

FURUNO

OPERATOR'S MANUAL

WEATHER STATION

MODEL **WS-200**



IMPORTANT NOTICES




- The descriptions in this manual are intended for readers with a solid knowledge of English.
- No part of this manual may be copied or reproduced without written permission.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications are subject to change without notice.
- Store this manual in a convenient place for future reference.
- FURUNO will assume no responsibility for the damage caused by improper use or modification of the equipment (including software) by an unauthorized agent or a third party.
- When it is time to discard this product it must be done according to local regulations for disposal of industrial waste. For disposal in the USA, refer to the Electronics Industries Alliance (<http://www.eiae.org/>).






SAFETY INSTRUCTIONS

The operator of this equipment must read these safety instructions before attempting to operate the equipment.

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

 Warning, Caution	 Prohibitive Action	 Mandatory Action
----------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------

 WARNING	
	The input voltage must be 12 VDC. Any other input voltage will damage the equipment.
	Always wear safety goggles and a dust mask when installing to avoid personal injury.






 CAUTION	
	Do not disassemble the unit. Disassembling the unit will damage the waterproof seal. Further, there are no user-serviceable parts inside.
	GPS position and velocity accuracies are controlled by the U.S. Department of Defense. Therefore, the position accuracy described in the specifications cannot be guaranteed.
	No one navigation device should ever be solely relied upon for the navigation of a vessel. Always confirm position against all available aids to navigation, for safety of vessel and crew.
	The compass safe distance for standard and steering compasses is 0.30 m. Observe this distance to prevent interference to a magnetic compass.

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FOREWORD

A Word to the Owner of the WS-200

Congratulations on your choice of the FURUNO WS-200 Weather Station. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For 60 years FURUNO Electric Company has enjoyed an enviable reputation for quality marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless installed, operated and maintained properly. Please carefully read and follow the recommended procedures for installation, operation and maintenance.

Thank you for considering and purchasing FURUNO equipment.

Features

The WS-200 Weather Station provides round the clock, up-to-the-minute comprehensive weather, position information, all in one remarkably small unit. Know what weather lies ahead before departing, by checking wind speed and direction, temperature and barometric pressure. And find minute changes in weather while underway.

The WS-200 outputs

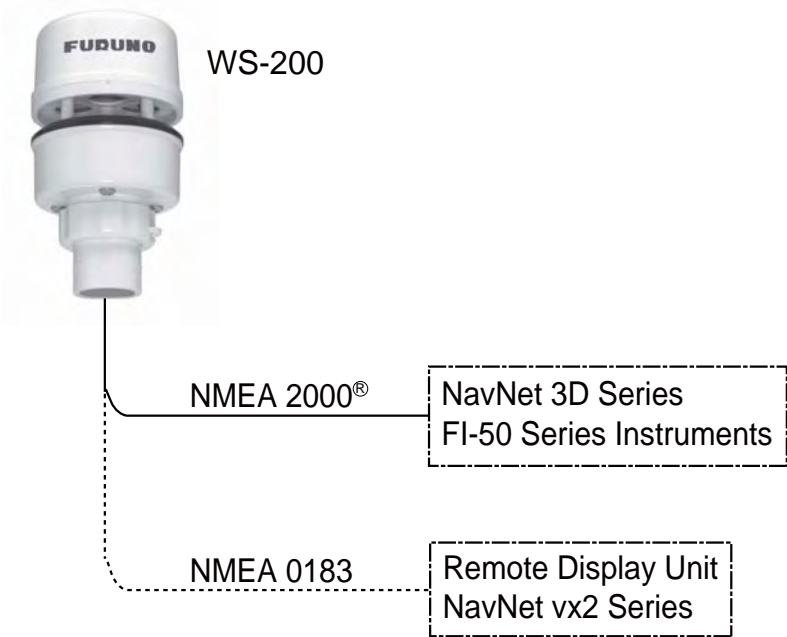
- Air temperature
- Angle of vessel pitch
- Angle of vessel roll
- Apparent wind speed
- Apparent wind direction
- Barometric pressure
- GPS position
- Rate of Turn
- True wind chill temperature
- True wind speed*
- True wind direction*
- Vessel speed over ground (SOG)
- Vessel course over ground (COG)
- Wind chill temperature

Other features

- Built-in GPS receiver with 12-channel parallel reception of 12 satellites
- Position accuracy within 3 m (WAAS)
- Position updated every second
- Built-in rate gyro
- Output in NMEA 0183 or NMEA 2000® format
- Space saving installation
- No moving parts for virtually maintenance free operation

* "Relative to water" information available with water-referenced speed in NMEA 0183 or NMEA 2000® format.

SYSTEM CONFIGURATION



1. INSTALLATION

1.1 Equipment Lists

Name	Type	Code No.	Qty	Remarks	
Standard Supply					
Weather Station	WS-200		1		
Installation Materials	CP20-03100	000-012-576	1 set, choose one	With NMEA 2000 [®] cable (6m)	See packing list at back of manual
	CP20-03110	000-012-577		No cable	
Optional Supply					
Cable Assy.	22-1025-02	000-168-883-10	1	6 m, for NMEA 2000 [®]	
Cable Assy.	22-1025-06	000-168-884-10	1	10 m, for NMEA 2000 [®]	
Cable Assy.	22-910-03	000-168-885-10	1	10 m, for NMEA 0183	
Cable Assy.	MJ-A7SPF/ SRMD-100	000-144-534	1	10 m, straight, MJ7P(P)-MJ7P(J), for NMEA 0183	

1.2 Parts, Tools & Materials

- Pencil
- Level
- Safety goggles
- Dust mask
- Electric drill
- Drill bits
- Phillips screwdrivers
- Plumber's tape (optional)
- Cutting pliers (some installations)
- Wire strippers (some installations)
- Electrical tape (some installations)
- Cable ties (some installations)

1.2.1 Cable

The Weather Station instrument can be connected to a device and/or network in several ways. *You must have the correct cable before beginning the installation.* Additional cable lengths are available.

- NMEA 0183 10m cable (option)
- NMEA 2000® 6m cable
- NMEA 2000® 10m cable (option)

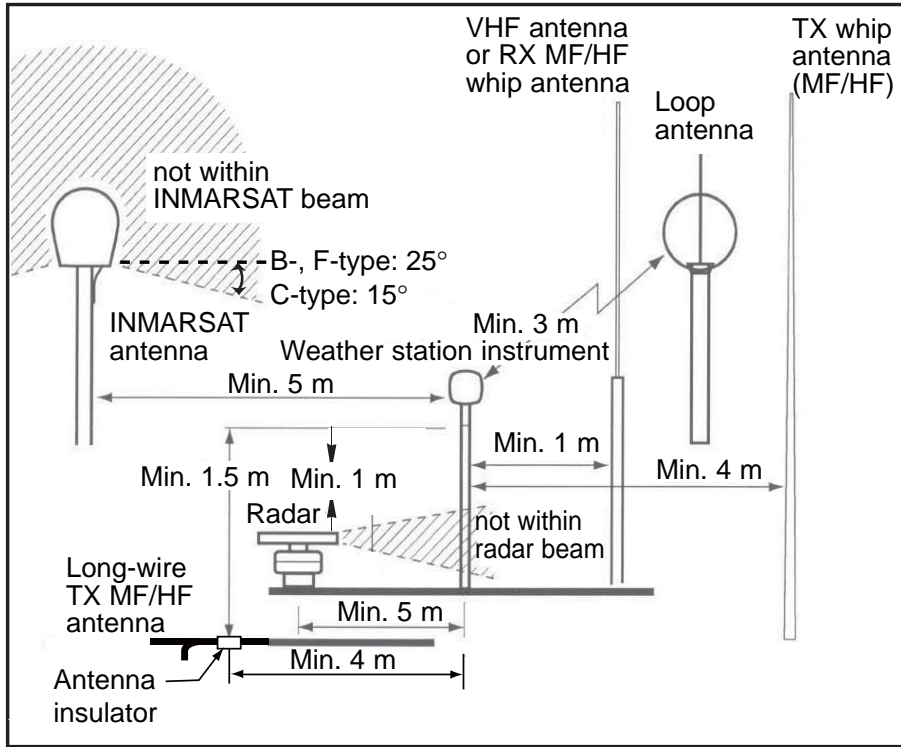
1.2.2 Antenna Mount

The Weather Station instrument has standard 1-14" UNS threads. Attach the instrument to a marine extension pole.

