

Yacht Devices

User Manual

Humidity Sensor YDHS-01

also covers models

YDHS-01R, YDHS-01N

Software version

1.50

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Package Contents

Device	1 pc.
This Manual	1 pc.
Sensor Mounting Pads	2 pc.
Plastic Clamps	2 pc.
Screws	2 pc.

Introduction

This Manual contains information on how to install, configure and operate the digital Humidity Sensor YDHS-01 (hereinafter Device) intended for use in NMEA 2000 marine electronics networks.

The Device provides chart plotters and instrumental displays with humidity and air temperature measurements and calculated dew point temperature. The Device is plug and play; you only need to plug it into a NMEA 2000 backbone to get readings on all chart plotters and instruments on board.

This product can be used for weather monitoring and fog prediction; mold prevention by monitoring of water intake or moisture condensation in lockers; and remote monitoring of living quality. From the helm you can see how comfort it is in the cabin.

The Device can be configured to turn specified channels of digital switching equipment on or off. For example, it can automatically turn on the ventilation when the humidity in the cabin is too high, and also turn it off when the humidity returns to normal. It can turn on the radar if fog is coming (the difference between actual temperature and dew point is lower than specified). See Section X for details.

The measurements of the last 24 hours (humidity and air temperature) are stored in the Device's RAM and can be retrieved by compatible software (CAN Log Viewer) or hardware to provide the user with historical data. The protocol is described in the Appendix C. We will be happy to help developers add support of this feature to their products.

Please read carefully chapters II and III before mounting the sensor. As any sensitive device, the sensor must be handled with care. An improper installation location (under direct sunlight, near a wet surface) can cause faulty or inaccurate sensor readings.

The Device is designed for operation in a NMEA 2000 network and is compatible with a wide range of equipment supporting this protocol. Raymarine SeaTalk NG, Simrad SimNet and Furuno CAN networks are branded versions of NMEA 2000 and differ only in the type of connectors.

The Device can be configured to display inside (saloon, cabin) or outside air temperature and humidity. This can be done easily with CAN Log Viewer software, or it can be done from any chart plotter using a smart sequence of switching of chart datum or magnetic variation setting (tested with Raymarine and Garmin

chart plotters, see chapters V and VII).

Configuration of data instance is also supported. For example, «Inside Humidity» with data instance 0, 1, 2 may mean humidity in saloon and in bow and aft cabins. Chart plotters with factory settings are usually able to show only one value with data instance 0, but manufacturers may supply dealers and professional installers with internal instruments to customize chart plotter screens. That allows installation of dozens of humidity sensors in a single network.

An important rule among sailors is to keep the ocean outside the ship and to remain dry as long as possible. Our Device can help you with that. We thank you for purchasing and wish you happy voyages!

Warranty and Technical Support

1. The Device warranty is valid for two years from the date of purchase. If a Device was purchased in a retail store, the sale receipt may be requested when applying for a warranty claim.
2. The Device warranty is terminated in case of violation of the instructions in this Manual, case integrity breach, or repair or modification of the Device without manufacturer's written permission.
3. If a warranty request is accepted, the defective Device must be sent to the manufacturer.
4. The warranty liabilities include repair and replacement of the goods and do not include the cost of equipment installation and configuration, as well as shipping of the defective Device to the manufacturer.
5. Responsibility of the manufacturer in case of any damage as a consequence of the Device's operation or installation is limited to the Device cost.
6. The manufacturer is not responsible for any errors and inaccuracies in guides and instructions of other companies.
7. The Device requires no maintenance. The Device's case is non-dismountable.
8. In the event of a failure, please refer to Appendix A before contacting technical support.
9. The manufacturer accepts applications under warranty and provides technical support only via e-mail or from authorized dealers.
10. The contact details of the manufacturer and a list of the authorized dealers are published on the website: <http://www.yachtd.com/>.

I. Product Specification

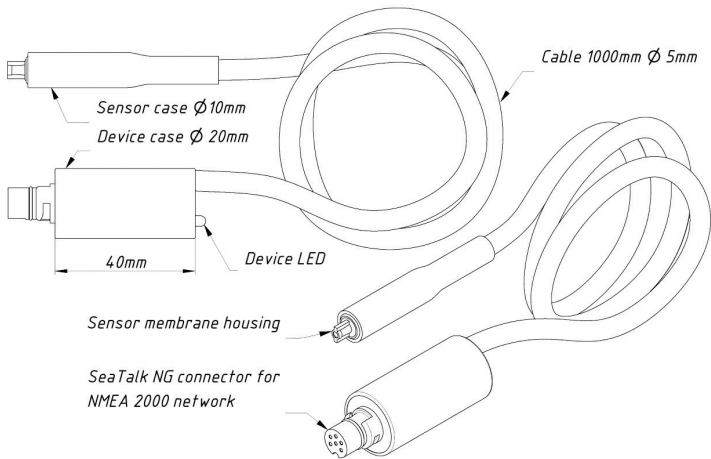


Figure 1. Drawing of YDHS-01R model of Device

Devices are supplied with different types of NMEA 2000 connectors. Models with the suffix R at the end of the model name are equipped with NMEA 2000 connectors compatible with Raymarine SeaTalk NG (as in the picture above). Models with the suffix N are equipped with NMEA 2000 Micro Male connectors which are used by Garmin and other manufacturers (see Appendix B).

