Magellan MX Weather Station™
User Manual

Columbia
Weather Systems

Magellan MX Weather Stations™

User Manual

Version 1.10

Serial Number: _____

Date Purchased: _____

All specifications subject to change without notice.

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Parts of the Magellan MX Weather Station™ user manual were adapted from the MaxiMet User Manual with permission from GILL Instruments Limited.

Welcome!

Congratulations on your purchase of a Magellan MX Weather Station.

Please read this manual completely prior to installation.

Important Notice: Shipping Damage

BEFORE YOU READ ANY FURTHER, please inspect all system components for obvious shipping damage. The Magellan MX is a high precision instrument and can be damaged by rough handling. Your unit was packaged to minimize the possibility of damage in transit. Please save the shipping container for any future shipment of your Magellan MX sensor.

In the event your order arrives in damaged condition, it is important that the following steps be taken immediately. The title transfers automatically to you, the customer, once the material is entrusted to the transport company.

NOTE: DO NOT RETURN THE INSTRUMENT TO COLUMBIA WEATHER SYSTEMS until the following steps are completed. Failure to follow this request will jeopardize your claim.

1. Open the container and inspect the contents. Do not throw away the container or any damaged parts. Try to keep items in the same condition as originally received.
2. Notify the transport company immediately.
3. Request the transport company's representative inspect the shipment personally.
4. After inspection, request a Return Materials Authorization (RMA) from Columbia Weather Systems by calling (503) 629-0887.
5. Return approved items to us at the following address:

   Columbia Weather Systems, Inc.

   5285 NE Elam Young Parkway, Suite C100

   Hillsboro, OR 97124
6. After a repair evaluation, an estimate of the cost of repair will be sent to you.

ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. The Magellan MX is adequately protected against ESD for its intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To avoid delivering high static voltages yourself:

1. Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground yourself with a wrist strap and a resistive connection cord to the equipment chassis before touching the boards. When neither of the above is possible, at least touch a conductive part of the equipment chassis with your other hand before touching the boards.
2. Always hold the boards by the edges and avoid touching the component contacts.

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SECTION 1: INTRODUCTION

The Magellan MX Weather Station

The Magellan MX weather stations are based on GILL Instruments all-in-one MaxiMet transmitters, which offer a wide range of weather station configurations.

The Magellan MX series features sensor transmitters with a built-in electronic compass and GPS.

Models that include a wind sensor are able to report apparent and true wind speed and direction, and GPS information.

Available in three configurations – fixed-mount, vehicle-mount, and portable – Magellan MX data can be monitored with our proprietary Weather Display Console and WeatherMaster™ Software, as well as with third-party software.

The Weather MicroServer is available for Ethernet connectivity, Modbus/TCP, Modbus RTU and SNMP interface, Weather Underground and CWOP interface, XML weather data, and FTP.

The standard Magellan MX configuration communicates over RS-232 and is provided with a 50ft sensor cable.

If a cable length greater than 200ft is needed the Magellan MX can also be ordered with RS-485 communication.

Technical Specifications

Operating Conditions

Temperature Operation: -40 to +158°F (-40 to +70°C)

Relative humidity: 0 - 100%

Wind Speed

Range: 0 to 134 mph (0 to 60 m/s)

Accuracy: ±3% 0.02 mph to 90 mph (±3% 0.01 m/s to 40 m/s), ±5% above 90 mph and up to 134 mph (40 m/s and up to 60 m/s)

Resolution: 0.02 mph (0.01 m/s)

Units Available: knots, mph, km/hr, m/s

Wind Direction

Measurement Range: 0-359°

Accuracy: ± 3° 0.02 mph to 90 mph (0.01 m/s to 40 m/s), ±5° above 90 mph and up to 134 mph (40 m/s and up to 60 m/s)

Resolution: 1°

Units Available: degrees

Temperature

Range: -40 to +158°F (-40 to +70°C)

Accuracy: ±0.54°F @ 68°F (±0.3°C @ 20°C)

Resolution: 0.18°F (0.1°C)

Units Available: °F, °C

Relative Humidity

Range: 0 - 100%

Accuracy: ±2% @ 68°F (10% to 90% Relative Humidity)

Resolution: 1% RH

Units Available: %RH

Barometric Pressure

Range: 8.85 – 32.48 inHg (300 - 1100 hPa)

Accuracy: ±0.015 inHg (±0.5 hPa) @ 77°F (25°C)

Resolution: 0.003 inHg (0.1 hPa)

Units Available: kPa, hPa, mbar, inHg

Rainfall (MX600)

Resolution: 0.003 inches (0.08 mm)

Precipitation Intensity: 0 to 5.90 inches/hour (0 to 150 mm/hour)

Units Available: mm, inches

Dew Point

Range: -40 to 158°F (-40 to +70°C)

Accuracy: ±0.54°F @ 77°F (±0.3°C @ 25°C)

Resolution: 0.18°F (0.1°C)

Units Available: °C or °F

Solar Radiation (MX501)

Range: 300 to 3000 nm

Intensity Range: 0 to 1600 W/m^2

Resolution: 1 W/m^2

Units Available: W/m^2

Compass

Measurement Range: 0-359°

Resolution: 1.0°

GPS

Horizontal Position Accuracy: Less than 2.5 meters Circular Error Probability

Accuracy: Longitude and Latitude report to 6 decimal places

Input Voltage

The Magellan MX is supplied with a wall mount switching power supply

Input: 100 - 240 VAC, 50/60 HZ, 0.6A

Output: 12 VDC, 2.08A

The Magellan MX can also be powered directly using a DC voltage source.

Input: 5 to 30 VDC

Electrical Conformity

Emissions: EN61326:2013

Immunity: EN61326:2013

Sensor Housing

Protection type: IP66

EMC: BS EN 61326, FCC CFR47 Parts 15.109

Materials: Polycarbonate

Current Consumption

Model	12VDC (GPS enabled)	Heating enabled
200	32mA	432mA
300 (No GPS)	5mA	NA
500	34mA	434mA
501	34mA	434mA
600	74mA	474mA

Heating enabled Temperature: +35°F (+2 °C)

Heating Temperature maintained: +41°F (+5°C)

Dimensions & Weights

Model	Height	Width	Weight
200	6.67 in (169.5 mm)	5.59 in (142 mm)	1.1 lb (0.5 kg)
300	6.1 in (155 mm)	5.59 in (142 mm)	1.05 lb (0.48 kg)
500	8.74 in (222 mm)	5.59 in (142 mm)	1.54 lb (0.7 kg)
501	5.74 in (146 mm)	5.59 in (142 mm)	1.76 lb (0.8 kg)
600	10.27 (261 mm)	5.59 in (142 mm)	1.76 lb (0.8 kg)

Principles of Measurements

Temperature & Relative Humidity (MX300, MX500, MX501 and MX600)

Temperature & Relative Humidity are measured by an internal solid-state instrument contained inside a solar radiation shield with a double louvre design.

Wind Speed & Direction (MX200, MX500, MX501 and MX600)

The wind sensor measures the times taken for an ultrasonic pulse of sound to travel from the North (N) transducer to the South (S) transducer and compares it with the time for a pulse to travel from S to N transducer. Similarly, times are compared between West (W) and East (E), and E and W transducer. For example, if a North wind is blowing, then the time taken for the pulse to travel from N to S will be faster than from S to N, whereas the W to E, and E to W times will be the same. The wind speed and direction can then be calculated from the differences in the times of flight on each axis. This calculation is independent of any factors such as temperature.

Barometric Pressure (MX300, MX500, MX501 and MX600)

Barometric Pressure is measured by a solid-state device fitted on to a circuit board inside the sensor housing.

Rainfall (MX600)

Rainfall is measured by using an optical infra-red beam sensor. Infra-Red beams bounce off the inner optical surface between transmitters and receivers. As rain drops make contact with the sensor surface, some of the infra-red beams are allowed to escape. The sensor detects the change in beam intensity and determines the size of the rain drop that caused the change. Through digital signal processing the output simulates a tipping bucket rain gauge measurement.

Solar Radiation (MX501)

Solar Irradiance is measured using a high quality Hukseflux LPO2 second class Solar Radiation Sensor/Pyranometer which complies with ISO 9060. This highly accurate instrument uses thermopile technology to measure hemispherical solar radiation from a 180-degree field of view angle.

Compass (MX200, MX500, MX501 and MX600)

Compass equipped sensors utilize a 2-axis compass and magnetic field sensing module. The compass is used to electronically sense the difference in the earth's field from the system's magnetic field. An on-board microprocessor electronically subtracts out the system's magnetic fields, reporting highly accurate compass readings. Wind direction data is corrected for the orientation of the sensor. The output of the wind direction is relative to magnetic North.

GPS (MX200, MX500, MX501 and MX600)

GPS equipped sensors use a highly accurate GPS antenna receiver module including a ceramic GPS patch antenna. The module is capable of receiving signals from up to 48 GPS satellites.

SECTION 2: PHYSICAL DESCRIPTION

Magellan MX Sensor Transmitter

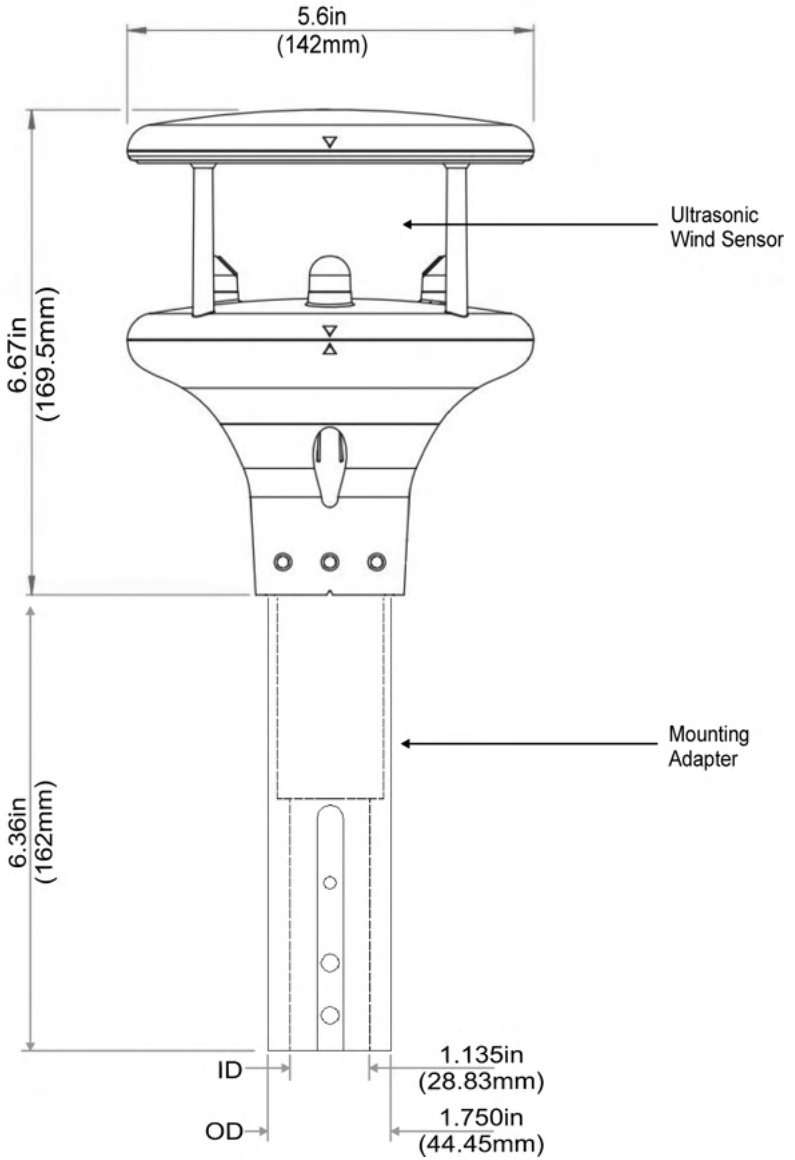
The Magellan MX Sensor Transmitter is an all-in-one sensor available in five unique models. Each model includes a different combination of sensors for measuring a variety of parameters.

Please reference the chart below to identify your specific model.

Sensors by Model #	**200**	**300**	**500**	**501**	**600**
Temperature		X	X	X	X
Relative Humidity		X	X	X	X
Barometric Pressure		X	X	X	X
Wind Speed	X		X	X	X
Wind Direction	X		X	X	X
Rain					X
Solar				X	
Compass	X		X	X	X
GPS	X		X	X	X

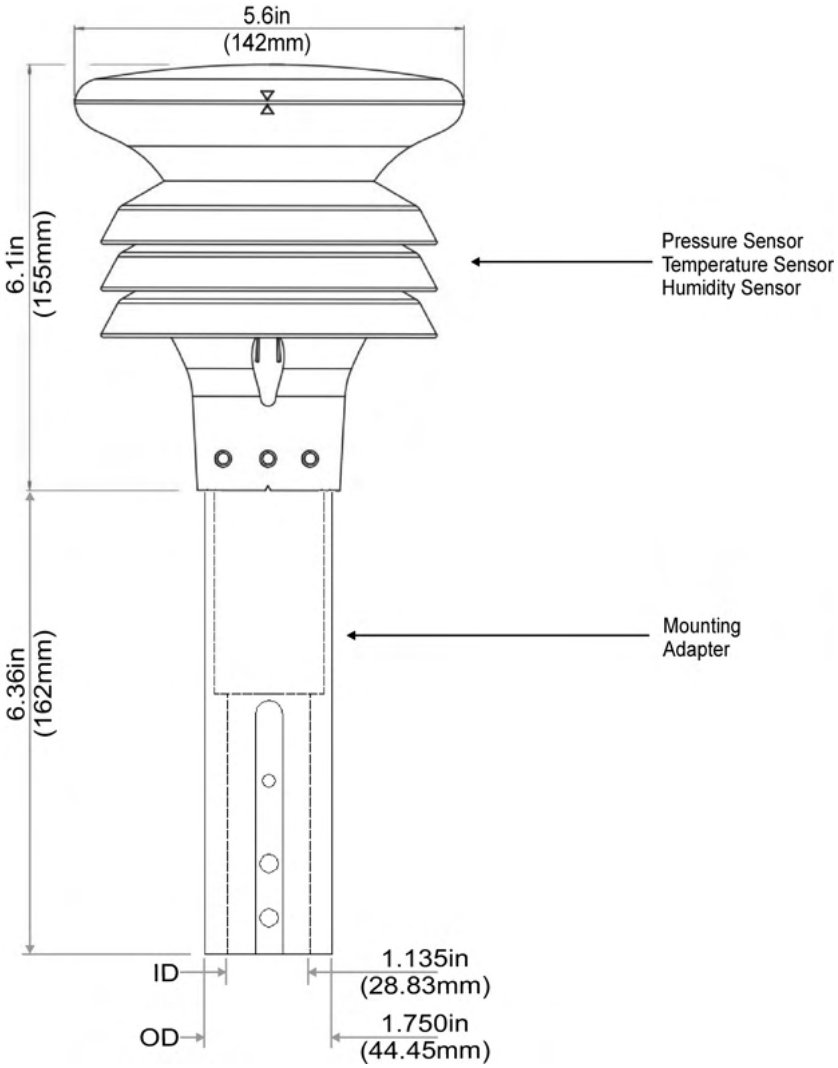
Magellan MX 200

The Magellan MX 200 features an ultrasonic wind sensor for precision wind speed and direction measurements. It also utilizes an electronic compass for corrected wind direction measurements. A built-in GPS provides longitude and latitude information and true wind measurements.



