

TACMET II ERMP 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 are 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

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 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 – TACMET II Weather Station

2.1 Overview

Met One's TACMET II ERMP 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. An internal fluxgate compass is included. This sensor is specific to the ERMP program. The unit has no moving parts and is ideally suited for use wherever reliable, maintenance free, performance over a wide operating range, under adverse conditions is required. The unit is built with a metal housing and filtering on all input and output lines to offer some protection from electromagnetic interference.

2.2 Specifications

PERFORMANCE

Wind Speed:

Range: 0-145 mph (0-65 m/s)
Accuracy: ± 1.1 mph (0.5 m/s) or 5%
Resolution: 0.1

Wind Direction:

Range: 0-360°
Accuracy: $\pm 3^\circ$ @ wind speeds > 5 mph (2.2 m/s)
Resolution: 0.1

Compass:

Accuracy: $\pm 2^\circ$

Temperature:

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

Relative Humidity:

Range: 0 to 100%
Accuracy: $\pm 2\%$
Resolution: 0.1

Pressure:

Range: 600-1100 mbar (17.71-32.45 InHg)
Accuracy: ± 1.50 mbar (± 0.04 InHg)
Resolution: 0.1 mbar (0.01 InHg)

MTBF:

80,000 hours

ELECTRICAL

Measurement Format: Two orthogonal axes, North-South and East-West
Measurement Rate: Approx. 2 Hz each axis
Operating Frequency: 40 kHz
Signal Output: RS-485 @ 19.2 K baud (default)
Power Requirements: 9.0 - 36 Vdc, <50 mA @ 12 Vdc, option dependent

PHYSICAL

Size: 12.25 inches (311 mm) X 4 inches (101.6 mm) dia.
Weight: 5.5 lbs (2.5 kg)
Mounting: P/N 102790-G3-100 Quick Mount to $\frac{3}{4}$ inch IPS vertical pipe stub

3.0 Installation

Be sure to mount the sensor in a clear, open area to minimize any turbulent effects caused by local obstructions (e.g., trees, buildings, etc.). The sensor is installed on Met One's P/N 102790-G3-100 pre-wired sensor mount. The keyway in the connector on the base of the sensor is matched to the keyway on the QuickMount.

Attach the sensor to the 102790-G3-100 QuickMount by inserting the sensor into the top of the mount, attaching the latch springs to the clips on the bottom of the sensor and snapping them down to lock the sensor in place. Do not force the sensor into the mount, if it does not seat right away, rotate the sensor 180° to allow the keyway to seat properly.

4.0 Input/Output Connections

The sensors' pin designations are as follows:

<u>PIN</u>	<u>FUNCTION</u>
A	Power Ground
B	9.0 - 36 Vdc
C	N/C
D	N/C
E	N/C
F	N/C
G	RS485 B(+)
H	RS485 A(-)
I	N/C
J	N/C

5.0 User Interface

The output of the TACMET II is a serial data stream transmitted once per second. Default settings are 19200 baud, N,8,1. The data is easily viewed and can be displayed and captured using Met One's WeatherView Software or any terminal emulator software. An **example** of the output format is shown below:

```
01+E1690 02+000.2 03+224.5 04+075.4 05+059.7 06+1014.1 07+12.54 [CR/LF]
```

The first parameter is the serial number of the sensor (E1690), the second parameter is the wind speed (in mph), the third parameter is the wind direction, the fourth parameter is the temperature (in Deg F), the fifth parameter is the relative humidity, the sixth parameter is the barometric pressure (in inHg), and the seventh parameter is the power supply voltage. The string terminates with CRLF.

6.0 Calibration

The sensor requires a wind tunnel for calibration. Met One can provide NIST traceable calibration in our wind tunnel. Please contact the factory for further 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. To clean the transducer screens, hold the unit upright and brush the transducer screens with a stiff acid brush. There are no adjustments or user repairable parts located inside the sensor.

Appendix A

Terminal Mode Commands

Terminal Mode Commands

Terminal mode is activated by entering three carriage return characters within a 2 second period. Terminal mode times-out after 2 minutes of inactivity.

Successful entry into Terminal Mode will return the prompt:

Command (HE for Help, QU to Quit):

HE - Display Help Menu

HE	Display the Help menu Command: HE<cr> HE - This Help Menu BV - Battery Voltage Printout Toggle On/Off CV - Compass Heading Printout Toggle On/Off MD - Set Magnetic Declination OI - Set Output Interval PU - Set Pressure Units QU - Quit command mode and save any changes SB - Set Baud rate SP - Sign-on Prompt Toggle On/Off ST - Set Serial Trigger Address SU - Set Speed Units TU - Set Temperature Units VN - Display Firmware Version Number
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SU - Wind Speed Units

Read or Set this serial port's output Units for Wind Speed.