1.3 Choosing the Mounting Location

For accurate readings and a reliable GPS signal, selecting the best location for the Weather Station instrument is very important. Easy access and appearance should be secondary considerations. Since each installation is unique, the best separation distances from other equipment on the boat will vary depending on the particular equipment and how it is configured. Choose a location that balances the requirements below (see the figure on the next page).

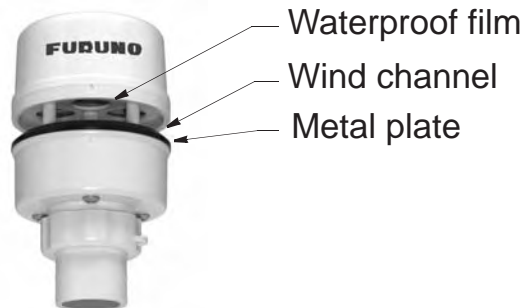
- The Weather Station instrument *must* be mounted in “clear air”—away from obstructions in any direction that will interfere with air flowing through the unit. If there is an obstruction, *be sure* to mount the Weather Station instrument at least 2m (6') away. On land, avoid roof tops, chimneys, trees, etc.
- If possible, mount the Weather Station instrument higher than any other object. Mount it a minimum of 500mm (20") above the surrounding surfaces.
Note: The higher the Weather Station instrument is mounted, the less accurate the pitch and roll readings.
- Because the Weather Station instrument has an electronic compass, it should be at least 0.30 m away from any on-board radar equipment or other strong magnetic fields from equipment such as radio transmitters, boat engines, generators, etc.
- Because the Weather Station instrument has a GPS, it *must* be lower than any on-board INMARSAT communications antenna.
- Because the Weather Station instrument has a GPS, *be sure* it is as far as possible from high-powered transmitting antennas to avoid mutual interference.
- Because the Weather Station instrument has a GPS, check for any electromagnetic shading. That is, any obstructions from other vessels or shoreline buildings that will interfere with the GPS signals that the Weather Station instrument *must* receive.



1.4 Installing the Weather Station Instrument

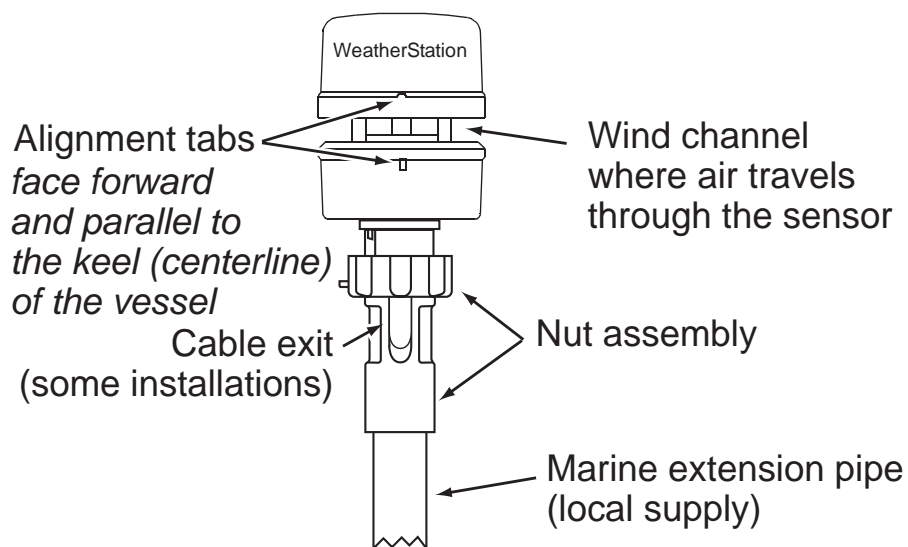
Before beginning the installation, note the following points:

- The blue metal plate and the blue film found in the wind channel of the Weather Station instrument are essential to its operation (see the figure below). Be careful not to scratch the plate, puncture the film, or damage them in any way.



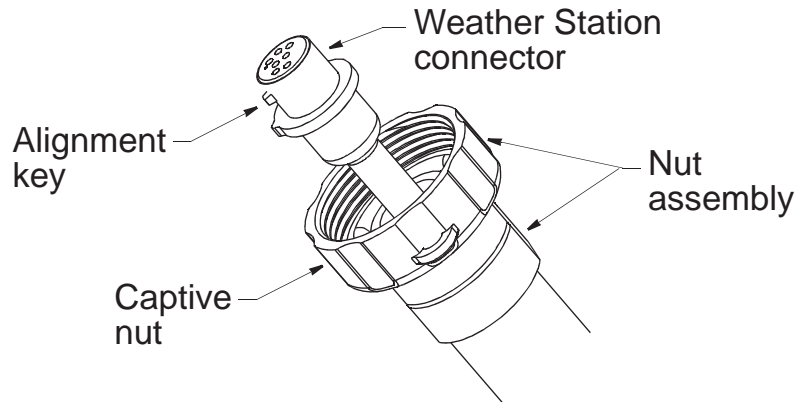
- Do not remove the waterproof connector(s) to ease cable routing. If the cable must be cut and spliced use a suitable splash-proof junction box. Cutting the cable or removing the waterproof connector(s), except when using a junction box, will void the sensor warranty.
- The Weather Station instrument must be installed vertically—NOT tilted to one side.

Installation overview



1. Fasten the marine extension pole (local supply) to the chosen location. Be sure the pole is vertical.
2. Screw the bottom of the nut assembly onto the marine extension pole.
Hand-tighten only. Do not over tighten.

3. With the nut assembly on the cable near the Weather Station connector, thread the cable through the pipe. *Be sure to leave several inches of cable extending beyond the nut assembly.*



CAUTION: If you use a thread lock, use plumber's tape. Do not use a liquid thread lock as it may weaken the plastic, causing it to swell and crack.

4. Screw the nut assembly onto the top of the pipe. **Hand-tighten only.** *Do not over tighten.*
5. Remove the warning label from the Weather Station instrument's socket. (The label may be discarded.) Remove the protective cover from the connector. (Save the cap to protect the connector, when the Weather Station instrument is removed.) Plug the 9-pin connector into the Weather Station instrument. The alignment key on the connector fits into a notch in the base of the Weather Station instrument.

CAUTION: Be sure the alignment tabs on the Weather Station instrument point forward toward the bow and parallel to the centerline of the boat. This is necessary to accurately measure wind direction and vessel heading.

6. *Be sure* the alignment tabs on the Weather Station instrument are facing forward and parallel to the keel (centerline) of the boat (see the figure on previous page). Slide the captive nut upward and screw it onto the base of the Weather Station instrument (see the figure on previous page). **Hand-tighten only.** *Do not over tighten.* Be careful **NOT** to rotate the Weather Station instrument or loosen the nut assembly from the antenna mount. *Double check to be sure the alignment tabs are still facing forward.*

Do not hand tighten or align the Weather Station instrument by holding the upper cap. Grasp the unit by hand below the wind channel to tighten and align.

2. WIRING, SETTINGS

The Weather Station instrument can be connected using the NMEA 0183 interface or the NMEA 2000® network standard.