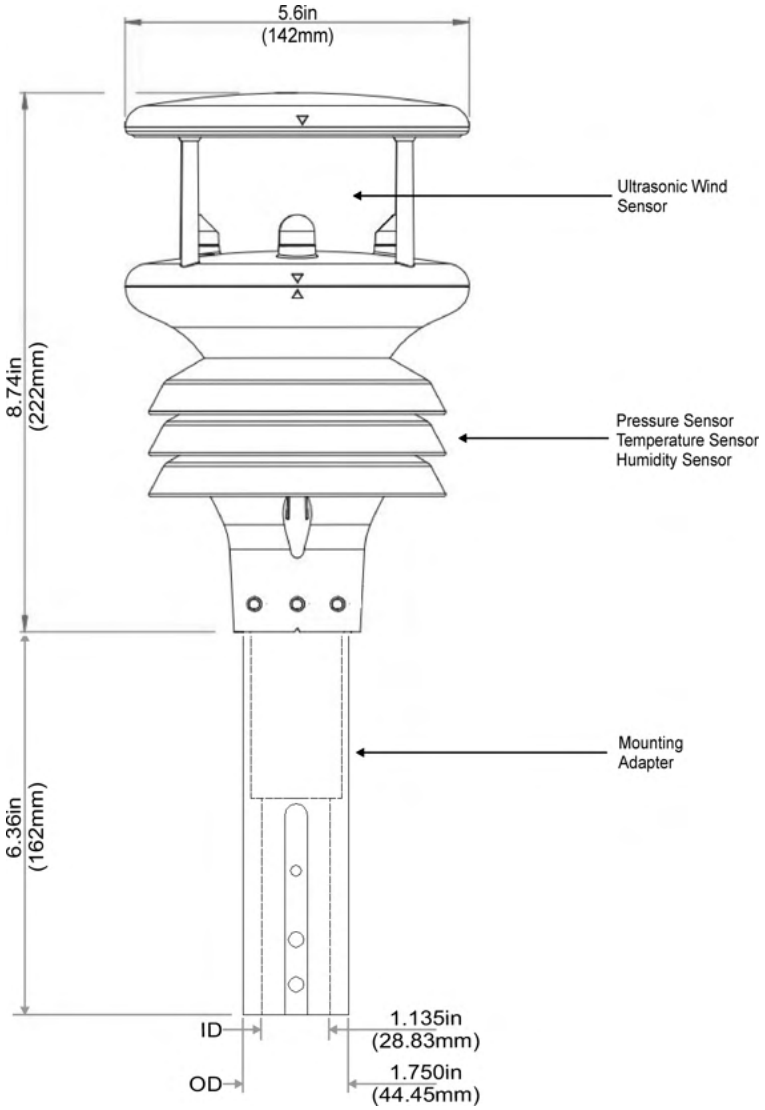
Magellan MX 300

The Magellan MX 300 measures Barometric Pressure, Temperature and Relative Humidity using a combined instrument mounted inside three double louvered, naturally aspirated radiation shields with no moving parts.



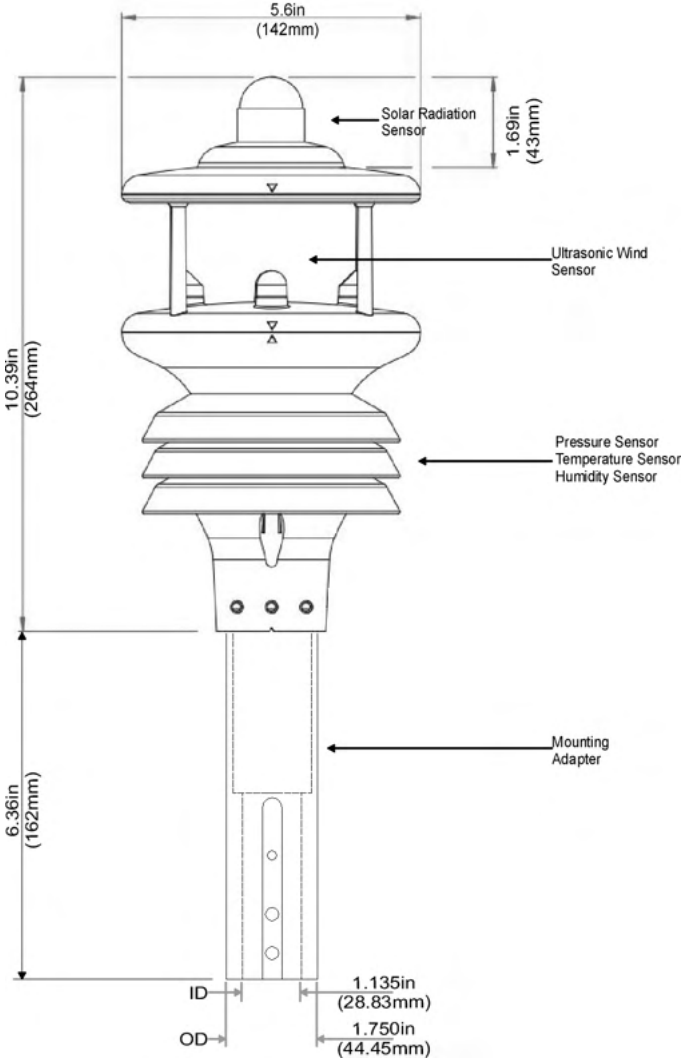
Magellan MX 500

The Magellan MX 500 features an ultrasonic wind sensor for precision wind speed and direction measurements. It also utilizes an electronic compass for corrected wind direction. A built-in GPS provides longitude and latitude information and true wind measurements. The sensor also measures Barometric Pressure, Temperature and Relative Humidity using a combined instrument mounted inside three double louvered, naturally aspirated radiation shields with no moving parts.



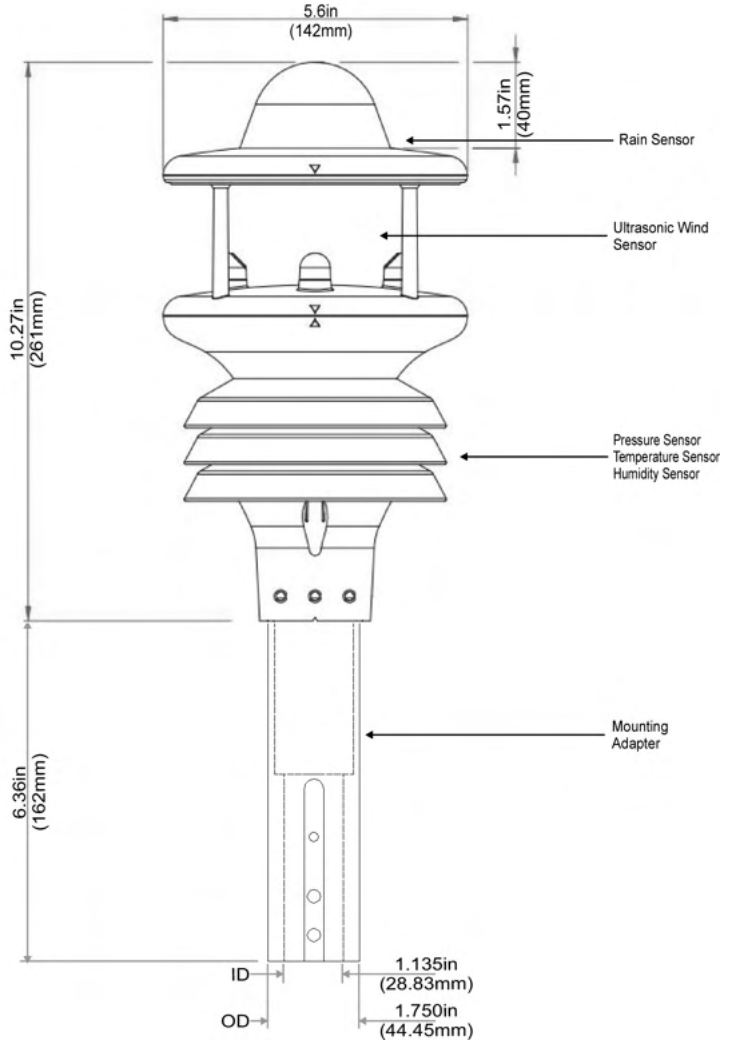
Magellan MX 501

The Magellan MX 501 features an ultrasonic wind sensor for precision wind speed and direction measurements. It also utilizes an electronic compass for corrected wind direction. A built-in GPS provides longitude and latitude information and true wind measurements. A second class Pyranometer measures solar irradiance. The sensor also measures Barometric Pressure, Temperature and Relative Humidity using a combined instrument mounted inside three double louvered, naturally aspirated radiation shields with no moving parts.

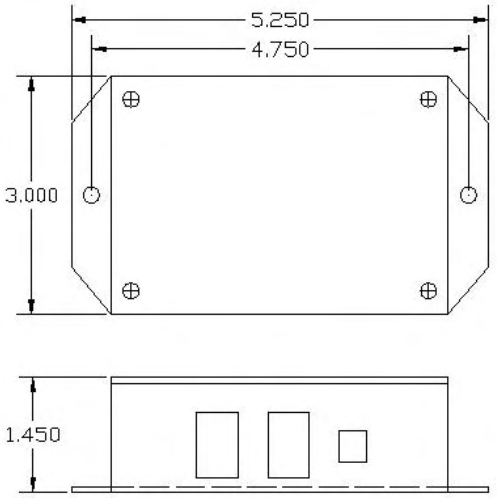


Magellan MX 600

The Magellan MX 600 utilizes an optical rain sensor to measure rainfall. The sensor also features an ultrasonic wind sensor for precision wind speed and direction measurements. It also utilizes an electronic compass for corrected wind direction measurements. A built-in GPS provides longitude and latitude information and true wind measurements. The sensor also measures Barometric Pressure, Temperature and Relative Humidity using a combined instrument mounted inside three double louvered, naturally aspirated radiation shields with no moving parts.



Interface Module



The Interface Module is used to supply power to the sensor transmitter and to provide two RS-232 communication ports. The RS-232 ports can be connected to computers, display consoles, transceivers, and other such devices.

The Interface Module has two LED indicators. The green LED is a power indicator and the red LED is a data indicator. In normal operation, the red LED will flash every second to indicate a data record being transmitted. The green LED will remain solid to indicate power is being supplied to the Magellan MX sensor transmitter.

Surge/Lightning Protector (Optional)

A nearby lightning strike may induce a high voltage surge which the internal suppressor of your weather instrument may not be able to withstand, causing significant damage to the weather station. This compact transient overvoltage suppressor is designed for weather stations in areas with an elevated risk of lightning strikes such as the top of high buildings, or installations with cable lengths greater than 100 feet.

- Superior 3-stage surge protection
- Tolerates up to 10kA surge currents
- Both differential and common mode protection on each channel
- Filtering against HF and RF noise
- Two power channels and two data channels
- Environmental protection class IP66

Part Number: 8355
Includes adjustable mounting kit

Weather MicroServer (Optional)

The Weather MicroServer is a self-contained and proprietary system. It employs a web browser user interface with real-time dashboard readout panels. No additional software is required to operate the MicroServer.

The MicroServer includes an Ethernet port that allows for connection to a local area network. Once configured the weather data can be accessed and monitored by several users on the network through the built-in web browser interface.

It also includes a 16GB microSD card for data logging, located on the front panel.

The Magellan MX Sensor connects to the MicroServer via RS-232 Serial Communication on COM1.

For cable lengths greater than 200ft, the Magellan MX Sensor can also connect to COM2 on the MicroServer over RS-485.

The MicroServer offers the following:

- One year of data logging at 1-minute interval
- Modbus/TCP, Modbus RTU (Serial RS-485) interfaces
- SNMP, BACnet, DNP3 Ethernet & Serial interfaces
- Weather Underground & CWS Weather Server interface
- XML Weather Data
- FTP weather data in XML or CSV format
- CWOP interface
- Interface to optional visibility, solar radiation sensors, and temperature sensors

Please refer to the Weather MicroServer user manual for more information.

WeatherMaster™ Software (Optional)

WeatherMaster software is designed to provide long term data storage for historical purposes on a Windows computer. It serves as a back-up system for the Weather MicroServer and provides the ability to quickly view past trend data for the life of the station.

Please refer to the WeatherMaster user manual for installation and operation procedures.

Weather Display Console (Optional)

The Weather Display Console provides a simple display of the weather data. It is designed to be viewed clearly from a distance in an area without a dedicated computer workstation.

Includes an industrial grade WVGA touchscreen interface. Seven-inch, TFT color LCD panel with 800 x 480 pixel resolution.

Displays the standard weather readings along with several calculated parameters.

Serial or Ethernet connection: Connects directly to weather station with serial port or connects to a Weather MicroServer over a network utilizing an existing Ethernet infrastructure -- no extra wiring. The MicroServer configuration also allows for data from one weather station to be monitored from multiple display consoles at various locations.

Screens can be factory-customized to meet specialized market and industry requirements.