COMMAND	RESULT
SU<cr>	Report Units setting
SU0<cr>	M/S
SU1<cr>	MPH (Default)
SU2<cr>	Knots
SU3<cr>	KPH

A unique value may be selected for each of the two serial ports, if applicable.

TU - Temperature Units

Read or Set output Units for Temperature.

COMMAND	RESULT
TU<cr>	Report Units setting
TU0<cr>	Celsius
TU1<cr>	Fahrenheit (Default)

PU - Pressure Units

Read or Set output Units for Pressure

COMMAND	RESULT
PU<cr>	Report Units setting
PU0<cr>	Millibars (Default)
PU1<cr>	Inches of Mercury

SB - Serial Baud Rate

Read or Set this serial port's Baud Rate

Note: This command is not supported by SDI-12 or Tracker Output.

SDI-12 is fixed at 1200 baud.

Tracker output is fixed at 9600 Baud.

COMMAND	RESULT
SB<cr>	Report Baud Rate setting
SB1<cr>	1200 baud
SB2<cr>	2400 baud
SB3<cr>	4800 baud
SB4<cr>	9600 baud
SB5<cr>	19200 baud (Default)

Baud rate changes take effect after cycling power to the sensor.

BV - Toggle Battery Voltage Printout in data string

Read or Set the Battery Voltage output option for this serial port

COMMAND	RESULT
BV<cr>	Report option setting
BV0<cr>	Battery Voltage printout Disabled (Default)
BV1<cr>	Battery Voltage printout Enabled

A unique value may be selected for each of the two serial ports, if applicable.

CV - Toggle Compass Heading Printout in data string

Read or Set the Compass Heading output option for this serial port

COMMAND	RESULT
CV<cr>	Report option setting
CV0<cr>	Compass Heading printout Disabled (Default)
CV1<cr>	Compass Heading printout Enabled

A unique value may be selected for each of the two serial ports, if applicable.

MD - Magnetic Declination

Read or Set the Magnetic Declination

COMMAND	RESULT
MD<cr>	Report Magnetic Declination setting
MDXX.X<cr>	Set Declination to XX.X Degrees

Note: West declination values are entered and reported as negative values.

ST - Serial Trigger

Read or Set the Serial Trigger character string (Poll command)

Note: ST must be immediately followed by serial trigger. Do not add a space between command and trigger.

COMMAND	RESULT
ST<cr>	Report Serial Trigger string setting
ST XXXXXX<cr>	Set Serial Trigger

VN - Software Version Number

Report the current Software Version Number

COMMAND	RESULT
VN<cr>	Report current Software Version

OI - Output Interval

Read or Set the Output Interval for this serial port

Note: This command is not supported by SDI-12, CAMEO/ALOHA, or Tracker Output.

COMMAND	RESULT
OI<cr>	Report Output Interval setting
OI1<cr>	Sensor Output every 1 second (Default)
OI2<cr>	Sensor Output every 2 seconds
OI3<cr>	Sensor Output every 5 seconds
OI4<cr>	Sensor Output every 15 seconds
OI5<cr>	Sensor Output every 30 seconds
OI6<cr>	Sensor Output every 60 seconds

SP - Sign-On Prompt

Read or Set the Sign-On Prompt output option at power-up for this serial port

COMMAND	RESULT
SP<cr>	Report option setting
SP0<cr>	Sign-On Prompt Disabled (Default)
SP1<cr>	Sign-On Prompt Enabled

A unique value may be selected for each of the two serial ports, if applicable.

QU - Quit

Exit the command mode and query to save any changes.

Command (HE for Help, QU to Quit): QU<cr>

To save changes type 'Y' : N<cr>

No changes were made

Restarting

Appendix B

Theory of Operation

Winds

Met One's sonic anemometer operates on the principal that the speed of the wind affects 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 then the transit time is decreased. If the sound is traveling in a direction opposite the wind then 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 102726 TACMET II uses a precision single-element Thermistor. This provides a highly accurate and stable temperature reading. The resistance value is 10K ohms at 77°F (25°C). The TACMET II interfaces directly 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, which is 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 102716 is a state-of-the-art, monolithic, signal conditioned, piezoresistive silicon pressure sensor. This sensor provides an accurate, high level analog output signal that is proportional to applied pressure. The basic accuracy of the P/N 102716 barometer is ± 0.04 inHg (± 1.5 hPa).

Fluxgate Compass

The internal fluxgate compass is low power and compact, and is a complete compass or magnetic sensor module that integrates easily into the TACMET II. The internal compass uses two magneto-inductive sensors, which change inductance with different applied magnetic field strengths, to sense magnetic fields.

The TACMET II microprocessor measures the output of the internal compass and then corrects the wind direction data for the orientation of the sensor. The output of the TACMET II wind direction is relative to magnetic North when a compass has been specified.