand Held Power".
6 Replace the foam inserts and TAMS components.

Handheld Receiver Installation

To install the Handheld Receiver (*see **Figure 13***):

1 Connect the antenna to the antenna connector on the Handheld Receiver's end panel (top connector).
2 Connect the power cable from the receiver case's "RADIO DISPLAY POWER" connector or from an auxiliary source to the power connector on the Handheld Receiver's end panel (bottom connector).
3 If you are outputting the data from the Handheld Receiver to a computer, connect the data cable between the computer's serial port and the RS-232 connector on the Handheld Receiver's end panel (middle connector).
4 Press the DISPLAY ON/OFF key on the Handheld Receiver's keypad to turn the Handheld Receiver on and begin receiving data from the Transmitter Station.

Battery Charging

The rechargeable battery within both the transmitter and receiver cases can be charged by connecting a power source to the DC Power input on the front of the case. To keep the battery charged and the system in a state of readiness, the power source may be left connected to the power input whenever the unit is not in use. This will trickle-charge the battery and maintain it at a fully charged level. If a battery has been unused for a period of a month or more, it is a good idea to recharge it before putting it into operation. Depending on how depleted the battery has become, recharging may take as long as 7 hours.

The Interface Module within the transmitter and receiver cases controls battery recharging, and it is equipped with three indicator LEDs that show the status of battery charging. These LEDs can be viewed by removing the foam inserts until the rear panel of the Interface Module is exposed (*see* ***Figure 14***).

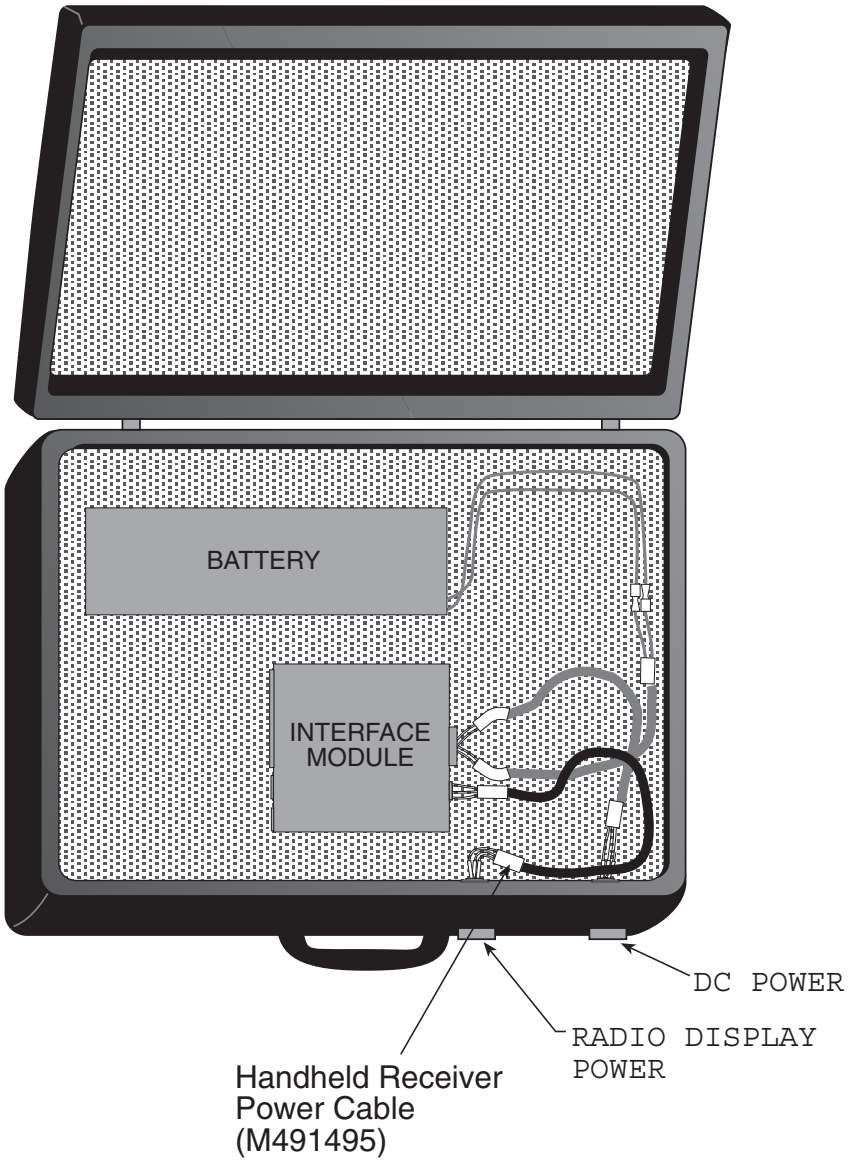


Figure 12. Handheld Receiver power kit installation

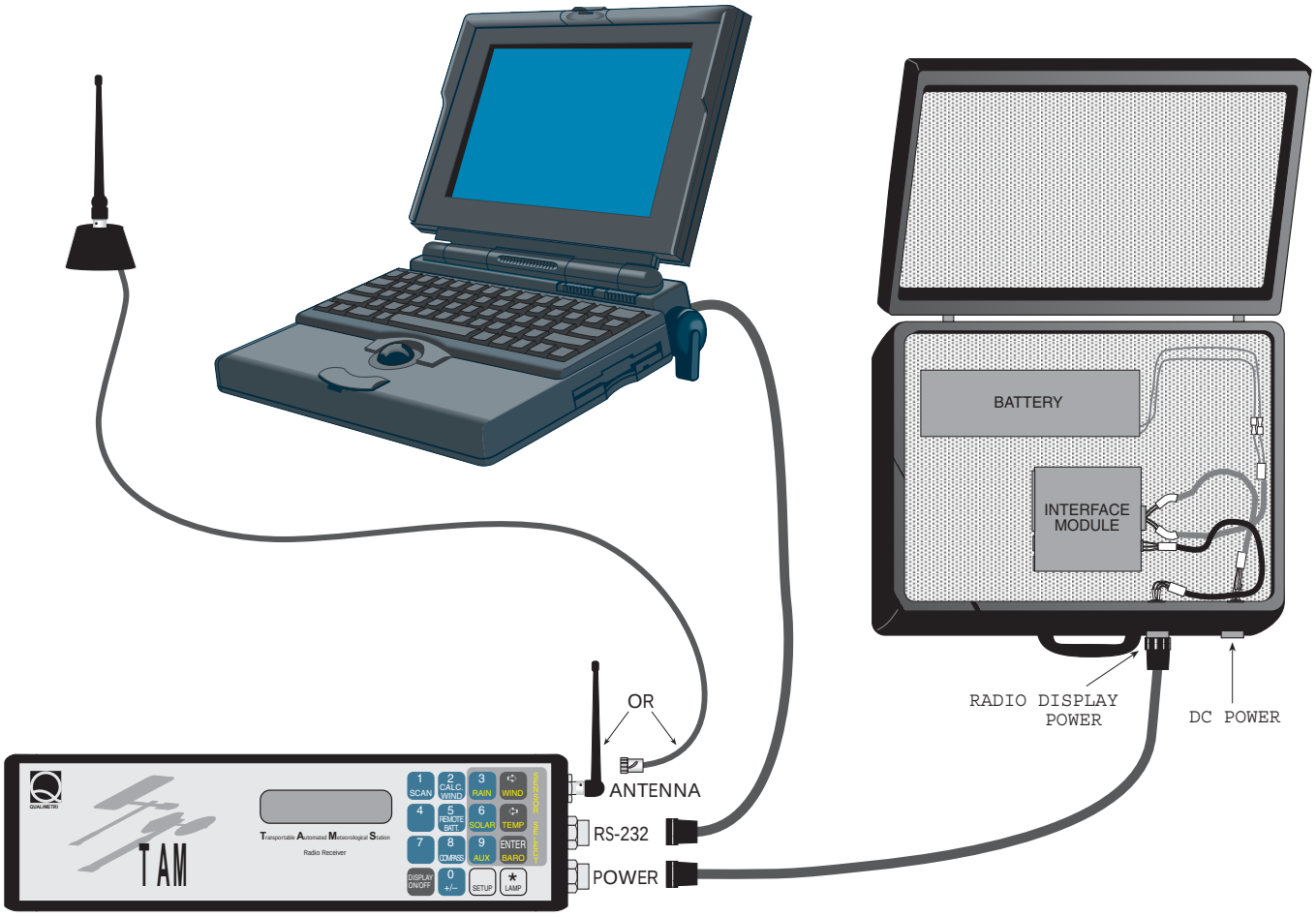


Figure 13. Handheld Receiver installation

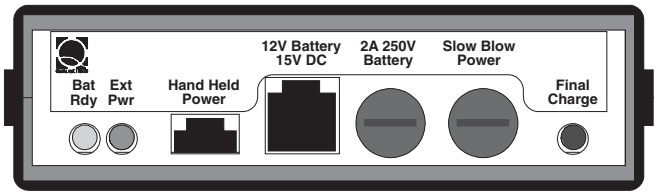


Figure 14. Interface module indicators and fuses

The leftmost LED (a yellow LED) is labeled **Bat Rdy**, and indicates, when lighted, that the battery is charged to operating levels.

The green LED to the right of the **Bat Rdy** LED is labeled **Ext Pwr**, and indicates, when lighted, that power is being received from an external source (connected to the case's DC POWER connector).

The red LED on the far right side of the panel is labeled **Final Charge**, and indicates, when lighted, that the battery is in the final stages of its charging cycle. When the battery is being charged after being largely depleted, both the **Final Charge** and **Bat Rdy** lights will be off until the charging cycle is nearly complete.

A solar panel kit is also available to provide power and battery charging capabilities for systems that will be installed for extended periods away from any external power source.

Interface Module Fuses

Two fuses are located on the Interface Module's rear panel to the left of the **Final Charge** LED. These fuses should be checked if problems with the Interface Module are suspected. If blown, replace them with similarly rated fuses.

Installing Auxiliary Sensors

Several sensor kits are available for TAMS to extend its monitoring capabilities to include rainfall and solar radiation. The sensor kits include the sensors and mounting hardware for the sensor. Other hardware may be required as well, such as a boom (P/N 96006) for mounting the solar radiation sensor and rain gauge to the tripod. A cable kit (P/N 96026) is also normally required to connect the optional sensors to the main cable.

Auxiliary Sensor Cable Installation

(*See **Figure 15***) When adding any of the available auxiliary sensors to a TAMS system, the Model 96026 cable kit is required. The cable kit consists of two separate cable assemblies. The first is a triple sensor cable that allows three auxiliary sensors to be connected at one time. This cable provides three separate sensor connectors at one end, and a single connector at the other that combines the three sensor inputs. This single connector attaches to the second cable assembly, which is a "T" cable joining the auxiliary sensor outputs to that of the Met Station. Its three ends connect to the Met Station, the tri-sensor cable, and the main cable to the transmitter or display. Both cable assemblies are routed through the center of the tripod. To install the cable assemblies, follow the steps below while referring to **Figure 15**.

1. Disconnect the main cable from the Met Station at the Met Station connector.
2. Connect the Met Station connector to the "top" end of the "T" cable (the end where the two legs are merged into a single cable—it is identified by a female connector with a part number label just below it).
3. Connect the "top" end of the tri-sensor cable (the end where the three legs are merged into a single cable—a 6-pin connector with a part number label just below it) to the SENSOR ADAPTER end of the "T" cable (long leg).
4. Connect the main cable to the short leg of the "T" cable.

Solar Radiation Sensor Installation

(*See **Figure 16***) The Model 96033 Solar Radiation kit adds a Silicon Cell Pyranometer to the TAMS sensor array. The pyranometer mounts to the standard 10' tripod using a Model 96006 Boom Adapter. The sensor is fully assembled onto a mounting clamp that slides over the boom for quick, easy installation.

1. Open the mounting clamp to an appropriate diameter by loosening the adjusting knob.
2. Slide the mounting clamp and sensor over the boom to the desired location. If an antenna is installed, it may be necessary to reposition the antenna on the boom so that its shadow does not interfere with the solar radiation sensor.
3. Tighten the adjusting knob enough to secure the sensor but allowing it to be rotated on the boom by hand.
4. Using the leveling bubble on the sensor base as a guide, level the sensor by adjusting the three leveling screws on the sensor's base. When the sensor is level, tighten the adjusting knob fully.
5. Connect the sensor cable to the SOLAR RAD. connector on the tri-sensor cable.

Rain Gauge Installation

(*See **Figure 17***) The Model 96034 Rain Gauge Kit adds a tipping bucket rain gauge to the TAMS' sensor array. The rain gauge mounts to the standard 10' tripod using a Model 96006 Boom Adapter. The sensor is fully assembled onto a mounting clamp that slides over the boom for quick, easy installation.

1. Open the mounting clamp to an appropriate diameter by loosening the adjusting knob.
2. Slide the mounting clamp and sensor over the boom to the desired location. If an antenna is installed, it may be necessary to reposition the antenna on the boom to allow room for the rainfall sensor.
3. Tighten the adjusting knob enough to secure the sensor but allowing it to be rotated on the boom by hand.
4. Level the sensor by rotating the sensor assembly on the boom and, if necessary, adjusting the tripod legs. When the sensor is level, tighten the adjusting knob fully.