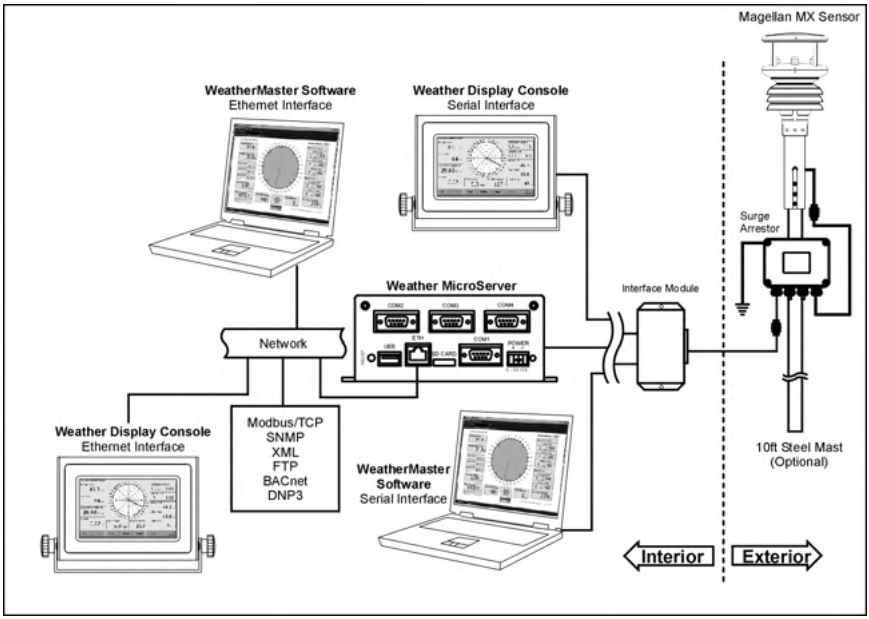
The Weather Display is also available in a 19” rack-mount chassis and a panel-mount configuration.

Please refer to the Weather Display Console user manual for more information.

SECTION 3: SYSTEM CONFIGURATIONS

The Magellan MX Fixed Mount Weather Stations can be installed in multiple configurations depending on communication options, power availability and viewing options. System includes a 50ft sensor cable.

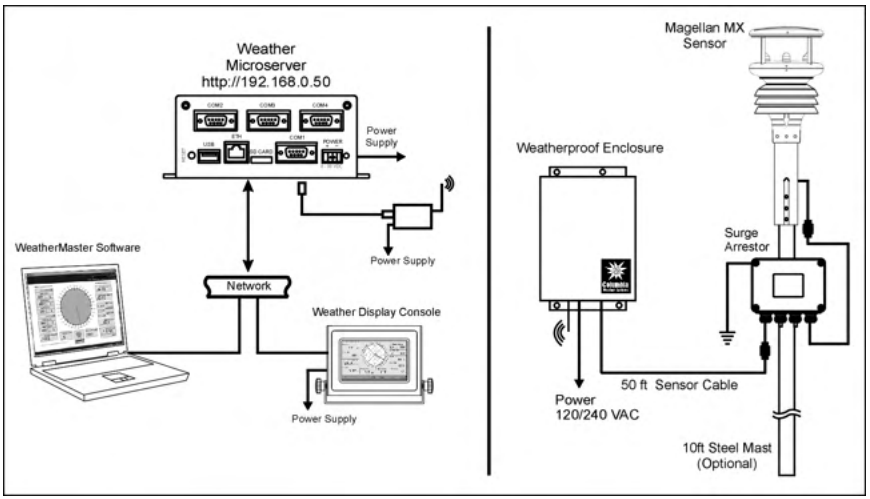
Cabled System



Magellan MX500 Sensor shown

Wireless System with Weatherproof Enclosure

The following is an example of a wireless configuration. Magellan MX500 Sensor shown.



The server transceiver is located near the Magellan MX Sensor and is housed in a weatherproof enclosure. A client transceiver is connected to a monitoring device. An RS-232 Interface Module is available as an option to connect the wireless transceiver to multiple devices. The 2.4GHz transceivers are capable of communicating at a distance of 1 mile with a clear line-of-sight.

The 900MHz transceivers are capable of communicating at a distance of 20 miles with a clear line-of-sight.

During normal operation the wireless transceiver pair will function as follows:

Transmitter (2.4GHz)

Red Power LED: Blinks Twice/Second

Green TX (Transmit) LED: Blinks Once/Second

Yellow RX (Receive) LED: OFF

Signal Strength: OFF

Receiver (2.4GHz)

Red Power LED: Blinks Twice/Second

Green TX (Transmit) LED: OFF

Yellow RX (Receive) LED: Blinks Once/Second

Signal Strength: All three LEDs should be lit depending on line-of-sight.

Transmitter (900MHz)

Red TX/Power LED: ON Solid

Green Data In LED: Blinks Once/Second

Yellow Data Out LED: OFF

Signal Strength: OFF

Receiver (900MHz)

Red TX/Power LED: ON Solid

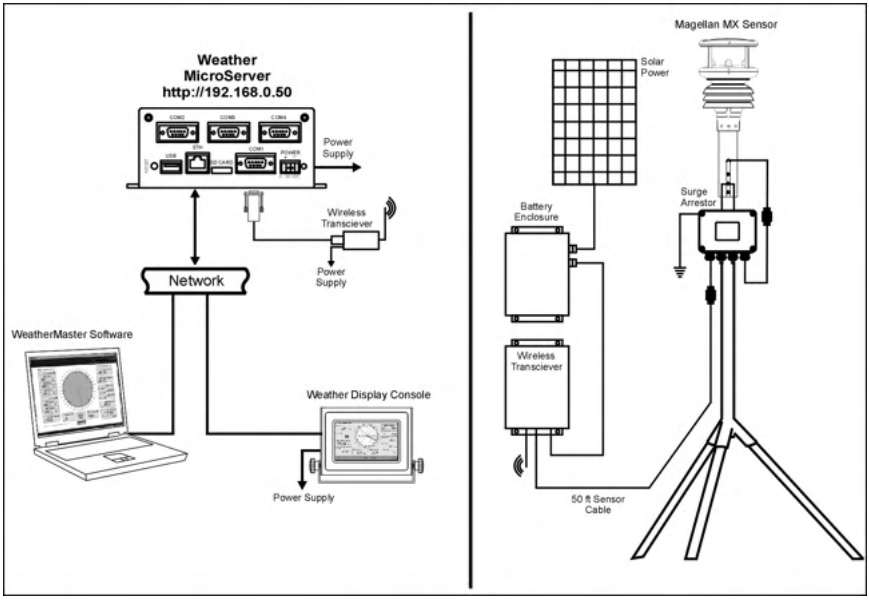
Green Data In LED: OFF

Yellow Data Out LED: Blinks Once/Second

Signal Strength: All three LEDs should be lit depending on line-of-sight.

Solar Power System with Wireless Communication

The following is an example of a solar powered wireless configuration. Magellan MX500 Sensor shown.



The Magellan MX Sensor and server transceiver are powered by a solar power system which includes either a 20-Watt solar panel and 36 Amp-hour battery or 40 Watt solar panel and 58 Amp-hour battery.

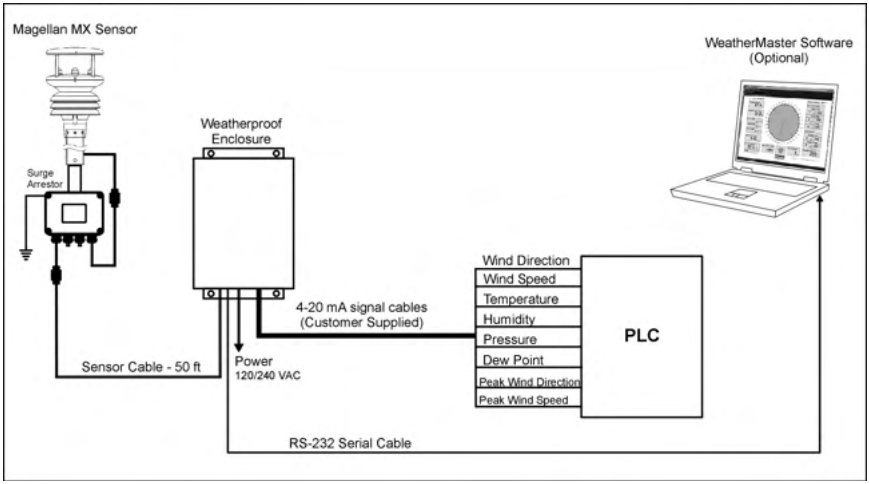
The server transceiver is located near the Magellan MX Sensor and is housed in a weatherproof enclosure. A client transceiver is connected to a monitoring device. An RS-232 Interface Module is available as an option to connect the wireless transceiver to multiple devices.

The 2.4GHz transceivers are capable of communicating at a distance of 1 mile with a clear line-of-sight.

The 900MHz transceivers are capable of communicating at a distance of 20 miles with a clear line-of-sight.

Magellan MX with 4-20mA Interface

The following is an example of the Magellan MX with 4-20mA interface. Magellan MX500 shown.



In this configuration, the Magellan MX system provides 4-20mA outputs for industrial interface to PLC, DCS, and SCADA systems.

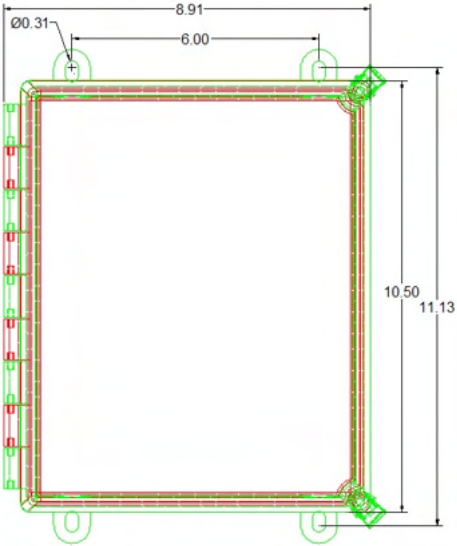
It includes the Magellan MX Sensor, sensor cable, power supply, AC surge arrestor and two 4-20mA converters housed in a weatherproof enclosure.

The station allows up to eight 4-20mA output channels for wind direction, wind speed, temperature, relative humidity, barometric pressure, dew point, peak wind direction and peak wind speed.

The 4-20mA configuration is available for all Magellan MX sensor transmitters.

Additional monitoring options, including the Weather Display Console, Weather MicroServer and WeatherMaster software can be connected to the system via an RS-232 serial cable.

Magellan MX with 4-20mA Interface Weatherproof Enclosure



The Magellan MX with 4-20mA Interface enclosure contains:

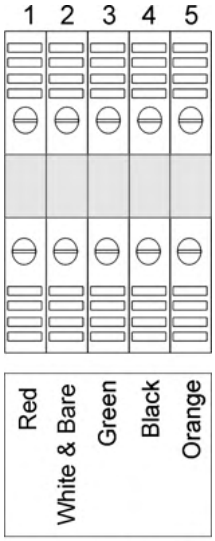
1. AC power supply with +24 VDC output
2. AC power filter and suppressor
3. Two RS-232 to 4-20 mA converters
4. Sensor connection terminal block

The enclosure is UL 508 Type 4, NEMA/EEMAC Type 4.

Enclosure flammability rating UL94-5V.

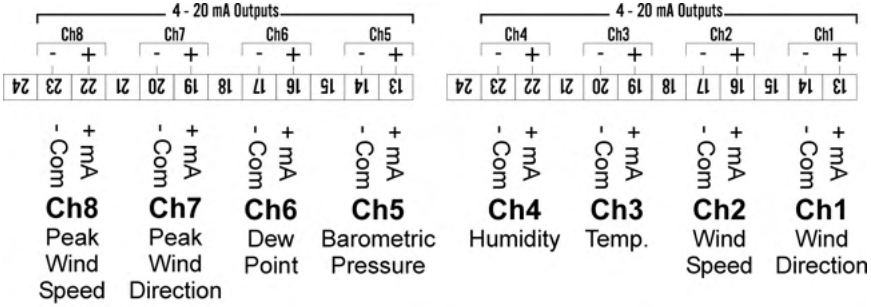
Connecting the Magellan MX Sensor to the 4-20mA Enclosure

Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the terminal block screws as shown below:



Sensor Cable

Connecting the 4-20mA Enclosure to the PLC



Ch1: Wind Direction Range: 0 to 360 degrees	Ch5: Barometric Pressure Range: 17 to 32.48 InHg
Ch2: Wind Speed Range: 0 to 134 mph	Ch6: Dew Point Range: -40 to +158 °F
Ch3: Temperature Range: -40 to +158 °F	Ch7: Peak Wind Direction Range: 0 to 360 degrees
Ch4: Relative Humidity Range: 0 to 100%	Ch8: Peak Wind Speed Range: 0 to 134mph

Note: The 4-20mA current signals source power to the PLC, no need to provide power to the output channels.

4-20mA Output Scaling

Depending on the specific model of Magellan MX Sensor that was ordered the current outputs will be configured appropriately.

See the system diagram provided with your system for the appropriate scaling. The output scaling is also provided on the inside lid of the weatherproof enclosure.

Below is an example of the scaling for the Magellan MX 500 Sensor.

The measurements update every second.

Converter 1

Channel 1: Wind Direction

Description: Instantaneous wind direction

Range: 0 to 360 degrees

Channel 2: Wind Speed

Description: Instantaneous wind speed

Range: 0 to 134 mph

Channel 3: Temperature

Description: Instantaneous temperature

Range: -40° to 158°F

Channel 4: Relative Humidity

Description: Instantaneous relative humidity

Range: 0 to 100%

Converter 2

Channel 5: Barometric Pressure

Description: Instantaneous barometric pressure

Range: 17 to 32.48 inches Hg

Channel 6: Dew Point

Description: Instantaneous dew point reading

Range: -40° to 158°F

Channel 7: Peak Wind Direction

Description: WMO* Wind Direction Gust

The maximum gust measured over a 60-second period and resets at the end of this period.

Range: 0 to 360 degrees

Channel 8: Peak Wind Speed

Description: WMO* Wind Speed Gust

The maximum gust measured over a 60-second period. The Gust is generated from a rolling 3-second average over the 60-seconds and resets at the end of this period.

