

TACMET II MOTS MMS WEATHER STATION OPERATION MANUAL



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Safety Notice

The contents of this manual have been checked against the hardware and software described herein. Since deviations cannot be prevented entirely, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections are included in subsequent editions.

Faultless and safe operation of the product presupposes proper transportation, storage, and installation as well as careful operation and maintenance. The seller of this equipment cannot foresee all possible modes of operation in which the user may attempt to utilize this instrumentation. The user assumes all liability associated with the use of this instrumentation. The seller further disclaims any responsibility for consequential damages.

Electrical & Safety Conformity

The manufacturer certifies that this product operates in compliance with the following standards and regulations:

FDA/CDRH This product is tested and complies with 21 CFR, Subchapter J, of the Health and Safety Act of 1968

US 21 CFR 1040.10

FCC Notices

Contains FCC ID: OUR-XBEE/OUR-XBEEPRO*

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT: The RF module has been certified for remote and base radio applications. If the module will be used for portable applications, the device must undergo SAR testing.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful 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: re-orient or relocate the receiving antenna; increase the separation between the equipment and receiver; connect equipment and receiver to outlets on different circuits; or consult the dealer or an experienced radio/TV technician for help.

RF Exposure

WARNING: To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended. The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

Warranty

All instruments are warranted against defects in parts or workmanship for a period of one (1) year from the date of shipment. Should any instrument or part prove to be defective within the warranty period, upon written notice and return of the unit (freight prepaid), Met One Instruments, Inc. will, at its option, repair or replace the defective unit, and return it, transportation prepaid via surface transportation.

Equipment abused, modified, or altered may cause cancellation of this warranty.

The above warranty applies only to items manufactured by Met One Instruments, Inc. Items not manufactured by Met One Instruments, Inc. are warranted only to the extent and in the manner warranted by the manufacturer of such items. Should emergency warranty repair be required at a customer's facility, Met One Instruments, Inc. will provide such repairs and charge only the portal-to-portal Field Service rates and actual expenses in accordance with our published rates then in effect. Expendable supplies and wear items, such as bearings and lightning-related damages, are not covered under this warranty.

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1.0 Safety

1.1 Safety

This manual may include a **CAUTION** and a **WARNING** indication. Familiarize yourself with the following definitions for the meanings of these indicators.

A **CAUTION** indicates a hazard and calls attention to a procedure that if not correctly followed could result in damage to the instrument. Do not proceed beyond a caution indicator without understanding the hazard.

A **WARNING** indicates a hazard to you and calls attention to a procedure that if not correctly followed could result in injury or even death. Do not proceed beyond a warning without understanding the hazard.

2.0 Introduction & Overview

2.1 Overview

Met One Instruments' TACMET II MOTS MMS Weather Station is designed as a stand-alone weather station to provide accurate measurements of wind speed, wind direction, temperature, relative humidity, and barometric pressure. The MOTS MMS Weather Station has a built-in 2.4 GHz spread spectrum radio module with data encryption (XBeePro). The unit has no moving parts and is ideally suited for use wherever reliable, maintenance free operation over a wide operating range under adverse operating conditions is required. The unit is built with a metal housing to offer some protection from electromagnetic interference. The MOTS MMS Weather Station is painted CARC tan.

2.2 Specifications

PERFORMANCE

Wind Speed

Range	0-65 m/s (0-145 mph)
Accuracy *	± 0.5 m/s (1.1 mph) $\pm 5\%$
Resolution	0.1 m/s (0.22 mph)

Wind Direction

Range	0 to 360°
Accuracy *	$\pm 5^\circ$ @ wind speeds > 2.2 m/s (5 mph)
Resolution	1°

Temperature

Range	-40° to 60°C (-40° to +140°F)
Accuracy	$\pm 2^\circ\text{C}$ ($\pm 3.6^\circ\text{F}$) @ WS>2.0 m/s (4.5 mph)
Resolution	$\pm 0.1^\circ\text{C}$

Relative Humidity

Range	0 to 100%
Accuracy	$\pm 3\%$
Resolution	1%

Barometric Pressure

Range	500 to 1200 hPa (14.75 to 35.50 in Hg)
Accuracy	± 0.40 hPa (± 0.01 in Hg)
Resolution	0.1 in Hg

MTBF 80,000 hours

** This accuracy is maintained when the sensor is within ± 10 degrees of vertical.*

ELECTRICAL

Measurement Format	Two orthogonal axis, North-South and East-West
Measurement Rate	Approx. 2 Hz each axis
Operating Frequency	40 kHz
Signal Output	RS232 @19.2 K baud (see section 5.0)
Power Requirements	9 - 36 Vdc: 100 mA draw @ 12 Vdc

PHYSICAL

Size	12.25 inches (311.2 mm) x 4 inches (101.5 mm) dia.
Weight	5.5 lb (2.5 kg)
Mounting	MS3106F18-1S Connector
Finish	per MIL-DTL-64159
Color	CARC TAN 686A, 33446

3.0 Installation

Be sure to mount the MOTS MMS Weather Station in a clear, open area to minimize any turbulent effects caused by local obstructions (e.g., trees, buildings, etc.). The MOTS MMS Weather Station is installed on the Climatronics P/N 102709 pre-wired Quick Mount. The keyway in the connector on the base of the MOTS MMS Weather Station is matched to the keyway on the mount.