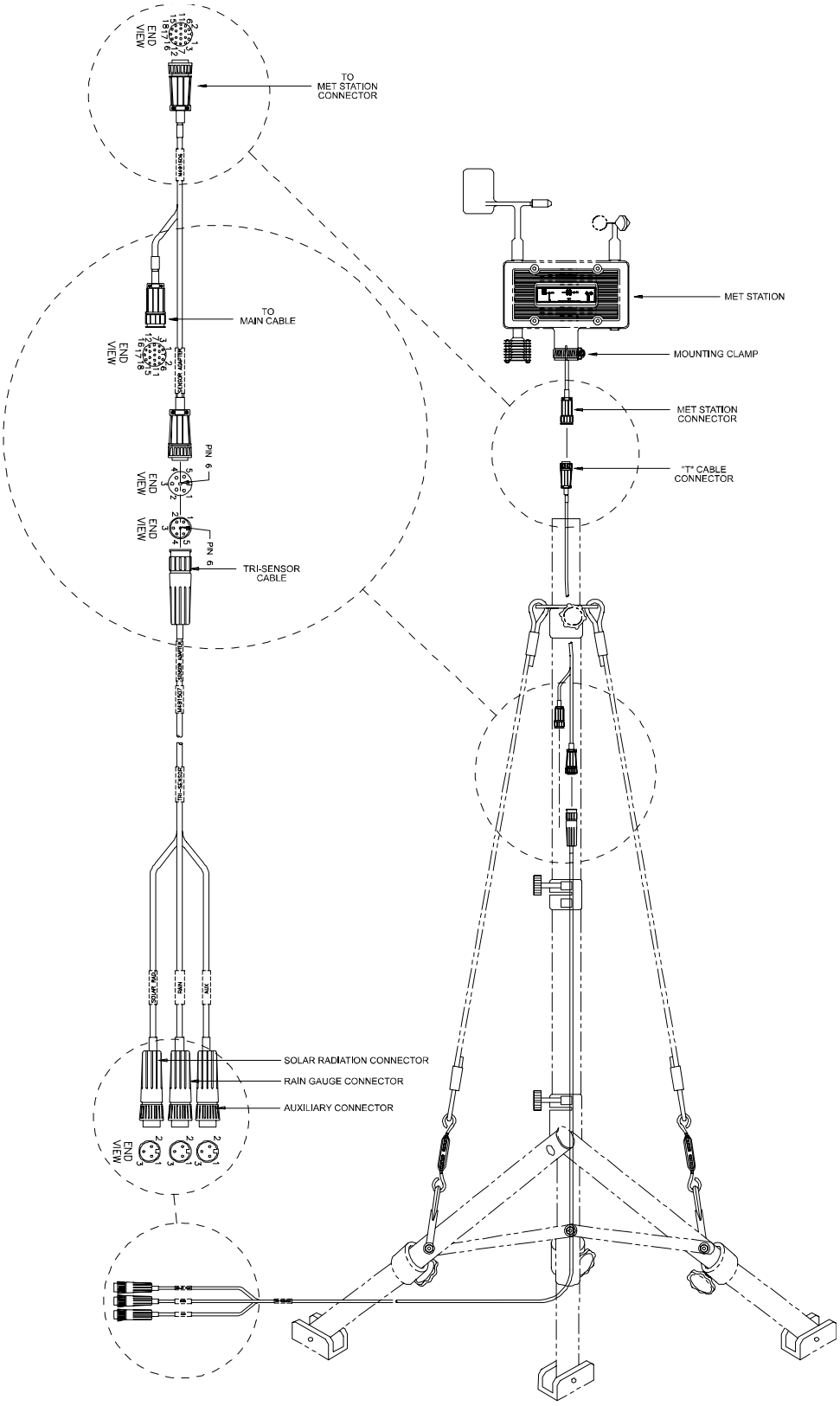


Figure 15. Auxiliary sensor cable installation

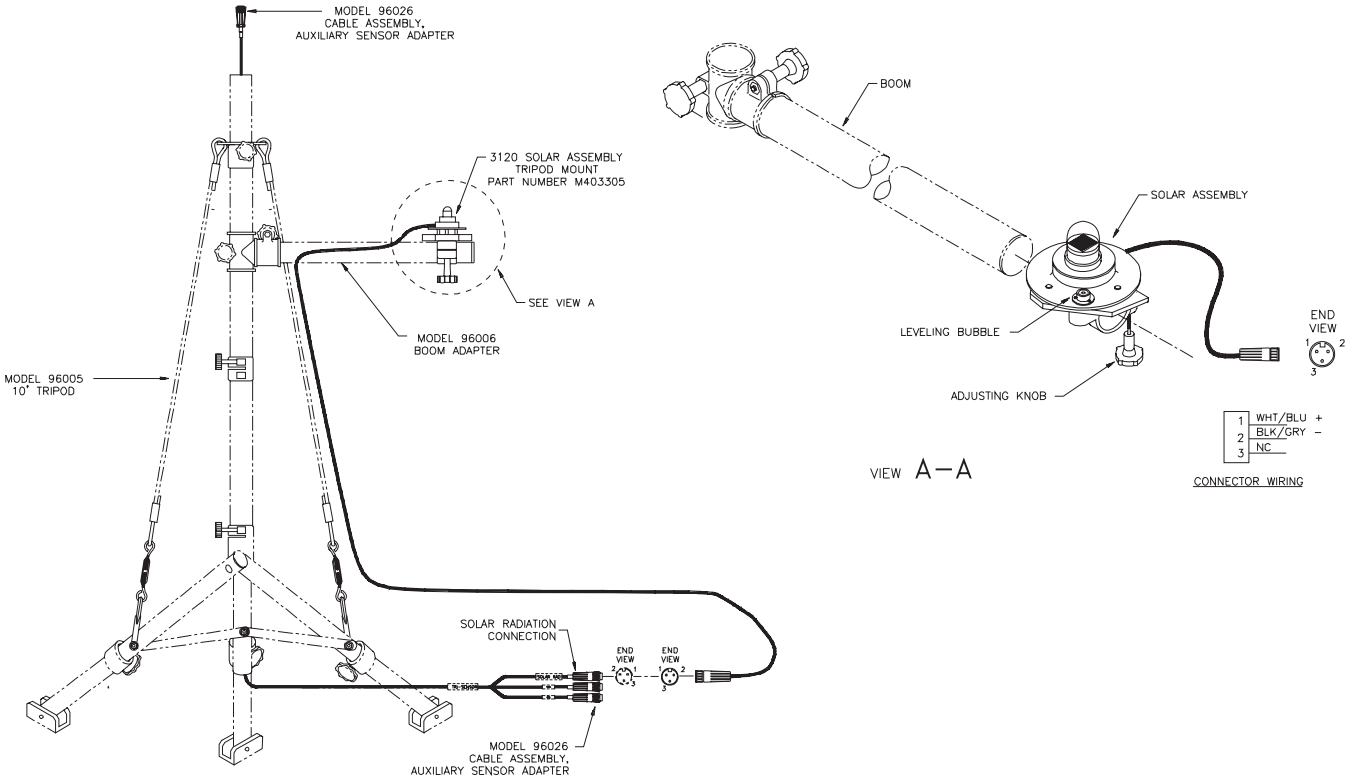


Figure 16. Solar radiation kit installation

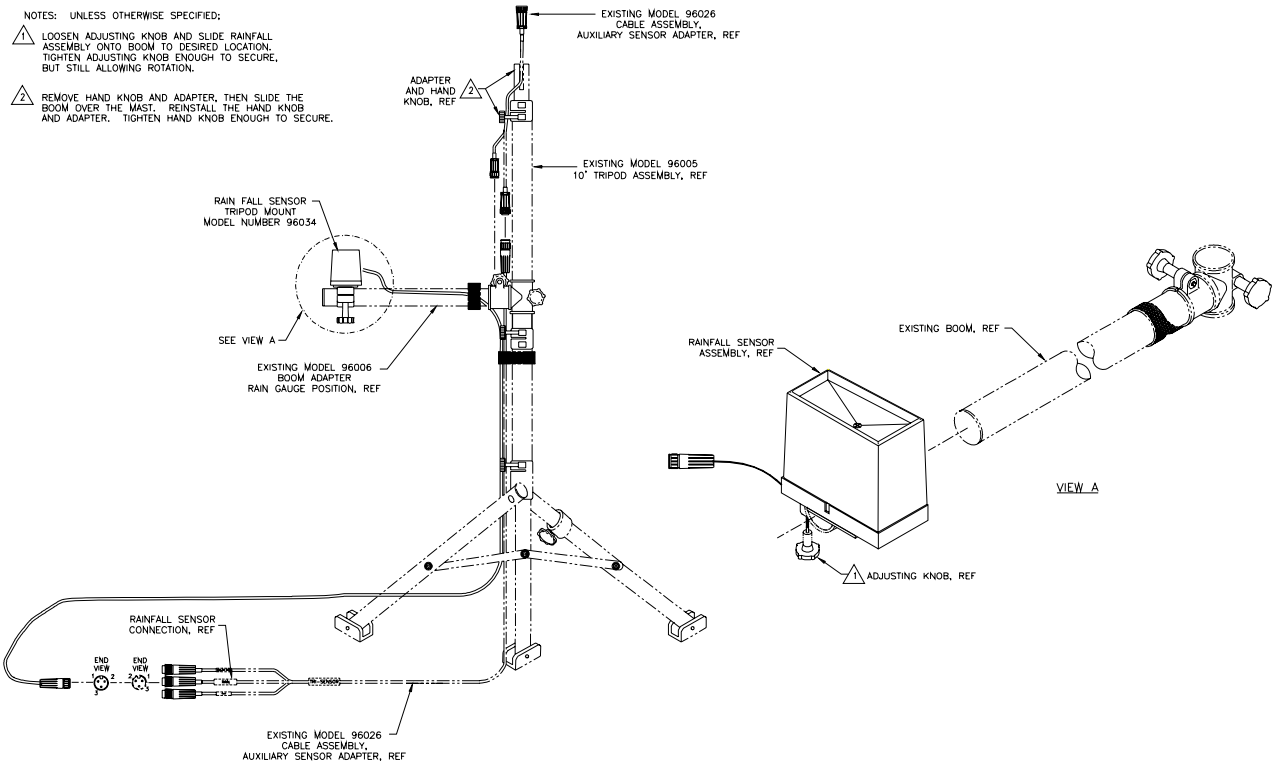


Figure 17. Rain gauge kit installation

5 Connect the sensor cable to the RAIN connector on the tri-sensor cable.

6 Enter the Setup Menu using TAMSTerm or a Control/Display. From the *Change Equipment* menu, select Rain; enter 0.02 inches for the bucket size.

Model 6011 Tipping Bucket Rain Gauge Installation

The Model 6011 Tipping Bucket Rain Gauge is the second rainfall option available with TAMS. This sensor uses a very accurate tipping bucket mechanism to measure rainfall. It is somewhat more rugged than the TAMS rain gauge, though at the same time bulkier and less portable. The Model 6011 rests on the ground rather than being mounted to the TAMS tripod.

1 Refer to the instruction provided in the Model 6011 User's Manual to install and level the rain gauge.

2 Connect the rain gauge cable to the RAIN connector on the tri-sensor cable.

SETUP

Preliminary Steps

Before the TAMS can be put into operation and data collected, a preliminary setup procedure will need to be performed. This procedure should need to be done only once in most instances, and the configuration saved for future uses. Performing the setup procedure is generally easier and the results less prone to mistakes when done at leisure prior to deployment of the system. The exact nature of the procedure and the steps involved depends on the TAMS configuration being used. The sections below explain the requirements for each configuration. (*Note: The TAMS does not collect data while in Setup mode.*)

TAMSView Setup

When using the *TAMSView* software, it is recommended that you use the accompanying *TAMSTerm* program to configure the Met Station. The only parameters that can be entered directly through the main *TAMSView* program are magnetic declination and data storage interval—which are also available through *TAMSTerm*. To set these values through *TAMSView*, refer to the ***TAMSView User's Manual***. Bear in mind, however, that if magnetic declination is set through a Control/Display or *TAMSTerm*, the *TAMSView* option "**Let TAMS supply magnetic declination**" should be selected from the **Magnetic_Declination** pull-down menu on the *TAMSView* menu bar.

TAMSTerm Setup

The *TAMSTerm* program allows you to perform a detailed setup of the TAMS and to view current weather data on a computer connected via local link to the Met Station(either using a Y-Adapter cable as shown in **Figure 7**, or by way of an adapter cable (96024) connected to the RS-232 connector on a Transmitter Station case). *TAMSTerm* simulates operation of the optional Control/Display, and can be used when a Control/Display is not part of a system. *TAMSTerm* comes on a single floppy disk, and is installed as described below. If you are using *TAMSView*, *TAMSTerm* is installed automatically with *TAMSView*.

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**".

To start the *TAMSTerm* program, double-click the *TAMSTerm* icon. A facsimile of the Control/Display's front panel will be displayed. *TAMSTerm*'s operation mirrors the operation of the Control/Display, with values entered and selections made through the 16-key keypad. To activate a key using *TAMSTerm*, simply click the mouse on that key.

To perform the Setup procedure, click the SETUP key on the *TAMSTerm* keypad, then follow the steps below for the Control/Display setup procedure.

Control/Display Setup

The Control/Display requires several values to be entered before it is ready for operation. These values are entered through the TAMS' setup program, which is organized into eight submenus:

- *Change Time/Date*
- *Change Data Output*
- *Change Units*
- *Change Equipment*
- *Diagnostic Tests*
- *Set Mag. Declination*
- *Calibrate Compass*
- *Save Configuration*

The following instructions provide a guide for entering the Setup data, with each available option explained and illustrated with sample entries.

Power Up

To power up the Control/Display, press the ON/OFF key located at the bottom left corner of the keypad. A "WELCOME" message will be displayed on the LCD screen.

The TAMS then performs a series of self tests, indicated by the following message:

```
Self testing . . .
Ser XXXX Ver X.XX
```

Using the Control/Display Keypad

***(See Figure 18*). At any time during the Setup procedure, pressing the SETUP key will return the display to the last setup submenu. From there, the right and left arrow keys can be pressed to move between submenus to alter information as needed. Pressing the SETUP key again will exit you from the setup program and return you to the last active weather display.**

When entering a numeric value, you must press the ENTER key after entering the value for it to be saved into memory. Selections made from a multiple-choice format menu are automatically saved when selected. To move the cursor within a numeric display right or left to change or correct a specific value, use the left and right arrow keys.

If any errors are detected, a message will appear indicating the nature of the error. Refer to **Table 4**, *Control Display Error Messages*, for the meanings of displayed errors.

Setup

If no problems are indicated during power up, initiate the Setup procedure by pressing the SETUP key. The first screen to appear is:

```
SETUP MENU
Change Time/Date
```

Time/Date

The Time/Date screen allows you to set the current time and date for accurate referencing of stored records. Press ENTER to call up the Time screen.

Time

Time is stored in a 24-hour/military/international time format. For example, 3:30:15 p.m. would be displayed as 15:30:15.

```
Time       01:05:40
Correct & hit ENTER
```

When the screen first appears, a cursor highlights the first digit. Enter the correct time in 24-hour format using the number keys. The cursor will automatically move to the next digit after a number is entered. When entering a single digit value for hours, minutes, or seconds, place a 0 before it. For example, to enter 1:05:40 a.m., press 0, 1, 0, 5, 4, and 0 in succession. Press ENTER to save the time and continue to the Date screen. Pressing SETUP after entering a new time will not save the entered time—you must press ENTER.

Date

After entering the time and pressing ENTER, the Date screen will appear with the cursor highlighting the first digit of the current date. The date is stored in day/month/year format. Enter the date using the number keys, remembering to place zeroes before single-digit days. (For example, to enter the date February 1, 1995, press the number keys 0, 1, 0, 2, 9, and 5 in succession.) The cursor will automatically move to the next digit after a number is entered. The date will be displayed as follows:

```
Date       01/02/95
Correct & hit ENTER
```

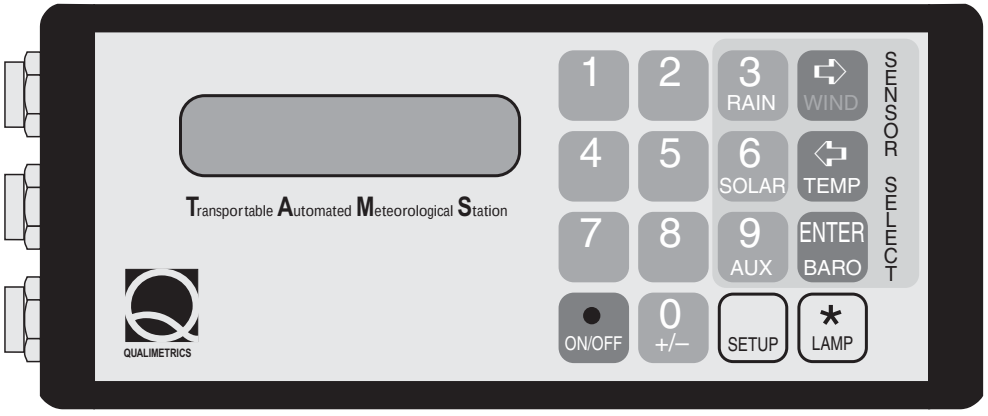


Figure 18. Control/Display front panel

Press ENTER to save the date and return to the Change Time/Date screen. (Note: Pressing SETUP after entering a new date will not save the entered date—you must press ENTER.) From the Change Time/Date screen, press the right arrow key to continue to the Change Data Output screen

Data Output

The Data Output menu allows you to set the Met Station's data output interval.

```
SETUP MENU
Change Data Output
```

Press ENTER to call up the Data Log Transmission screen.

Transmit Data Log to Computer

The Data Log Transmission option (not available with *TAMSTerm*) instructs the Met Station to download its stored data to a computer (for more detailed information on the Met Station's data logging feature, refer to the chapter titled ***Met Station Data Log***).

```
Hit 0 to send data
log to the computer
```

Press the 0 key to send the stored data to a computer. To bypass this function, press ENTER. The following message will appear:

```
Hit 0 to erase past
weather, else ENTER
```

Press 0 to erase the stored weather data. To bypass this function, press ENTER. The Storage Timing screen will then appear.

Storage Timing

The Storage Timing function controls how often (if at all) the Met Station stores data into memory.

```
Store every      0 min
Correct and hit ENTER
```

Enter the data storage interval in minutes. To disable automatic data storage, enter 0 for the storage interval. Press ENTER to save the storage interval setting and continue to the Output Timing screen.

Output Timing

The Output Timing function controls the Met Station's automatic output of data to a computer or Control/Display. When this function is enabled, the Met Station sends its most recent set of measurements automatically to a connected computer or Control/Display at an interval set through this series of screens. The first screen is used to enable or disable timed output.

```
Computer Output is:
Disabled
```

Press the left and right arrow keys to toggle the selection between "enabled" and "disabled". To enable automatic output, press ENTER while the screen reads "Enabled". The following screen will then appear:

```
Output every     5 seconds
Correct & hit ENTER
```

Enter the interval, in seconds, at which you want the Control/Display to transmit incoming data to a computer. Press ENTER to save the output interval setting. If the output interval is set to 0, timed output will be disabled.

From the Data Output menu, press the right arrow key to call up the Change Units menu.

Units

Setting Units of Measurement

```
SETUP MENU
Change Units
```

From the Change Units menu, press ENTER to call up the Current Units screen:

```
Units of Measure
are: ENGLISH
```

The Control/Display can be programmed to measure, display and output meteorological information in English units (inches, feet, etc.), Metric units (centimeters, meters, etc.), or "Custom" units. If English or Metric units are chosen, then all environmental data will be measured, displayed, and output in one of those standards. Custom Units allows units for temperature, pressure, and elevation to be set independently. **Table 2** shows the available units of measure.

Press the right or left arrow key to toggle between "English", "Metric", and "Custom". Press ENTER to select the displayed standard. The Control/Display will then request measuring units for wind data. The following screen will appear:

```
Units of Measure for
Wind: Knots
```

Press the right or left arrow key to toggle between "Knots", "Miles per Hour", "Meters per Sec", and "Kilometers per Hour". Press ENTER to select the displayed unit of measure. If either English or Metric units was chosen initially, the main menu will appear after the wind

units of measure is chosen. If Custom units was chosen, you will next be asked to specify the units of measure for temperature, pressure, and rain as explained below.

Custom Units of Measure

If "Custom" units is chosen, units of measure must be selected for each of the parameters individually. Following wind speed units, you will be asked to specify units of measure for temperature:

Units of Measure for
Temp: Fahrenheit

Press the arrow keys to toggle between Fahrenheit and Celsius. Press ENTER to select the displayed units of measure and continue to the barometric pressure units screen.

Units of Measure for
Pressure: Inches/Hg

Press the arrow keys to toggle between Inches/Hg and millibars. Press ENTER to select the displayed units of measure and continue to the rain units of measure screen.