Device parameter	Value	Unit
Operating voltage (from an NMEA 2000 network)	7..16	V
Protection against reverse polarity	Yes	—
Average current consumption	23	mA
Load equivalency number	1	LEN
Operating temperature range (except the sensor)	-40..+80	°C
Weight	62	g
<i>Relative Humidity Measurement</i>		
Operating range	0..100	% RH
Measurement resolution	0.04	% RH
Typical accuracy in range 20..80 % RH (1)	± 2	% RH
Accuracy in the rest of range	± 3	% RH
<i>Relative Humidity Measurement</i>		
Operating range	-40..+120	°C
Measurement resolution	0.01	°C
Typical accuracy in range 5..60 °C	± 0.3	°C
Accuracy in the rest of range (maximum)	± 1	°C

Note 1: Normal operating range is 0..80 % RH, beyond this limit the sensor may read a reversible offset with slow kinetics (+3 % RH after 60 hours at humidity >80 % RH).




Yacht Devices Ltd declares that this product is compliant with the essential requirements of EMC directive 2004/108/EC.



Dispose of this product in accordance with the WEEE Directive. Do not mix electronic disposal with domestic or industrial refuse.

II. Sensor Care and Cautions

As with any sensitive device, sensor must be handled carefully. The sensor membrane may require cleaning from sea salt and dirt.

- Do not clean the sensor with chemicals and remove the sensor when painting in the cabin. The sensor should not get in close contact with volatile chemicals such as solvents or other organic compounds. High concentration and long exposure to such must be avoided. Ketenes, Acetone, Ethanol, Isopropyl Alcohol, Toluene, etc. are known to cause drift of the humidity reading – irreversibly in most cases. 
- Do not use high pressure washing and do not point a jet of high pressure at the sensor. This can damage the membrane or lead to the penetration of water through the membrane.
- The sensor is not light sensitive, but long exposure to direct sunlight can cause significant heating of the sensor case. After high temperature exposure, the sensor may temporarily read a negative humidity offset (typically -1 to -2 % RH). This offset slowly disappears again by itself when the sensor is exposed to ambient conditions (typically within 1-3 days).
- Sea salt on the sensor due to hygroscopy can lead to incorrect moisture readings. Wash the sensor with a weak stream of fresh water.
- The sensor has a solid metal body protected with resin, but the membrane at its end has a plastic housing and may be damaged if the sensor is accidentally dropped or struck.

III. Sensor Mounting

When deciding the sensor mounting location, please keep in mind the following recommendations:

1. Choose a well-ventilated area remote from wet surfaces. A sensor located near the deck will detect water evaporation from the wet deck in wet weather. A sensor located in a locker measures the humidity of the air in the locker, but not outside air humidity.
2. Do not place the sensor in direct sunlight. Heating the sensor causes error in humidity and temperature measurements both.
3. To prevent the sensor from being heated by the boat itself, minimize the area of contact between the sensor case and other surfaces, use materials with low thermal conductivity (plastic) to isolate the sensor case from metal surfaces or surfaces that can be heated from inside or from other parts of the boat.
4. Do not place the sensor where it can be flooded by water, gets wet in the rain or sprayed with water. In this case the sensor will measure the drop of water on it.
5. The sensor has a solid metal body protected with resin, but membrane at its end has a plastic housing. Avoid places where the sensor may be exposed to accidental impact.
6. The sensor should be placed vertically with the membrane end pointing toward the deck, which is usually more protected from condensation drops or occasional water spray.
7. The minimum outer diameter of the wire is 30mm when being bent.

The following places may be a good mounting locations:

1. Under the cockpit table on sailing yachts.
2. Under the standing shelter on catamarans and motor boats.

You can affix a sensor with the pads supplied and plastic clamps as shown in Figure 1.

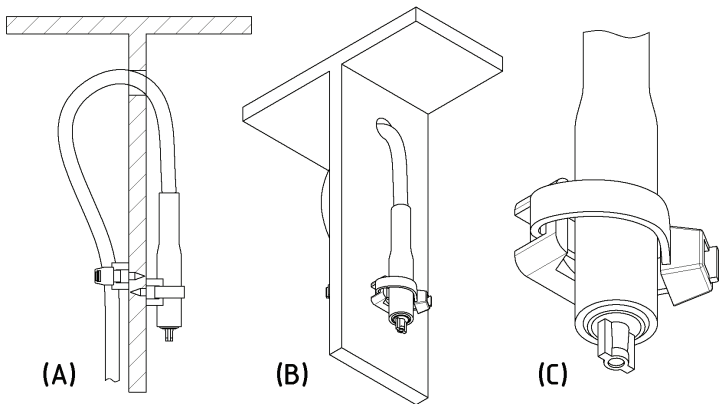


Figure 1. Sensor fixed with supplied pads and plastic clamps. A – side view, B – isometric, C – fixing of clamp.

IV. Device Connection and Testing

The Device requires no maintenance. When deciding where to install the Device, choose a dry mounting location. Avoid places where the Device can be flooded with water, this can damage it. The Device sensor can be mounted inside or outside, see the sensor mounting recommendations in the previous chapter.

The Device is directly connected to the bus without a drop cable. Before connecting the Device, turn off the bus power supply. Refer to the manufacturer's documentation if you have any questions regarding the use of connecting cables, terminators and connectors:

- SeaTalk NG Reference Manual (81300-1) for Raymarine networks
- Technical Reference for Garmin NMEA 2000 Products (190-00891-00) for Garmin networks

After connecting the Device, close the lock on the connection to ensure water resistance and reliability.

After turning on the bus power supply, the LED of the Device with factory settings will produce two short signals every second. This indicates normal operation (see chapter VIII).

If the Device is connected to a network having a chart plotter or any other device transmitting «Datum» (PGN 129044) or “Magnetic Variation” (PGN 127258) messages, the Device will produce six half-second LED signals when a message of that type is received for the first time after power is turned on. This usually happens within 15 seconds after the Device is turned on. The signal series confirms that the Device is properly connected to the NMEA 2000 network and that the chart plotter is able to receive data from the Device.