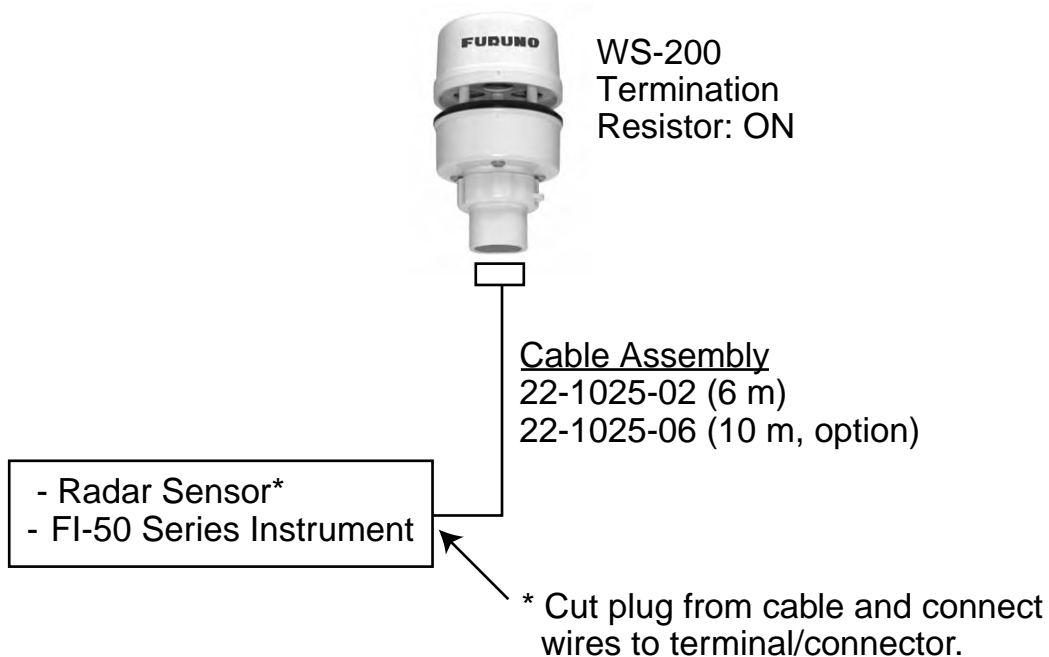
Before doing the wiring, please note the following points:

- To reduce electrical interference, separate the cables from other electrical wiring and the engine.
- Be careful not to tear the cable jackets when passing them through bulkheads and other parts of the boat.
- Coil any excess cable(s) and secure it with a zip-tie to prevent damage.
- The LEN (Load Equivalency Number) for this equipment is 13. (LEN is the amount of current a device draws from the NMEA 2000 network. 1 LEN = 50mA.)

2.1 NMEA 2000® Connection

2.1.1 Direct Connection

Insert the contact pin (supplied) into the #5 socket of the Weather Station connector to activate the termination resistor. (See page 8 for location of #5 socket.) Route the cable assembly to the NMEA 2000® device. Coil any excess cable and secure it with a cable tie to prevent damage. Connect the cable assembly to the NMEA 2000® device.

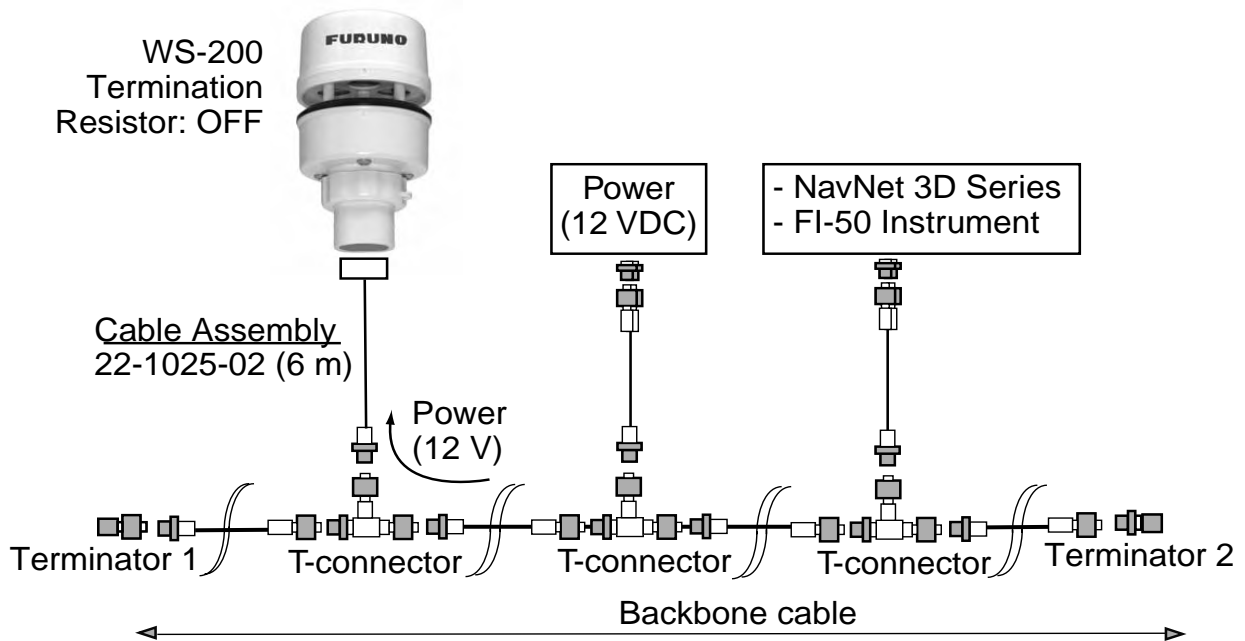


2.1.2 Network Connection

Drop cable connection

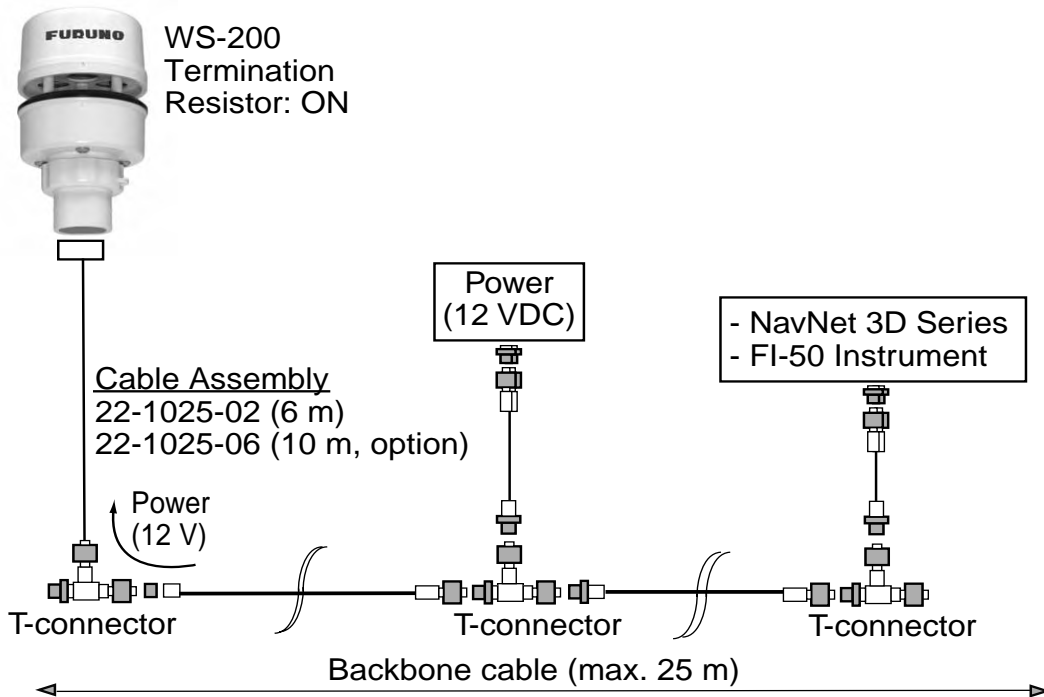
A drop cable is connected to a backbone cable with T-type connectors*. The backbone cable is of the “light” type. Attach a terminator at the ends of the backbone cable. *Only two termination resistors are required on an NMEA 2000® network. More than two will degrade performance.*

* Recommended type: LTWSS-050505-FMF-TS001 (LTW Technology, Inc.), or equivalent.

