

Yacht Devices

User Manual

Outboard Gateway YDOG-01

also covers models

YDOG-01N, YDOG-01R

Firmware version

1.00

2021

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Package Contents

Device	1 pc.
This Manual	1 pc.
Paperclip for reset	1 pc.
NMEA 2000 Drop Cable	not supplied

Note: Device can be connected to the network backbone directly, without an NMEA 2000 drop cable.

Introduction

The Outboard Gateway (hereinafter Gateway or Device) is designed for petrol engines without digital interfaces, and provides NMEA 2000 equipment with engine revolutions (RPM), alternator voltage (measured at the NMEA 2000 interface) and engine hours. It can also be programmed to use data from NMEA 2000 temperature or pressure sensors and send these data as coolant and oil pressure or temperature, boost or fuel pressure.

To connect the Gateway, you only need to connect it to the NMEA 2000 backbone, make 3-5 turns of its wire around the spark plug wire, and affix the loops with tape. In most cases, no additional settings are required, but you might need to set the RPM divider according to the ignition system and type of your engine.

The Device can be programmed to issue high revolutions, high temperature and low voltage warnings, and set the state of the charge indicator (displayed on MFD or NMEA 2000 display). If you have a single battery on your boat, the low voltage warning can prevent the situation where a problem with the alternator or voltage regulator of your engine is detected when the battery is already nearly dead.

The Gateway is equipped with a hidden button that allows changing the engine number (0 - 3), RPM divider (from 0.5 to 8) and resetting the Device's settings. These settings are enough to install the Device.

To configure other settings, you need a PC gateway (from any manufacturer, including our USB, Ethernet and Wi-Fi products) and software. The firmware of the Outboard Gateway can only be updated from free CAN Log Viewer software (works on Microsoft Windows, Linux and MacOS X) connected to NMEA 2000 with one of our NMEA 2000 gateways.

Thank you for purchasing our product and 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 of 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, nor the shipping of the defective Device to the manufacturer.
5. Responsibility of the manufacturer in case of any damage as a consequence of Device 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. In the event of a failure, please refer to Appendix A before contacting technical support.
8. The manufacturer accepts applications under the warranty and provides technical support only via e-mail or through authorized dealers.
9. Contact details of the manufacturer and a list of the authorized dealers are published on the website: <http://www.yachtd.com/>

I. Specification

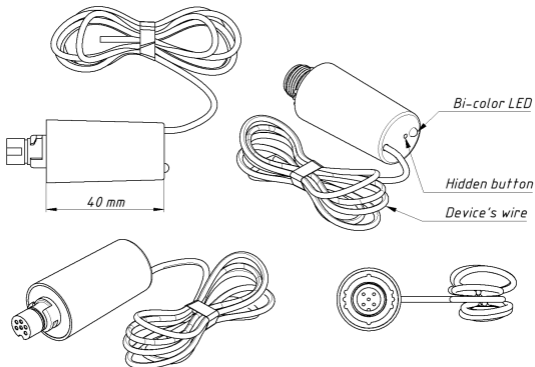



Figure 1. Drawing of YDOG-01R (at left) and YDOG-01N (at right) models of Device

Our devices are supplied with different types of NMEA 2000 connectors. Models containing an «R» in the suffix of the model name are equipped with Raymarine SeaTalk NG compatible connectors. Models containing «N» in the suffix are equipped with NMEA 2000 Micro Male (DeviceNet) connectors which are used by Garmin and other manufacturers.

Device parameter	Value	Unit
Supply voltage (from NMEA 2000 network)	9-16	V
Current consumption (from NMEA 2000 network)	30	mA
Load Equivalency Number	1	LEN
Pulse counting range (per minute)	200-70000	PPM
RPM (pulses) counting accuracy	±0.5	%
Voltage measurement accuracy	±0.05	V
Engine hours resolution	1	second
Operating temperature range	-20 to +80	°C
Device case length (without connector)	40	mm
Wire length	2000	mm
Wire temperature range	-50 to +180	°C
Weight	25	g

 Yacht Devices Ltd declares that this product is compliant with the essential requirements of EMC directive 2014/30/EU and radio and TTE directive 1999/5/EC.



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

II. Device Installation and Connection to NMEA 2000

The Device requires no maintenance. When deciding where to install the Device, choose a dry mounting location. Do not place the Device where it can be flooded by water or exposed to rain or water spray. Please note that you may need to observe LED signals and/or press the Gateway's hidden button during the configuration procedure.