Units of Measure for
Rain: Inches

Press the arrow keys to toggle between inches and millimeters. Press ENTER to save the selection and return to the Change Units menu. Press the right arrow key at the main menu to continue to the Change Equipment menu.

Equipment

Entering Optional Equipment

After pressing the right arrow key at the Change Units menu, the following screen will appear:

SETUP MENU
Change Equipment

As specified in the introduction chapter of this manual, TAMS has five self-contained sensors, and allows for the addition of optional external precipitation sensors, solar radiation sensors, and auxiliary equipment. The Change Equipment menu allows you to specify any connected optional sensors, and instructs the Control/Display to measure and display data from those sensors. Press the ENTER key to append any optional sensors, or press the right arrow key to proceed to Diagnostic Tests. Press the SETUP key to exit the setup menu completely.

Condition	English	Metric	Custom Units
Wind Direction	Degrees	Degrees	Degrees
Wind Speed	Knots	Knots	Knots
	MPH	MPH	MPH
	m/s	m/s	m/s
	km/hr.	km/hr.	km/hr.
Temperature	°F	°C	°F or °C
Humidity	%	%	%
Dew Point	°F	°C	°F or °C
Pressure	In. Hg	Millibars	In. Hg or Millibars
Rain	Inches	Millimeters	Inches or Millimeters

Table 2. Measurement Units

Rain

The Control/Display will ask if a rain gauge is connected or not connected:

Rain Gauge is:
Not Connected

Press the arrow keys to choose if the gauge is "Not Connected" or "Connected". If the rain gauge is connected, press the ENTER key and the screen to enter bucket tip size will appear:

Bucket Tip Size is:
0.02 inch

Choose the tip size that corresponds to the connected rain gauge: 0.02 inch for the Model 96034 TAMS rain gauge; 0.01 inches, 0.1 millimeter, 0.25 millimeter, or 1.0 millimeter for the Model 6011 or 6021 rain gauges. Press the ENTER key to save the selection and the screen to enter Solar Radiation will appear.

Solar Radiation

The Control/Display will ask if a solar radiation sensor is connected:

Solar Radiation is:
Not Connected

Press the right and left arrow keys to select "Connected" or "Not Connected". Press the ENTER key again to save the selection and the screen to enter the solar radiation scaling factor will appear:

SR Scale 14.28 w/mV
Correct & hit ENTER

Enter the watts/m^2 per millivolt of measurement for the solar radiation sensor connected and press the ENTER key to save the value and the screen to enter Auxiliary Input will appear.

Auxiliary Equipment

The Control/Display will ask if an auxiliary input device is attached to the TAMS:

Auxiliary Input is:
Not Connected

Press the right and left arrow keys to specify whether an auxiliary input device is "Connected" or "Not Connected". Press the ENTER key to select the displayed choice.

If you select "Not Connected", pressing ENTER will return you to the Change Equipment screen. From there you can press the right arrow key to call up the Diagnostics menu.

If you select "Connected", you then cycle through a series of selection screens that let you specify what auxiliary equipment is connected.

The first equipment option is a barometric pressure sensor:

Barometer is:
Connected

Use the right or left arrow key to toggle the selection between "Connected" and "Not Connected". When the desired selection is shown, press ENTER to make the selection and move to the next screen.

Compass is:
Connected

Use the right or left arrow key to toggle the selection between "Connected" and "Not Connected". When the desired selection is shown, press ENTER to make the selection and move to the next screen.

Wind Sensor is:
Standard

Select "Standard". If the display reads "Low Threshold", use the right or left arrow key to change the selection to "Standard", then press ENTER to return to the Change Equipment screen. From there you can press the right arrow key to call up the Diagnostics menu.

Diagnostics Menu

The diagnostics menu provides for the future incorporation of a series of diagnostic tests for the TAMS, including tests to check the system's RAM, ROM, EEPROM, analog-to-digital converter, and barometric pressure sensor. These tests are not currently available. Press the right arrow key to call up the Set Magnetic Declination menu.

Set Mag. Declination

After pressing the right arrow key at the Diagnostic Tests menu, the following screen will appear:

SETUP MENU
Set Mag. Declination

Press ENTER to enter the magnetic declination of the Met Station site. The following screen will then appear:

Declination 0 EAST
Correct & hit ENTER

Magnetic declination values consist of a number and a direction (East or West). This value represents the number of degrees to the East or West of True North that a compass will read at a specific location. This value can be obtained from many maps, such as those available from the United States Geological Survey (USGS).

To enter a magnetic declination, enter the numeric value using the number keys. The direction is changed using the arrow keys. To change the indicated direction to East, press the right arrow key. To change the direction to West, press the left arrow key. When the displayed value is correct, press ENTER. At the Set Mag. Declination menu, press the right arrow key to continue to the Calibrate Compass menu.

Calibrate Compass

The next option on the setup menu lets you calibrate the magnetic compass. Calibration cancels out magnetic errors introduced by the Met Station and any surrounding sources of interference (such as a vehicle when the TAMS is vehicle-mounted). Field calibration is normally not required. To enter this menu, press the ENTER key at the following screen:

SETUP MENU
Calibrate Compass

The first selection on this menu gives you the choice of clearing the current calibration settings or recalibrating the compass:

Select Function
Clear Calibration

To clear the current calibration settings, press ENTER. A message will notify you that the calibration has been cleared, and you will be returned to the Select Function screen. To toggle the selection to the Calibrate option, press the right or left arrow key. The message "Calibrate" will appear in place of "Clear Calibration". Press the ENTER key to call up the following screen:

Calibration
Move to CAL 1 30 secs

During this procedure, multiple readings will be taken while the TAMS is rotated through 360°. When the TAMS is mounted to a tripod, the entire Met Station body should be rotated. When the TAMS is mounted to a vehicle, the entire vehicle should be rotated with the TAMS fixed. This will allow the calibration procedure to cancel out the error introduced by the vehicle itself.

When ready to begin calibration, press ENTER. The message "Calibrating..." will appear briefly. When this message appears, begin rotating the TAMS slowly. The entire 360° rotation must take at least 60 seconds. Once you have begun calibration, the screen below will appear and will remain until calibration is complete.

Calibration
Move to CAL 2 30 secs

After you have rotated the TAMS the full 360° (taking a minimum of 60 seconds), press ENTER to end calibration. When the calculations are complete, you will be returned to the Select Function screen. To return to the main setup menu, press SETUP.

Save Configuration

The final option on the setup menu lets you save the settings you have entered during the setup procedure. If you do not save the settings, the TAMS will still operate using the settings you have entered. These changes will be lost, however, when the unit is powered down, and the last saved settings will be in effect. Saving the configuration will make the new settings the default values, and they will be in effect each time the unit is powered up. To save the settings, press ENTER at the Save Configuration screen:

SETUP MENU
Save Configuration

To exit Setup mode without saving the configuration, press SETUP.

Exiting Setup

To exit the Setup mode and return to the last active weather data screen, press the SETUP key from any setup menu. To make further changes, press the SETUP key at any time to return to the SETUP menu and change system settings as appropriate.

Control/Display Setup Quick Reference

MENU SYSTEM

SETUP MENU Change Time/Date	SETUP MENU Change Data Output	SETUP MENU Change Units	SETUP MENU Change Equipment	SETUP MENU Diagnostic Tests	SETUP MENU Set Mag. Declination	SETUP MENU Calibrate Compass
Time/Date	**Log/Output**	**Units**	**Equipment**	**Diagnostics**	**Declination**	**Calibration**
Time Date	Transmit Log Erase Past Weather Storage Timing Output Enable • Output Timing	English/Metric/Custom • Wind • Temperature • Pressure • Rain	Rain • Tip Size Solar • SR Scale Aux Barometer Compass Low Thresh. Wind	RAM ROM EEPROM A/D BP System	Set Declination	Clear Calibration Calibrate

Moving through the Menus

SETUP — Press the SETUP key to call up the Setup Menu. There are seven submenus available from the Setup Menu: Change Time/Date, Change Data Output, Change Units, Change Equipment, Diagnostic Tests, Set Magnetic Declination, and Calibrate Compass.

WIND — Press the RIGHT ARROW key to move to the next submenu.

TEMP — Press the LEFT ARROW key to return to the previous submenu.

ENTER BARO — Press the ENTER key at any submenu to enter that menu; press the ENTER key after entering a value to save the value.

1 ENTER BARO — Change the current setting using the NUMBER KEYS, or press ENTER to move to the next option.

SETUP — Press the SETUP key at any time to return to the last submenu.

SETUP — From any submenu, press the SETUP key to resume normal operation.

Figure 19. Control/Display setup menus

TAMS AND PLUME MODELING

TAMS has been designed to be compatible with the major software packages available for plume modeling in hazardous materials response situations, including ALOHA (*version 5.21 and later*), CHARM, Safer Systems, and EIS. When using any of these packages, the *TDriver* software must be installed and running on the computer that will be running the plume modeling software.

TDriver

TDriver is a software package included with TAMS plume modeling systems that converts the standard TAMS data to the format required by the plume modeling software (ALOHA, CHARM, etc.) and provides a simple means of viewing collected data on a computer. To install the *TDriver* software:

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

To use TAMS with a plume modeling software package, you must start *TDriver* before starting the plume modeling software. Start *TDriver* by double-clicking the *TDriver* icon. After installation, it is recommended that you move the *TDriver* icon to the StartUp folder so that it starts automatically whenever Windows is started.

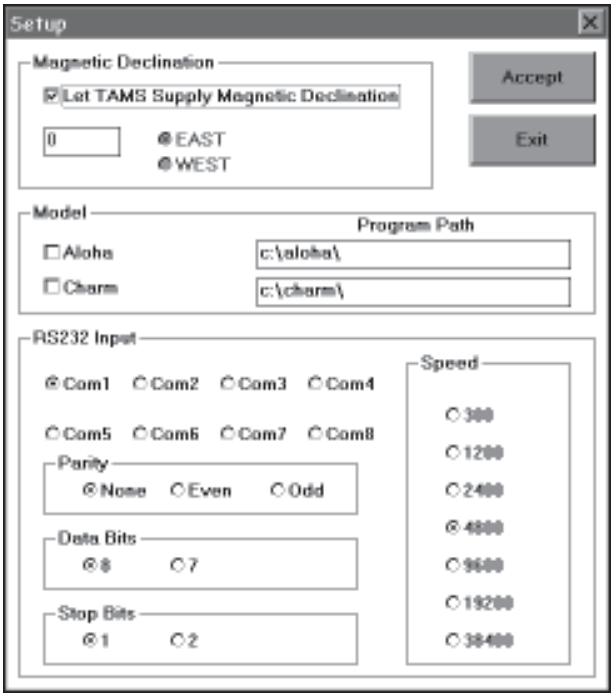
TDriver Display

The *TDriver* display is essentially an on-screen representation of the Handheld Receiver's front panel, including keypad and display window. The various weather and system status displays available with the Handheld Receiver (see ***Viewing TAMS Data***) can be viewed in *TDriver* by clicking the appropriate key on the display. *TDriver* also includes system configuration options available from two pull-down menus at the top of the *TDriver* display.

TDriver also features a minimized display mode, in which the full keypad and screen is replaced by a small floating window that scrolls automatically through the full series of data screens. Current data for each parameter is shown for several seconds before being replaced by the next parameter. This floating window can be moved at will around the desktop for convenient viewing, and will always remain on top of any other open windows. To close this window and return to the main *TDriver* display, click the **X** in the upper righthand corner of the window.

Setup Menu

Clicking on the **Setup** menu on the *TDriver* menu bar (or clicking the SETUP key on the graphic keypad) will call up the screen shown below.



The options available on this menu allow you to set magnetic declination, specify the plume modeling software being used, and enter communication settings.

Setting Magnetic Declination

Before using the plume modeling software, magnetic declination must be set for the Met Station site. Magnetic declination can be entered into the Met Station's internal memory directly as part of its configuration data using a Control/Display or the *TAMSTerm* software, or it can be entered in *TDriver*, which will then use this value to correct data received from the Met Station.

Magnetic declination should only be entered using one of the available methods: *either* enter it directly into the Met Station (with a Control/Display or *TAMSTerm*) *or* enter it in *TDriver*. As a rule, if a Control/Display or

TAMSTerm is available, enter the magnetic declination using one of those tools, and on the *TDriver* **Setup** screen click ***Let TAMS Supply Magnetic Declination***. If neither a Control/Display nor *TAMSTerm* is available, you must enter the magnetic declination in *TDriver*. If a value is entered both in *TDriver* **and** into the Met Station directly (via *TAMSTerm* or a Control/Display), the value entered in *TDriver* will take precedence.

To set magnetic declination using a Control/Display or *TAMSTerm*, refer to the *Control/Display Setup* and *TAMSTerm Setup* sections of this manual.

To enter a magnetic declination in *TDriver*, click **Setup** on the *TDriver* menu bar, or click the SETUP key on the graphic keypad, then enter the magnetic declination of the Met Station site in the space provided.

Specifying the Plume Modeling Package

The section of the *TDriver* Setup menu labeled **Model** allows you to specify the name and location of the plume modeling software to be used with TAMS. To specify the software, click the checkbox beside the appropriate software so that it is checked. In the **Program Path** box to the right of the selected package name, enter the location on the hard disk of the software itself. The default path is **c:\aloha**, or **c:\charm**. If the software is located in another directory or on another disk, type in the path to its location.

Communication Settings

The settings found under the heading **RS232 Input** on the **Setup** menu set the communication parameters for the COM port to which the TAMS is connected. Click the appropriate selection buttons until the settings shown on the screen are correct for your computer's COM port.

Accept/Exit

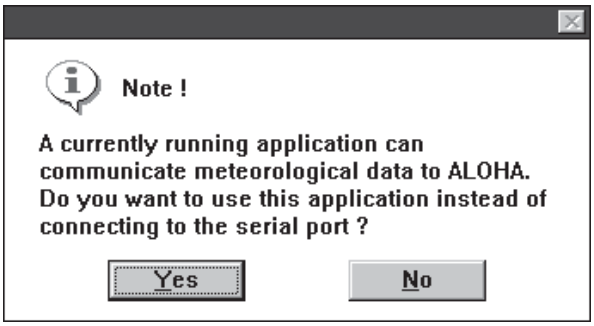
When the setup parameters are correct, click **Accept** to save the changes and return to the *TDriver* display. To return to *TDriver* without saving any changes, click **Exit**.

Units Menu

Clicking **Units** on the *TDriver* menu bar will call up the units of measure selection screen. Clicking the checkbox at the top of the screen, ***Override TAMS Units***, lets you specify the units of measure to be used when displaying weather data on the *TDriver* display. When this selection is unchecked, the units options are grayed out, and data will be displayed in TAMS' default transmission units. When it is checked, the units options become active and you can select the display units from the choices shown. When the units are set as desired, click **Accept** to save the changes and return to the *TDriver* display. To return to *TDriver* without saving any changes, click **Exit**.

ALOHA and TDriver

When using NOAA's ALOHA software, starting ALOHA (with *TDriver* running) will call up the caution screen shown below.



In this alert, TDriver is the application that ALOHA is referring to. Click Yes to instruct ALOHA to use the TDriver software for acquiring TAMS data.

VIEWING TAMS DATA

The variety of system configurations possible with TAMS allows collected weather data to be viewed in a number of ways. Each of the available display mechanisms—Control/Display, Handheld Receiver, TAMSTerm, and TAMSView software—provides a different view of the data. The following sections explain the use of each.

Using the Control/Display

The Control/Display gives a real-time view of collected data on a backlighted LCD display.

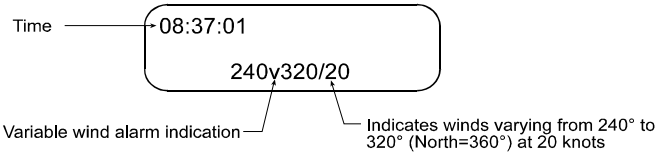
Weather Displays

During normal operation, TAMS displays current weather conditions on the Control/Display's LCD screen. Before placing the TAMS into service, however, an initial setup procedure must be performed. During this procedure, explained in the ***Setup*** section, several of the keys serve special functions. Thereafter, simply pressing the weather keys—found within the gray outlined section of the numeric keypad—will call up current data for the indicated parameters.

The following examples of data screens do not fully illustrate the array of units of measure in which weather information can be displayed. Units can be customized for any parameter—with the exception of density altitude, which is always displayed in feet, and solar radiation, which is always displayed in watts/m^2—using the setup procedure. Refer to the ***Setup*** chapter for details.

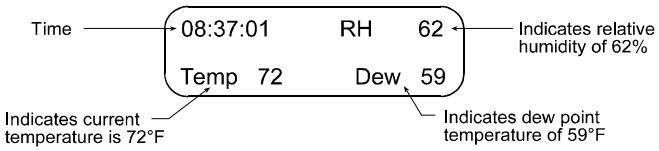
Wind Screen

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^o or more.