The Device information should be displayed in the list of NMEA 2000 devices (SeaTalk NG, SimNet, Furuno CAN) or in the common list of external devices on the chart plotter (see Figure 1 on the next page). Usually, access to this list is in the «Diagnostics», «External Interfaces» or «External devices» menu. Data from the Device are available to all the equipment connected to the network and can be displayed simultaneously on several chart plotters and digital navigation instruments.

Raymarine

Share icon

Diagnosics

Select Device

Press to show diagnostic data for all devices: **Show All Data**

Device	Serial No	Network	Software
Digital Radome	E92129 0240451	SeaTalkHS	1.04
Raymarine p70 Display	0140299	STng	2.12
YDHS-01	00080001	STng	1.00 01/03/2017
i50 Tridata Instrument	0130213	STng	1.06
E22158-SeaTalk-STNG-Converter	1034742	STng	1.21
YDBC-05	00005027	STng	1.2 27/02/2015
Raymarine EV-1 Course Computer	0240651	STng	1.01 (RSCP V1 L4)

Standby Radar Tx Sonar GPS Fix

Figure 1. Raymarine c125 MFD devices list with Humidity Sensor (YDHS-01)

Under the factory settings, the Device shows the data as outside humidity and air temperature, and sends a calculated dew point temperature. Switch to the chart plotter screen, which provides information about the air temperature and humidity, or add this data bar to the screen using the instructions supplied with your equipment.

V. Device Programming and Settings



Programming of the Device should not be performed at sea.

The Device can be programmed by three methods. Table 1 on the next page shows the applicability of the methods for different settings. The following methods are supported:

1. By a special sequence of datum or variation settings on a chart plotter (column [1] at Table 1). This method is tricky, but it only requires a chart plotter and it can be performed on legacy chart plotters. Tested with Garmin and Raymarine chart plotters. See chapter VII for details.
2. With a special installation description string which can be entered for the Device in PC software like CAN Log Viewer from our company, ActiSense NMEA Reader or Maretron N2KAnalyzer. This method is very simple and may be supported in some models of chart plotters. Described in the next chapter.
3. Using special PC software, including professional NMEA 2000 installer software. The Device supports «Request Message», «Command Message» and «Write Fields» functions of PGN 126208, which allows changing of the Device settings.

Table 1. Applicability of the programming methods

Number	Setting or action	Method		
		[1]	[2]	[3]
(1)	NMEA 2000 device instance	Yes	Yes	Yes
(2)	NMEA 2000 system instance	Yes	Yes	Yes
(3)	NMEA 2000 data instance	Yes	Yes	Yes
(4)	Inside / outside	Yes	Yes	Yes
(5)	Turn on/off transmission of humidity, air temperature and dew point temperature	Yes	Yes	Note 3
(6)	Transmission interval for periodic messages	Note 1	Yes	Yes
(7)	Humidity and temperature offset	No	Yes	Note 3
(8)	Installation description	No	Yes	Yes
(9)	Reset all settings to factory values	Yes	Yes	Note 3
(10)	NMEA 2000 message priority	No	No	Note 2
(11)	Digital switching settings	No	Yes	No

Note 1: Only turning on with default transmission interval and off are allowed with this method.

Note 2: Setting is not stored in non-volatile memory and acts only while Device is powered.

Note 3: Not allowed with «Command Message» and «Write Fields» of PGN 126208, use method 2.

NMEA 2000 device (1) and system (2) instances should not be modified by a user, these fields are used by installers in complex NMEA 2000 networks. Message priority (10) can be dynamically managed on the network by devices and is not intended to be managed by a user.

NMEA 2000 data instance (3) may be used when multiple Devices are installed. For example, «Inside Humidity» with data instance 0, 1, 2 may mean humidity in saloon and in the bow and aft cabins. Chart plotters with factory settings are usually able to show only one value with data instance 0, but manufacturers may supply dealers and professional installers by internal instruments to customize chart plotter screens. Please refer to your chart plotter manual before changing this setting.

Inside / outside (4) setting switches the transmitting type of measured data between inside (cabin, saloon) air temperature and humidity to outside (the boat) and vice versa. Actually, it changes only the type of transmitted data. The calculated dew point temperature is not affected by this setting because NMEA 2000 only has the «Dew Point Temperature» data type. This can cause a conflict if two Devices are installed. In theory, this conflict can be solved by assigning different data instances (3) to the Devices or selecting a data source in the chart plotter or instrument display. But in practice many of modern chart plotters and instrumental displays have no such capabilities. In this case, you can leave only one source of dew point temperature in your network with the next setting.

Table 2. Data types in periodically transmitted messages

NMEA 2000 Message	Humidity	Air temperature	Dew point
PGN 130311 Environmental Parameters	Yes	Yes	No
PGN 130312 Temperature	No	Yes	Yes (1)
PGN 130313 Humidity	Yes	No	No
PGN 130316 Temperature, Extended Range	No	Yes	Yes (1)

Note 1: Dew point sent in separate message from air temperature

Settings (5) allows you to turn off a specific data type in the transmitted messages. For example, when humidity is turned off, a message with PGN 130313 is transmitted with a «no data available» value. And the same for air temperature. The only exception is for the dew point temperature. The Device will stop sending messages with dew point temperature if this data type is turned off.

Note that a small number of chart plotters and instrumental displays incorrectly process the «no data available» value if there is more than one data source present on the network. This may cause «flashing» of data on the display when it receives a «no data available» value after a valid value from other source.

The Data transmission interval (6) setting allows changing of the interval of periodical (data transmitting) messages with methods [2] or [3] and individually turning on/off message transmission with all three methods. Intervals from 50 milliseconds (value 50) to 1 hour (value 3600000) are allowed, a value of 0 turns off the transmission (but data can be received by request). «Restore default Interval» value is also supported in method [3] (see Appendix C). In case of method [1], the user can only turn on and off transmission of messages.