Attach the MOTS MMS Weather Station to the 102709 Quick Mount by inserting it into the top of the mount, aligning the latch springs with the clips on the bottom of the sensor. It may be necessary to rotate the MOTS MMS Weather Station 180° to allow the keyway to seat properly. When the sensor is properly seated in the mount, attach the latch springs to the clips on the sensor and snap them down to lock the sensor in place.

The MOTS MMS Weather Station is supplied with an internal flux-gate compass to automatically orient the wind direction data to True North. It is not necessary to manually align the MOTS MMS Weather Station towards North.

4.0 Input/Output Connections

The sensors' pin designations are as follows:

<u>PIN</u>	<u>FUNCTION</u>
A	Power and RS232 Ground
B	+9 to +36 Vdc Power Input
C	N/C
D	N/C
E	N/C
F	N/C
G	RS232 Receive Data
H	RS232 Transmit Data
I	N/C
J	N/C

Radio Antenna Connector: TNC Jack

5.0 User Interface

The MOTS MMS Weather Station is designed to work with Met One Instruments' AWeather Software (P/N 102742) in a radio network with multiple devices. The sensor only outputs a serial data string when addressed by AWeather. The output string can be viewed, displayed, and logged using AWeather. The output configuration is 19,200 baud, N/8/1. The RS232 output port on the sensor is for factory use only.

An **example** of the output format is shown below:

```
<STX>R S0011 000.6 102 +077.1 055 29.77 63<EOT>
```

The first data parameter (after the STX and "R" characters) is the serial number of the sensor (S0011). The second parameter is the wind speed in miles per hour. The third parameter is the wind direction in degrees. The fourth parameter is the temperature in degrees Fahrenheit. The fifth parameter is the relative humidity in percent and the sixth parameter is the barometric pressure in inches of mercury. A two-digit checksum follows the data. The string terminates with an EOT character.

6.0 Calibration

A zero wind speed check can be done by covering the sensor with a thick plastic bag sealed beneath the sensor. The wind speed should read zero, and the wind direction will bounce around. WS, WD, temperature, relative humidity and pressure should be checked by co-location with a reference sensor. For formal calibration, the unit needs to be returned to the factory. The sensor requires a wind tunnel for WS/WD calibration. Met One Instruments, Inc. can provide NIST traceable calibration in our wind tunnel. Please contact the factory for details.

7.0 Maintenance

Because the sensor has no moving parts to wear out, periodic maintenance is not required. In extremely corrosive environments, the condition of the connector used to mount the sensor should be checked.

In harsh environments, the transducer screens should be checked for dust or sand buildup. Should the transducer screens need to be cleaned, with the unit upright, brush the transducer screens with a short, medium to firm bristle brush.

There are no adjustments or user repairable parts located inside the sensor.

Appendix A Theory of Operation

Winds

Met One Instruments' sonic anemometer operates on the principal that the speed of the wind effects the time it takes for sound to travel from one point to a second point. If the sound is traveling in the direction of the wind, the transit time is decreased. If the sound is traveling in a direction opposite the wind, the transit time is increased. This principal is well known and is the basis of most sonic anemometers.

Temperature / Humidity

The temperature sensor in the P/N 102760 TACMET II uses a precision single-element Thermistor. This provides a highly accurate and stable temperature reading. The resistance value is 10K ohms at 25°C. This allows the TACMET II to directly interface with the temperature sensor without additional electronics; sensor compensation is handled through software.

The relative humidity sensor is a capacitive element sensor. It has a linear voltage output connected directly to the TACMET II microprocessor. The humidity sensor element's construction provides excellent resistance to wetting, dust, dirt, oils, and common environmental chemicals. A heavy contaminant layer of dirt will slow down the sensor's response time because it will take longer for water vapor to equilibrate in the sensor.

Barometric Pressure

The P/N 102555 barometer uses proven silicon sensor technology with microprocessor-based signal compensation, eliminating the need to insulate or thermally regulate the barometer. The P/N 102555 has a pressure range of 14.75 to 35.50 in Hg (500 to 1200 hPa). The P/N 102555 has a TTL output that reduces the power consumption of the barometer to 33 mW. The accuracy of the sensor is ± 0.4 hPa (0.01 in Hg)