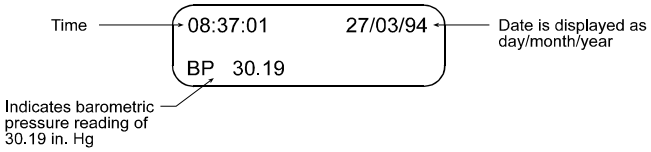
Temperature Screen

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



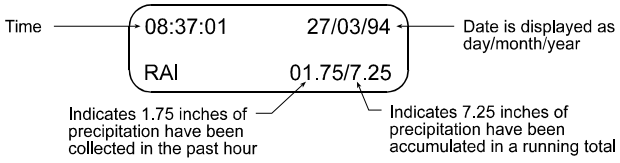
Barometric Pressure Screen

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



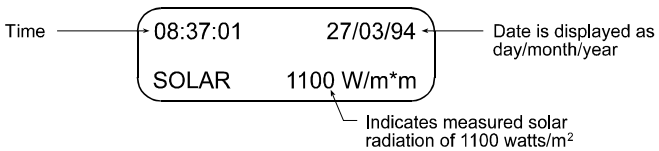
Rain Screen

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.



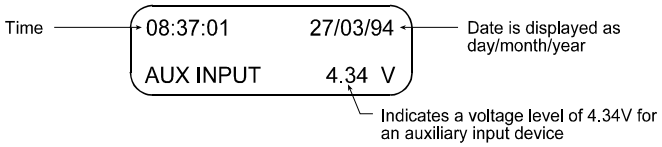
Solar Radiation Screen

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



Auxiliary Input Screen

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



Display Characteristics

When the Control/Display displays a value for one of the monitored weather parameters, the value shown is the result of a series of measurements and calculations controlled by the TAMS software. For each property, measurement parameters vary, including the rate at which measurements are taken, the time period over which they are averaged, and the frequency at which the display is updated with the result. **Table 3** shows the time periods used in this process, as well as the display resolution for each measured property.

Table 3
Control/Display Display Characteristics

Measured Propoerty	Sample Rate	Averaging Period	Display Update Rate	Resolution
Wind Direction	Once per second	5 seconds	1 second	10°
Wind Speed	Once per second	5 seconds	1 second	1 mph 1 m/s 1 knot
Temperature	Once every 30 seconds	5 minutes	1 minute	1°
Relative Humidity	Once per minute	5 minutes	1 minute	1%
Dew Point	Based on Temperature and Humidity	Computed once per minute	1 minute	1°
Pressure	Once every 10 seconds	5 minutes	1 minute	0.01 in. Hg 0.1 mb
Rain	Once per minute	N/A	1 minute	0.01" 0.1 mm
Solar	Once every 30 seconds	5 minutes	30 seconds	1 w/m^2
Aux.	Once every 30 seconds	1 minute	30 seconds	0.01 V

Control/Display Error Messages

Table 4 lists error messages that may appear on the Control/Display during operation, paired with suggested corrective actions.

Message	Meaning/Suggested Action
"SBY"	Indicates the TAMS is awaiting sensor data. This is the normal message when the unit is first powered up.
	Low battery indicator. Replace the internal "AA" batteries.
Sensor display shows all 9s	TAMS is not receiving data from the sensor. Check all wiring and connections; check sensor operation, and replace if necessary.
"EEPROM error (LS)."	The stored serial number data has been lost from one or more of its three stored locations. The number indicates the locations that are no longer retaining data. Contact All Weather Inc.
"EEPROM error (LD)."	Some amount of setup data has been lost. The number indicates the extent of the loss. Contact All Weather Inc.
"EEPROM error (CT)."	The system has had difficulty accessing the EEPROM data. Some data may have been lost. Contact All Weather Inc.

Using the Handheld Receiver

The Handheld Receiver displays real-time data on a backlighted LCD display similar to the Control/Display's. The data displays, however, vary somewhat from those found on the Control/Display. Several system monitoring options—such as current power level—have also been added to provide an ongoing view of system performance.

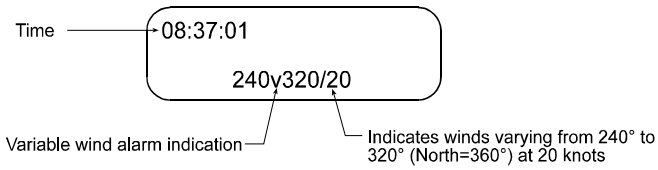
To turn the Handheld Receiver's display ON, press the DISPLAY ON/OFF key on the keypad.

Weather Displays

Weather displays are accessed by pressing any of the weather keys on the Handheld Receiver keypad. These keys are enclosed within a gray box on the right side of the keypad, with the parameter names highlighted in yellow lettering.

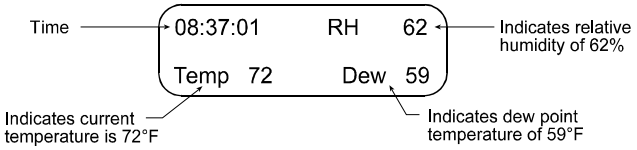
Wind Screen

The WIND screen displays instantaneous values for wind speed and wind direction.



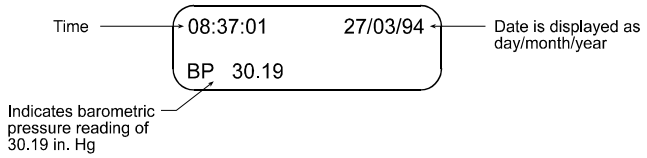
Temperature Screen

The TEMP screen displays current readings for temperature (TEMP), relative humidity (RH), and dew point temperature (DEW).



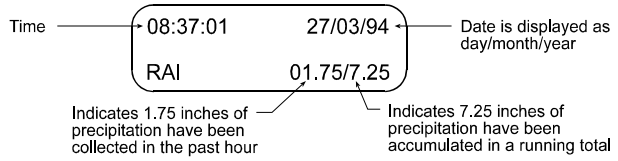
Barometric Pressure Screen

When a barometric pressure sensor is installed in the Met Station, the BARO screen displays the current barometric pressure reading. SBY will be displayed without a barometric pressure sensor installed.



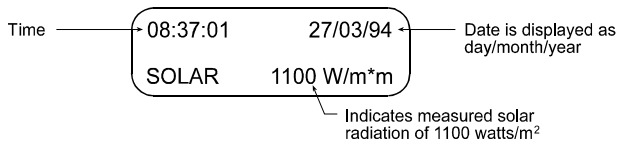
Rain Screen

When an optional rain gauge is installed, the RAIN screen displays rainfall measured over the past hour, and rainfall accumulated in a running total that resets at 10 inches, or 254 mm. SBY will be displayed without a rain gauge installed.



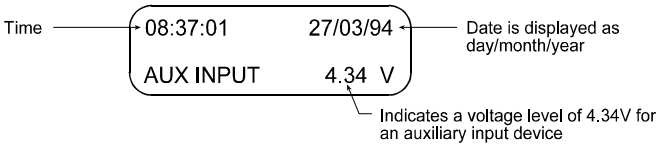
Solar Radiation Screen

When an optional solar radiation sensor is installed, the SOLAR screen displays the current value for solar radiation as watts/m^2 of output. SBY will be displayed without a solar radiation sensor installed.



Auxiliary Input Screen

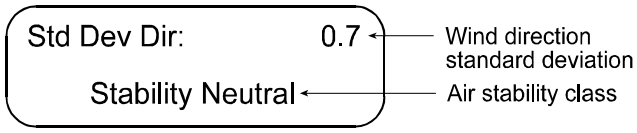
The AUX screen displays Time, Date, and the voltage of any attached auxiliary equipment.



Calculated Wind Screen

The CALC. WIND screen displays calculated values for Wind Direction Standard Deviation and Air Stability Class based on measured wind values. Air Stability Class is an expression of the stability of the air determined from measured wind data, and is displayed as one of seven descriptive values:

- Extremely Stable
- Moderately Stable
- Slightly Stable
- Stability Neutral
- Slightly Unstable
- Moderately Unstable
- Extremely Unstable.

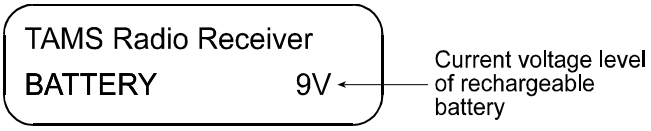


System Status Displays

Two keys on the Handheld Receiver's keypad—REMOTE BATT. and COMPASS—allow you to view the current status of two system functions.

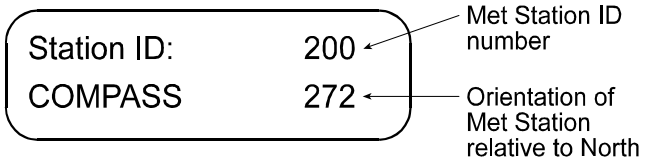
Remote Battery Screen

When the Handheld Receiver is being powered by the rechargeable battery within a receiver case, the REMOTE BATT. screen shows the current voltage level of the battery. If the battery is charged, the REMOTE BATT. screen will show 9V. When the battery is low, 7V will be shown.



Compass Screen

The compass screen displays the orientation of the Met Station relative to magnetic North. This value is used in the Met Station's calculations to correct wind direction readings to read relative to North regardless of the orientation of the Met Station (the compass is aligned with the wind vane at the factory). The Magnetic Declination value entered during the Setup procedure is also used in the calculations to adjust wind direction values to read relative to True North. The magnetic declination value is not incorporated into the value shown on the COMPASS screen.



Other Keys

There are several other specialized keys on the Handheld Receiver's keypad in addition to those explained above.

Scan Key

Pressing the SCAN key causes the Handheld Receiver's display to automatically scan through all the weather displays, pausing on each for several seconds. To cancel scan mode, press any of the individual weather display keys.

Display On/Off Key

The DISPLAY ON/OFF key turns the LCD display on or off. This key does not affect operation of the radio receiver portion of the Handheld Receiver. The radio receiver is turned on automatically as soon as power is applied.

Setup Key

The SETUP key is intended for future expansion of the Handheld Receiver. Pressing this key will have no effect on the display or function of the Handheld Receiver.

Lamp Key

The LAMP key turns on or off the LCD display's lamp. Turning the lamp on renders the display a great deal more visible in dark conditions.

Using TAMSTerm

The TAMSTerm program simulates the operation of the handheld Control/Display, and can be used when a Control/Display is not part of a system. The same data available through the Control/Display can be viewed on a computer using TAMSTerm without an intervening Control/Display.

Once TAMSTerm has been installed according to the ***TAMSTerm Setup*** section in the ***Setup*** chapter of this manual, double-click the TAMSTerm icon to call up a facsimile of the Control/Display's front panel. TAMSTerm's operation mirrors the operation of the Control/Display, with values entered and selections made through the 16-key keypad. To activate a key using TAMSTerm, simply click the mouse on that key. Click any of the weather keys—WIND, TEMP, RAIN, etc.—to view current values for the selected parameter. For an explanation of the data displayed on each screen, refer to the preceding Control/Display screen descriptions.

Using TAMSView

Use of the TAMSView software is explained in detail in the ***TAMSView User's Manual***. Refer to that manual for instructions in using TAMSView.

MET STATION DATA LOG

The TAMS Met Station automatically stores an ongoing log of measured and calculated data in its internal memory. This accumulated data can be retrieved using a computer link, or the TAMS can be programmed through the Setup procedure to automatically output the most recent data packet at a user-defined interval.

Logged Data

Retrieving Logged Data

(*Note: A Control/Display is required to retrieve the Met Station's data log.*)

The Met Station's internal memory stores data at a regular interval set by the user via the Setup program. Logged data can then be retrieved in a single, bulk package via the Control/Display using the Change Log/Output selection within the Setup program and stored to a computer connected to the Control/Display's serial port. To copy the internal log from the Met Station:

1. Enter the Setup program via the Control/Display.
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 the 0 key to retrieve the stored data. (To continue through the Setup program without retrieving the data log, press ENTER).

Logged data is not automatically erased after being downloaded. To erase the data log, follow the steps described below.

Erasing Logged Data

The Met Station'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.

1. Enter the Setup program via the Control/Display. (*Note: The "erase past weather" screen follows immediately after the "send data log to the computer" command, which allows the data to be erased immediately after downloading without exiting the Setup program.*)
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. For an explanation of the format of retrieved data, refer to the *Data Format* section of this manual.

Storage Interval

How often data records are stored in the Met Station's 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 instructs the Met Station to send its most recent set of data to the serial port of the Control/Display (if connected), or to a computer, at regular intervals.

1. Press ENTER at the "Storage Interval" screen 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 the desired state is shown, press ENTER.
3. If timed output has been enabled, you will then be asked to specify an output interval. Enter the interval, in seconds, at which you want the Met Station to transmit its most recent set of data to a computer. Press ENTER to save the output interval setting. If the output interval is set to 0, timed output will be disabled.

MAINTENANCE

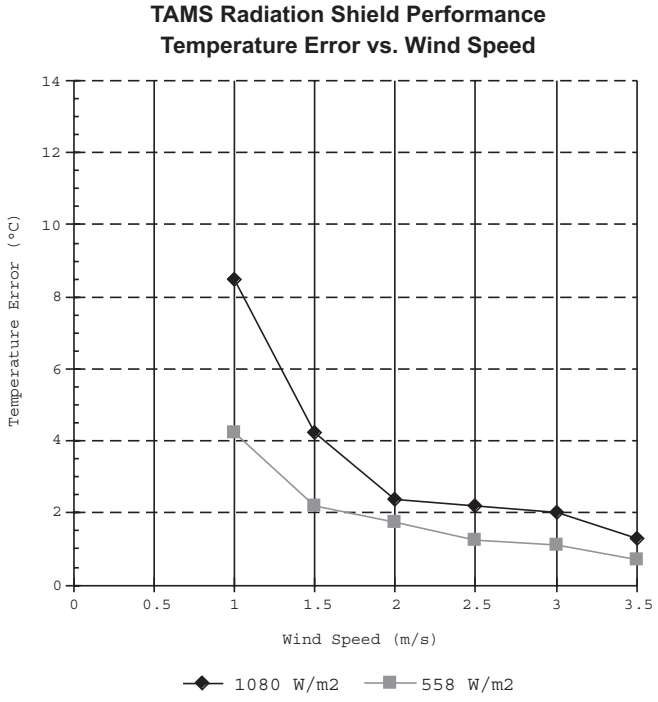
The only required maintenance of the TAMS system consists of replacement of depleted batteries in the Control/Display and periodic external cleaning.

If the power supply batteries in the Control/Display need replacement, a battery icon will appear on the screen. Please note that prolonged use of the unit with low or failing batteries may begin to give other error messages. One set of 12 new "AA" batteries will last a minimum of 24 hours of continuous use. Replace the batteries as described in the installation section.

Data stored in the Met Station's memory is retained through the power supplied by a lithium memory backup battery (Duracell XL, DL 1/2 AASE, 3 Volts) on the transmitter printed circuit board. Under normal use, this battery will last for several years. When the battery needs replacement, a message will appear when the TAMS unit is turned on. (This message will also be displayed if the battery is not installed.) To avoid losing any data, the battery should be replaced during the annual factory calibration. This battery is not field replaceable and the unit should be returned to the factory for replacement. Opening and breaking the factory seal on the transmitter assembly voids the warranty.

Warnings

- Although the components of the unit are extremely durable, the Control/Display should not be subjected to prolonged exposure to direct sunlight in hot weather, as this type of exposure can cause eventual degradation of the Control/Display.
- Temperature and relative humidity data are subject to the constraints of natural aspiration of the Self-Aspirating Solar Radiation Shield (SARS). At low wind speeds and in direct sunlight, the temperature should be corrected according to the graph below (Radiation Shield Performance).
- If visible moisture is present on the SARS, the sensor may transmit inaccurate relative humidity and temperature data until the moisture has evaporated or been removed.
- Prolonged use of the TAMS after the Control/Display's low battery icon has appeared on the screen may result in erroneous sensor readings and/or other error messages.



CALIBRATION

TAMS is calibrated at the factory, but to assure reliable performance it should be returned to the factory once a year for recalibration. This service includes calibration of all sensors, as well as thorough electrical and mechanical checks. The lithium memory backup battery will be replaced at this time if necessary.

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.

TAMS AND ELECTROMAGNETIC COMPATIBILITY (EMC)

In the following statements, "TAMS" may be interpreted to mean either of the following:

1. TAMS Model 9600 (Met Station connected to TAMS Control/Display via a shielded cable), powered by batteries or by an AC adapter (All Weather Inc. Model Number 9610 or 9611).
2. TAMS Met Station, cable, and Control/Display connected as above, and further connected, via the Control/Display RS-232 connector and All Weather Inc. Model 96024 shielded cable, to an FCC certified Class B personal computer (including computer, monitor, keyboard, printer, pointing device and necessary cables).

TAMS has been certified as generating acceptably low levels of radio interference as specified in FCC Rule Part 15, Subpart B, Class A digital device. This specification is directed toward equipment used in industry and in field applications.

TAMS has also qualified for certification as a Class B device under the FCC Rule cited above. Class B standards are stricter than those of Class A, and are directed toward equipment used in residential applications.