The Device sensor is calibrated at the factory, and wrong readings usually mean that the sensor requires some cleaning (see chapter II) or is mounted improperly (see chapter III). Therefore, you can set an offset (7) from -10.0 to +10.0 (Celsius, % RH) for the sensor readings to align with readings from other ship equipment.

Installation description (8) are two text fields (see the next chapter), which can be filled in by installer to specify the Device's location or leave notes and contact data. Special strings starting with «YD:» in the second field are used for Device programming in method [2].

Resetting of settings (9) returns a Device to the factory state.

The next two chapters describe the details of Device programming with methods [2] and [1]. Regarding method [3], please refer to your software manual and the NMEA 2000 Standard.

To learn about digital switching settings (11), see Sections VI and X.

VI. Programming with Installation Description String

Installation description strings are usually written by installers to specify the device location or to leave notes or contact information. This can be done with professional PC software (with a hardware connector to NMEA 2000 network) and it may be supported by some models of chart plotters. Please refer to your software or chart plotter documentation for details.

Address Claim	
Address	52 HEX: 34
Update	
Unique number	80075
Manufacturer code	717
Device instance	0
System instance	0
Class / function	75 / 170
Industry	4: Marine
Self-configurable	Yes
Update	

Product Information	
Database version	1.301
Product code	588
Model version	Humidity Sensor / YACHTD.COM
Model ID	YDHS-01
Software version	1.02 13/11/2017
Serial	00080075
Certification	Not applicable
LEN (mA)	1 [50 mA]

Heartbeat		
<input checked="" type="checkbox"/> CAN1	<input type="checkbox"/> CAN2	<input checked="" type="checkbox"/> Equipment
Updated 00:01:39.296		

Configuration Information	
Installation description 1	
Installation description 2	YD:DEV 1
Manufacturer information	Yacht Devices Ltd., www.yachtd.com
Update	

Refresh

Figure 1. Programming with CAN Log Viewer

To program the Device, enter a special string starting with «YD:» to the installation description field 2 in the Device properties. For example, «YD:DEV 1» (without quotes) will change the NMEA 2000 device instance of the Device to 1. If the command is accepted by the Device, it will add «DONE» to the entered text and «YD:DEV 1 DONE» will be displayed in the case of our example. Note that the Device always accepts correct strings regardless of the current settings, etc.

In Figure 1 on the previous page, you can see the process of programming the Device with free CAN Log Viewer software (to open this window, select the item «NMEA 2000 Devices» in the «View» menu, refresh the list of devices, select the device and click «Properties» button). You can download this program (runs on Microsoft Windows, Mac OS X and Linux) at <http://www.yachtd.com/downloads/>, Yacht Devices NMEA 2000 Wi-Fi Gateway or Yacht Devices NMEA 2000 USB Gateway is required to connect the PC with NMEA 2000 network.

In the software you can also modify the NMEA 2000 device instance by entering a value in the dedicated field (see «Address Claim» group on the screenshot).

After entering the command as shown in Figure 1 (click «Update» button to apply changes), the value in the «Device Instance» field will be changed to 1, and «Installation Details 2» field will be changed to «YD:DEV 1 DONE».

The full list of special strings is in Table 1. Please see the PGN description in Table 2 of previous chapter.

Note 1: This setting stops the transmission of data, but does not stop the transmission of corresponding messages. Please see previous chapter for details.

Table 1. Special strings

String format	Examples	Description
YD:DEV <number>	YD:DEV 1	Set NMEA 2000 device instance value (0..255). Factory setting 0.
YD:SYS <number>	YD:SYS 1	Set NMEA 2000 system instance value (0..15). Factory setting 0.
YD:DAT <number>	YD:DAT 252	Set NMEA 2000 data instance value (0..252). Factory setting 0.
YD:INSIDE YD:OUTSIDE	YD:INSIDE YD:OUTSIDE	Switches transmitted type of measured data to inside (cabin, saloon) air temperature and humidity or to outside. Factory setting OUTSIDE.
YD:PGN <pgn> <interval>	YD:PGN 130311 0 YD:PGN 130312 500	Set transmitted interval for specified message (130311, 130312, 130313, 130316) in milliseconds. Values from 50 to 3600000 (1 hour) are allowed, value 0 turns transmission of specified PGN off. See also Table 2 of previous chapter.
YD:DATATYPE <string>	YD:DATATYPE NONE YD:DATATYPE DHT YD:DATATYPE HT	«NONE» — turn off transmission of all data types. «D» in the string turn on transmission of dew point, absence of «D» turn off transmission. «H» and «T» — the same for humidity and air temperature. String is ignored if not equal to «NONE» or contains other characters than «D», «H» and «T» (must be specified without spaces). «DHT» string turns on transmission of all data types. See also Note 1 on the page #18.
YD:TEMPERATURE <d> YD:HUMIDITY <d>	YD:TEMPERATURE 1 YD:HUMIDITY -1.5	Set positive or negative offset in °C or % RH. Values from -10.0 to 10.0 are allowed.

String format	Examples	Description
YD:SWT (parameters) YD:SWH (parameters) YD:SWD (parameters)	See Section X.	Turn on or off a channel of digital switching equipment depending on actual temperature, humidity, or difference between actual temperature and dew point.
YD: RESET	YD: RESET	Reset all settings to factory values.

VII. Programming with Datum or Variation

To program the Device with this method, you must connect it to a network with a chart plotter. This method of programming is tricky, but is compatible with virtually all NMEA 2000 chart plotters.