Range: 0 to 134 mph

* WMO - World Meteorological Organization

SECTION 4: INSTALLATION

Installation Overview

Unpacking the System

Installing the Sensor Transmitter

Installing the Mast

Installing the Mounting Adapter

Installing the Surge Arrestor

Connecting the Sensor Transmitter to the Interface Module

Connecting to MicroServer, Weather Display and Computer (refer to Section 3: System Configurations)

Unpacking the Unit

Unpack the Magellan MX weather station and verify that all parts are included.

1. Standard system includes:
    - ❑ Magellan MX Sensor Transmitter
    - ❑ 50 ft sensor cable + additional cable length if ordered
    - ❑ Interface Module with (2) 3-position terminal blocks
    - ❑ 12VDC power supply
    - ❑ User Manual
    - ❑ 6-foot RS-232 cable + additional cable length if ordered
    - ❑ Mounting Adapter with Hex Key
2. Weather MicroServer (Optional):
    - ❑ MicroServer
    - ❑ Power supply
    - ❑ 7-foot Ethernet cable
    - ❑ User manual
3. Surge Arrestor (Optional):
    - ❑ Surge Arrestor
    - ❑ Mounting Hardware
4. Weather Display Console (Optional):

- ❑ Display Console
- ❑ Power supply
- ❑ 6-foot RS-232 cable + additional cable length if ordered
- ❑ User manual

5. WeatherMaster software and user manual (Optional)

Inspect all system components for obvious shipping damage (Refer to “Important Notice: Shipping Damage” in case of damage).

NOTE: Save the shipping carton and packing material in case the unit needs to be returned to the factory. If the system does not operate or calibrate properly, see **Maintenance** and **Troubleshooting** sections, for further instructions.

Installing the Magellan MX Sensor Transmitter

Site Selection:

Finding a suitable site for the sensor transmitter is important in obtaining representative ambient measurements. The site should represent the general area of interest.

The sensor transmitter should be installed in a location that is free from turbulence caused by nearby objects, such as trees or buildings.

WARNING: To protect personnel (and the device), a lightning rod should be installed with the tip at least 40 inches (one meter) above the sensor transmitter. The rod must be properly grounded, compliant with all local applicable safety regulations.

Installing the Mast

There are three acceptable methods for mounting the mast to a roof or building structure: Sloped roof mounting, flat roof mounting or wall mounting. See **Optional Sensor Mounting Hardware** for more information.

Location

Do not attach the sensor transmitter to a radio transmitting mast or tower.

Select a mounting location that will allow the sensor cable to be routed away from other data cables to avoid interference. Do not mount sensors close to power lines. For normal roof mounting, the recommended minimum distance from power lines is 25 ft. (8 m). Use extreme caution when working close to power lines.

Mounting Method

Choose the appropriate mounting method for the installation and obtain any necessary mounting hardware. Refer to Optional Sensor Mounting Hardware section for information on optional sensor mounting hardware and accessories which are available from the factory.

If the mounting hardware is not obtained from the factory, be certain to use metal parts which are plated or galvanized to assure maximum longevity.

Secure the mast to the roof, using guy wires with sufficient tensile strength or to building wall using a wall-mount hardware kit.

Routing Cable

Use plastic tie wraps to secure the cable to mast, particularly at the mast base. Tighten the tie wraps securely and clip off any excess length with a wire cutter tool.

Once the Magellan MX sensor transmitter has been placed, route the cable back to the Interface Module or weatherproof enclosure.

CAUTION: There may be electric wires in the wall. When routing cable through walls, we recommend that you shut off the electricity in the room(s) where you are drilling.

Any mast or tower should always be properly earth grounded to minimize electrical storm damage. The use of a properly grounded metal mast or tower, however, does not insure protection from electrostatic discharge. These items could become electrically charged resulting in damage to the sensors and/or console. This could damage the system in the event of an electrical storm.

Note: If the standard 50 ft. cable provided with the sensor transmitter is not long enough, it may be extended by splicing on an appropriate length of 22-gauge, stranded, seven conductor shielded cable with the same color code. When cutting and splicing, insure good contacts, proper color coding of the terminal leads, and a good seal. (A good solder splice, and water proof insulation are essential; merely twisting the respective wires together is not adequate.) Additional cable (Part No. 81547) is available from the factory.

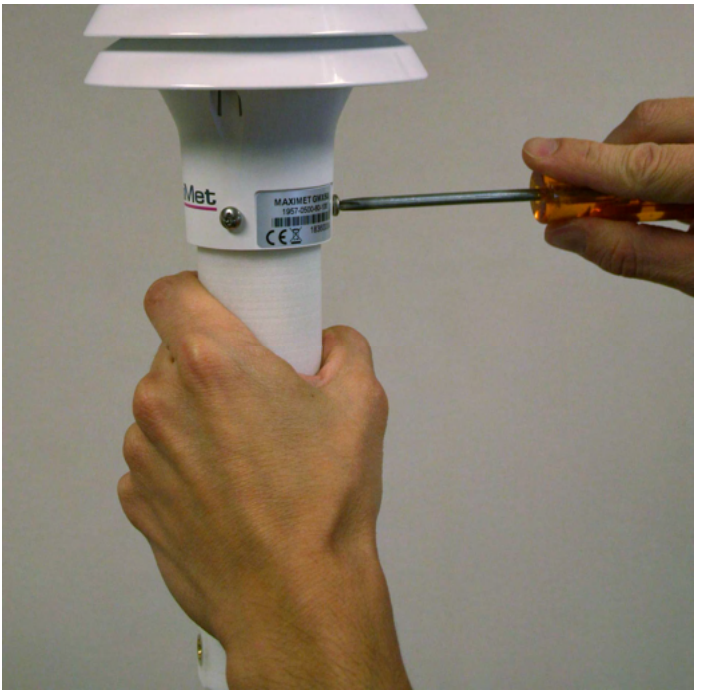
Sensor Mounting Hardware

Mounting Adapter with screws and hex key

Follow the steps below to install the mounting adapter and sensor:

1. Connect the sensor connector to the sensor.

2. Mount the sensor onto the mounting adapter using the three screws provided.

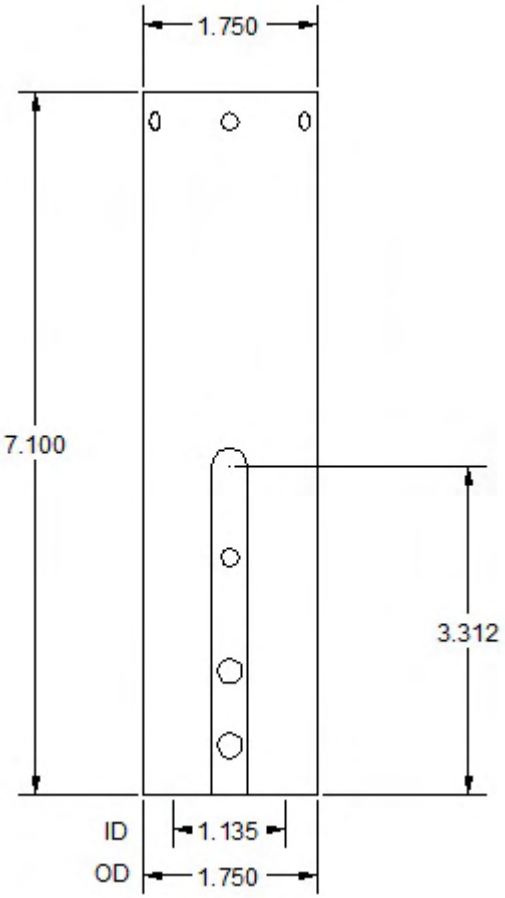


3. Place the mounting adapter onto the mast.

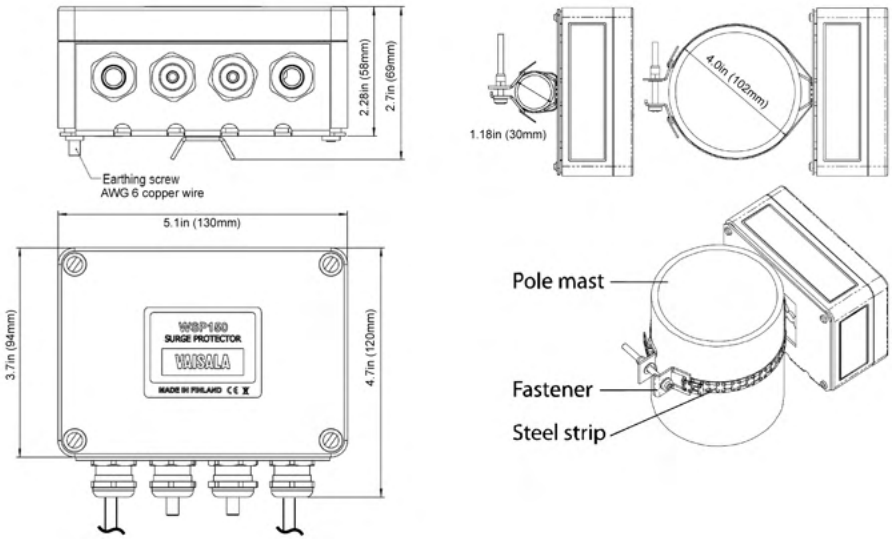
4. Tighten the two set screws on the mounting adapter using the hex key provided.
5. Connect the 50ft Sensor Cable (or longer if ordered) to the sensor pigtail.

Mounting Adapter

Dimensions (inches)



Installing the Surge Arrestor



1. Attach the unit to the mast close to the weather sensor with the adjustable mounting clamp, see figure above.

2. Slide the steel strip beneath the latch on the back of the enclosure.

3. Wrap the steel strip around the pole mast. You may shorten the strip to a suitable length.

4. Loosen the fastener by backing up the screw half way.

5. Attach the steel strip ends to the fastener by latching the fastener to a hole on the strip and folding it over.

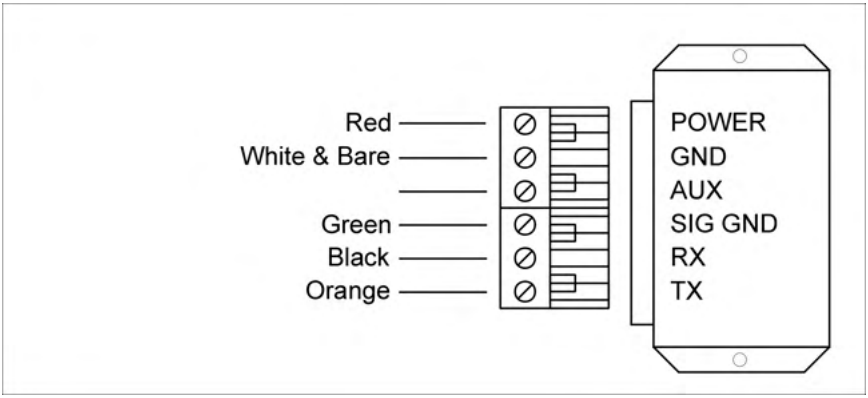
6. Tighten the fastener's screw in order to secure the unit to the pole.

7. If the mast is not grounded, ground the unit using the grounding screw located on the back of the unit with an AWG 6 (16 mm^2) copper wire.

Connecting the Sensor Transmitter to the Interface Module (RS-232)

Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the terminal block screws on the Interface Module as follows:

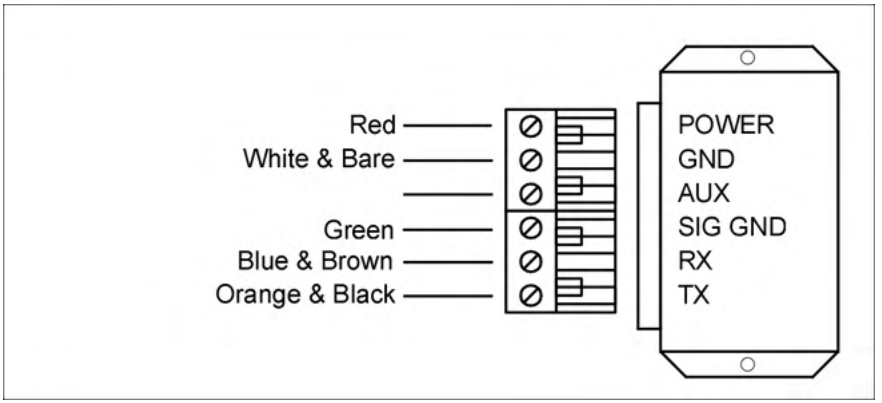
Terminal Number	Function	Color
1 POWER	+12 V	RED
2 GND	Ground	White & Bare
3 AUX	No Connection	
4 SIG GND	Signal Ground	Green
5 RX	RX	Black
6 TX	TX	Orange



The Magellan MX Sensor includes reverse polarity protection.

RS-485 Interface Module Connections

Terminal Number	Function	Color
1 POWER	+12 V	RED
2 GND	Ground	White & Bare
3 AUX	No Connection	
4 SIG GND	Signal Ground	Green
5 RX	Data +	Blue & Brown
6 TX	Data -	Black & Orange



The Magellan MX Sensor includes reverse polarity protection.

Optional Sensor Mounting Hardware

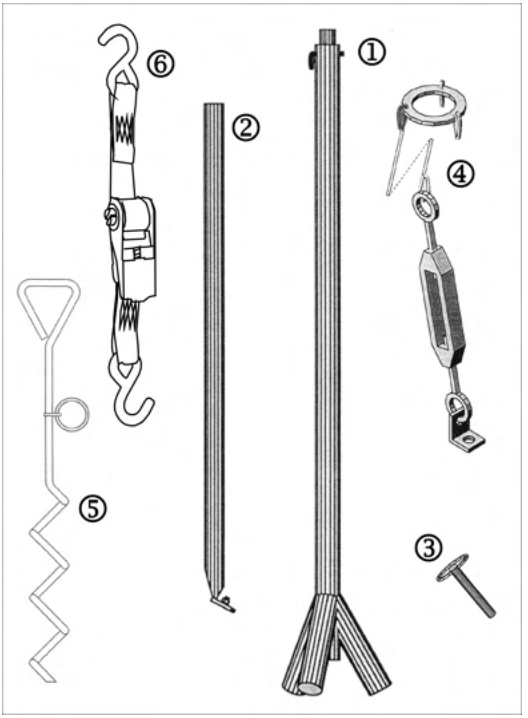
Tripod and Tiedown Kit

The tripod is designed to provide up to 10 feet of stable, secure support for your meteorological sensors.