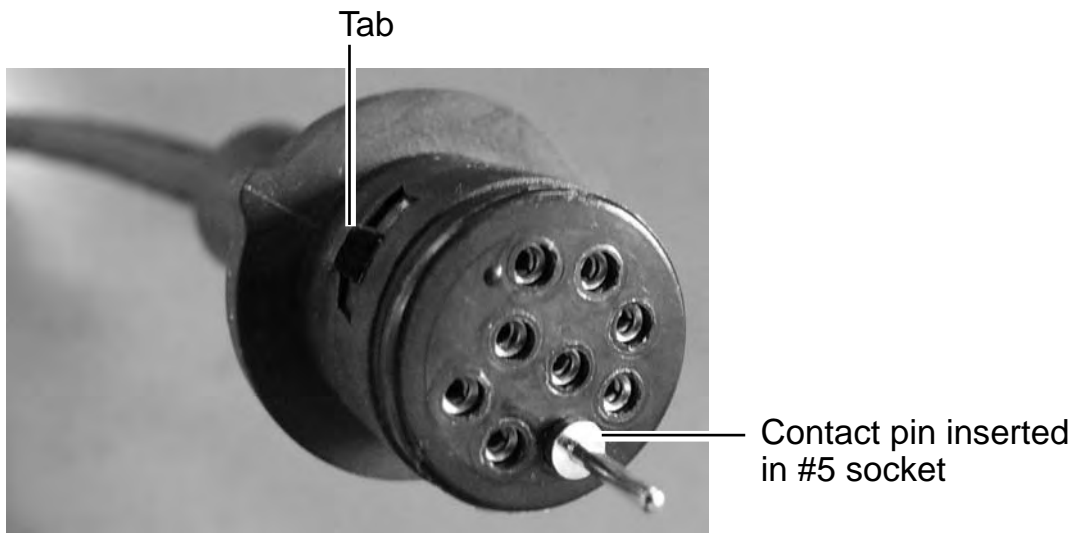


Backbone cable connection

Use this connection method to connect the WS-200 at the final node in the backbone cable. Use T-type connectors to connect equipment to the backbone cable.



Connect the Weather Station at the last node in the network. Insert the contact pin (supplied) into the #5 socket of the Weather Station connector to activate the termination resistor.

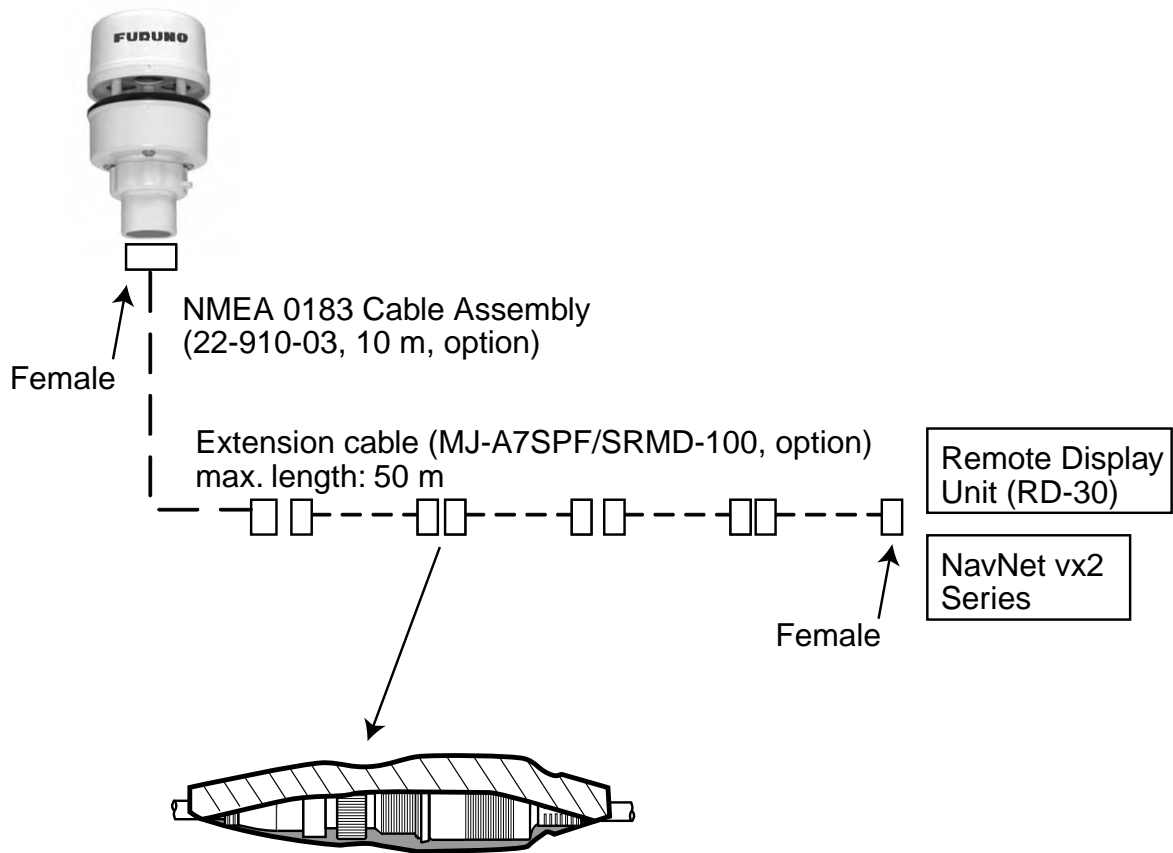


2.1.3 Routing and Connecting the Cable Assembly

Route the cable assembly to the NMEA 2000® device. Coil any excess cable and secure it with a cable to prevent damage. Connect the cable assembly to the NMEA 2000® device.

2.2 NMEA 0183 Connection

Wiring outline



Waterproof connectors by wrapping them with vulcanizing tape and then vinyl tape. Bind tape ends with suitable cable ties.

Wiring procedure

Route the cable assembly to the display. Coil any excess cable and secure it with a cable tie to prevent damage. Connect the Weather Station to your NMEA 0183 display.

2.3 Settings for NavNet vx2

The following items in the NavNet vx2 menu are applicable to the WS-200. For details and operating procedure, see the Installation Manual for your NavNet vx2 model.

NAV SETUP menu

Set POSITION SOURCE to GPS or ALL.

GPS SETUP menu

- **GEODETTIC DATUM**
Select your chart type. WGS-84 is the GPS standard.
- **ANTENNA HEIGHT**
Set the height of the Weather Station above the sea surface.
- **FIX MODE**
Select position fixing mode from 2D (three satellites in view) or 2D/3D (three or four satellites in view).
- **COLD START**
Clear the Almanac currently stored in the built-in GPS receiver to receive the latest Almanac.



WAAS SETUP menu


- **WAAS MODE**
Select ON to use the WAAS mode.
- **WAAS SEARCH**
Select WAAS satellite search method, automatic or manual.
- **CORRECTIONS DATA**
Select the type of message for WAAS connection, 00 for North America, 02 for elsewhere.

WAAS settings effective from the program version numbers shown below.