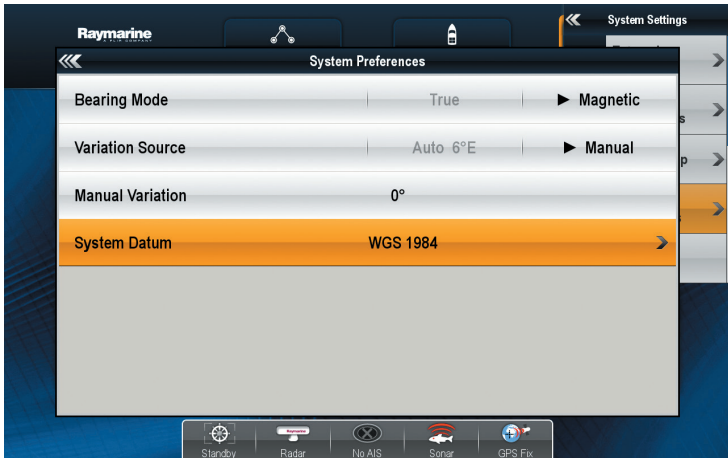


Figure 1. Setting the chart datum and magnetic variation on Raymarine c125

If one network includes several chart plotters, turn off all of them except the one from which you will program the Device. If multiple Devices are connected to the network, they will be programmed at the same time.

The Device confirms commands received from the chart plotter by lighting LEDs for 3 seconds once or repeatedly. If you are not able to see the Device LED when sitting behind the chart plotter, you may need an assistant.

Programming the Device is performed either by a sequential change of chart datum settings, or sequential change of the magnetic variation settings on the chart plotter. Older models of Raymarine plotters do not send notifications when changing the magnetic variation (NMEA 2000 message with PGN 127258) and only the first method is available for them. Garmin plotters do not send notifications when the chart datum is changed (NMEA 2000 message with PGN 129044) and only the second method is available for them.

To select a programming method, refer to the documentation of your chart plotter. In some cases you may need to update the plotter firmware.

STEP 1. Putting the Device into standby mode

The Device enters standby mode if, when it is switched on, the chart datum is set on the plotter to «Ireland 1965» or if the magnetic variation on the plotter is set to a user-defined value of 26°E.

Usually, the plotter sends notifications on settings every 20 seconds. When changing the setting on the plotter as mentioned above, do not forget the initial configuration of the plotter. Cycle the Device power. Within a minute after the Device is turned on, it will produce a confirmation signal (LED will light up for 3 seconds). This means that the Device is put into standby mode. If the Device power is turned off along with the plotter power, the wait time for the signal will be increased by the plotter loading time.

If after some time the setting on the plotter automatically returns to the previous value, that is an indication that there is another device on the network sending notifications. It may be an NMEA0183-NMEA2000 converter, another plotter, or a computer connected to the NMEA 2000 network. Turn off the power of this device or disconnect it from the NMEA 2000 bus

at the time of programming. It is recommended to disconnect any such device from the bus when the bus power is off.

STEP 2. Putting the Device into programming mode

If the Device was put into standby mode by setting the chart datum (magnetic variation), all the subsequent steps should be carried out with the setting of chart datum (magnetic variation).

In the standby mode, without turning the Device power off, change the chart datum setting on the plotter to «Australian Geodetic 1966» or change the magnetic variation setting to 28°W. The Device will produce one confirmation signal and enter programming mode.

The programming mode ends automatically 10 minutes after the Device power is turned on. Four confirmation signals are produced at the same time. After that, the Device returns to normal operation mode. The settings are not saved into non-volatile memory and if the Device settings were changed at the time of programming, they will be kept only until the Device power is turned off.

STEP 3. Programming the Device

Device actions in response to chart plotter settings changes are described in Table 1 on the next page. Please note that changing the Device settings occurs only when changing the plotter configuration. To increase the value of the system instance by 2, set 21 °E, then 24°E (if the Device transmits inside measurements) or 23°E (if Device transmits outside measurements), and then set 21 °E again. After each change, wait for the Device confirmation signal (LEDs light up for 3 seconds). Usually, when changing the setting, the plotter sends notification immediately and the Device signals just after the setting value is changed.

Table 1. Device actions in response to setting changes

Chart datum	Magnetic variation	Result
ARC 1950 (Africa)	22°E	Turn on and off transmission of periodic messages with a 4-bit value (0..15, binary 0000..1111), reset to 0 after 15. This setting increases the value. See note 1.
Bermuda 1957	20°E	Increase NMEA 2000 data instance value (0..252), reset to 0 after 252. Factory setting is 0. To decrease the value, reset all settings to factory values first and then increase the data instance.
Bogota Observatory (Colombia)	21°E	Increase NMEA 2000 system instance value (0..15), reset to 0 after 15. Factory setting is 0.
Campo Inchauspe (Argentina)	23°E	Increase NMEA 2000 device instance value (0..255), reset to 0 after 255. Factory setting is 0. To decrease value, reset all settings to factory values first and then increase it.
European 1950 (Mean, European Datum)	29°E	Reset all settings to factory values.
Guam 1963 (Pacific Ocean)	24°E	Switches transmitted type of measured data to inside (cabin, saloon) air temperature and humidity.
Hjorsey 1955 (Ireland)	25°E	Switches transmitted type of measured data to outside (the boat) air temperature and humidity. This is the factory setting.
Liberia 1964 (Africa)	27°E	Turn on and off transmission of humidity, air temperature and dew point temperature with 3-bit value (0..7, binary 000..111), reset to 0 after 7. This setting increases the value. See note 2.

Note 1: Unlike the programming method described in the previous chapter, this method does not allow setting the interval for messages with periodic transmission. This method allows turning on and off message transmission only. When transmission is turned on, the interval specified in NMEA 2000 Standard for this message is applied (see Appendix C).

1st bit (least significant) corresponds to PGN 130311 «Environmental Parameters», 2nd to PGN 130312 «Temperature», 3rd to PGN 130313 «Humidity», and 4th to PGN 130316 «Temperature, Extended Range». Factory setting have all these bits set (value 15, 1111 binary). Increasing of the value over 15 causes it to reset to 0 (transmission of all periodic messages is off) and the next increase will turn on the transmission of PGN 130311 (setting value of 0001 binary).