Constructed from welded aluminum and powder coated for appearance and longevity, the 15-pound tripod can easily support up to 60 pounds of equipment. An optional tie-down kit allows for additional security in high-wind areas.

To install, insert the legs into the main body and secure with stainless steel retainer pins. Extend the mast to the desired height and insert another retainer pin. Install the guy wires to complete the set-up.

Tripod Parts List:



Description	Ref.	Qty.
Body/Mast Assembly	1	1
Legs	2	3
Retainer Pins	3	4
Guy Wire Ring with 3 Wires and Turnbuckles	4	1
Anchor Screw with Chain	5	1
Clamp with Strap	6	1

Specifications

Capacity: Supports up to 60 lbs.

Shipping Weight: 17 lbs

Shipping Box Dimensions: 71" x 9" x 9"

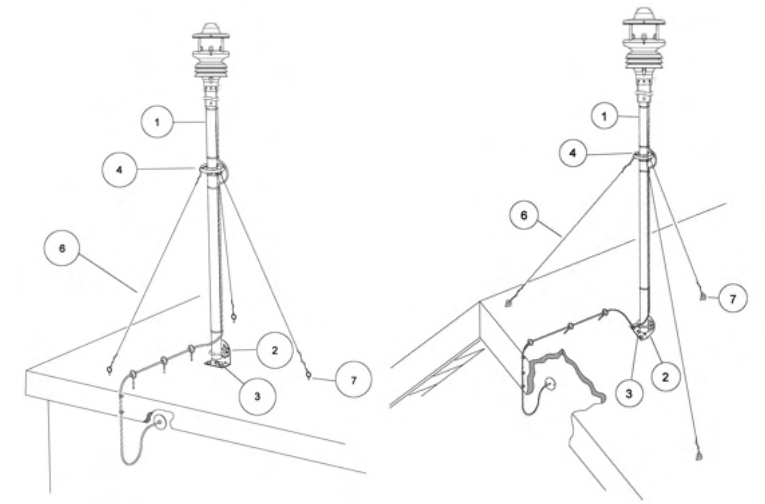
Tripod and Tiedown Kit Part Number: 88019

Sensor Mast

10-foot steel mast available for use with Roof Mount Hardware Kit (Part No. 88002) or Wall Mount Kit (Part No.88003).

Roof Mounting

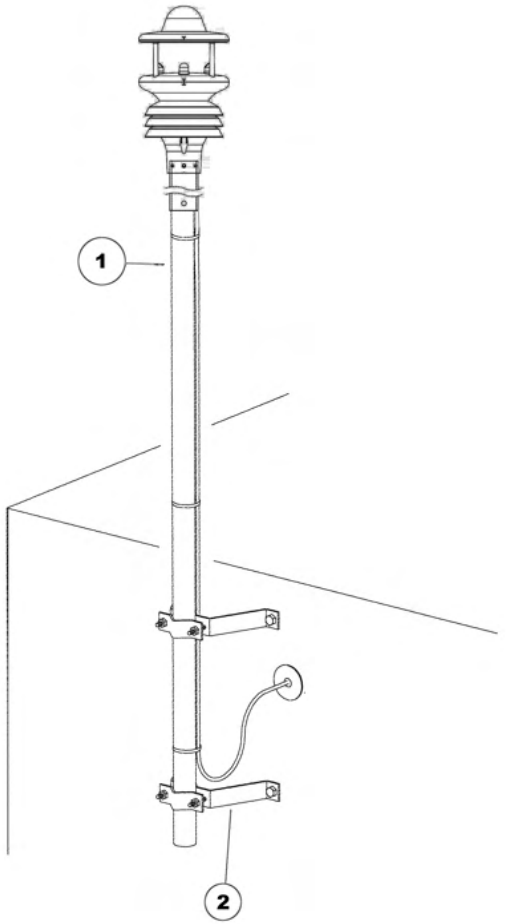
The Roof Mount Kit (Part No. 88002) is suitable for both a slanted and flat roof installation. The figure and table below illustrates and describes the individual parts.



Description	Ref.	Qty.	Part No.
Steel mast, 10 ft.	1	1	88005
Universal Mast Anchor	2	1	88010
Lag Screw, Roof Mast Mount 1/4" x 2 1/4" (for comp. roofs)	3	4	88030
Guy Wire Clamp, 1/8"	4	1	88070
Steel Guy Wire, Galvanized	6	50ft.	88080
Eye Bolt Wood Screws, 1/4" x 3"	7	4	88090
Turnbuckles, 6" open x 4" closed	(not shown)	3	88100

Wall Mounting

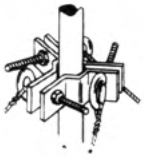
The figure and table below illustrates and describes the individual parts in the Wall Mounting Kit (Part No. 88003). Individual parts are also available.



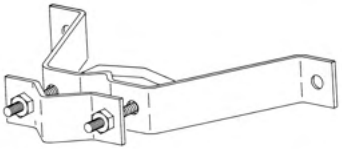
Description	Ref.	Qty.	Part No.
Mast, 10 ft.	1	1	88005
4" Wall Mount Bracket	2	2	88120

EYE BOLT SCREW

UNIVERSAL MAST ANCHOR



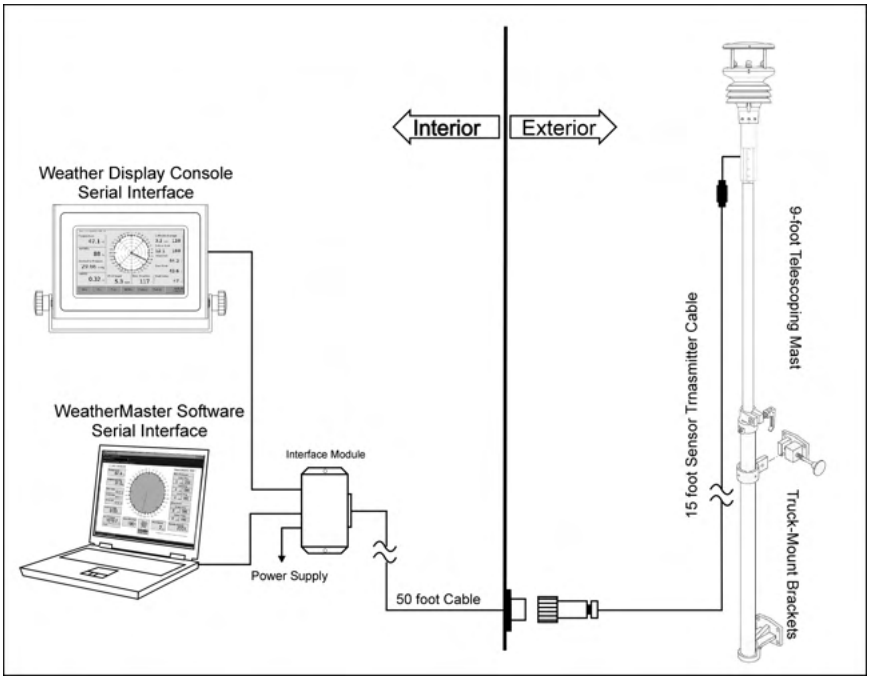
GUY WIRE CLAMP



4" WALL MOUNT BRACKET

SECTION 5: VEHICLE MOUNT INSTALLATION

Vehicle Mount System Configurations



Installation Overview

The Magellan MX should be mounted horizontally and vertically as level as possible.

It is not possible to calibrate for changing magnetic anomalies. Thus, for greatest accuracy, keep the sensor away from sources of local magnetic distortion that will change with time, such as electrical equipment that will be turned on and off, or ferrous bodies that will move. Insure that the sensor is not mounted close to areas that may see large sources of local magnetic fields. It is recommended that the sensor be installed as far away as possible from motors.

It is also important to bear in mind the effect the structure of the vehicle has on the wind flow across the sensor. And therefore the turbulence it creates will impact on the measurements the sensor produces.

For applications where the vehicle is moving while collecting data; the Magellan MX Sensor utilizes it's internal compass and GPS to compensate for the speed of the vehicle and provide True Wind readings.

Unpacking the Unit

Installing the telescoping mast and truck-mount brackets

Installing the vehicle mount connector and routing cable

Installing the Interface Module

Installing and connecting the Weather Display Console and Computer Software

Installing the Magellan MX sensor transmitter and mounting adapter

Unpack the Magellan weather station and verify that all parts are included.

1. Standard system includes:

- ❑ Magellan MX Sensor Transmitter
- ❑ 15 ft external sensor cable and male sensor connector (plus additional cable lengths, if ordered)
- ❑ 50 ft internal cable with vehicle mount female sensor connector (plus additional cable lengths, if ordered) and all-weather connector cap
- ❑ Interface Module with power supply
- ❑ (2) 3-position terminal block connectors
- ❑ 6-foot RS-232 cable (plus additional cable lengths, if ordered)
- ❑ 9 ft telescoping mast with vehicle-mount brackets
- ❑ Mast extension sleeve adapter
- ❑ User Manual

2. Weather Display Console (**Optional**)

- ❑ Display Console
- ❑ Power supply
- ❑ 6-foot RS-232 cable (plus additional cable lengths, if ordered)
- ❑ User Manual

3. WeatherMaster Software, with User Manual (**Optional**)

Inspect all system components for obvious shipping damage (Refer to “Important Notice: Shipping Damage” in case of damage).

Save the shipping carton and packing material in case the unit needs to be returned to the factory. If the system does not operate or calibrate properly, see **Maintenance** and **Troubleshooting** sections, for further instructions.

Installing the telescoping mast and vehicle-mount brackets

1. Select a location on the vehicle where the Magellan sensor mast will be installed.
2. Three mounting brackets are included with the mast. The mounting base plate and a spring-loaded securing mounting bracket will be permanently mounted to the vehicle for quick and easy set up. The third bracket is attached to the mast and mates with a slot on the spring-loaded mounting bracket. This bracket may be loosened and re-positioned on the mast to fit the installation scheme and mounting bracket positioning. A spacer for the spring-loaded bracket is provided to insure that the mast is 90° vertical.
3. Ensure the vehicle-mount sensor connector is in close proximity to the mast's mounting bracket location (refer to the vehicle-mount sensor connector section below). Mark and drill the appropriate mounting bracket holes. Be sure to allow for sufficient structural backing, to adequately support the mast and sensor.
4. External sensor cabling is intended to hang freely along the side of the mast. This assures the mast's easy extension and retraction without pinching, crimping, or cutting the sensor cable. Users may tie-wrap the cable to the lower portion of the mast. The external sensor cable has a male connector that couples to the vehicle-mount female connector on the side of the vehicle.
5. To extend the mast, locate the large textured locking ring at the top of the nested mast. This ring loosens and tightens the mast extension. A counter-clockwise rotation loosens the ring and allows the mast to be fully extended. Clockwise ring rotation tightens the extension in place.

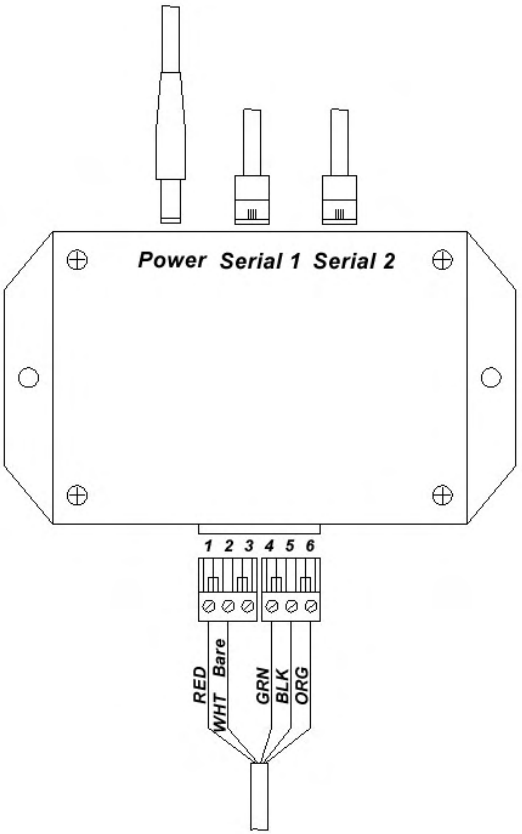
Installing the vehicle mount sensor connector and routing cable

1. To install the female vehicle-mount sensor connector, drill a ¾" hole in close proximity to the sensor mast mounting bracket installation. A recommended location is near the mast's lower base bracket.
2. Drill four small pilot holes for the mounting screws.
3. Run 50-ft cable through the hole and route to the Interface Module location.
4. Connect the cable to the 3-position connectors, as listed in the chart below.
5. Affix the connector with mounting screws on the external side of the vehicle and ensure the associated all-weather connector cap is securely attached.

Installing the Interface Module

Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the terminal block screws on the Interface Module as follows:

Terminal Number	Signal	Color
1	+12 V	RED
2	Ground	White and Bare
3	No Connection	
4	Signal Ground	Green
5	RX	Black
6	TX	Orange



The Magellan MX Sensor includes reverse polarity protection.

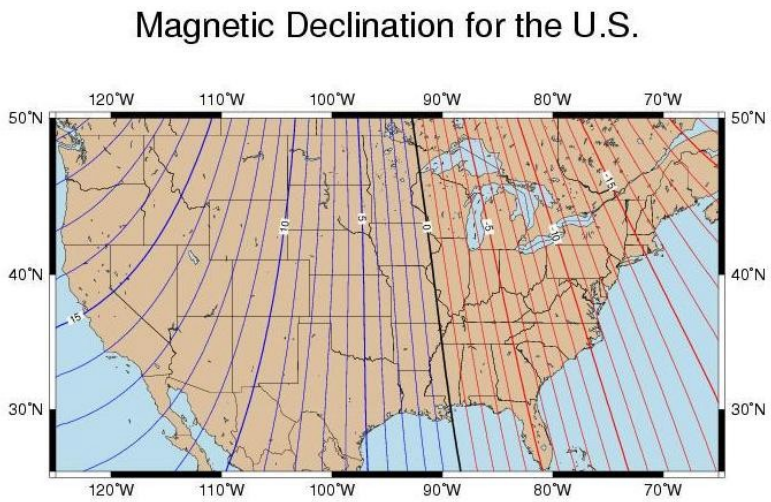
Installing the sensor transmitter and North Orientation

North Alignment

The Magellan MX sensor has a built-in electronic compass for North alignment.