The following is a standardized FCC advisory to be furnished with Class B registered devices:

WARNING: This equipment generates and uses radio frequency energy. If not installed and used properly, that is, in strict accordance with the manufacturer's instructions, it may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart B of Part 15 of FCC Rules and Regulations, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: (1) Reorient the receiving antenna, (2) Relocate the computer or TAMS with respect to the receiver, (3) Move the computer or TAMS away from the receiver, or (4) Plug the computer or TAMS AC adapter into a different outlet so that the computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find helpful the booklet prepared by the Federal Communication Commission: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government printing Office, Washington, D.C. 20402 (Stock No. 004-000-00345-4).

The following is a standardized FCC advisory to be furnished with Class B registered devices:

FCC Compliance Statement: This device complies with Part 15 of the FCC Rules. (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

SPECIFICATIONS

General

Input Power:
- **Voltage:** 11-16VDC
- **Current:** 50mA typical (no radio)

Serial Output:
- **RS-485**
  - **baud rate:** 4800
  - **max. distance:** 4,000'
- **RS-232**
  - **baud rate:** 4800
  - **max. distance:** 100'

Environmental Parameters

	Low	*High*
Operating Ambient Conditions		
System (except displays)		
Temperature	-40°F (-40°C)	130°F (55°C)
Humidity	0%	98% condensing
Wind		100 mph
Displays		
Temperature	0°F (-18°C)	122°F (50°C)
Humidity	0%	98% non-condensing
Storage Ambient Conditions		
System (except displays)		
Temperature	-55°F (-48°C)	135°F (57°C)
Humidity	0%	98% condensing
Displays		
Temperature	0°F (-18°C)	135°F (57°C)
Humidity	0%	98% non-condensing

Met Station

Wind Speed:
- **Range:** 2 to 55 mph
- **Accuracy:** ±1 mph or ±5% of reading (whichever is greater)
- **Resolution:** 1 mph
- **Threshold:** 2 mph

Wind Direction:
- **Range: 0-360°**
- **Accuracy: ±5° RMSE**
- **Resolution: 10°**

Temperature (subject to constraints of natural aspiration):
- **Range:** -40 to +130°F (-40 to +55°C)
- **Accuracy:** -40 to -10°F (-40 to -24°C) ±3°F/±2°C
  -9 to +110°F (-23 to +43°C) ±1°F/±1°C
  +110 to +130°F (+43 to +55°C) ±3°F/±2°C
- **Resolution:** 1°F/1°C

Humidity (subject to constraints of natural aspiration):
- **Range:** 0-100% RH
- **Accuracy:** ±3% from -40 to +130°F (-40 to +55°C)
- **Resolution:** 1%

Barometric Pressure (subject to constraints of measurement at high wind speeds):
- **Range:** 18 to 32 in. Hg (610 to 1084 mb)
- **Accuracy:**

  -4 to +149°F (-20 to +65°C) case temp.:
  ±0.03 in. Hg (±1 mb) typ.
  ±0.075 in. Hg (±2.5 mb) max.

  -40 to -4°F (-40 to -20°C) case temp.:
  ±0.125 in. Hg (±4.2 mb) max.
- **Resolution:** 0.01 in. Hg/0.1 mb

Size: 8.5"L x 6.75"H x 2.0"D (216mm x 171mm x 51mm)
Weight: 2 lbs. (0.9 kg) maximum

Tripod
Tubing Material: aluminum
Height (fully extended): 10'

Compass
Range: 0-359°
Accuracy: ±3° (with compass oriented horizontally to earth within ±15°)
Resolution: 1°

Radio
Frequency: 467.75 MHz
RF Output Power: 2W
Sensitivity: 1 µV for less than 1 x 10E-6 BER

Battery
Type: Sealed dry cell lead acid
Capacity: 12V, 5 amp hours
Max. Recommended Storage Time: 24 months @25°C (decreasing with increasing temp.)

Battery Charger
Input Voltage: 12-18VDC
Charge Current: 750mA (typical)
Battery Charge Time (from full discharge): 7.5 hours
Trickle Current: 40mA (typical)

Control/Display
Power: 6 or 12 AA batteries, optional lithium batteries, or 9-15 Vdc external source
Operating Range: 24 hours continuous operation with alkaline batteries
Serial Output: RS-232 asynchronous, 1200 baud, no parity
Size: 9"L x 3.75"H x 1.7"D (229mm x 95mm x 43mm)
Weight: 2 lbs. (0.9 kg) maximum
Serial Output to Met Station: RS485

OPTIONS AND ACCESSORIES

Communication Options

Model 9604 Control/Display

The Model 9604 Control/Display consists of a 16-key keypad with LCD and backlight. It supports RS-485 from the TAMS (9600-3) and RS-232 to a computer. Power to the display and to a connected Met Station can be provided from on-board batteries or through an optional power adapter.

Product Overview

The Control/Display consists of a backlighted display and a 16-key keypad on its front panel, along with three connectors on its end cap for connecting to a Met Station, computer (RS-232), and auxiliary power. The Control/Display performs four main functions:

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

Display

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 Met Station. A key-activated backlight allows easy viewing in the dark or in dim light.

Keypad

The 16-key keypad can be used to select a weather parameter for display or to configure the Met Station 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.

Connectors

The Control/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 Met Station or Transmitter Case.

Power

The top connector on the Control/Display's end cap is used for auxiliary power. The Control/Display's internal battery compartment accommodates six or twelve 1.5V AA batteries, which will power both the Control/Display and the Met Station (through the appropriate cable) for limited periods. Alternatively, a DC power adapter can be connected to this top connector to provide longer-term power (see the ***Power*** section of this chapter for power adapter options). The Control/Display will continue to provide power to the Met Station even after being switched off with the keypad's ON/OFF switch.

RS-232

The middle of the three connectors is an RS-232 output port designed to transfer TAMS data from the Met Station to a computer. The Model 96024 50' cable— fitted with a Control/Display connector on one end and a standard DB9 serial port connector on the other—connects the Control/Display to a computer.

Met Station/Transmitter Connector

The bottom connector on the Control/Display's end cap provides an RS-485 interface to the Met Station. This RS-485 link can be made directly to the Met Station or through the Deluxe Transmitter Carrying Case (96003). The link is a bidirectional communications link with weather data going from the Met Station to the Control/Display, and control data going from the Control/Display to the Met Station.

Installation and Use

Refer to the ***Installation*** chapter of this manual for instructions on installing and using the Control/Display.

Specifications

Operating Ambient Conditions

Temperature:	0-135° F (-18-+57° C)
Humidity:	0-98% non-condensing

Storage Ambient Conditions

Temperature:	0-135° F (-18-+57° C)
Humidity:	0%-98% non-condensing

Size:	9"L x 3.75"H x 1.7"D (229mm x 95mm x 43mm)
Material:	Black anodized aluminum housing, polycarbonate end caps
Weight:	2 lbs. (0.9 kg) maximum
Power:	6 or 12 AA batteries or 11-16 Vdc external source
Serial Output to Transmitter	RS-485, 4800 Baud
Serial Output to Computer	RS-232, 4800 Baud (no parity)

Model 9605 Radio Transmitter Kit

The 9605 Radio Transmitter Kit is used to transmit meteorological data from the Met Station to a remote receiver (9606 or 9607 kit) at distances up to 10 miles. The kit comes with a UHF radio modem, antenna assembly, and all the appropriate cabling and mounting hardware to connect the radio to the Met Station. A 96003 Deluxe Transmitter Case is required with this kit.

Product Overview

The Radio Transmitter Kit consists of a radio transmitter, interface module, and rechargeable battery. These components are housed within a Model 96003 portable weathertight case, which has connectors built into its front panel to allow the transmitter to be left outdoors when necessary.

Radio Modem

The heart of the 9605 Radio Transmitter Kit is the 2W UHF radio modem. This radio is shipped tuned to the itinerant frequency of 467.75 MHz. All Weather Inc. is licensed for this frequency as a private carrier (WPJW615), which enables our customers to begin operating immediately and to continue operating under the All Weather Inc. license.

Communications

The radio link is simplex (output from the Met Station only) and is turned off except during transmission periods. The transmission interval is programmed into the Met Station using a Control/Display or computer, and can be set to a value anywhere from once every five seconds to once every four minutes. Data is transmitted over the radio link at 4800 baud using a robust protocol to ensure data integrity. The length of time taken for one transmission is less than !/2 second.

Connections

The radio kit is wired into the Transmitter Case, which in turn provides the connections to the Met Station and antenna, as well as protection from mechanical shock and from the environment.

Antenna

The antenna is an omnidirectional unity gain (without ground plane) half wave whip antenna designed to be mounted on the 10' tripod's boom adapter (96006). The antenna comes with 17 feet of RG58A/U coaxial cable, complete with a BNC male connector that mates with the BNC female connector on the Transmitter Case. Internal cabling in the case (included in the kit) completes the connectivity and signal routing.

Installation and Use

Refer to the ***Installation*** chapter of this manual for instructions on installing and using the Radio Transmitter Kit.

Specifications

Radio

Dimensions:	3"L x 3.2"W x 1.4"H (76mm x 81mm x 36mm)
Weight:	10 ounces
Temperature Range:	-30° to +60° C
Humidity:	100% Non-condensing
Supply Voltage:	9-16 VDC
Supply Current:	30mA Receive (typ) 900mA Transmit (typ)
Frequency Range:	450-470 MHz (synthesized) Tuned to 467.75 MHz
RF Output Power:	2 Watts
Sensitivity:	1 uV for less than 1 x 10E-6 BER
RF Connector:	BNC, female, 50 ohms

Modem

Data Rates	300,1200,2400,4800,9600 baud; programmed to 4800 baud
Connector:	9 pin D, Female, DCE
Signal Levels:	RS-232 or TTL Programmed to RS-232
Data Format:	Asynchronous, 8 data bits
Protocol:	Full Handshake or Data Activation; programmed to Data Activation

Antenna & Cabling

Whip Antenna:	1/2 Wave Base Loaded 2.4dB gain with Ground Plane 0 dB gain with no Ground Plane (Antenna is trimmed to optimal length for 467.75 MHz at factory.)
Antenna Mount:	3/4 Hole Brass Mount, mounts through flange which mounts on the tripod.
Cable:	17' RG58A/U Stranded Center Conductor Cable. 50 ohm, 30.8pF/ft, Attenuation 11.5dB/100ft @ 400 MHz Male BNC

Model 9606
Radio Receiver Kit

The 9606 Radio Receiver Kit is used to receive meteorological data from a Met Station interfaced to a 9605 Radio Transmitter Kit. The kit comes with a UHF radio modem, antenna assembly, and cabling. A 96004 Deluxe Receiver Case is required with this kit.

Product Overview

The Radio Receiver Kit is used on the receiving end of a TAMS radio link, and consists of the radio receiver and antenna. The receiver is normally connected to a computer running the TAMSView interface software, which enables the data to be displayed graphically and to be stored or sent on to other computers.

Radio Modem

The 9606 Radio Receiver Kit uses a UHF radio modem tuned to the itinerant frequency of 467.75 MHz to receive TAMS data from a 9605 Radio Transmitter Kit. All Weather Inc. is licensed for this frequency as a private carrier (WPJW615), which enable our customers to begin operation immediately and to continue operating under the All Weather Inc. license.

Communications

The radio link is simplex, designed for receiving data only. For this reason the radio must be always on in order to receive the periodic messages from the transmitter. Data is acquired at 4800 baud at the transmission interval programmed into the Met Station.

Connections

The radio is typically wired at the factory into the 96004 Deluxe Receiver Case, which in turn provides all the connectivity to the computer and antenna, as well as shock resistance and environmental protection. The case provides the radio with either battery power or DC power from an external source.

On/Off Switch

A Radio On/Off switch with indicator LED is mounted into the case. This switch should be turned off when the unit is not in use to prevent the radio from draining the battery.

Antenna

A magnetically mounted receiving antenna with 12 feet of RG58A/U coaxial cable is provided for flexible mounting configurations. A detachable, !/2 wave helical whip with a 0-90° adjustable elbow provides a way to attach the magnetic mount vertically to a wall or horizontally on a shelf while maintaining a vertical polarity to the antenna. The antenna can also be detached from the base and mounted directly to the receiver case.

Installation and Use

Refer to the ***Installation*** chapter of this manual for instructions on installing and using the Radio Receiver Kit.

Specifications

Radio

Dimensions:	3"L x 3.2"W x 1.4"H (76mm x 81mm x 36 mm)
Weight:	10 ounces
Temperature Range:	-30° to +60° C
Humidity:	100% Non-condensing
Supply Voltage:	9-16VDC Supply Current: 30 mA Receive (typ) 900 mA Transmit (typ)
Frequency Range:	450-470 MHz (synthesized) Tuned to 467.75 MHz
RF Output Power:	2 Watts
Sensitivity:	1 uV for less than 1 x 10E-6BER
RF Connector:	BNC, female, 50 ohms

Modem

Data Rates:	300,1200,2400,4800,9600 baud; programmed to 4800
Connector:	9 pin D, Female, DCE
Signal Levels:	RS-232 or TTL; programmed to RS-232
Data Format:	Asynchronous, 8 data bits
Protocol:	Full handshake or Data Activation; programmed to Data Activation

Antenna & Cabling

Whip Antenna:	1/2 Wave Helical tuned 467.75 MHz; BNC, 50 ohm
Antenna Mount:	Magnetic Mount suitable for horizontal or vertical mounting
Cable:	12 feet, 50 ohm RG58A/U Attenuation 11.5dB/100ft @ 400 MHz

Model 9607
Handheld Receiver Kit

The 9607 Handheld Receiver Kit is used to receive meteorological data from a Met Station interfaced to a 9605 Radio Transmitter Kit. The receiver kit comes with a microcontroller-based handheld display/ keypad, UHF radio modem, antenna assembly, and cabling. The Handheld Receiver Kit requires a 12V power source, such as the 96010 wall mount AC-to-DC converter.

Product Overview

The Handheld Receiver is a small, handheld radio receiver and data display device used to receive transmissions from a remote TAMS Radio Transmitter. The receiver is also equipped with an RS-232 interface for connection to a computer and includes circuitry to filter extraneous noise from received data before sending it on to the computer.

The Handheld Receiver receives TAMS data from a 9605 Radio Transmitter via a UHF radio modem tuned to the Itinerant frequency of 467.75 MHz. All Weather Inc. is licensed for this frequency as a Private Carrier which enables our customers to begin operation immediately and to continue operating under the All Weather Inc. license. The radio link is simplex with the Handheld Receiver designed for receiving data only. For this reason the radio must be "on" (plugged into a power source) all the time in order to receive the periodic messages from the transmitter. The data is acquired at 4800 baud and according to the transmission interval programmed into the Met Station.

The receiver antenna can either be connected directly to the Handheld Receiver's BNC connector, or attached to the magnetic mount with its 12 feet of cable.

An optional carrying case (96004) can be used to provide the radio with either battery power or connection to an external DC power source. Alternatively, a DC power adapter (such as the 96010) can be plugged directly into the Handheld Receiver.

Data for individual weather parameters can be viewed on the Handheld Receiver's LCD display by selecting the desired parameter on the keypad, or scan mode can be used to view all the parameters in sequence.

The received data packets are filtered of any noise and then passed on to the unit's RS-232 port, where they can then be output to a computer.

Installation and Use

Refer to the ***Installation*** chapter of this manual for instructions in installing and using the Handheld Receiver Kit.

Specifications

Dimensions:	14.5"L x 3.75"W x 1.75"H (368mm x 95mm x 44 mm)
Weight:	approx. 2 lbs
Material:	Black Anodized Aluminum
LCD	20 characters by 2 lines with backlight
Keypad:	16 position
Temperature Range:	0° to 135°F (-18° to +57° C)
Humidity:	0%-98% Non-condensing
Supply Voltage:	11-16VDC
Supply Current:	120 mA Typical 220 mA Typ (Backlight On)
Frequency Range:	450-470 MHz (synthesized) Tuned to 467.75 MHz
Sensitivity:	1 uV for less than 1 x 10E-6BER
RF Connector:	BNC, female, 50 ohms
RS-232 Output	4800 baud
Connector:	5 pin Female Conxall
Data Format:	Asynchronous, 8 data bits
Protocol:	Two Wire
Antenna & Cabling	
Whip Antenna:	1/2 Wave Helical tuned 467.75 MHz; BNC, 50 ohm
Antenna Mount:	Magnetic Mount suitable for horizontal or vertical mounting
Cable:	12 feet, 50 ohm RG58A/U Attenuation 11.5dB/100ft @ 400 MHz

ModelS 96030, 96031 RS485 to RS232 Converter

Product Overview

The TAMS Met Station comes with both an RS-232 and an RS-485 communication link. The RS-232 link is typically only used for communicating with a computer or radio modem within 100 feet of the Met Station. The RS-485 (RS-422) link allows serial communication over longer distances, up to 4,000 feet. Most computers have only RS-232 serial ports, however, and do not have RS-485 or RS-422 ports. The 96030 makes the RS-485 interface usable with standard computers by translating the RS-485 signals into RS-232 signals that a computer can understand.