Note 2: 1st bit (least significant) corresponds to humidity, 2nd bit to air temperature and 3rd to dew point temperature. Factory setting has all bits set (value 7, 111 binary). Increasing of the value over 7 causes it to reset to 0 (transmission off for all data types) and next the increase turns on transmission of humidity (setting value 001 binary).

STEP 4. Saving the settings in the non-volatile memory

Without turning the Device power off, change the chart datum setting on the plotter to «WGS 1984», or magnetic variation setting to 27°W. The Device will save the settings in the non-volatile memory, produce three confirming signals, and return to normal operation mode. If you do not save the settings into the non-volatile memory, they will be kept only until the power is turned off (see STEP 2). Do not forget to return the initial chart plotter settings after programming.

VIII. LED Signals

Signal	Meaning
Repeated very short (25 milliseconds) signals	Normal operation. It is indicator of periodical messages sending (see Table 2 in chapter V). Interval between flashes is 500 milliseconds by default, but can be changed by user.
Six half-second signals, once after power on	Chart plotter presence indicator. This sentence is produced on first receiving of «Datum» (PGN 129044) or «Magnetic Variation» (PGN 127258) messages. Usually it happens within 20 seconds after chart plotter loading.
Three second signal, once or repeatedly	Programming signals. See chapter VII for details.
Repeated 2.5 second signal with 0.5 second interval	Device cannot claim NMEA 2000 address. Possible under special factory tests only.
Signals with length of 1 second or more, from time to time	Cable is located near refrigerators, alternators or other sources of strong electromagnetic interference. See note 1.
Constant LED signal	Sensor cable and/or sensor are damaged. See note 1.

Note 1: Communications with the sensor are digital, data integrity is protected by a checksum. When the Device cannot get response from the sensor, or data are invalid, the Device turns on an LED for one second and makes the next attempt after a small delay (less than second). If communication fails, signal time is set to 1 second again. Therefore, communication errors produce signals of variable length, but not less than 1 second. Cable or sensor damage causes a constant LED signal.

IX. Firmware Updates



Firmware updates are supported in the firmware version 1.40 and later.

Firmware updates can be done with free CAN Log Viewer software running on Microsoft Windows, Mac OS X and Linux:

http://www.yachtd.com/products/can_view.html

The program must be connected to an NMEA 2000 network with USB Gateway YDNU-02 or a Wi-Fi Gateway YDWG-02.

You should download the latest firmware version from our website:

<http://www.yachtd.com/downloads/>

Open the downloaded .ZIP archive with the update and copy the YDHS01.BIN to the disk. The README.TXT file inside the archive can contain important information regarding the update.

1. Click the «NMEA 2000 Devices» item in the «View» menu.
2. Click the «Refresh» button (see Figure 1 at the next page) in the opened window and wait for the Device to appear in the list.
3. Select the Device and click the «Firmware Update» button.
4. Locate and select the update file with the .BIN extension on the disk.
5. Wait while the firmware is uploading.

If in doubt, watch the video with the update procedure on our web site. During the firmware upload, the Device's LED flashes very fast. When the firmware is updated, Devices produce five half-second signals and the CAN Log Viewer also informs you that the update is successfully done.

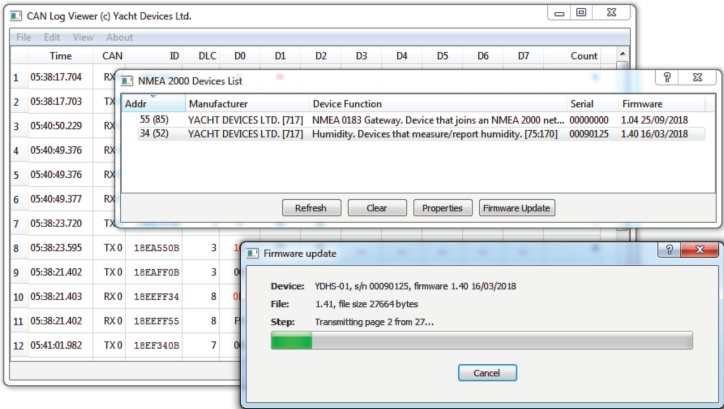


Figure 1. Firmware update of Humidity Sensor

X. Digital Switching Support

The Humidity Sensor (with firmware 1.50 or later) can turn on or off channels of NMEA 2000 digital switching which support the PGN 127502 «Switch Bank Control». A list of compatible equipment can be obtained on our web site. Configuration can be performed with the method described in Section VI.

You can configure 3 different rules to turn on and 3 rules to turn off the channels depending on the actual temperature value, relative humidity value, and difference between actual temperature and dew point (six conditions in total). Here is an example command:

```
YD:SWT ON <-0.5 60 0 1
```

This command programs the temperature rule to turn ON channel 1 (values 1 – 28 are allowed, channel numbers start from 1) of Switching Bank 0 (values 0 – 252 are allowed, zero based) if the temperature is below -0.5 Celsius (allowed values are from -273.15 to 2000 Celsius) in the last 60 seconds (intervals from 0 to 65534 seconds are allowed).

The command:

```
YD:SWT OFF >5 10 0 1
```

Programs the temperature rule to turn OFF this channel if the temperature has exceeded 5 Celsius in the last 10 seconds. The bank number and the channel in the ON and OFF conditions of the same rule can be different.