C-MAP specifications		NAVIO specifications	
Program No.	Model	Program No.	Model
1950026-03.02	Model 1804C-BB	1950025-03.02	Model 1804C-BB
1950024-03.02	Model 1804C	1950023-03.02	Model 1804C
1950028-03.02	Model 1704C	1950027-03.02	Model 1704C

3. MAINTENANCE

 CAUTION
 Do not disassemble the unit.
Disassembling the unit will damage the waterproof seal. Further, there are no user-serviceable parts inside.

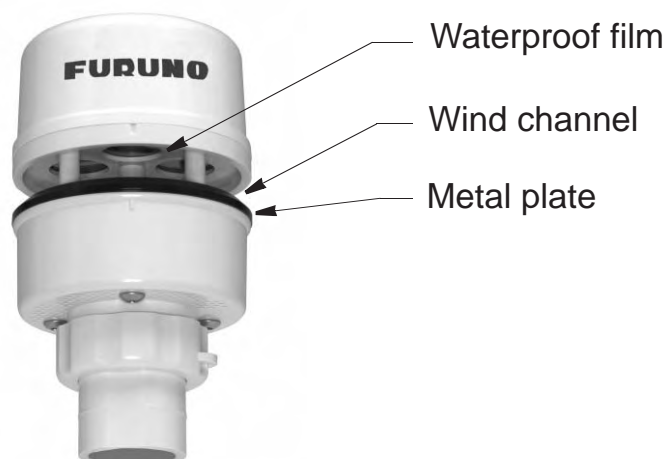
NOTICE
 Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.
Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

3.1 Maintenance

Since the Weather Station instrument has no moving parts, it requires minimal maintenance. It is calibrated at the factory and does not require any calibration after purchase.

The blue metal plate and the blue waterproof film found in the wind channel of the Weather Station instrument are essential to its operation (see the figure below). The blue waterproof film protects the transducers, so *be careful* to keep it intact. Do not to scratch the metal plate or damage it in any way.

Keep the wind channel free of *SPIDER WEBS*, insects, dirt, and other debris.



WS-200

3.2 Troubleshooting

No Readings or Inaccurate Readings

- Is there power to the Weather Station instrument?
- Are all the connections tight?
- Is the cable-run free of kinks?
- Is the wiring correct?
- Are there any obstructions in the wind channel of the Weather Station instrument?

Keep it free of *spider webs*, insects, dirt, and other debris. *Be careful not to puncture the blue waterproof film or scratch the blue plate.*

- Is there ice on the Weather Station instrument?

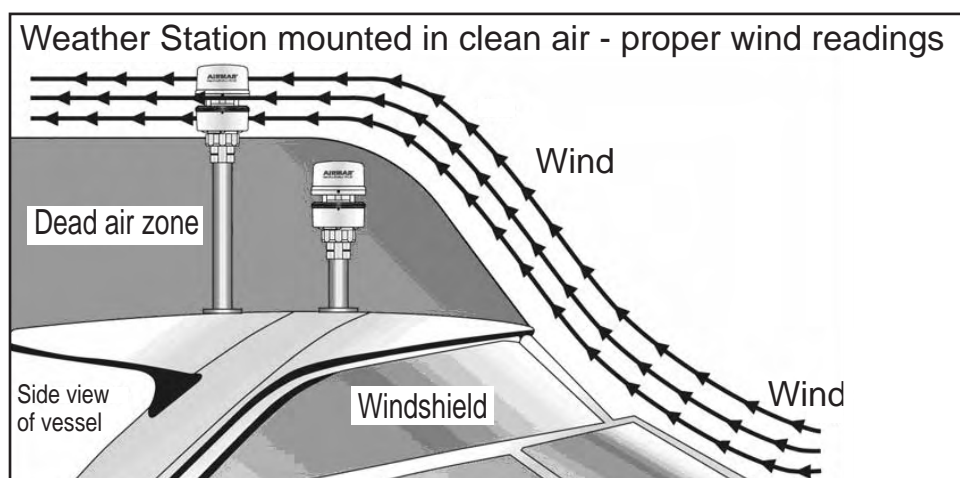
No GPS Fix

- Does the Weather Station instrument have a clear view of the sky?

Wind Readings Are Too Low

- Is the Weather Station instrument mounted forward and low on the boat's hard-top in dead air?

Move the instrument farther back and higher as in the figure below.

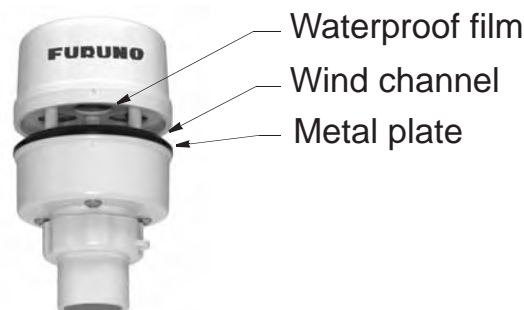


Mounting location

4. HOW THE WEATHER STATION INSTRUMENT WORKS

About the Ultrasonic Wind Sensor

The ultrasonic wind sensor (an ultrasonic anemometer) measures apparent wind speed and direction. The Weather Station instrument contains four ultrasonic transducers, visible through the four holes in the top of the sensor's wind channel (see the figure below). These transducers operate in pairs—one transducer injects a pulse into the air, and the other (directly opposite to it) listens for the arrival of that pulse. Each pulse bounces off the metal plate at the bottom of the wind channel and is carried by the wind to arrive at the opposing transducer a short time later.



Weather Station ultrasonic wind sensor

When there is no wind, the pulse travels at the speed of sound from the sender to the receiver. Whenever the wind is blowing, the pulse will arrive sooner than if the air is still. Similarly, whenever the wind is blowing in the opposite direction, the pulse will arrive later than if the air is still. The four transducers take turns in sending and receiving pulses to cover all eventualities of wind direction.

A microprocessor within the Weather Station instrument then combines the measurements from all four transducers to calculate the resultant wind speed and direction. Throughout this process, the sensor monitors the air temperature, to compensate for the fact that the speed of sound in air changes with temperature.

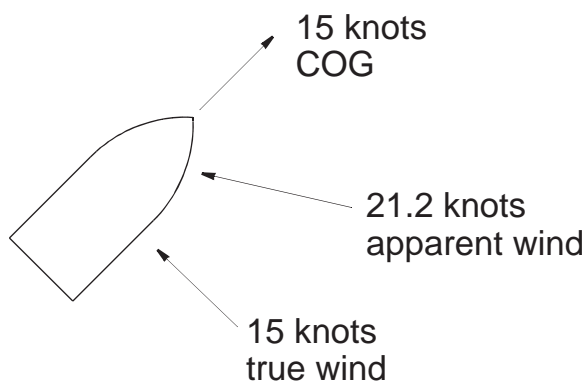
Note: Do not use wind data in the WIND mode of an autopilot, because the data is not sufficiently accurate.

True and Apparent Wind

The Weather Station instrument has the unique ability to display both *true* and *apparent* wind. *True* wind is the actual motion of the air relative to the earth. *Apparent* wind is the wind which an observer experiences while moving or on board a boat. It is the result of two motions—the actual motion of the air (the true wind) and the motion of the boat. If the vessel is not moving, then the true and apparent wind will be the same.

There are two components to any wind measurement: speed and direction. By convention, the wind direction is an angle representing the direction *from* which the wind is blowing. Sometimes this angle is referenced to true or magnetic north, and sometimes it is referenced to the bow of the vessel. Both true and apparent wind use these same references.

Consider the case of a vessel proceeding at a speed of 15 knots in calm air. An observer on board would experience a wind of 15 knots from dead ahead. This *apparent* wind would be due solely to the motion of the boat. If a *true* wind of 15 knots was blowing from the stern, an observer would experience dead calm—no *apparent* wind. That is because the boat is moving at the same speed and in the same direction as the surrounding air.