The Magnetic Declination has been entered in the sensor for your area. To change the magnetic declination, please see the Operation section.

Wind direction can refer to either **Magnetic North**, which is read with a magnetic compass, or **True North**, which uses the earth's geographic meridians. The magnetic declination is the difference in degrees between the true north and magnetic north.



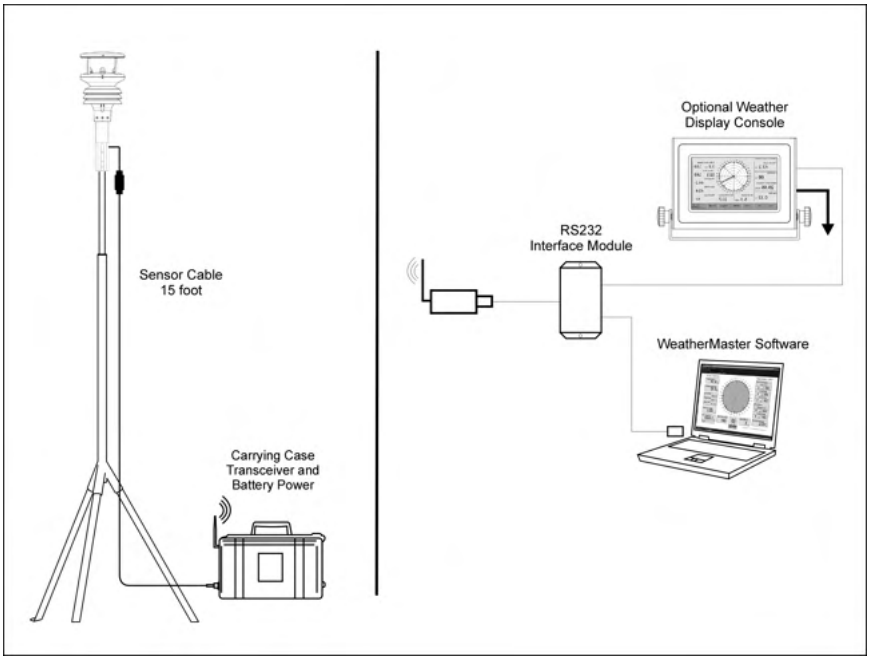
Connecting the Weather Display Console and Computer

Connect the Weather Display Console to the Interface Module using the RJ-11 cable. The Display Console can be connected to either serial port 1 or 2.

Connect the Interface Module to the computer using the RJ-11 and DB-9 connector (RS-232 Interface). The computer can be connected to either serial port 1 or 2. On the computer end, the DB-9 connector is plugged into the computer serial port (normally COM port 1). If the computer does not have a serial port, then a USB to Serial Adapter is required.

SECTION 6: PORTABLE INSTALLATION

Magellan MX Portable with WeatherMaster Software:



Unpacking the Unit

Standard system includes:

1. System Carrying Case
    - ❑ Magellan MX Sensor Transmitter
    - ❑ 15 ft sensor cable
    - ❑ 2.4 GHz Transceiver and antenna
    - ❑ (2) 12 volts Batteries
    - ❑ Battery Charger
    - ❑ User Manual
2. Tripod
    - ❑ Guy wire and collar
    - ❑ Tie-down kit
    - ❑ Canvas tripod bag
3. Receiving Transceiver
    - ❑ 2.4 GHz Transceiver and antenna
    - ❑ 6-foot RS-232 Transceiver cable
    - ❑ Interface Module (**Optional**)
4. Weather Display Console (**Optiona**l)
    - ❑ Display console
    - ❑ Power supply
    - ❑ 6-foot RS-232 cable
    - ❑ User manual
5. WeatherMaster software (**Optional**)
    - ❑ Software CD
    - ❑ 6-foot computer cable
    - ❑ User manual
6. Weather MicroServer (**Optiona**l)
    - ❑ MicroServer
    - ❑ 7-foot Ethernet cable
    - ❑ Power supply
    - ❑ User manual

Inspect all system components for obvious shipping damage (Refer to “Important Notice: Shipping Damage” in case of damage).

Save the shipping carton and packing material in case the unit needs to be returned to the factory.

Magellan MX Portable Carrying Case

The Magellan MX carrying case stores the sensor head, batteries, transceivers and other accessories. It serves as a weatherproof enclosure with a wiring harness, antenna, and connection to the sensor head for power and communication via the wireless transceiver.

Telescoping Tripod and Tiedown Kit

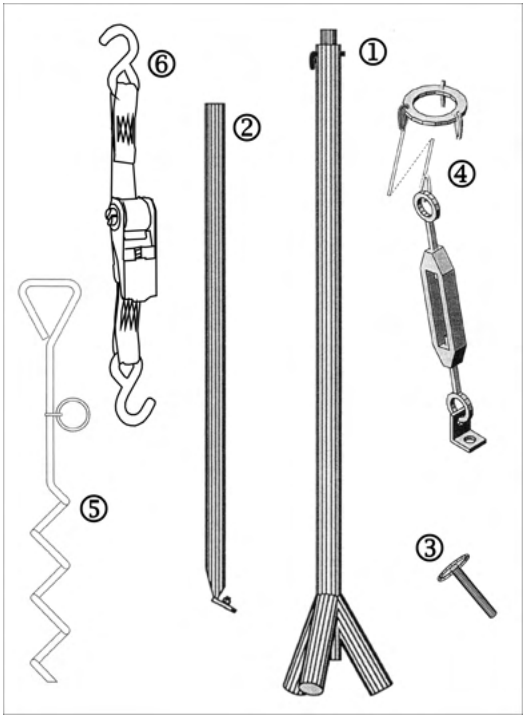
The tripod is designed to provide up to 10 feet of stable, secure support for your meteorological sensors.

Constructed from welded anodized aluminum for appearance and longevity, the 15-pound tripod can easily support up to 60 pounds of

equipment. An optional tie-down kit allows for additional security in high-wind areas.

To install, insert the legs into the main body secure with stainless steel retainer pins. Extend the mast to the desired height and insert another retainer pin. Install the guy wires to complete the set-up.

Tripod Parts List:



Description	Ref.	Qty.
Body/Mast Assembly	1	1
Legs	2	3
Retainer Pins	3	4
Guy Wire Ring with 3 Wires and Turnbuckles	4	1
Anchor Screw with Chain	5	1
Clamp with Strap	6	1

Specifications

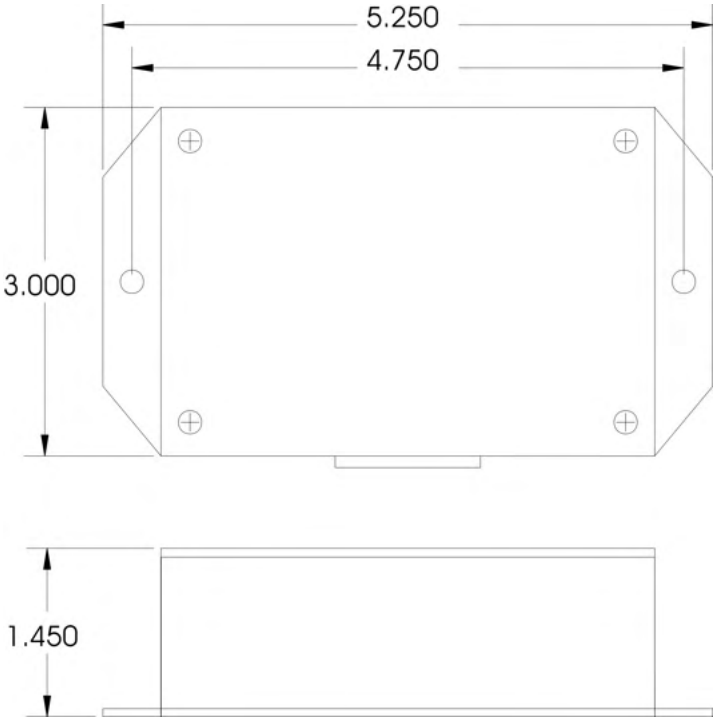
Capacity: Supports up to 60 lbs.

Shipping Weight: 17 lbs

Shipping Box Dimensions: 71" x 9" x 9"

Tripod and Tiedown Kit Part Number: 88019

RS-232 Interface Module



The RS-232 Interface Module connects up to four devices to the wireless transceiver, such as computers, display consoles and other such devices.

Set Up Instructions

Site Selection:

1. Upon arrival at the deployment site, determine a suitable location where the Magellan mast may be set up away from physical obstructions and heavy foot traffic. Because of the wireless transceivers, the telescoping tripod and sensors may be located as far as 1-mile (Line of Sight - LOS) away from where the weather data is viewed.
2. Site location should be away from trees, buildings or other obstructions that will alter accurate wind direction and speed-readings.
3. Screw the grounding/tie-down auger into the ground at the center of the placement until the auger portion is adequately secured.
4. If the site selection is on blacktop/pavement, use a 6” nail spike or Rebar driven into the surface at a 45° angle. This sufficiently secures the mast during operations.

Mast Set Up and Sensor Alignment:

1. Remove tripod components from the bag. Stand the tripod up (without legs) so the sensor head may be attached to the mast.
2. Attach the Sensor Head to the mast.
3. Attach sensor cable by connecting the 8-pin waterproof male connector/sensor cable to the one-foot female sensor pig-tail waterproof connector.
4. Holding the tripod vertical, place tripod legs in their respective slots, one leg at a time. Once the first leg is in, balance the tripod until the other legs are inserted and the tripod is free standing.
5. With all legs in place, insert the leg locking pins. The tripod may now be picked up and moved over the grounding stake.
6. Secure the tripod to the grounding stake using the clamp strap. Ensure the strap is tight enough to keep the tripod in-place during high winds.
7. Extend the mast to its fullest height and insert the locking pin.
8. If the guy wire kit is used, remove the sensor and mounting adapter prior to mast set up and slide the guy wire ring collar onto the mast extension, then reinstall the sensor. Anchor the end of each guy wire to the corresponding tripod foot using the wing nuts. Extend the mast fully and adjust the guy wires using the turnbuckles to tighten the guy wires evenly.

Transportation Case and Sensor Plug-In

1. Place the Magellan MX transportation case at the foot of the tripod.
2. Attach the 8-inch wireless antenna to the antenna cable on the outside of the case.
3. Plug the 8-pin Female Sensor Cable to the 8-pin male connector on the outside of the case.
4. Ensure the red/black power cord connectors are connected to their respective battery terminals inside the case.
5. Latch and seal the case to the internal components from the weather elements.

Battery Power System

1. The Magellan MX comes with a Battery Power System that consists of two 12VDC, 7.5AH batteries and a 12-Volt battery charger. For example, each battery will continuously operate the Magellan MX 500 for approximately 22 hours before the battery drops to 50% charge. One battery is intended to be charging while the other is in operation.
2. Swap batteries, as necessary to continue weather station operations.

Operation

Once the Mast is set up, with the Sensor Head attached, plug the red/black power terminals to the corresponding battery terminals. The Magellan will automatically sense and transmit weather data via wireless transceiver.

1. Transceiver Power/Connectivity/Transmission:
    a) Check for the red power light
    b) Check for the steady green connectivity light
    c) Check for the one-second green pulsing/blinking transmission light
2. Once the transceiver lights are all operational, data is being transmitted. If the green transmission light is not blinking once per second, data is not being transmitted. Re-check the RS-232, power, and antenna connections.

Monitoring

The data transmitted from the remote sensor can be monitored using the Weather Display console, computer weather software, and/or Weather MicroServer.

Connect the wireless transceiver to the appropriate device. Please refer to the system diagrams provided with the system.

SECTION 7: OPERATION

The Magellan MX Sensors output an ASCII comma-delimited data string over RS-232. Communication can be established with the sensor through a “Terminal” program such as PuTTY.

Communication Settings

The protocol for both serial ports is the following:

Bits per Second (baud rate): 9600

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

RS-232 Output

Once the sensor is properly connected to a terminal program a record will be displayed once per second.

Magellan MX200

The following is an example of the Magellan MX200 Sensor output record, (wind speed readings are in miles per hour, time is UTC):

A,001.65,001.65,002.79,002.75,001.16,001.16,295,329,269,303,272,307,034,168,000.00,+45.528124:-122.931768:+0066.60,010C,2016-02-04T10:04:20.1,+12.3,0004,0100,61

NODE,SPEED,CSPEED,GSPEED,CGSPEED,AVGSPEED,AVGCSPEED,DIR,CDIR,GDIR,CGDIR,AVGDIR,AVGCDIR,COMPASSH,GPSHEADING,GPSSPEED,GPSLOCATION,GPSSTATUS,TIME,VOLT,STATUS,WINDSTAT, CHECKSUM

Magellan MX300

The following is an example of the Magellan MX300 Sensor output record, (barometric pressure readings are in InHg, temperature readings are in Fahrenheit):

B,29.795,028,+056.9,+024.7,2016-02-11T17:11:40.3,+12.2,0004,11

NODE,PRESS,RH,TEMP,DEWPOINT,TIME,VOLT,STATUS

Magellan MX500

The following is an example of the Magellan MX500 Sensor output record, (barometric pressure readings are in InHg, temperature readings are in Fahrenheit, wind speed readings are in mph, time is UTC):

E,003.10,002.95,000.00,000.00,000.00,000.00,119,043,000,000,000,000,29.804,029,+056.8,+025.0,282,355,000.20,+45.528156:-122.931840:+0069.00,010C,2016-03-18T18:41:33.0,+12.2,0004,0100,42

NODE,SPEED,CSPEED,GSPEED,CGSPEED,AVGSPEED,AVGCSPEED,DIR,CDIR,GDIR,CGDIR,AVGDIR,AVGCDIR,PRESS,RH,TEMP,DEWPOINT,COMPASSH,GPSHEADING,GPSSPEED,GPSLOCATION,GPSSTATUS,TIME,VOLT,STATUS,WINDSTAT,CHECKSUM

Magellan MX501

The following is an example of the Magellan MX501 Sensor output record, (barometric pressure readings are in InHg, temperature readings are in Fahrenheit, wind speed readings are in mph, solar radiation is W/^{2,} time is UTC):

F,005.32,005.32,004.56,004.56,000.44,002.16,058,082,059,084,063,091,29.795,052,+056.7,+039.3,0130,01.00,024,196,000.00,+45.527744:-122.931800:+0059.80,010C,2017-05-12T17:27:16.7,+12.4,0004,0100,6A

NODE,SPEED,CSPEED,GSPEED,CGSPEED,AVGSPEED,AVGCSPEED,DIR,CDIR,GDIR,CGDIR,AVGDIR,AVGCDIR,PRESS,RH,TEMP,DEWPOINT,SOLARRAD,SOLARHOURS,COMPASSH,GPSHEADING,GPSSPEED,GPSLOCATION,GPSSTATUS,TIME,VOLT,STATUS,WINDSTAT,CHECKSUM

Magellan MX600

The following is an example of the Magellan MX600 Sensor output record, (barometric pressure readings are in InHg, temperature readings are in Fahrenheit, wind speed readings are in mph, rainfall in inches, time is UTC):

G,003.26,003.78,000.00,000.00,000.00,000.00,076,357,000,000,000,000,29.801,030,+056.8,+025.8,00000.00,0.0000,N,281,182,000.53,+45.528068:-122.931904:+0065.60,010C,2016-03-18T18:51:21.3,+12.2,0004,0100,27

NODE,SPEED,CSPEED,GSPEED,CGSPEED,AVGSPEED,AVGCSPEED,DIR,CDIR,GDIR,CGDIR,AVGDIR,AVGCDIR,PRESS,RH,TEMP,DEWPOINT,PRECIPT,PRECIPI,PRECIPS,COMPASSH,GPSHEADING,GPSSPEED,GPSLOCATION,GPSSTATUS,TIME,VOLT,STATUS,WINDSTAT,CHECKSUM

Fields Definition:

NODE Outputs a Node letter (A to Z).