To check the programmed rule, run the following command without parameters:

```
YD:SWT
```

The answer in the «Installation Description 2» field will be:

```
SWT ON <-0.50 60 0 1, OFF >5.00 10 0 1 DONE
```

To disable the ON condition, type:

YD:SWT ON NEVER

To configure the rule for relative humidity, use the command YD:SWH in the same way. This command programs the humidity rule to turn ON channel 3 of Switching Bank 1 if the humidity has been above 60% (allowed values are from 0 to 100 percent) in the last 10 seconds:

YD:SWH ON >60 10 1 3

Table 1. Dew point temperature, Celsius

RH, %	Actual temperature, Celsius										
	1	10	20	30	40	50	60	70	80	90	99
1	-49	-44	-38	-32	-26	-20	-15	-9	-3	2	7
10	-27	-20	-13	-5	3	10	17	25	32	39	46
20	-19	-12	-4	5	13	21	29	37	45	53	60
30	-15	-7	2	11	19	28	36	45	53	61	69
40	-11	-3	6	15	24	33	41	50	59	68	75
50	-8	0	9	18	28	37	46	55	64	73	81
60	-6	3	12	21	31	40	49	59	68	77	85
70	-4	5	14	24	33	43	52	62	71	81	89
80	-2	7	16	26	36	46	55	65	75	84	93
90	0	8	18	28	38	48	58	68	77	87	96
99	1	10	20	30	40	50	60	70	80	90	99

The third rule is managed by YD:SWD and accepts the difference (from -273.15 to 2000 Celsius) between actual temperature and dew point temperature as an argument. To turn on the radar (bank 0, channel 2) if the fog is coming (actual temperature is less 4°C from dew point), type:

YD:SWD ON <4 10 0 2

Note that dew point is calculated by the Device when the actual temperature is above 0°C, and this rule will never act when the actual temperature is 0°C or less.

When the condition becomes true (and remains true for a specified time interval), the Device sends the command to the network. If no response (PGN 127501 «Binary Status Report») is received in 200 milliseconds or the status of the channel in the answer does not match, the Device re-sends the command one time.

After sending the command, the condition becomes inactive. It will be active again when it remains false for the specified time interval. Therefore, it is not recommended to use a zero time interval, since this can cause sending of multiple messages if the measured value is not stable (or has no noticeable trend). Also, if the interval is too big, the fact that returning to the original state will take as much time as the triggered action may lead to undesirable results.

For example, you need to program the ventilation (bank 0, channel 1) to run if the humidity is above 70% or temperature less than 8°C degrees from the dew point (for example, humidity is above 60% at 20°C, see Table 1) for more than 10 minutes; and stop ventilation when humidity is below 60% or temperature is more than 10°C degrees from the dew point.

To configure the Humidity Sensor in this way, enter the following commands (one by one, and wait for confirmation with «DONE» after the each command):

```
YD:SWH ON >70 600 0 1
YD:SWD ON <8 600 0 1
YD:SWH OFF <60 10 0 1
YD:SWD OFF >10 10 0 1
```


Appendix A. Troubleshooting

Fault	Possible reasons and solution
The LED does not signal after the Device is turned on	<p>1. No power supply on the bus. Check if the bus power is supplied (NMEA 2000 network requires a separate power connection and can not be powered by a plotter or another Device connected to the network).</p> <p>2. Loose connection in the power supply circuit. Treat the Device connector with a spray for cleaning electrical contacts. Plug the Device into another connector.</p>
The Device LED flashes, but the Device is not displayed in the list of external devices on the plotter, data do not appear, a series of six LED signals not observed within a minute after switching on the Device and the plotter	<p>1. Loose connection in the data circuit. Treat the Device connector with a spray for cleaning electrical contacts. Plug the Device into another connector.</p> <p>2. There are problems in the NMEA 2000 network. The network segment is not connected to the plotter or there are missing terminators in the network. Plug another device into the selected connector and make sure it appears in the list of devices on the plotter</p>
Sensor readings are not accurate	<p>1. Sensor is under direct sunlight or was heated. Please, see chapter II and III of this manual.</p> <p>2. Sea salt is on sensor. Sensor requires cleaning, see chapter II for details.</p>
Data readings flash on instruments, LED is lit for one second or more from time to time	<p>1. Electromagnetic interference. Remove sensor cable from power cables.</p>
Constant signal of LED, no data available	<p>1. Sensor or sensor cable are damaged. Check the sensor cable.</p>

Appendix B. Device Connectors

V+, V- - Battery 12V; CAN H, CAN L - NMEA 2000 data;
SCREEN - Not connected in the Device.

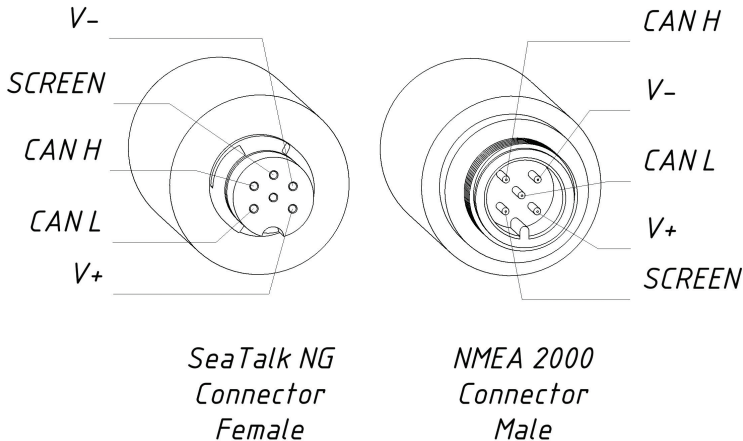


Figure 1. NMEA 2000 connectors of the YDHS-01R (left) and YDHS-01N (right) models