Now, consider the more complicated situation of a vessel proceeding at 15 knots with a *true* wind of 15 knots blowing from the side (see the figure at right). To an observer on board, the *apparent* wind would be 21.2 knots blowing from an angle 45° off the bow.

In order to calculate the true wind speed and direction when on board a moving vessel, it is necessary to know the apparent wind speed and direction, the speed and course over ground of the vessel, the compass heading, and the local magnetic variation. Note that heading and course are not the same thing: heading is the direction the bow of the vessel is pointing, while course is the direction the vessel is traveling. Heading and course may differ due to the effects of wind and current.

Because true wind is calculated using the data from several sensors, its accuracy depends on the accuracy of all the raw data used in the calculation. For instance, if the electronic compass is located near iron or a similar magnetic disturbance, the heading will be incorrect, and the true wind calculation will therefore be in error, perhaps by quite a bit. In another example, the speed and course over ground provided by the GPS receiver are averaged over time. If the boat is performing maneuvers, changing speed and/or direction, then it will take a few seconds for the SOG and COG values to "catch up". The reported true wind values will therefore also be incorrect until the vessel reaches a steady-state condition, traveling in a straight line at a constant speed.

Air Temperature Sensor

The Weather Station instrument includes a built-in negative-temperature-coefficient thermistor that measures the ambient air temperature. This NTC thermistor is located in a thermally isolated region of the Weather Station housing that is open to the outside air.

Wind Chill Temperature

Wind Chill is a term that describes the heat loss on the human body resulting from the combined effects of low temperature and wind. As wind speed increases, heat is carried away from the body at a faster rate, causing a reduction in skin temperature. Because the face is the part of the human body that is most likely to be exposed, the wind-chill index is adjusted for the average adult face.

The concept of wind chill does not apply to inanimate objects, such as a boat. The only effect that wind chill has in this case is to shorten the time it takes the object to cool to the actual air temperature—wind chill does not cause an object to cool below that temperature. For example, fresh water freezes at 0°C (32°F) regardless of what the wind chill is.

The Weather Station instrument calculates two values for wind-chill temperature: one using the apparent wind-speed, and one using the true wind-speed. The *apparent* wind-chill temperature is relevant to what an observer is currently experiencing on the vessel. The *true* wind-chill temperature indicates what the wind chill would be if the vessel were not moving.

Wind chill temperature is only defined for temperatures at or below 10°C (50°F) and wind speeds above 2.6 knots (3MPH).

In the default condition, transmission of wind-chill data is disabled or enabled depending on NMEA format used.

NMEA 0183 format (XDR sentence): OFF

NMEA 2000® format (PGN sentence 130880): ON

Barometric Pressure Sensor

The Weather Station instrument contains a temperature-compensated, silicon, piezoresistive, pressure sensor. It measures atmospheric pressure for use as a digital barometer. While a single measurement of air pressure at a given location has little value, the trend of changing pressure and wind over time can be a useful tool in performing basic weather forecasting.

GPS

This Weather Station instruments has a built-in Global Positioning System with its own antenna, receiver, and position determining electronics. The GPS receiver receives radio signals from a constellation of orbiting satellites maintained by the U.S. government. By accurately measuring the time it takes for a transmission to travel from each satellite to the receiver, the unit is able to determine the distance between the satellite and the receiver. When the distance is known to three satellites, the unit is able to calculate the latitude and longitude of the receiver. This is known as a 2D fix. If the distance is known to four or more satellites, then the unit is additionally able to calculate the altitude of the receiver. This is known as a 3D fix.

The GPS receiver in the Weather Station instrument takes approximately one minute on average to achieve a position fix after power is first applied. This is known as the "time to first fix."

The GPS receiver synchronizes itself to the atomic clocks on board each satellite. This allows the GPS receiver to accurately determine the date and time as well.

If the GPS receiver is mounted on a moving vessel, its changing position over time allows the speed and course over ground to be calculated. The course reported by a GPS is always with respect to true north.

The ability of the Weather Station instrument to calculate true wind speed and direction depends on the presence of a GPS fix. If the GPS receiver is not tracking at least three satellites, then the Weather Station instrument will be unable to provide true wind data. (Apparent wind data should always be available, regardless of the status of the GPS receiver.)

True Wind Relative to Water

If a fix from a GPS receiver is not available, it is still possible for the Weather Station instrument to determine a value for true wind, if the speed of the vessel through the water is known. In this case, it is necessary that a water-speed sensor with an NMEA output be connected to the NMEA input on the Weather Station instrument.

The Weather Station instrument's calculation for true wind relative to water makes the significant simplifying assumption that the vessel's course is the same as its heading. That is, the effects of wind and current on the motion of the boat are ignored. The direction of the true wind relative to water is referenced only to the bow of the vessel, not to true or magnetic north.

5. TECHNICAL INFORMATION

Note 1: Do not use wind data in the WIND mode of an autopilot, because the data is not sufficiently accurate.

Note 2: Pitch and roll data should not be used where control of follow-up is necessary; for example, radar, scanning sonar.

NMEA 0183 Sentence Commands

* These sentences are enabled at the factory.

\$GPD TM	Datum Reference
\$GPGGA *	GPS Fix Data
\$GPGLL	Geographic Position –Latitude/Longitude
\$GPGSA	GNSS DOP and Active Satellites
\$GPGSV	GNSS Satellites in View
\$WIMDA *	Meteorological Composite. Barometric Pressure, Air Temperature, Wind Direction, Wind Speed
\$WIMWD *	Wind Direction and Speed, with respect to north
\$WIMWV *	Wind Speed and Angle, in relation to the vessel's bow/centerline (relative)
\$WIMWV *	Wind Speed and Angle, in relation to the vessel's bow/centerline (theoretical)
\$GPRMC	Recommended Minimum Specific GNSS Data
\$TIROT	Rate of Turn
\$--VHW	Water Speed and Heading
\$GPVTG *	Course Over Ground and Ground Speed
\$WIVWR	Relative Wind Speed and Angle
\$WIVWT	True Wind Speed and Angle
\$YXXDR	Transducer Measurements: Wind Chill and Vessel Attitude
\$GPZDA *	Time and Date
\$PFEC, GPatt	Heading, Pitch, and Roll
\$PFEC, pidat	

NMEA 2000® PGN Commands

Output NMEA 2000® PGNs

PGN 059392	ISO Acknowledgment
PGN 060928	ISO Address Claim
PGN 065281	Terminator ON/OFF Status
PGN 065285	Proprietary: Boot State Acknowledgment
PGN 065287	Proprietary: Access Level
PGN 126208	Acknowledge Group Function
PGN 126464	PGN List - Transmit/Received PGN's Group
PGN 126720	Addressable Multi-Frame Proprietary
PGN 126992	System Time
PGN 126996	Product Information
PGN 126998	Configuration Information
PGN 127251	Rate of Turn
PGN 127257	Attitude
PGN 127258	Magnetic Variation
PGN 129025	Position, Rapid Update
PGN 129026	COG & SOG, Rapid Update
PGN 129029	GNSS Position Data
PGN 129033	Time & Date
PGN 129044	Datum
PGN 129538	GNSS Control Status
PGN 129539	GNSS DOPs
PGN 129540	GNSS Sats in View
PGN 130306	Wind Data
PGN 130310	Environmental Parameters
PGN 130311	Environmental Parameters
PGN 130323	Meteorological Station Data
PGN 130822	Unit Division Code
PGN 130823	Browser Control Status
PGN 130880	Proprietary: Additional Weather Data
PGN 130881	Heater Control
PGN 130944	Datum

Input NMEA 2000® PGNs

PGN 059904	ISO Request
PGN 060928	ISO Address Claim
PGN 065286	Boot State Request
PGN 126208	Request Group Function
PGN 126208	Command Group Function
PGN 126720	Addressable Multi-Frame Proprietary
PGN 128259	Speed
PGN 130821	NAV Source Select