SPEED Outputs wind speed readings in mph.

CSPEED Outputs Corrected Speed if a GPS option is enabled in mph.

GSPEED Outputs WMO Gust Speed in mph.

CGSPEED Corrected Gust Speed if a GPS option is enabled in mph.

AVGSPEED Outputs WMO average speed reading based on AVG short and AVG long settings in mph.

AVGCSPEED Outputs WMO average corrected Speed reading using GPS based on AVG short and AVG long settings in mph.

DIR Outputs wind direction readings in degrees.

CDIR Outputs Compass corrected wind direction readings in degrees.

GDIR Outputs WMO Gust Direction in degrees.

CGDIR Compass corrected WMO Gust Direction in degrees.

AVGDIR Outputs WMO average direction reading based on AVG short and AVG long settings in degrees.

AVGCDIR Outputs WMO average compass corrected direction reading based on AVG short and AVG long settings in degrees.

PRESS Outputs the Barometric Pressure reading in Inches Mercury.

RH Outputs Relative Humidity reading in %RH.

TEMP Outputs the Temperature reading in degrees Fahrenheit.

DEWPOINT Outputs the Dew point reading in degrees Fahrenheit.

PRECIPT Outputs Rain Total reading in inches.

PRECIPI Outputs Rain Intensity reading in inches. It is the sum of the last sixty lots of 1-minute accumulated Rain data. A new sum measurement is generated every minute.

PRECIPS Outputs Precipitation (Rain) Status as No (N) or Yes (Y).
Changes N to Y when total precipitation is incremented.
Changes Y to N when total precipitation has not incremented in the last 60 seconds.

SOLARRAD Outputs the Solar Radiation Reading in Watts per metered squared.

SOLARHOURS Sunshine Hours.

COMPASSH Compass Heading direction reading.

GPSHEADING Outputs a GPS direction heading.

GPSSPEED Outputs a GPS Speed over ground.

GPSLOCATION Outputs Longitude, Latitude and GPS height in meters.

*GPSSTATUS Outputs a location fix and the number of viewable satellites.

TIME Outputs Date and Time. If the sensor is GPS enabled the time is updated by the GPS and is UTC.

VOLT Outputs the Sensors Supply Voltage.

STATUS Outputs the Sensors Status Code

WINDSTAT Outputs Status codes relating to Wind Sensor Data

Note: WMO - World Meteorological Organization

*GPSSTATUS - Location Fix and Number of Satellites

Result e.g. 010B.

Where: 0 is padding.

1 is GPS SPS mode fix valid (0 is fix not available).

0B is a hexadecimal representation of the number of satellites acquired, 11 satellites found. 0A would be 10 satellites, etc.

Magnetic Declination

The Magellan MX sensor firmware allows the setting of a declination angle to correct the wind direction output to True North. Once the declination angle is set in the sensor, it is stored permanently in non-volatile memory. The declination angle must be reset only if the system is used in a different geographical location separated by many miles from the original location.

Please note that the magnetic declination is set at the factory per system, based on the shipping destination.

To reset the magnetic declination:

1. Determine the Correct Declination

Visit the following web site for help in determining the correct declination for your site:

http://www.ngdc.noaa.gov/geomag/declination.shtml

Under Declination click “Calculate”

Under Lookup Latitude/ Longitude enter your zip code and click “Get & Add Lat / Lon” or manually enter latitude and longitude.

Under Calculate Declination click “Calculate”

The declination will be displayed in degrees (º) and minutes ('), e.g. 16º 27'. Divide the minutes by 60 to get decimal remainder of degrees, e.g. 27 minutes = 0.45 degrees. The declination will be rounded up from 16.45 to 16.5 to conform to the data entry format of one decimal place.

2. Read or Set the Magnetic Declination

With the Magellan MX sensor connected through the Interface Module to a computer, open a “Terminal” program such as PuTTY with the following communication settings:

Bits per Second (baud rate): 9600
Data bits: 8
Parity: None
Stop bits: 1
Flow control: None

Once communication has been established a data string will be displayed in the terminal window once per second.

Press the * (asterisk) key to enter SETUP MODE.

The magnetic declination must be entered in ±XXX.X format.

For example, to set a declination value of +002.3 degrees type:

COMPASSDECL +002.3 and press the Enter key.

If the entry is correct, then the sensor will report back with:
New value saved (Advise to verify Compass Heading)

To verify the declination value (compass heading) type:
COMPASSDECL and press the Enter key.

The declination value will be displayed; COMPASSDECL = +002.3

For a magnetic declination due West enter a negative number, for example: -010.1

Return to Measurement Mode by typing Q and pressing the Enter key.

The data string will resume displaying once per second.

Sensor Status Codes

Code	Status	Condition
0000	OK	No fault conditions detected in measurement period
0001	Wind Measurement Fault	Wind Sensor faulty
0002	GPS Error	e.g. Locating Satellite fix
0004	Source for Corrected Wind Direction is GPS	GPS notification
0006	GPS Location Missing	GPS error
0010	Temperature Measurement Fault	Temperature sensor faulty
0020	Dewpoint fault	If Temperature and Humidity are reporting correctly then this code indicates a main pcb fault
0040	Humidity fault	Humidity Sensor faulty
0080	Pressure Sensor Warning	Pressure sensor reading not available/unit faulty
0100	Compass fault	Invalid heading due to compass fault

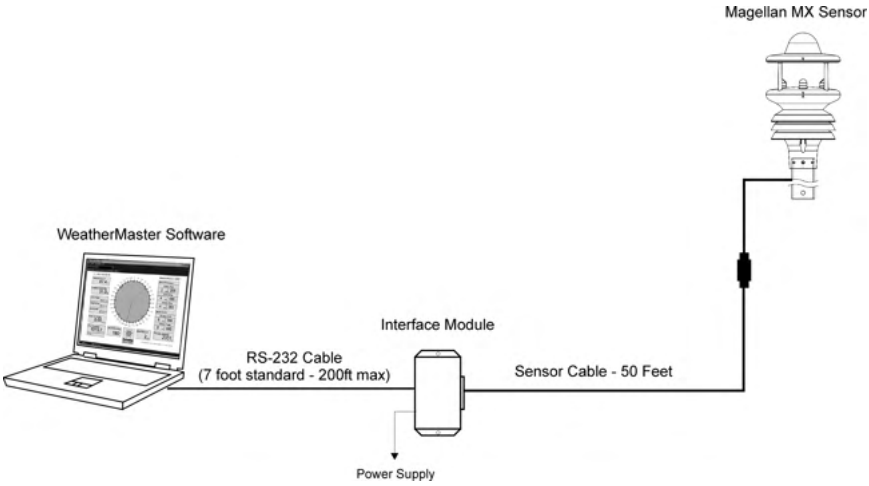
WindStat Codes

Code	Status	Condition
0000	OK	No fault conditions detected in measurement period
0001	Wind Sensor Axis failed	Wind U Axis blocked or faulty
0002	Wind Sensor Axis failed	Wind V Axis blocked or faulty
0004	Wind Sensor both Axis failed	Wind U and V Axis blocked or faulty
000B	Wind Sensor readings failed	Wind Sensor data output fault
0100	Wind Average Building	WMO wind average building
0200	Corrected Wind Measurement not available	Compass corrected wind measurement failure

Connecting the Magellan MX Sensor to a Computer

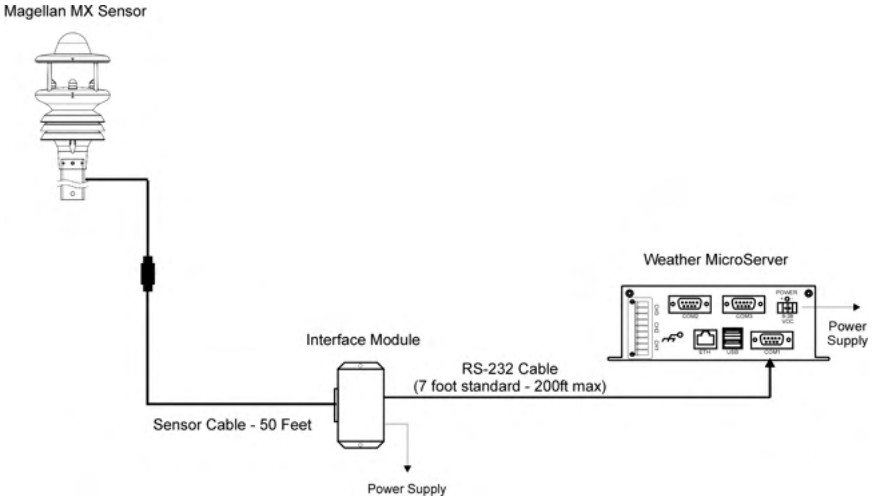
Connect the provided RS-232 cable to either serial port on the Interface Module. Connect the other end of the RS-232 cable and DB-9 connector to an available serial port on the computer.

A serial to USB converter may be required if the computer or laptop does not have a serial port installed.



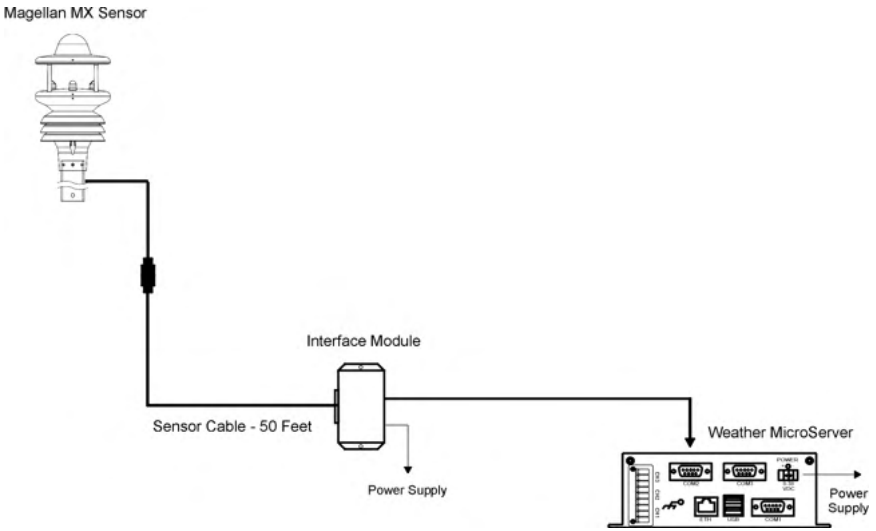
Connecting the Magellan MX Sensor to the MicroServer (RS-232)

Connect the provided RS-232 cable to either serial port on the Interface Module. Connect the other end of the cable and DB-9 connector to COM 1 on the MicroServer, securing it with the attached screws.



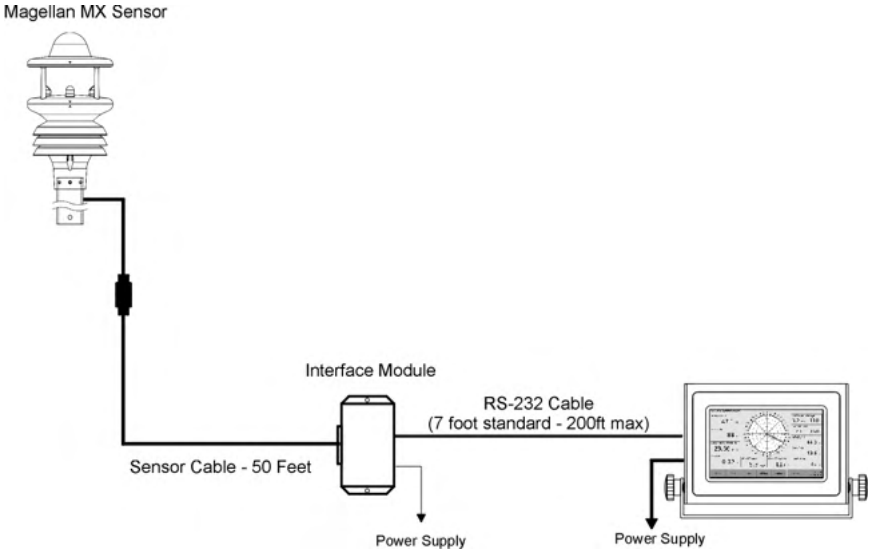
Connecting the Magellan MX Sensor to the MicroServer (RS-485)

For cable lengths greater than 200ft the Magellan MX Sensor can also communicate over RS-485. Connect the provided cable to either serial port on the Interface Module. Connect the other end of the cable and DB-9 connector to COM 2 on the MicroServer, securing it with the attached screws.