Installation and Use

Connections to the 96030 and 96031 are made easy by the use of standard TAMS connections to the RS-485 cable (GREEN circular connector) and standard computer connections (DB25, DE9) to the computer cable. The onboard dip switch is set to configure the unit for RS-422 (SW1-4 Off, SW5 On). The 96030 uses standard 110VAC for power, and the 96031 uses 220VAC. A wall transformer with a 6' cable is provided with each.

Typically, the RS-485 to RS-232 converter is located near the receiving computer. A 6' computer cable terminating in a female DE9 connector is used to provide the final connection to the computer. It is recommended that the 96030 and 96031 be used in conjunction with the 96032 lightning sponge for longer cable runs. The 96032 provides protection from lightning and surges and is easily connected in series between the 96030 and Met Station.

Specifications

Size:	3.5" L (89mm) x 2" W (51mm) x 0.875"H (22mm)
Power:	
96030	115VAC @ 60 Hz 6 ft cable
96031	220VAC @ 50 Hz 6 ft cable
Data Rate:	0 - 64 KBPS
Indicators:	2 LEDs TD & RD
Switch	DTE/DCE switch selectable for reversing TD & RD.
MTBF:	596,000 Hours (68 Years)
Environmental:	0° to 50°C, 0% to 95% RH
Computer Cable	
Length:	6 ft.
Converter End	DB25 Male
Computer End	DE9 Female
Gender Changer	DB25 Female to Female
RS-485 Pigtail Cable	
Length	6 "
Connector	6-pin Circular Conxall Mates with 96015, 96016,96017 and 96018

Cases

Model 96001
Standard Carrying Case

Product Overview

The TAMS standard carrying case is a black Polystyrene, pressure-formed case with black powder-coated aluminum valance hardware and latches, and exterior dimensions of approximately 18"x14"x7". The case has a hinged cover with twin lid stays, a hinged carrying handle, and two key-lock latches for security. The internal foam has precut pockets to accommodate the TAMS components and cables (see **Figure 20**).

Instructions

Two plastic hook latches secure the hinged cover to the body of the carrying case. For ease of opening of the case, press down with the palm of your hand on the case's lid while releasing the latches with the other hand. For security, two eyelets are provided between the cover and body that will accommodate up to a $^{5}/_{16}$" diameter shank padlock (customer supplied). When stowing the TAMS in the case, be sure to place the TAMS components in their appropriate positions in the foam inserts (see **Figure 20**) so that the cover will close properly and will hold the components securely during transit. Water should be kept out of the carrying case, since the open cell foam will retain water.

Specifications

Material:	Polystyrene
Dimensions:	18"x14"x7"
Weight:	5 lbs

Model 96002
Met Station Weathertight Carrying Case

Product Overview

The TAMS weathertight carrying case is a black ABS/Polycarbonate molded case, measuring 17" x 10" x 6.5". The case has a hinged cover with a silicone o-ring seal and a pressure relief valve for equalizing the atmospheric and case pressures, a padded hinged carrying handle, and an eyelet provision for padlock security. The interior has pockets constructed in its "pluck" open-cell foam inserts to accommodate the TAMS components and cables (see **Figure 20**).

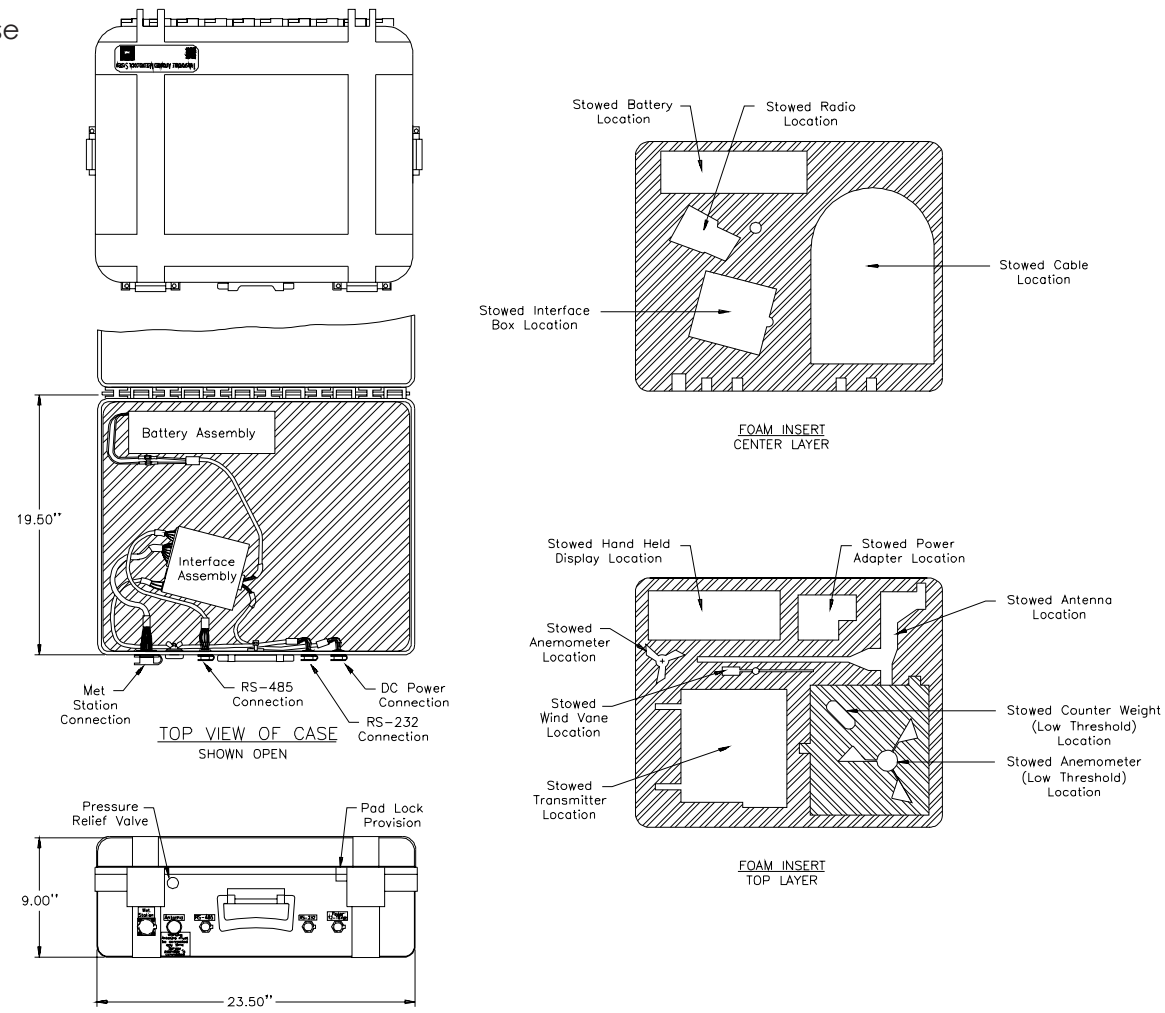
The carrying case also has an I/O connector on its front adjacent to the carrying handle compatible with any of the various length Met Station-to-Control/Display cables (96015, 96016, 96017, 96018). A short pigtail cable on the inside of the carrying case attaches to the Control/Display to allow the carrying case to be used as a weathertight enclosure for the Control/Display and auxiliary batteries during extended inclement weather use.

Instructions

Two plastic hook latches secure the hinged cover to the body of the carrying case. For ease of opening of the case, press down with the palm of your hand on the case's lid while releasing the latches with the other hand. For security, two eyelets are provided between the cover and body that will accommodate up to a $^{1}/_{4}$" diameter shank padlock (customer supplied). When stowing the TAMS in the case, be sure to place the TAMS components in their appropriate positions in the foam inserts (see **Figure 20**) so that the cover will close properly and will hold the components securely during transit. Water should be kept out of the carrying case, since the open cell foam will retain water.

The case is equipped with a pressure release valve adjacent to the handle to maintain equal pressure between the case and its surroundings. This valve must be open (counterclockwise three turns) when the case is subjected to atmospheric changes—such as during aircraft travel or any significant altitude change. In wet conditions, the valve should be kept closed (clockwise until snug) to keep moisture out.

Figure 20.
Carrying case
layout



To use the weathertight carrying case as a temporary enclosure for the Control/Display, connect an optional Met Station-to-Control/Display cable between the Met Station and the external connector adjacent to the handle on the front of the carrying case. Connect the short pig-tail cable inside the case to the bottom connector on the end cap of the Control/Display. This allows the Control/Display to operate while protected within the weather-tight carrying case during extended field installations.

Specifications

Material:	ABS/Polycarbonate (Black)
Dimensions:	17" x 10" x 6.5"
Weight:	6 lbs

Model 96003 Deluxe Transmitter Carrying Case

The TAMS Deluxe Transmitter Carrying Case is designed to carry the TAMS Met Station, 5 A-h battery, battery charger, radio, and associated cabling to and from a remote operation site. It serves as a power and signal interface box during operation and provides a weatherproof and shock-resistant enclosure.

Product Overview

The 96003 Carrying Case is made out of durable UV and ozone-stabilized plastic, and is sealed against moisture, dust, and other contaminants. Its customized foam interior organizes the interior components and provides for their protection against shock and vibration. Weathertight connectors on the exterior of the case are labeled for connecting the Met Station, antenna, serial communications, and auxiliary power inputs.

The case contains a 5 A-h rechargeable battery for portable power that can sustain the system from 24 hours to 5 days before a recharge, depending on whether radios are being used and on their transmission interval. Connecting an auxiliary power adapter or solar panel to the case will provide power to the Met Station and will also recharge the battery. After use, the case can be connected to an external source to fully charge the battery, and can be left plugged in to maintain a trickle charge and keep the unit in a fully ready condition.

The case also servers as a signal router, with the main cable from the Met Station plugging into the case's MET STATION connector. The case then splits out the RS-232 and RS-485 lines and makes them available on separate connectors. The RS-485 connector can be used to connect to a Control/Display or to a computer up to 4,000 feet away, typically with an RS-485 to RS-232 converter installed at the computer end. The RS-232 link is a computer link that can be used up to 100 feet from the case.

The case can also be used with the 9605 radio kit. In this configuration, the case holds the radio in protective foam and provides power as well as routing of the RF and digital outputs.

Instructions

Two plastic hook latches secure the hinged cover to the body of the carrying case. For ease of opening of the case, press down with the palm of your hand on the case's lid while releasing the latches with the other hand. For security, two eyelets are provided between the cover and body that will accommodate up to a 1/4" diameter shank padlock (customer supplied). When stowing the TAMS in the case, be sure to place the TAMS components in their appropriate positions in the foam inserts (see **Figure 20**) so that the cover will close properly and will hold the components securely during transit. Water should be kept out of the carrying case, since the open cell foam will retain water.

The case is equipped with a pressure release valve adjacent to the handle to maintain equal pressure between the case and its surroundings. This valve must be open (counterclockwise three turns) when the case is subjected to atmospheric changes—such as during aircraft travel or any significant altitude change. In wet conditions, the valve should be kept closed (clockwise until snug) to keep moisture out.

Specifications

Dimensions:	21.9"L x 18"W x 8.4"D 557mm x 457mm x 213mm
Weight:	
Case, Battery, Charger	21 lbs
Case, Battery, Charger, Met Station, Radio, Cables, DC Supply	28 lbs
Material:	ABS UV and Ozone Stabilized
Operating Temperature:	-20° to 140°F (-29° to 60° C)
Pressure Equalization Valve	
Connectors	
Met Station	18-pin female Conxall
Radio Antenna	BNC female 50 ohm
RS-485	6-pin female Conxall
RS-232	5-pin female Conxall
Power	3-pin male Conxall 12-18Vdc
Battery	
Type	Sealed Dry Cell Lead Acid
Capacity:	12 V, 5 A-H
Operation:	
Storage & Discharge	-65° to 65°C
Charge	-40° to 65°C
Maximum Recommended Storage Time:	24 months @ 25°C (decreasing with increasing temp)
Cycle Life (100% Discharge @ 1Amp)	300 cycles
Float Life @ 25°C	8 years
Battery Charger	
Temperature Range	-40° to +60° C
Input Voltage	12-18 VDC
Charge Current	750 mA (typical)
Battery Charge Time (from full discharge)	7.5 Hours
Trickle Current	40 mA (typical)

Model 96004
Deluxe Receiver Carrying Case

The 96004 TAMS Deluxe Receiver Carrying Case is designed to carry the 5 A-h battery, battery charger, radio or radio receiver display and associated cabling to and from the operation site. It serves as a power and signal interface box during operation and provides a weather proof and shock resistant enclosure.

Product Overview

The 96004 Carrying Case is made of durable UV and ozone-stabilized plastic, and is sealed against moisture, dust, and other contaminants. Its customized foam interior organizes the interior components and provides for their protection against shock and vibration. Weathertight connectors on the exterior of the case are labeled for connecting the antenna, serial communications, and auxiliary power inputs.

The case contains a 5 A-h rechargeable battery for portable power. Depending on whether a radio or a Handheld Receiver is used with the case, the battery can last from 1.5 to 6 days between chargings. Connecting a power adapter to the case will provide power to the radio or Handheld Receiver as well as recharging the battery. When the case is not in use, it can be plugged into a power source to fully charge the battery for the next use, and can be left plugged in to maintain a trickle charge and keep the unit fully charged.

When the case is used with the 9606 radio kit, it serves as the signal router. The radio antenna connects to the case, and the case provides the RS-232 connection to the computer.

Instructions

Two plastic hook latches secure the hinged cover to the body of the carrying case. For ease of opening of the case, press down with the palm of your hand on the case's lid while releasing the latches with the other hand. For security, two eyelets are provided between the cover and body that will accommodate up to a 1/4" diameter shank padlock (customer supplied). When stowing the TAMS in the case, be sure to place the TAMS components in their appropriate positions in the foam inserts (see **Figure 20**) so that the cover will close properly and will hold the components securely during transit. Water should be kept out of the carrying case, since the open cell foam retains water.

The case is equipped with a pressure release valve adjacent to the handle to maintain equal pressure between the case and its surroundings. This valve must be open (counterclockwise three turns) when the case is subjected to atmospheric changes—such as during aircraft travel or any significant altitude change. In wet conditions, the valve should be kept closed (clockwise until snug) to keep moisture out.

Specifications

Dimensions:	17.8"L x 12.8"W x 6.8"D (452mm x 325mm x 172mm)
Weight:	
Case w/ Battery & Charger	15 lbs
Case w/ Battery, Charger, 9606 & 96010	20 lbs
Case w/ Battery, Charger, 9607 & 96010	21 lbs
Material:	ABS UV and ozone stabilized
Operating Temperature:	-20° to 140°F (-29° to 60° C)
Pressure Equalization Valve	
Connectors	
Radio Antenna	BNC female 50 ohm
RS-232	5-pin female Conxall
Radio Display Power	3-pin female Conxall
Power	3-pin male Conxall, 12-18Vdc
Battery	
Type:	Sealed Dry Cell Lead Acid
Capacity:	12 V, 5 A-H
Operation:	
Storage & Discharge	-65° to 65°C
Charge	-40° to 65°C
Maximum Recommended Storage Time:	24 months @ 25°C (decreasing with increasing temp)
Cycle Life (100% Discharge @ 1Amp)	300 cycles
Float Life @ 25°C	8 years
Battery Charger Temperature Range	-40° to +60° C
Input Voltage	12-18 VDC
Charge Current	750 mA (typical)
Battery Charge Time (from full discharge)	7.5 Hours
Trickle Current	40 mA (typical)

Tripods and Mounting

Model 96005
10' Tripod

The 96005 is a sturdy, lightweight, adjustable aluminum tripod. It is designed to support the TAMS with all its possible accessories and attachments. It has extendable legs, guying, adaptable feet, and an optional accessory mounting boom. The unit disassembles for transport in a single carrying bag.

Product Overview

The 96005 10' Tripod is the key support system for the TAMS Met Station and its accessories. It can be quickly assembled and easily adjusted to different heights. Its extendable legs allow the tripod to remain vertical when installed on a sloping or irregular surface, while the feet provide a convenient way to anchor the tripod firmly by weighting them, staking them to the ground, or bolting them down.

TAMS accessories (solar radiation sensor, rainfall sensor, radio antenna, etc.) can be mounted to the tripod using the optional Boom Adapter (96006). Several Boom Adapters can be used simultaneously when the number of options added requires it.

Installation

For instructions on installing the 10' tripod, refer to the ***Installation*** chapter of this manual.

Specifications

Tubing Material:	Aluminum
Tubing Color:	Silver
Fasteners & Fittings Material:	Polycarbonate (glass reinforced)
Fastener & Fittings Color	Black
Height:	
(fully extended mast & legs)	10'
(legs and mast at minimum)	6'4"
Leg Span:	
(feet to feet fully extended base diameter)	5'8"
Clearance under legs (fully extended)	1'6"
Tripod Feet Mounting Hole Diameters:	
Lag Bolt (1/4")	0.28 "
Tent Stake	1"
Tripod Weight:	14 lbs

Model 96006
Boom Adapter

The 96006 is a boom adapter that attaches to the 96005 10' Tripod and provides mounting for Met Station accessories such as a radio antenna, pyranometer, rain gauge, and solar panel.