**SPECIFICATIONS OF WEATHER STATION
WS-200**

1 GENERAL

- 1.1 Wind speed range 0 to 80 kt (0 to 92mph)
- 1.2 Wind speed resolution 0.1 kt (0.1mph)
- 1.3 Wind speed accuracy
 - No precipitation* 1 kt +10% of reading RMS (0 to 10 kt, 0 to 11.5mph)
2 kt (2.3mph) or 5% RMS, whichever is greater
(10 to 80kt, 11.5 to 92.2mph)
 - Wet conditions** 5 kt RMS (5.7mph)
- 1.4 Wind direction range 0° to 360°
- 1.5 Wind direction resolution 0.1°
- 1.6 Wind direction accuracy 6° RMS typical (4 to 10 kt, 4.61 to 11.5mph),
3° RMS typical (>10 kt, 11.5mph)
8° RMS typical (>8 kt, 9.21mph, wet conditions**)
- 1.7 Pitch/roll range -45° to +45°
- 1.8 Pitch/roll accuracy 0.2°
- 1.9 Barometric pressure range 850 to 1150 hPa
- 1.10 Pressure accuracy ±20 hPa
- 1.11 Wind temperature range -25°C to 55°C
- 1.12 Temperature resolution 0.1°
- 1.13 Temperature accuracy 1.1°C, wind speed: 4.0kt or more
- 1.14 Wind chill temperature range -25°C to +10°C, wind speed: 2.6kt or more
- 1.15 Other functions Rate of turn

*: When the wind speed is less than 4 kt (4.6mph) and/or the air temperature is below 0°C, wind speed and direction readings will be less accurate.

** : Wet conditions include moisture, rain, frost, dew, snow, ice and/or sea splay in the wind channel.

2 GPS RECEIVER

- 2.1 Receiving frequency 1575.42 MHz
- 2.2 Tracking code C/A code, WAAS
- 2.3 Number of channel GPS: 12 channels parallel, 12 satellites, WAAS: 2 channels
- 2.4 Position fixing method All in view, 8-state Kalman filter
- 2.5 Accuracy GPS: 10 m approx. (2drms)
WAAS: 3 m approx. (2drms)
- 2.6 Tracking velocity 999 kt
- 2.7 Position update interval 1 s

2.8 Position fixing time 60 s typical (cold start)

3 INTERFACE

3.1 Data format NMEA2000 or NMEA0183 Ver.3.1 (selected by cable)

3.2 NMEA0183

Input sentences VHW

Output sentences DTM, GGA, GLL, GSA, GSV, MDA, MWD, MWV, RMC, ROT
VTG, VWR, VWT, XDR, ZDA

3.3 NMEA2000

Input PGN 059904, 060928, 065286, 126208/720, 128259, 130821

Output PGN 059392, 060928, 065281/285/287, 126208/464/720/992/996/998
127251/257/258, 129025/026/029/033/044/538/539/540,
130306/310/311/323/822/823/880/881//944

4 POWER SUPPLY

12 VDC: 0.2 A max.

5 ENVIRONMENTAL CONDITION

5.1 Ambient temperature -25°C to +55°C

5.2 Relative humidity 95% at 40°C

5.3 Degree of protection IPX6

5.4 Vibration IEC 60945

6 COATING COLOR

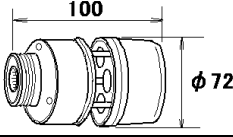
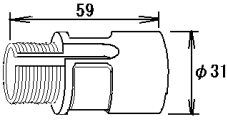
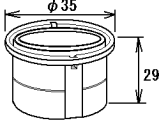
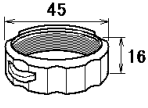
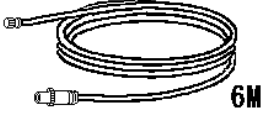
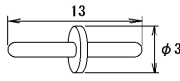
N9.5

PACKING LIST

20BC-X-9851 -1 1/1

WS-200-A

A-1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ウェザーステーション WEATHER STATION		WS-200 000-012-575-00	1
パイプマウントキット PIPE MOUNT KIT.			
アダプター CABLE SIDE-EXIT ADAPTOR		04-673-01 000-168-927-10	1
アダプター ADAPTOR		04-564-01 000-168-926-10	1 (*1)
ナット CAPTIVE NUT		04-565-01 000-168-925-10	1 (*1)
工事材料 INSTALLATION MATERIALS			
ケーブル組品 CABLE ASSEMBLY		22-1025-02 *6M* 000-168-883-10	1
コンタクトピン CONTACT PIN		05-251-01 000-168-935-10	2
図書 DOCUMENT			
取扱説明書 OPERATOR'S MANUAL		OME-44510-* 000-168-027-1*	1

(*1)は組立てられています。
(*1): PRE-ASSEMBLED.

17-478-01 rev. 02

型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

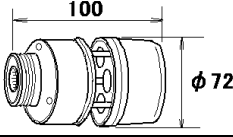
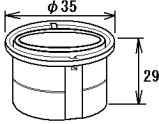
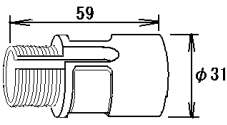
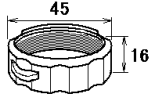
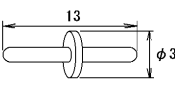
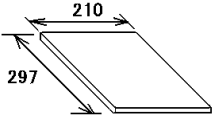
20BC-X-9851

PACKING LIST

20BC-X-9852 -0 1/1

WS-200-N

A-2

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
ウエザーステーション WEATHER STATION		WS-200 000-012-575-00	1
パイプマウントキット PIPE MOUNT KIT.			
アダプター ADAPTOR		04-564-01 000-168-926-10	1 (*1)
アダプター CABLE SIDE-EXIT ADAPTOR		04-673-01 000-168-927-10	1
ナット CAPTIVE NUT		04-565-01 000-168-925-10	1 (*1)
工事材料 INSTALLATION MATERIALS			
コンタクトピン CONTACT PIN		05-251-01 000-168-935-10	2
図書 DOCUMENT			
取扱説明書 OPERATOR'S MANUAL		OME-44510-* 000-168-027-1*	1

(*1)は組立てられています。

(*1): PRE-ASSEMBLED.

17-478-01 rev. 02

型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。なお、品質は変わりません。

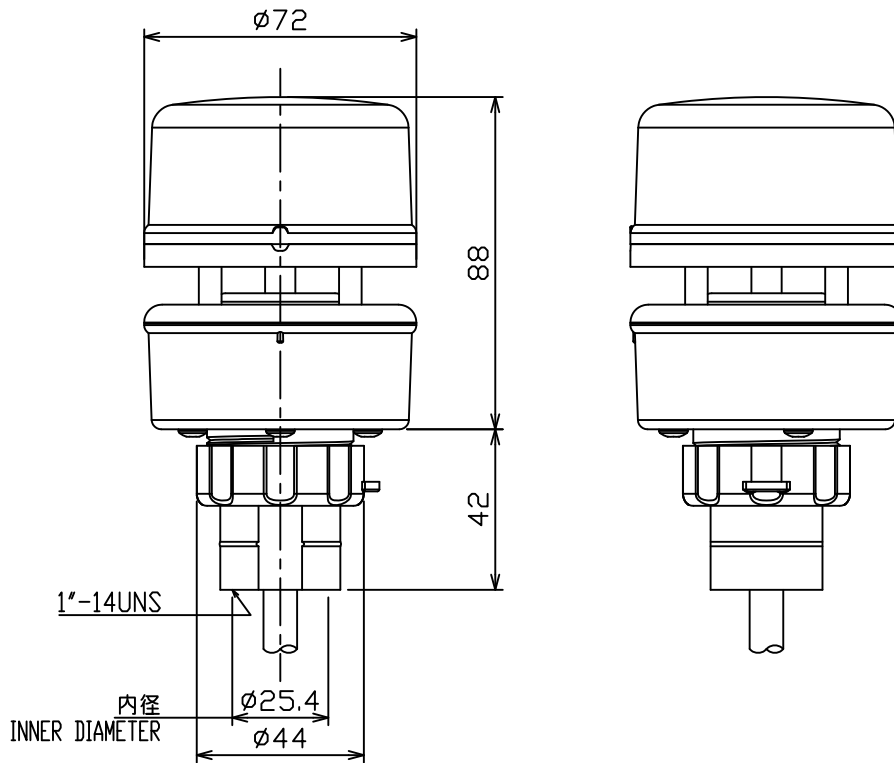
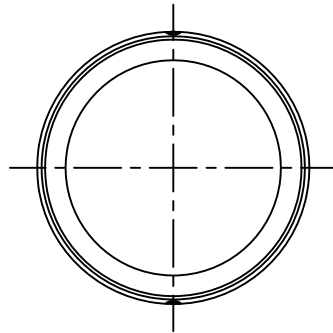
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C4451-Z02-A