Connecting the Magellan MX Sensor to the Display Console

Connect the provided RS-232 cable to either serial port on the Interface Module. Connect the other end of the cable to the serial port (bottom port) on the Weather Display Console.



SECTION 8: CALIBRATION

Factory Calibration and Repair Service

Recommend sending in for calibration every two years. Calibration consists of replacing the Temperature and Humidity probe and the Gore-Tex filter. The sensor is also tested to ensure it is within specification.

Send the device to Columbia Weather Systems, Inc. for calibration. See USER SUPPORT INFORMATION section for more information.

SECTION 9: MAINTENANCE

The Magellan MX series of sensors does not contain any moving parts or user-serviceable parts requiring routine maintenance.

Cleaning

To ensure the accuracy of measurement results, the sensor transmitter should be cleaned when it becomes contaminated.

The precipitation sensor; plastic dome on the Magellan MX600 should be carefully cleaned periodically with a soft, lint-free cloth moistened with water.

The wind sensor on the Magellan MX200, 500, 501 and 600 should be gently cleaned if there is any build-up of deposits. Use a lint free soft cloth with a mild detergent. Do not use solvents or attempt to remove build-up with a tool. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool.

The radiation shield utilized on the Magellan MX300, 500, 501 and 600 should be kept cleaned and free of biological growth. To clean use a lint free soft cloth with a mild detergent. Do not use solvents or attempt to remove build-up, ice or snow with a tool. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool.

SECTION 10: TROUBLESHOOTING

This chapter describes common problems, their probable causes and remedies.

Problem	Possible Cause	Action
Loss of communication with Magellan MX sensor transmitter	Blown fuse Poor cable connection	Check the Interface Module fuse, replace if needed. Check all cable connections between sensor and optional monitoring device.
Wind measurement failure. Both the speed and direction sensors are not reporting correct data	Blockage (trash, leaves, branches, debris) between the wind transducers. Confirm the wind transducers are not damaged.	Remove the blockage.

Loss of communication with the Magellan MX sensor transmitter:

- Check the Interface Module. If the Green Power LED and Red Power LED are out, it is possible that the fuse has blown. Disconnect power and remove the four screws on the front panel of the Interface Module to check the fuse.
- Check all weatherproof cable connectors between the Magellan MX sensor and any optional monitoring device; e.g., MicroServer, Display Console. Look for broken or damaged pins. Also inspect the cable connectors for water intrusion.
- If a surge protector was purchased and installed, an electrical event may have tripped the protector. Test for loss of communication by bypassing the surge protector and establish a direct cable connection. Determine if communication has been reestablished. To purchase a replacement surge protector please call 1-503-629-0887 and reference Part No. 8355.

SECTION 11: USER SUPPORT INFORMATION

This section consists of the following items:

1. One-Year Limited Warranty: Please read this document carefully.
2. Return for Repair Procedure: This procedure is for your convenience in the event you must return your Magellan MX for repair or replacement. Follow the packing instructions carefully to protect your instrument in transit.

Limited Warranty

Columbia Weather Systems, Inc. (CWS), warrants the Magellan MX Weather Station to be free from defects in materials and/or workmanship when operated in accordance with the manufacturer's operating instructions, for one (1) years from date of purchase, subject to the provisions contained herein. CWS warranty shall extend to the original purchaser only and shall be limited to factory repair or replacement of defective parts.

EXCLUSIONS

Certain parts are not manufactured by CWS (i.e., certain purchased options, etc.) and are therefore not covered by this warranty. These parts may be covered by warranties issued by their respective manufacturers and although CWS will not warrant these parts, CWS will act as agent for the administration of any such independent warranties during the term of this warranty. This warranty does not cover normal maintenance, damage resulting from improper use or repair, or abuse by the operator. Damage caused by lightning or other electrical discharge is specifically excluded. This warranty extends only to repair or replacement, and shall in no event extend to consequential damages. In the event of operator repair or replacement, this warranty shall cover neither the advisability of the repair undertaken, nor the sufficiency of the repair itself.

THIS DOCUMENT REFLECTS THE ENTIRE AND EXCLUSIVE UNDERSTANDING OF THE PARTIES, AND EXCEPT AS OTHERWISE PROVIDED HEREIN, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, PARTICULARLY THE WARRANTIES OF MERCHANT ABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Return for Repair Procedure

1. In the event of defects or damage to your unit, first call the Service Department Monday through Friday, 8:30 am to 4:00 pm PST, (503) 629-0887 to determine the advisability of factory repair. The Service Department will issue an RMA number (Return Merchandise Authorization) to help us identify the package when received. Please write that number on the outside of the box.

2. In the event factory service is required, return your Magellan MX Weather Station as follows:

   A. Packing

   - Wrap the Sensor Transmitter in a plastic bag first.
   - Pack in original shipping carton or a sturdy oversized carton.
   - Use plenty of packing material.

   B. Include:

   - A brief description of the problem with all known symptoms.
   - Your telephone number.
   - Your return street shipping address (UPS will not deliver to a P.O. box).
   - Write the RMA number on the outside of the box.

   C. Shipping

   - Send freight prepaid (UPS recommended).
   - Insurance is recommended. (The factory can provide the current replacement value of the item being shipped for insurance purposes.)

   D. Send to:

      Columbia Weather Systems, Inc.
      5285 NE Elam Young Parkway, Suite C100
      Hillsboro, Oregon 97124

   E. C.O.D. shipments will not be accepted.

3. If your unit is under warranty, after repair or replacement has been completed, it will be returned by a carrier and method chosen by Columbia Weather, Inc. to any destination within the continental U.S.A. If you desire some other specific form of

conveyance or if you are located beyond these borders, then you must bear the additional cost of return shipment.

4. If your unit is not under warranty, we will call you with an estimate of the charges for your approval.

Reference

Glossary

Aspirating Radiation Shield

A device used to shield a sensor such as a temperature probe from direct and indirect radiation and rain while providing access for ventilation.

Barometric Pressure

The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the “column” of air lying directly above the point in question.

Celsius Temperature Scale

A temperature scale with the ice point at 0 degrees and the boiling point of water at 100 degrees.

Dew Point

The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur. When this temperature is below 0°C, it is sometimes called the frost point.

Density Altitude

Density altitude is a meteorological variable that is important to pilots, especially during the summer. The density altitude is the altitude in a standard atmosphere where the density is the same as the given atmospheric density. During a hot muggy summer day, a pilot begins take off from an airport with an elevation of 2500 feet. Because of the warm temperature and the moisture in the air, the airplane has to work as if it was taking off at an airport at an elevation of 6000 feet resulting in the plane needing more power and a longer roll down the runway to take off.

Fahrenheit Temperature Scale

A temperature scale with the ice point at 32 degrees and the boiling point of water at 212 degrees.

Global Radiation

The total of direct solar radiation and diffused sky radiation received by a unit horizontal surface. Global radiation is measured by a Pyranometer.

Heat Index

The heat index or apparent temperature is a measure of discomfort due to the combination of heat and high humidity. It was developed in 1979 and is based on studies of evaporative skin cooling for combinations of temperature and humidity.

Pyranometer

It measures the combined intensity of incoming direct solar radiation and diffused sky radiation. The Pyranometer consists of a radiation-sensing element, which is mounted so that it views the entire sky.

Relative Humidity

Popularly called humidity. The ratio of the actual vapor pressure of the air to the saturation vapor pressure.

Sea Level Pressure

The atmospheric pressure at mean sea level, either directly measured or, most commonly, empirically determined from the observed station pressure.

In regions where the earth's surface pressure is above sea level, it is standard observational practice to reduce the observed surface pressure to the value that would exist at a point at sea level directly below.

Solar Radiation

The total electromagnetic radiation emitted by the sun. 99% of the sun's energy output falls within the wavelength interval from 0.15 microns to 4.0 microns, with peak intensity near 0.47 microns. About one-half of the total energy in the solar beam is contained within the visible spectrum from 0.4 to 0.7 microns, and most of the other half lies near infrared, a small additional portion lying in the ultraviolet.

Wind Chill

That part of the total cooling of a body caused by air motion.

Unit Conversion

Speed

Kilometers per hour = 1.610 x miles per hour

Knots = 0.869 x miles per hour

Meters per second = 0.448 x miles per hour

Feet per second = 1.467 x miles per hour

Temperature

Temperature in °C = 5/9 (temperature in °F - 32)

Temperature in °F = (1.8 x temperature in °C) + 32

Distance

Millimeters = 25.4 x inches

Pressure

Millibars = 33.86 x inches of mercury

Kilopascals = 3.386 x inches of mercury

Pounds per square inch = 0.49 x inches of mercury

Standard atmospheres = 0.0334 x inches of mercury

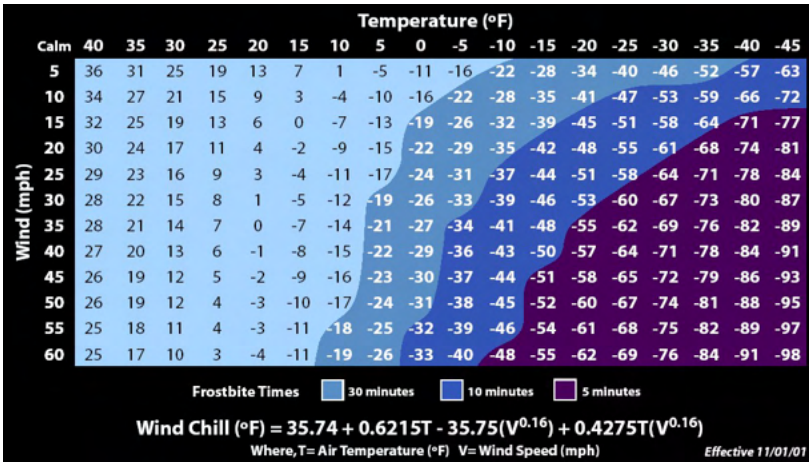
Tables and Formulas

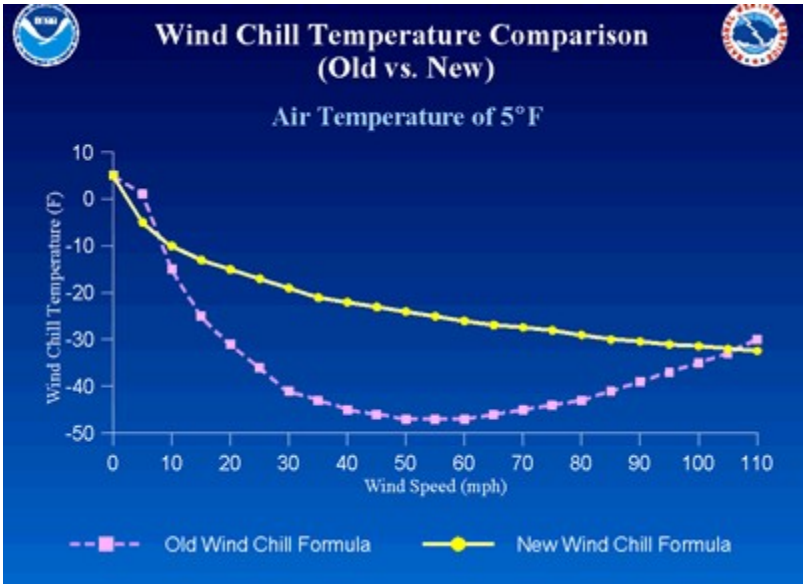
Wind Chill Chart

In 2001, NWS implemented an updated Wind chill Temperature (WCT) index. The change improves upon the former WCT Index used by the NWS and the Meteorological Services of Canada, which was based on the 1945 Siple and Passel Index.

In the fall of 2000, the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) formed a group consisting of several Federal agencies, MSC, the academic community (Indiana University-Purdue University in Indianapolis (IUPUI), University of Delaware and University of Missouri), and the International Society of Biometeorology to evaluate and improve the wind chill formula. The group, chaired by the NWS, is called the Joint Action Group for temperature Indices (JAG/TI). JAG/TI's goal is to upgrade and standardize the index for temperature extremes internationally (e.g. Wind chill Index).

The current formula uses advances in science, technology, and computer modeling to provide a more accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures.





Wind Chill Equation

$WC = 35.74 + 0.6215\ T - 35.75(V^{0.16}) + 0.4275\ T(V^{0.16})$

Where:

WC = wind chill temperature in °F

V = wind velocity in mph

T = air temperature in °F

Note: *Wind chill Temperature is only defined for temperatures at or below 50 degrees F and wind speeds above 3 mph.*

Heat Index

Heat index is calculated using the following formula:

HI= -42.379 + 2.04901523*T + 10.14333127*RH - .22475541*T*RH - .00683783*T*T - .05481717*RH*RH + .00122874*T*T*RH + .00085282*T*RH*RH - .00000199*T*T*RH*RH

Where T is temperature in degrees F and RH is relative humidity in percent.

HI is the heat index expressed as an apparent temperature in degrees F.

Heat Index look up table (printed for reference)

	Temperature in °F													
RH	70	75	80	85	90	95	100	105	110	115	120	125	130	135
0	64	66	73	78	83	87	91	95	99	103	107	111	117	120
5	64	69	74	79	84	88	93	97	102	107	111	116	122	126
10	65	70	75	80	85	90	95	100	105	111	116	123	131	
15	65	71	76	81	86	91	97	102	108	115	123	131		
20	66	72	77	82	87	93	99	105	112	120	130	141		
25	66	72	77	83	88	94	101	109	117	127	139			
30	67	73	78	84	90	96	104	113	123	135	148			
35	67	73	79	85	91	98	107	118	130	143				
40	68	74	79	86	93	101	110	123	137	151				
45	68	74	80	87	95	104	115	129	143					
50	69	75	81	88	96	107	120	135	150					
55	69	75	81	89	98	110	126	142						
60	70	76	82	90	100	114	132	149						
65	70	76	83	91	102	119	138							
70	70	77	84	93	106	124	144							
75	70	77	85	95	109	130	150							
80	71	78	86	97	113	136								
85	71	78	87	99	117	140								
90	71	79	88	102	122	150								
95	71	79	89	105	126									
100	72	80	90	108	131									

Dew Point

B = (ln (RH/100) + ((17.2694*T) / (238.3+T))) / 17.2694

Dew Point in °C = (238.3 * B) / (1-B)

Where:

RH = Relative Humidity

T = Temperature in °C

Ln = Natural logarithm

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