Product Overview

The 96006 Boom Adapter is required whenever accessories or options are added to the TAMS and mounted to the 10' tripod (96005). The boom is a 2' extension rod that accepts the quick release mounting fixtures found on the radio antenna, pyranometer, rain gauge, and solar panels. It is easily adjusted to different placements and orientations, allowing it to be optimally positioned for the application at hand. The boom can be quickly removed from the tripod and placed in the tripod's carrying bag for transport.

Installation

For instructions on installing the boom adapter, refer to the ***Installation*** chapter of this manual.

Specifications

Tubing Material:	Aluminum
Tubing Color:	Silver
Fasteners & Fittings Material:	Polycarbonate (glass reinforced)
Fastener & Fittings Color	Black
Length:	2 '
Boom Weight (with mounting hardware)	0.8 lbs

Model 96007
6’ Tripod

Product Overview

The 6' tripod assembly consists of a tripod, tripod adapter, and convertible rubber/spiked feet. The tripod is a standard heavy duty 60" camera tripod with a 3/8-16 UNC mounting stud. It is constructed of black anodized, telescoping aluminum tubing that can be collapsed to approximately 30" x 4 “. The tripod adapter mounts on the top of the tripod and fits to the Met Station’s mounting neck. The convertible feet provide the option of having a metal spike protrude from each foot for stabilizing the tripod on soft surfaces, or of having rubber pads exposed for gripping on harder surfaces or where spikes are not appropriate.

Installation

The tripod can be adjusted to any height between the minimum of about 30" and the maximum of 60". If the tripod adapter has not yet been installed onto the tripod, position it on the tripod’s top mounting flange and turn it clockwise until tight. To set up the tripod:

1. Pivot the three tripod legs out from the center as far as they will go.
2. Loosen the thumb nuts on the leg sections and extend the legs to their maximum lengths.
3. Tighten the thumb nuts, adjusting the individual leg lengths as required to level the tripod.
4. Loosen the single thumb nut on the center mast and extend it to its highest position.
5. Tighten the center mast thumb nut.
6. To stow the tripod, reverse the above sequence.

When the tripod is used on a surface where a sharp metal spike is desired for stability, twist the three rubber feet clockwise until they stop. This exposes the metal spikes for penetration into the surface.

When the tripod is used on a surface where rubber feet are desired, twist the three rubber feet counter clockwise until they stop. This recesses the metal spikes and allows the tripod to rest on the rubber feet.

Specifications

Material:	Aluminum (Black)
Size:	6’
Weight:	5 lbs

Model 96008
1” Pipe Adapter

Product Overview

The 96008 1” Pipe Adapter is used for mounting the Met Station to a standard 1” pipe. It is slotted on one side to allow the Met Station cable to exit from the piping and be routed down the side of the pipe. The 1" pipe has threads to mate with a standard 1" pipe fitting/coupler. This adapter is used in applications where a tripod is not available, required, or desired.

Installation

Screw the pipe adapter to the mounting pipe with a standard 1" pipe coupling. Slide the neck of the Met Station over the pipe adapter so that the cable extends out through the slot in the side of the adapter and route the cable down the side of the pipe.

Specifications

Material:	1" Sch 40 aluminum pipe. (black anodized)
Length:	4"
Cable Slot Length:	2.85 “ L x 0.38” W

Power

Model 96010, 96011 120VAC or 220VAC to 15VDC Power Adapter

Product Overview

The 96010 and 96011 are AC-to-DC power adapters designed to convert 120VAC, 60Hz (96010) or 220VAC, 50Hz (96011) to 15VDC at 1.0 ampere. Both adapters come with a 6' cord terminated with the standard three-pin (RED) female connector used for all TAMS power connections. When used with the TAMS Transmitter Case (96003) or Receiver Case (96004) the adapter will provide power to the system and charge the internal battery at up to 800 mA. To keep the batteries fully charged, the adapter may be left connected to the case when in storage.

Both adapters will also plug directly into the Control/Display (9604), the Handheld Receiver (9607), or into the TAMS Met Station with the appropriate adapter cable.

Installation and Use

Transmitter and Receiver Cases

Connect the two-prong power supply to a suitable 120VAC (96010) or 220VAC (96011) outlet. Connect the three-pin circular connector (RED) to the case's "Power 12-18 Vdc" connector.

Control/Display

Connect the two-prong power supply to a suitable 120VAC (96010) or 220VAC (96011) outlet. Connect the three-pin circular connector (RED) to the top connector on the Control/Display's end cap (see ***Figure 1***). When the TAMS is turned on, the message: "SYSTEM POWERED BY EXTERNAL POWER SOURCE" will appear on the LCD display.

Handheld Receiver

Connect the two-prong power supply to a suitable 120VAC (96010) or 220VAC (96011) outlet. Connect the three-pin circular connector (RED) to the bottom connector on the Handheld Receiver's end cap.

Specifications

Input:		
96010	120 Volts AC, 60 Hz,	24 W
96011	220 Volts AC. 50 Hz	
Output:	15 VDC at 1 Ampere	
Cord Length:	6 feet	
Connector:	Conxall 3 Pin Female	

Model 96012 Cigarette Lighter Power Adapter

The 96012 is a cigarette lighter power adapter with 25 feet of cable terminated with the standard TAMS power connector.

Product Overview

The 96012 is an auxiliary power adapter designed to provide DC power to a TAMS Met Station, Transmitter Case, Receiver Case, Control/Display, or Handheld Receiver from a standard automobile or truck cigarette lighter. The adapter is fused and comes with 25 feet of 20 gauge cable.

Installation and Use

Plug the cigarette lighter adapter into the vehicle's cigarette lighter receptacle. Plug the connector end (RED) into the mating RED connector of the TAMS component to be powered.

Specifications

Cigarette Adapter	Fused 3A
Cable	2-conductor 20 AWG (stranded) with foil shield, 10 mil PVC jacket on single conductors, gray PVC outside jacket, 0.3" thick
Length:	25 feet
Connector:	Conxall 3-pin female cable end

Model 96013
Unterminated 50' Power Cable

The 96013 is a 50' auxiliary power cable with on unterminated end and the other end terminated with a power connector compatible to all power connections of the TAMS system.

Product Overview

The 96013 is an auxiliary power adapter designed to provide DC power to a TAMS Met Station, Transmitter Case, Receiver Case, Control/Display, or Handheld Receiver. Its TAMS connection is the standard 3-pin female connector (RED) compatible with all TAMS power input connectors. The cable's other end is left unterminated to provide the user with the flexibility to customize the power source connection. The source to which the unterminated connection is made must be in the range of 9-15 VDC.

Installation and Use

The unterminated end of the cable consists of a black wire and a white wire. Connect the black wire to the negative terminal of the power source. Connect the white wire to the positive terminal. Finally, connect the TAMS connector (RED) to the mating RED connector on the TAMS component to be powered.

Specifications

Cable:	2 Conductor 20 AWG (stranded) with foil shield, 10 mil PVC jacket on single conductors, Grey PVC Outside jacket 0.3" thick
Length:	50 feet
Connector:	1) Conxall 3 pin female cable end 2) Unterminated; Black=Ground (-), White=Power (+)

Models 96036, 95037
10W or 18W Photovoltaic Solar Panel

Product Overview

When used as a portable remote station communicating over a UHF radio link, the TAMS also requires a portable source of power. The 5 A-h battery in the case is only good for a limited time—a length of time that is highly dependent on the station's transmission interval. For example, if the TAMS is transmitting every 5 seconds, the 5 A-h battery will last about 30 hours. If it is transmitting every 30 seconds, the battery will last about 72 hours. A car battery can be plugged into the case to extend this time significantly, depending on the battery's rating. Another way to extend the TAMS' operation time is to use the Model 96036 or 96037 Solar Panel. These lightweight, quick-connecting solar panels provide power to the unit during the day, while also recharging the battery so that it can provide the necessary power at night. Use of these panels extends the TAMS' ability to operate from its 5 A-h battery to a period of several weeks, depending on the installation area's climate, latitude, and season.

The 96036 10W panel is designed to be used when longer transmissions intervals (>every 20 seconds) are used. With transmission intervals of less than 20 seconds, the 96037 18W panel should be used.

Installation and Use

Both panels come with quick-mounting brackets and the standard TAMS power connector (RED), allowing them to be plugged directly into a Transmitter Case. They should be mounted on the southern side of the tripod if located in the Northern hemisphere, and on the northern side if located in the Southern hemisphere. The angle of the panel should be adjusted to 5-10° greater than the latitude of operation. For example, if the latitude of the installation site is 38°, the panel should be tilted up to an angle between 43 and 48°.

Specifications

Material:	Laminated ethylene vinyl acetate (EVA) on an anodized aluminum backing
Dimensions:	
96036	17.5" x 10.5" x 0.44" 44.4cm x 26.7cm x 1.1cm
96037	17.5" x 19.5" x 0.44" 44.4cm x 49.5cm x 1.1cm
Weight:	
96036	1.8 lbs (0.82 kg)
96037	3.28 lbs (1.49 kg)
Cable:	10 foot AWG #18-2 polyethylene-jacket; Conxall Circular Connector 3 position socket
Typical Peak Power	
96036	10 W
96037	18.5W
Voltage @ peak power	
96036	17.1V
96037	16.8V
Current @ peak power	
96036	0.58 A
96037	1.10 A
Short Circuit Current	
96036	0.60A
96037	1.19 A
Open-Circuit Voltage	
96036	21.1V
96037	20.8V
Temperature Coefficient of Current:	
96036	0.68mA/°C
96037	1.2mA/°C
Effect of Temperature on Power:	Approx 0.37%/°C
Temperature Coefficient of Voltage	-72mV/°C

Cables

Cable Color Coding

The TAMS system has been designed to be flexible and adaptable to as many monitoring situations as possible. Toward this end, many of the cable connections found on the various TAMS components have been made to accept multiple cable configurations. When this is the case, any cable that can be used at a specific connection is marked with a matching color band or typewritten label. Typewritten labels are used when a cable can be used with more than one type of connection. Color bands are used with cables that serve the same function (power or signal, for instance) but vary in some other way (length, for example). These color bands identify the cable's function (and mating connectors) according to a simple color coding scheme:

RED	Power end connection
BLUE	Met Station end connection
GREEN	RS-485 end connection

As an example: The cable end of the Model 96010 AC Adapter (RED) can connect to a Transmitter Case, Receiver Case, Power Extension Cable, Control/Display, or any other red-labeled connector of opposing sex.

Models 96015, 96016, 96017, 96018
RS485 Met Station (18-pin) to Control/Display (6-pin) Cable

Product Overview

The cables in this series are 6-conductor cables designed to make a direct connection between the TAMS Met Station (9600, 9601, 9602, or 9603) and a Control/Display (9604), or between the Met Station and an RS-485-to-RS-232 converter. The cable provides a four wire RS-485 connection [Transmit (+ & -) and Receive (+ & -)], as well as ground (common) and battery power from the Control/Display to the Met Station. The only difference between models is their lengths (see *Specifications* below).

Installation

Connect the 18-pin connector (BLUE) to the Met Station, and the 6-pin connector (GREEN) to the lower connector on the Control/Display's end cap or to the mating connector on the RS-485-to-RS-232 converter (see ***Figure 1*** for Control/Display connector locations).

Specifications

Cable:	6 Conductor Twisted Pair 24 AWG Gray PVC Jacket
Connectors:	18 Pin Female Conxall Circular Connector 6 Pin Male Conxall Circular Connector
Length:	
96015	15'
96016	50'
96017	100'
96018	200'

Model 96019
15' Met Station to Transmitter Case Cable

Product Overview

The 96019 is an 18-conductor 15' cable designed to make a direct connection between the TAMS Met Station (9600, 9601, 9602, or 9603) and the Transmitter Case (96003). The cable brings out all the possible TAMS interconnections. Typically, this cable is used with the 96005 10' tripod and is routed down the center tube of the tripod. It can also be used with the 96008 Pipe Adapter to bring the signals to the Transmitter Case from the Met Station when it is mounted on a pipe.

Although this cable brings out all the possible signals from the Met Station, the case (96003) does not normally pick up the auxiliary, solar, and rain signals. To connect to any of these sensors, the Auxiliary Sensor Cable is required. The Auxiliary Sensor Cable connects directly to the Met Station's pigtail cable, and the 96019 cable then connects to the Auxiliary Sensor Cable.

The 96019 allows for radio, RS-485, or RS-232 communications through the Transmitter Case. Power is also routed through the 96019 from the case's battery supply or from the case's direct DC connection. This cable is generally required whenever the Transmitter Case (96003) is used in conjunction with the Met Station.

Installation

The cable is marked at one end with a BLUE color band, and at the other with a label that reads "TRANSMITTER CASE ONLY". Connect the blue-banded end to the Met Station pig tail cable or a blue-banded Met Station secondary cable (such as the 96023 Y-Adapter Cable). Connect the "TRANSMITTER CASE ONLY" end to the "MET STATION" connector on the Transmitter Case.

Specifications

Cable:	15 Feet, 20 conductor Twisted Pair 24 AWG gray PVC Jacket
Connectors:	18 pin Female Conxall Circular Connector 18 pin Male Conxall Circular Connector

Model 96020
15' Control/Display to Transmitter Case Cable

Product Overview

The 96020 allows the Control/Display to be used with a TAMS radio system by connecting to the Met Station through the Transmitter Case (96003). The cable connects the Control/Display to the Transmitter Case's RS-485 connector to allow setup of the Met Station or viewing of TAMS data. The Control/Display and connecting cable can also be useful for checking the system before hooking up an RS-485 link to a computer.

Installation

(Note: This cable is labeled "HHD-CASE ONLY RS485". HHD stands for Handheld Display, which is another designation for the Control/Display.)

Both end connectors on the 96020 are identical, so the orientation of the cable is unimportant. Connect either end to the bottom connector on the Control/Display's end cap; connect the other end to the Transmitter Case's "RS-485" connector.

Specifications

Cable:	15 foot 5 conductor, twisted pair 24 AWG, PVC Gray Jacket
Connectors:	(2) 5 Pin Male Conxall (Circular) Transmit + Transmit - Receive + Receive - Common

Model 96021
50' RS232 Computer (DB9) to Y-Adapter Cable

Product Overview

The TAMS Met Station can be connected directly to a computer to enable configuration of the system—using TAMSTerm—as well as logging and display of TAMS data. To accomplish this there must be a direct RS-232 (or RS-485) connection between the computer and the Met Station, and there must also be a way to provide power to the Met Station. The Y-Adapter Cable (96023) provides the splicing of power and serial lines to the Met Station, and the 96021 Computer to Y-Adapter Cable provides the connection between the Y-Adapter Cable and the computer's serial port. The 96021 mates with the RS-232/RS-485 trunk of the Y-Adapter Cable and extends the RS-232 transmit, receive, and common lines, terminating them in a standard DB9 connector. Transorbs on both the transmit and receive lines provide extra protection for the serial port.

Installation

The Y-Adapter Cable (96023) consists of a main trunk at one end (which is the Met Station end), which then splits into two branches (power and serial) at the other end. There are two blue-banded connectors on the Y-Adapter Cable, one on the main trunk and another on the serial leg of the "Y". The connector on the main trunk connects to the Met Station or a Met Station-compatible cable. The blue-banded connector on the serial leg connects to the blue-banded end of the Model 96021.

Connect the cable's blue-banded connector to the blue-banded connector on the serial leg of the Y-Adapter Cable. Connect the DB9 connector to the computer's serial port.

Specifications

Cable:	Conductor 20 AWG with PVC Jacket
Length:	50 feet
Connectors:	18 Pin Female Conxall 9 Pin Male Sub D
Transorbs:	
Maximum Clamping Voltage	+/- 26.9V

Model 96022
50’ Power Extension Cable

Product Overview

The Model 96022 50’ Power Extension Cable provides an extension from the Y-Adapter Cable (96023) to a Power Adapter (i.e., 96010, 96012 etc.) when the power source is at a distance from the Met Station. It can also be used as an extension power cable between a power adapter and a Transmitter case (96003) or Receiver case (96004).

Installation

Both ends of this cable are identical TAMS power connectors (RED), so the orientation of the cable is irrelevant. Either end can be connected to a mating red power connector.

Specifications

Cable:	2 Conductor 20 AWG with PVC Jacket
Length:	50 feet
Connectors:	3 Pin Cable to Cable Conxall (to Power adapter) 3 Pos Cable End Conxall (to Y-Adapter or to Transmitter or Receiver Case)

Model 96023
15’ Y-Adapter RS232/RS485 & Power Cable

Product Overview

For those applications where a direct computer connection is to be made to the Met Station, the Y-Adapter Cable provides both the serial connection between the Met Station and computer and a separate power connection. The Y-Adapter provides only the means of splitting the signals from the Met Station, and must be used in conjunction with other cables to complete the connections. The cable’s 15' length allows it to be used with the 10' tripod (96005).