表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
$0 < L \leq 50$	± 1.5
$50 < L \leq 100$	± 2.5
$100 < L \leq 500$	± 3



注記

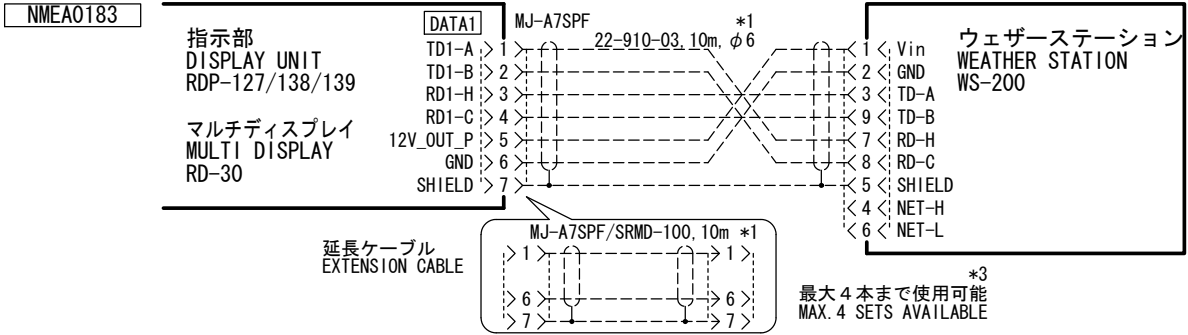
1) 指定なき寸法公差は表1による。

NOTE

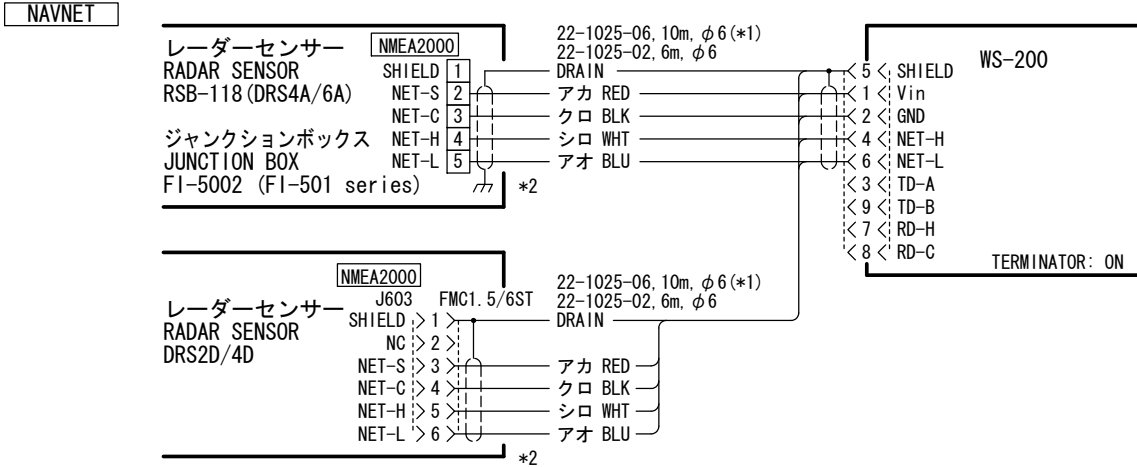
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

DRAWN	Feb. 20 '08 T.YAMASAKI	TITLE	WS-200
CHECKED	Feb. 21 '08 T.TAKENO	名称	ウェザーステーション
APPROVED	Mar. 3 '07 R.Esumi		外寸図
SCALE	1/2 MASS 0.3 $\pm 10\%$ kg	NAME	WEATHER STATION
DWG.No.	C4451-G01-A	REF.No.	OUTLINE DRAWING

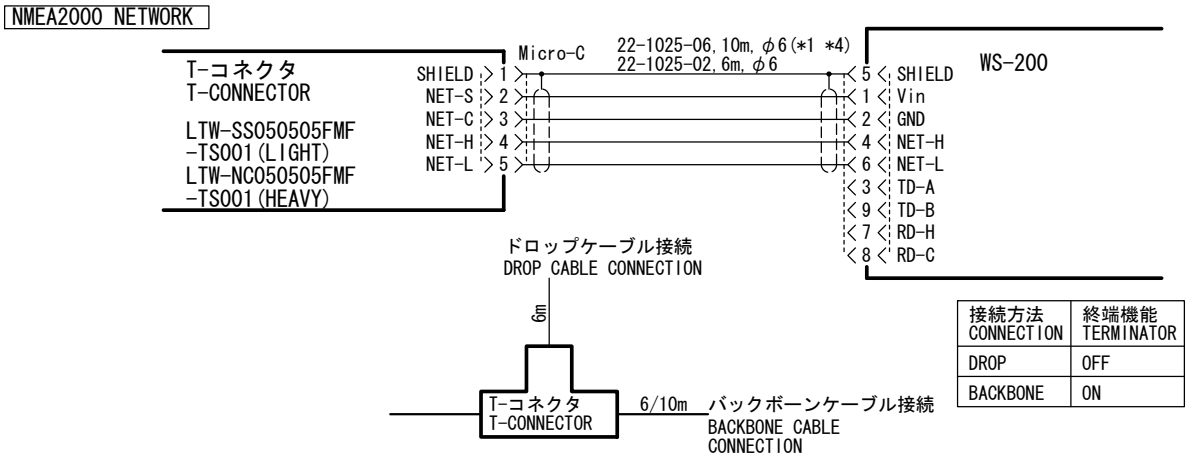
A



B



C



D

注記

- * 1) オプション。
- * 2) プラグを切断して各線を端子 (コネクタピン) に接続する。
- * 3) 延長ケーブルを使用して、最大50mまで延長が可能。
- * 4) バックボーン接続時のみ使用可能。

NOTE

- *1: OPTION.
- *2: CUT PLUG OFF FROM CABLE AND CONNECT WIRES TO TERMINAL/CONNECTOR.
- *3: MAX. 50m LENGTH AVAILABLE BY USING EXTENSION CABLE.
- *4: FOR ONLY BACKBONE CONNECTION.

DRAWN	22/May/08 T. YAMASAKI	TITLE	WS-200
CHECKED	22/May/08 T. TAKENO	名称	ウェザーステーション
APPROVED			相互結線図
SCALE	MASS kg	NAME	WEATHER STATION
DWG. No.	C4451-C01- A	REF. No.	INTERCONNECTION DIAGRAM

ECF

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

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Nishinomiya, 662-8580, JAPAN

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Fax : +81-(0)798-65-4200

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Printed in USA

A : MAY 2008

Pub. No. OME-44510-A

(DAMI) WS-200



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