Appendix C. NMEA 2000 Messages

Table 1. NMEA 2000 Messages

Message	Received	Transmitted	Period, sec	Note
PGN 59392 ISO Acknowledgment	Yes	Yes	—	
PGN 59904 ISO Request	Yes	—	—	
PGN 60160 ISO Transport Protocol (DT)	Yes	—	—	
PGN 60416 ISO Transport Protocol (CM)	Yes	—	—	
PGN 60928 ISO Address Claim	Yes	Yes	—	
PGN 65240 ISO Commanded Address	Yes	—	—	
PGN 61184 Proprietary: History Request	Yes	—	—	Table 2
PGN 126208 NMEA Group Function	Yes	Yes	—	1
PGN 126464 PGN List (Received / Transmitted)	—	Yes	—	
PGN 126993 Heartbeat	—	Yes	60	
PGN 126996 Product Information	—	Yes	—	
PGN 126998 Configuration Information	—	Yes	—	
PGN 127258 Magnetic Variation	Yes	—	—	2
PGN 127501 Binary Status Report	Yes	—	—	Section X
PGN 127502 Switch Bank Control	—	Yes	—	Section X
PGN 129044 Datum	Yes	—	—	2
PGN 130311 Environmental Parameters	—	Yes	0.5	3
PGN 130312 Temperature	—	Yes	2	3
PGN 130313 Humidity	—	Yes	2	3
PGN 130316 Temperature, Extended Range	—	Yes	2	3

Table 1 continued

Message	Received	Transmitted	Period, sec	Note
PGN 130816 Proprietary: History Data	—	Yes	—	Table 3

Note 1: Request Message, Command Message and Write Fields are supported.

Note 2: Used in Device programming (see chapter VII).

Note 3: User can change the period or turn off transmission of this message (see chapter V). See Table 2 in chapter V for description of transmitted data types.

Table 2. PGN 61184 «Proprietary: History Request»

Single Frame: <i>Yes</i>		Priority: <i>3-6</i>			Frequency: <i>N/A</i>	
Destination: <i>Address</i>		Query Support: <i>Prohibited</i>			Direction: <i>Receive</i>	
Field #	Name	DD	DF	Width [bits]	Value [decimal]	Remark
1	Manufacturer Code	172	52	11	717	Yacht Devices Code
2	Reserved Bits	1	52	2	3	All bits set to «1»
3	Industry Group	168	52	3	4	«Marine Industry»
4	1st Point Offset	6	52	13	0..8291	0 to get the latest data
5	Data Instance	201	52	3	<ul style="list-style-type: none"> • 0: Temperature (0.1 Kelvin/bit, zero offset) • 1: Humidity (0.01 %/bit, -300% offset) • 2: Pressure (10 Pa/bit, zero offset) • Other values: Reserved 	Type of requested data, 0 and 1 are supported only. Messages with other instances are ignored
6	Points Interval	383	116	16	2..58 with step 2, 60..65520 with step 60	Interval between points in seconds
7	Number of Points	6	53	8	1..107	0 – 107 points can be returned
8	Reserved	1	52	8	255	All bits set to «1»

Table 3. PGN 130816 «Proprietary: History Data»

Single Frame:	No	Priority:			6	Frequency:	N/A
Destination:	Global	Query Support:			Prohibited	Direction:	Answer
Field #	Name	DD	DF	Width [bits]	Value [decimal]	Remark	
1	Manufacturer Code	172	52	11	717	Yacht Devices Code	
2	Reserved Bits	1	52	2	3	All bits set to «1»	
3	Industry Group	168	52	3	4	«Marine Industry»	
4	1st Point Offset	6	52	13	As in the request	See Table 2	
5	Data Instance	201	52	3	As in the request	See Table 2	
6	Points Interval	210	80	16	As in the request	See Table 2	
7	Data Age	383	116	16	0..65532	Age of the point with zero offset, in milliseconds	
(8..115)	Data (variable number of fields, from 0 to 112)	0	54	16	65535 means «sensor error» or «no data»	Value depends on field #5, see Table 2	

Note: *The Device stores measurements (actual temperature and relative humidity) over the last 3.5 minutes with 2-second intervals (100 points of each type) and measurements of the last 24 hours with 1-minute intervals (1440 points of each type) in the RAM. Depending on Field #6 of the request, the Device will return data from the short (when the interval is below 60 seconds) or long array.*

The Device ignores incorrect requests. For correct requests, if no data is available, the Device returns only 7 fields in the answer. To obtain the number of returned points, subtract 8 bytes (width of fields #1-#7) from the message payload size and divide the result by 2 (width of the data field in bytes).

The requesting device should compare fields #1 - #6 of the answer against the request sent to be sure that the answer is addressed to it. In case of a mismatch, it should re-send the request.

Note that field #7 in the request is the age of the point with zero offset in the Device's memory. The age of the first returned point in milliseconds can be calculated as:

$$(field\ #4) * (field\ #6) * 1000 + (field\ #7)$$

Example: A request of the last 100 measurements of the temperature with 2-second intervals from the Device with the network address 0x34 (hexadecimal):

18EF340B CD 9A 00 00 02 00 64 FF

The answer's payload size is 24 bytes (0x18 hexadecimal), 8 points are returned, the age of the 1st returned point is 332 milliseconds (0x14C hexadecimal):

```
19EF0034 00 18 CD 9A 00 00 02 00
19EF0034 01 4C 01 94 0B 94 0B 96
19EF0034 02 0B 8C 0B 8A 0B 94 0B
19EF0034 03 82 0B 8C 0B
```

The latest temperature value is 296.4 Kelvin (0x0B94 hexadecimal, 23.25 Celsius or 73.85 Fahrenheit). The oldest value, measured 16 seconds and 332 milliseconds ago (when the Device was turned on, because the number of returned points [8] is less than the storage size [100] and less than requested [100]), is 295.6 Kelvin (0x0B8C hexadecimal).

The CAN Log Viewer software (version 1.20 and above) can display historical data from all our sensors and display sent and received CAN messages. This free program is the best way to test and learn the protocol.