Installation

The main trunk of the Y-Adapter (BLUE) connects to the Met Station. The RED power connector can be connected to any of the standard power adapters, or to the 50' power extension cable (and then to a power adapter). The RS-232/RS-485 connector (BLUE connector on the Y end of the cable) will interface with any of the RS-485 or RS-232 cables with mating BLUE Met Station connectors. *(Note: only the RS-232 and RS-485 lines are brought through this Y trunk; if auxiliary sensors are used, the Auxiliary Sensor Cable should therefore be installed upstream of the Y-Adapter Cable.)*

Specifications

Cable:	15’ 10-conductor 20 AWG PVC jacket
Connectors:	18 Pin Female Conxall Circular (Met Station) 18 Pin Male Conxall Circular (RS-485/RS-232) 3 Pin Male Conxall Circular (Power)

Model 96024
50' RS232 Computer (DB9) to Control/Display, Handheld Receiver, Transmitter or Receiver Case Cable

Product Overview

TAMS data can be acquired by computer over an RS-232 link to a Control/Display (9604), Handheld Receiver (9607), transmitter case (96003 with a 9605 radio kit), or receiver case (96004 with a 9606 radio kit). The 96024 cable is used to make any of these connections. It has a DB9 computer connector at one end to connect to the computer's serial port, and a 5-pin circular connector at the other end to connect to the RS-232 port of the Control/Display, Handheld Receiver, transmitter case, or receiver case. Transorbs are connected between the Transmit and Common lines and between the Receive and Common lines at the computer connection to provide transient protection for the computer.

Installation

Connect the five-pin circular connector to the middle connector on the Control/Display's end cap (see ***Figure 1***). Connect the DB9 connector to the computer's serial port.

For maximum functionality and ease of use, All Weather Inc.'s TAMSView software should be used for communication between the TAMS and computer. Standard communications programs—such as Procomm—can be used, however, to retrieve raw TAMS data. For an explanation of the data format, refer to the *Data Format* section of this manual.

Specifications

Cable:	4 Conductor with shield 20 AWG with PVC Jacket
Length:	50 feet
Connectors:	5 Pin Male Conxall 9 Pin Female Sub D
Transorbs:	
Maximum Clamping Voltage	+/- 26.9V

Model 96025
15' Handheld Receiver to Carrying Case Power Cable

Product Overview

The TAMS Handheld Receiver has no power source of its own, and so must rely on an external power source. In those instances where AC power is not available, the Handheld Receiver can be operated from the 5 A-h battery in the Receiver Case (96004). The 96025 provides a power connection between the case and the Handheld Receiver, and is required any time portable power is to be provided to the Handheld Receiver by the case.

Installation

(Note: This cable is labeled "RADIO HHD POWER". RADIO HHD stands for Radio Handheld Display, which is another designation for the Handheld Receiver. The cable end labeled "HHD" connects to the Handheld Receiver.)

One end of the cable is labeled "CASE", and the other is labeled "HHD". Connect the "CASE" end to the "RADIO DISPLAY POWER" connector on the case. Connect the "HHD" end to the bottom connector on the Handheld Receiver's end cap.

Specifications

Cable:	2 Conductor 20 AWG PVC jacket
Length:	15 Feet
Connectors:	2 Conxall Circular Connectors 3 Pin (male)

Model 96026
Auxiliary Sensor Adapter Cable

Product Overview

The TAMS Met Station can be outfitted with additional weather sensors to augment the standard array, adding parameters such as solar radiation and rainfall to a station's monitoring capabilities. These sensors are all external to the Met Station and connect to it via cable. The 96026 provides a convenient way to connect one or more of these optional sensors to a TAMS.

(*See **Figure 15***) The 96026 comes with two cables fitted with standard TAMS connectors to splice in the external sensors. The first cable connects to the TAMS Met Station connector and splits out the three optional sensor channels. The main trunk of this cable is essentially a 1' extension of the TAMS Met Station pigtail, and therefore all cables that mate with the TAMS Met Station (BLUE) will also mate with it. The second cable of the set mates with the sensor trunk and extends those lines 15 feet before splitting them into three separate sensor connections: solar, rain, and auxiliary. Each of the sensor connections is a three-pin circular connector labeled with the name of its associated sensor.

Installation

For installation of the Auxiliary Sensor Cable and auxiliary sensors, refer to the ***Installation*** chapter of this manual.

Specifications

Cable A)	
Sensor Adapter Cable	20-conductor 20 AWG PVC jacket
Length	
Main Trunk	Approx. 11"
Sensor Trunk	Approx. 18"
Connectors:	18 Pin Female Conxall (to Met Station) 18 Pin Male Conxall 6 Pin Male Conxall (to Tri-Sensor Cable)
Cable B)	
Tri-Sensor Cable	6 Conductor 20 AWG PVC Jacket
Length:	15 feet (total) Individual sensor splits are each 1 foot long
Connectors:	6 Pin Female Conxall (to Sensor Adapter Cable) 3 Pin Male Conxall (to Pyranometer) 3 Pin Male Conxall (to Rain Gauge) 3 Pin Male Conxall (to Auxiliary Sensor)

Lightning Protection

Model 96032
RS422/RS485 Lightning Sponge

Product Overview

A lightning strike in the vicinity of data lines can cause induced currents which can lead to serious damage to computer components. Typical leading edge wave-fronts of a lightning strike rise at the rate of 1,000 Volts per microsecond. The TAMS Lightning Sponge incorporates 3 separate stages that limit high voltage transients, consisting of gas tubes and two stage of avalanche diodes. The DC series resistance is limited to approximately 5 Ohms, and the response time is measured in nanoseconds.

The TAMS RS-485 Lightning Sponge limits the signal voltage to 7.5 Volts and passes signals whose data transfer rate can exceed ten million bits per second. The TAMS Lightning Sponge is specified to work in series with the 96030 and 96031 RS-485 to RS-232 converters.

Installation

The Lightning Sponge is fitted with quick-connect, TAMS RS-485 compatible connectors (GREEN), and is designed to be inserted between the TAMS transmitter and an RS-485 to RS-232 converter. In order to provide lightning protection, the lightning sponge must be grounded. A 12 gauge ground wire is included in the kit for this purpose.

Specifications

Size:	4.5"L x 1.8"W x 1.5"H (114mm x 46 mm x 38mm)
Number of Data Lines Protected	4
Stages of Protection:	3; Gas Tubes & Avalanche diodes
Maximum Output Voltage:	7.5 V
Power Per Signal:	1500 W
Response Time:	< 5 nanoseconds
Connections:	TAMS Conxall Circular 6 Pin TAMS RS-485
Ground Wire:	12 AWG Unterminated

Auxiliary Sensors

Model 96033
Silicon Cell Pyranometer

Product Overview

In TAMS applications where the measurement of direct and reflected sky radiation is needed, the Model 96033 Silicon Cell Pyranometer is available. This sensor measures total sun and sky radiation over the spectrum of 0.25 to 1.15 microns. The Silicon Cell Pyranometer is a compact, lightweight instrument. The sensor body is equipped with a pyrex glass dome to protect the cell from wind and moisture, and desiccant is included to prevent moisture condensation inside the dome.

The 96033 includes quick-mounting hardware for installing the sensor onto the Model 96006 Boom Adapter of the Model 96005 10' tripod. A built-in bubble level helps assure that the unit is mounted level.

The sensor should be located toward the end of the boom on the south side of the tripod when located in the Northern Hemisphere, and on the north side of the tripod in the Southern Hemisphere. The Model 96026 Auxiliary Sensor Cable provides a quick-connect method for connecting the sensor electrically into the system.

Installation

For instructions on installing the Silicon Cell Pyranometer, refer to the ***Installation*** chapter of this manual.

Specifications

Transducer	Silicon Photovoltaic Cell
Spectral Response	0.25 - 1.15 microns
Range	0-1500 W/m^2
Sensitivity	Approx 50 mV/m^2
Time Constant	< 1 millisecond
Temperature Compensation	40-140°F (4-60°C)
Instantaneous Accuracy	±5%
Average Accuracy	±3%
Size	
Diameter	5"
Height	4" (not including boom clamp)
Weight	Approx. 1.5 lbs

Model 96034
Rain Gauge

Product Overview

When rainfall measurements are desired or required in a portable application, the Model 96034 TAMS Rain Gauge is available to add rainfall measurement to the standard TAMS array. The rain gauge is a portable sensor designed to mount on the Boom Adapter (96006) of the TAMS 10' tripod (96005). The rain gauge mount uses a quick-release clamp, which allows the entire assembly to slide onto the boom adapter for quick setup. Once installed, the gauge is easily adjusted. The Model 96026 Auxiliary Sensor Cable provides a quick-connect method for connecting the rain gauge electrically into the system. The rain gauge is calibrated at the factory.

The Model 96034 collects rainfall in a tipping bucket with an outlet on its underside. The tipping bucket tips when a weight equal to a 0.02" volume of water is collected. A mercury wetted reed switch closes a contact which trips a latch in the TAMS. The TAMS microcontroller then resets the latch and increments an internal counter.

The rainfall sensor's water outlet is protected from clogging by a dual strainer/filter arrangement. The grill at the outlet prevents smaller debris and dirt from clogging the outlet, while a strainer that sits atop the collector blocks larger pieces of debris from entering the orifice. To ensure continued reliable operation, the collector should be removed and rinsed periodically, and the orifice should be checked for obstructions.

Installation

For instructions on installing the Rainfall Sensor, refer to the ***Installation*** chapter of this manual.

Specifications

Housing Material:	Beige Plastic
Height:	5.4" (13.7 cm)
Width:	2.75" (7 cm)
Weight:	< 1 lb
Cable:	10 Feet, 2 conductor 24 AWG Shielded PVC Jacket
Connector:	Conxall 3 Position Circular Socket
Resolution:	0.02"
Accuracy:	±4% up to 3"/hr.
Maximum Rate:	unlimited

DATA FORMAT

Each packet of TAMS 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 TAMS data, and allows the user to control the way the data is displayed. TAMS data is also designed for input to the most widely used plume modeling software packages—including ALOHA, EIS, SAFER Systems, and Radian Corporation's CHARM—and is modeled on the ALOHA format.

For advanced data manipulation and evaluation, collected TAMS 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 22** shows a typical data packet broken into its various components, and the function of each component is explained in the paragraphs below.

Data Output

TAMS' data output is in the form of a free-field, comma-delimited data packet that includes all the measured and calculated data generated by TAMS. The full data packet is shown in **Figure 22**. The first portion of the packet—up to the first checksum— is used by ALOHA and some other plume modeling software packages in their calculations. This data includes the standard array of weather parameters—wind speed, wind direction, and air temperature—along with several other values measured or calculated by TAMS. Following the first checksum comes the remainder of the TAMS data, data that is not used by ALOHA. This includes additional sensor values, compass heading, magnetic declination, stability class, and so on. This additional data is ignored by ALOHA, but some parameters are used by other plume modeling software and can be displayed on-screen. 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 22**, for example, the two commas preceding the final checksum indicate that no auxiliary sensor is connected.

Data Fields

Figure 22 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
B	instantaneous battery voltage in volts
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
#P	number of parameters to follow, not including the final checksum

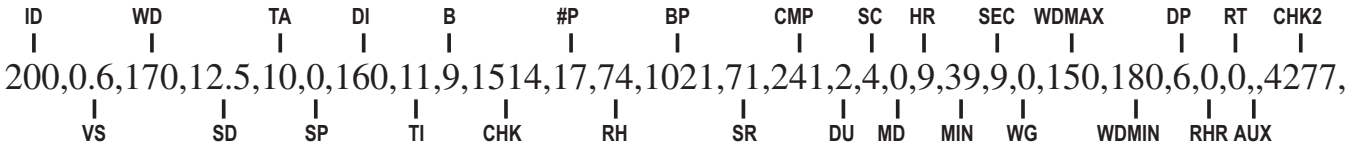


Figure 22. TAMS data output with extended data

RH	relative humidity, in percent
BP	barometric pressure, in millibars
SR	solar radiation, in watts/m^2
CMP	compass heading, in degrees, as measured by an optional electronic compass
DU	display units; number representing units of measure entered by the user for all parameters
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
MD	magnetic declination, in degrees, as entered by the user
HR	time of report: hour
MIN	time of report: minute
SEC	time of report: second
WG	wind gust, maximum measured over the last 2 minutes, in meters per second
WDMIN	minimum wind direction; lowest wind direction value (from 1-360□) measured over the last 2 minutes, in degrees
WDMAX	maximum wind direction; highest wind direction value (from 1-360□) measured over the last 2 minutes, in degrees
DP	dew point, in degrees Celsius
RHR	rainfall measured over the last hour, in inches
RT	total rainfall measured over last 24 hours, in inches
AUX	voltage level of a connected auxiliary sensor
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

TAMS MODELS AND OPTIONS

Table 5 shows the full list of available TAMS models and options. This table may also be reproduced and used as an order form for purchasing complete TAMS systems or adding to an existing system. A full description of each option can be found in the ***Options and Accessories*** chapter of this manual.

Table 5 TAMS Order Form

Qty	Model	Description
		Met Stations
_____	9600	Met Station with wind speed, wind direction, temperature, relative humidity
_____	9601	Met Station with wind speed, wind direction, temperature, relative humidity, barometric pressure
_____	9602	Met Station with wind speed, wind direction, temperature, relative humidity, electronic compass
_____	9603	Met Station with wind speed, wind direction, temperature, relative humidity, barometric pressure, electronic compass
		Interfaces
_____	9604	Control/Display
_____	9605	Radio Transmitter Kit; requires 96003 Deluxe Transmitter Carrying Case
_____	9606	Radio Receiver Kit; requires 96004 Deluxe Receiver Carrying Case
_____	9607	Handheld Receiver Kit; requires power source
_____	9610	TAMSView Software
_____	9611	TAMSTerm & TDriver Software Utilities
		Cases
_____	96001	Standard Carrying Case; holds Met Station, Control/Display, and 15' cable
_____	96002	Weathertight Carrying Case; holds Met Station, Control/Display, 15' cable; external connector for Control/Display
_____	96003	Deluxe Transmitter Carrying Case; includes 5 A-h rechargeable battery, battery charger, internal cables, storage for radio, antenna, Control/Display, and cables
_____	96004	Deluxe Receiver Carrying Case; includes 5 A-h rechargeable battery, battery charger, internal cables, storage for radio, antenna, Handheld Receiver, and cables
		Tripods and Adapters
_____	96005	10' Tripod; includes Met Station tripod adapter and mounting feet
_____	96006	Boom Adapter for 10' tripod; required to mount Rainfall Sensor, Pyranometer, and radio antennas
_____	96007	6' Tripod; no provision for mounting solar options or radio antennas
_____	96008	1" Pipe Adapter, for mounting Met Station to standard 1" pipe
		Power
_____	96010	110VAC to 15VDC Power Adapter; 1,000 mA
_____	96011	220VAC to 15VDC Power Adapter; 1,200 mA
_____	96012	Cigarette Lighter Power Adapter; 25'
_____	96013	Unterminated Power Cable; 50'
_____	96036	9W Photovoltaic Solar Panel Kit; requires 96006 Boom Adapter (not available with Model 96005-A tripod)
_____	96037	18W Photovoltaic Solar Panel Kit; requires 96006 Boom Adapter (not available with Model 96005-A tripod)
		Cables
_____	96015	RS485 Met Station to Control/Display Cable; also connects to RS485/RS232 converter; 15'
_____	96016	RS485 Met Station to Control/Display Cable; also connects to RS485/RS232 converter; 50'
_____	96017	RS485 Met Station to Control/Display Cable; also connects to RS485/RS232 converter; 100'
_____	96018	RS485 Met Station to Control/Display Cable; also connects to RS485/RS232 converter; 200'
_____	96019	Met Station to Transmitter Case Cable; 15'
_____	96020	Control/Display to Transmitter Case Cable; 15'
_____	96021	RS232 Computer to Y-Adapter Cable; 50'
_____	96022	Power Extension Cable; 50'
_____	96023	Y-Adapter RS232/RS485 & Power Cable; 15'
_____	96024	RS232 Computer to Control/Display or Handheld Receiver Cable; 50'
_____	96025	Handheld Receiver to Carrying Case Power Cable; 15'
_____	96026	Auxiliary Sensor Adapter Cable; required for Rainfall Sensor, Pyranometer, and auxiliary sensors; approx. 15'
		Accessories
_____	96030	110V RS485-to-RS232 Converter; 96032 Lightning Sponge available
_____	96031	220V RS485-to-RS232 Converter; 96032 Lightning Sponge available
_____	96032	RS422/RS485 Lightning Sponge; for use with 96030 and 96031 RS485-to-RS232 Converters
_____	96033	Silicon Cell Pyranometer Kit; with 10' cable; requires 96006 Boom Adapter and 96026 Auxiliary Sensor Adapter Cable
_____	96034	Rain Gauge Kit; 0.02" 5V tipping bucket; requires 96006 Boom Adapter and 96026 Auxiliary Sensor Adapter Cable

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