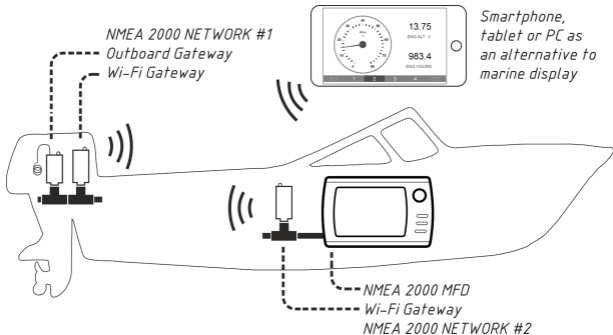


Figure 1. Bridging of two NMEA 2000 networks over Wi-Fi

If your outboard engine is big enough, the Device can be placed inside the engine. Make sure that it is securely fastened, ventilated, isolated from hot surfaces and protected from possible water, oil or petrol spray. If you have a problem with routing the NMEA 2000 cable to the motor, you can place the Outboard Gateway and NMEA 2000 Wi-Fi Gateway YDWG-02 inside the motor, and power them from the ignition.

The data from the Wi-Fi Gateway can be accessed from any web browser or app. Or you can install the second Wi-Fi Gateway inside your boat and the pair creates a Wi-Fi bridge to virtually join NMEA 2000 the network inside your boat with the network inside your engine.

The Device is powered from the NMEA 2000 interface and can be directly connected to the NMEA 2000 network backbone without a drop cable. To connect the Device to a Simrad SimNet network (with yellow connectors) you can use an adaptor cable (SimNet Female – NMEA 2000 Micro Female, Navico part number 24006199).

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 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 connector to secure and waterproof it. After turning on the NMEA 2000 network power supply, the Device's LED will start flashing every 5 seconds, indicating that the Gateway is powered and functioning (see Section IV for details).

Please note that you can't directly connect the Device to NMEA 2000 port of your chart plotter, the NMEA 2000 network requires a dedicated 12V power source.

III. Connection to the Engine and Initial Setup



Do not electrically connect Device's wire.

The Device's wire works like an antenna catching ignition impulses sent to a spark plug. Usually you need to wrap the wire 3-5 times around the spark plug wire, and fix the loops with tape (we recommend a tape rated for automotive use). More turns make the signal stronger, but it makes noise stronger too.

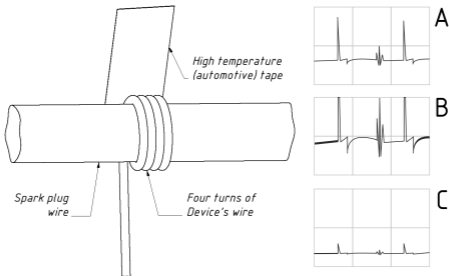


Figure 1. A – signal is good, B – signal is over amplified, C – signal is too weak.

Avoid placing the Device's wire near voltage regulators, an alternator or other sources of electro-magnetic noise. If the wire is too long, you may cut it. If the wire is too short, you can enlarge it, but note that a longer wire can also catch more noise. If you have a choice between enlarging of NMEA 2000 cable and Device's wire, it is better to enlarge the NMEA 2000 cable, because it is designed to work in a harsh environment and is less susceptible to electromagnetic interference.

The ignition system sends from one impulse per two revolutions (most 2-stroke twin-cylinder outboard motors) to 8 impulses per revolution to a spark plug, depending on the engine type and the ignition system type. The factory setting of the Device is one impulse per revolution (classic 2-stroke engines, 4-stroke engines with CDI).

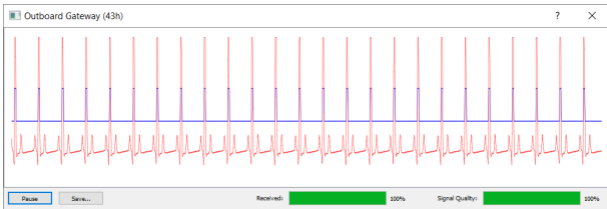


Figure 2. Oscillograms in the CAN Log Viewer

If you have one of our NMEA 2000 gateways, you can observe the incoming signal (500 milliseconds recording, updated twice per second) in the free CAN Log Viewer software (see Section VI). To open the window with oscillograms (Figure 2), click the “More...” button in the Outboard Gateway properties window (Section VI, Figure 1).

The red line in the window shows the signal as it is seen by the Gateway, the blue line shows impulses detected by the Gateway. The «Signal Quality» in the lower right corner is the assessment of AI of the Gateway (good values are in the range of 60-100%). The «Received» progress bar shows how many points of the current oscillogram were received by the CAN Log Viewer from the Device. The real time transmission of oscillograms significantly loads the NMEA 2000 network, and we recommend turning off AIS and chart plotters to increase the “Received” value. The window’s data can be saved as spreadsheet or image with the “Save...” button.

The following steps help you setup your Gateway.

1. Tuning the signal level

Do not change factory settings at this step. If you bought a used device, we recommend that you reset it (Section V.4). Run the engine at idle revolutions and check the Device’s LED signals (see Section V). If the first signal in a sequence is RED, add one more turn, because the signal is too weak (Figure 1.C).

If you can observe the signal in the CAN Log Viewer (Figure 2), its amplitude should be 90-100% and noises should be less than 30% of the window area height.

2. Tuning the signal quality

When the signal strength is tuned, check the second LED's signal. It will be GREEN, if the quality of the signal is good. If the signal is RED, try removing one or two turns (the first signal must remain GREEN, we assume that the signal is overamplified, as at Figure 1.B), or, conversely, try to add one more turn (assuming that signal is amplified not enough amplified, despite the first signal being GREEN). The general rule is to have the smallest possible number of turns enough to keep first two signals GREEN at idle revolutions.

3. Adjust the RPM divider and the algorithm

When the quality of the signal is tuned, you should adjust the RPM divider if required. Note, that the NMEA 2000 Standard limits an engine revolution at 16384. Even if you need the divider 8, at idle speed (600-900 RPM) revolutions will be visible at MFD and will be 8 times higher (4800-7200 RPM). But to complete the installation, you need to test it at full speed, because at full speed noise can become higher (and you may need to change the route of Device's wire).

For most modern 2-stroke twin-cylinder outboard motors a divider of 0.5 is required. Classic 2-stroke engines and 4-stroke engines with CDI need a divider of 1 (factory setting). Classic 4-stroke engines with an ignition distributor need a divider of 2.

The Device has four built-in algorithms of signal processing. The first algorithm (factory default) is optimized to count up to 15000 pulses per minute and cut high-frequency noise from the signal. It is well suited for RPM dividers 0.5-2. The second algorithm counts up to 70000 pulses per minute and must be manually selected if you are using a divider of 3 or higher. Algorithms 3 and 4 are experimental and can be changed in future versions.

Both settings can be modified with the hidden button or with PC software (please, refer Sections V and VI).

4. Other settings

In case of two or more engines, you should configure the engine number for all engines except the port engine. This can be done with the hidden button or with PC software.

If the current engine hours are known, you can specify this number as fixed offset (YD:HOURS command). We also recommend configuring warnings and linking external pressure and temperature sensors, if you have them. These settings can be modified with PC software only. Please refer to Section VI.

IV. LED Signals

The Device is equipped with a bi-color LED that indicates the Device's state. At power on, the Device produce a single very short GREEN flash to indicate that power is supplied.

1. Signals during normal operation

During the normal operation, the Device emits a four-flash sequence every 5 seconds. When the engine is running, you should observe GREEN-GREEN-RED-GREEN or four GREEN flashes.

The first flash in the sequence is GREEN if the signal strength is sufficient, and must be RED if the engine is off. The second flash is GREEN if the quality of the signal is good. If you are changing the speed, the first signal should remain GREEN, but the second may change to RED during changes. Please, refer to Section III for details.

The third signal is GREEN if the Device receives messages listed at Appendix B (see "Receive" column) from the NMEA 2000 network. Usually, this signal is RED and changes to GREEN when you are opening the list of external devices or the list of NMEA 2000 devices on a chart plotter or cycle the power of some NMEA 2000 device in the network.

The fourth signal is GREEN if the Device sent something to NMEA 2000 (and the message was received by another device or devices). This signal should be always GREEN, because the Gateway sends periodic messages with engine data every 100 and 500 milliseconds (see Appendix B). It can be RED in case of network error or when engine messages settings are modified with YD:PGN or YD:ZERO_RPM commands (see Section VI).

2. Signals during configuration with button

The LEDs' behavior during configuration with the hidden button is described in Section V.

3. Signals during firmware update

The LEDs' behavior during firmware update is described in Section VII.

V. Configuration with a Hidden Button

With this method, you can change engine number, RPM divider, and pulse counting algorithm, as well as reset the Device to factory settings.

The status LED of the Device will constantly shine RED when the hidden button is pressed.

1. Engine number programming

Click the hidden button (see Figure 1 in Section I) with the paper clip supplied with the Device. A single click puts the Device into engine number programming mode.

After one second, the Device will issue a series of GREEN flashes. A single flash means that the engine number is set to 0 (factory setting, port or single engine), two flashes means that engine number is 1 (starboard engine in twin engines configuration), and so on.

Click the button and the setting value will be increased (or reset to the smallest value, if the maximum value has been exceeded), and the Device will issue a series of GREEN flashes to visually confirm the new setting.

To leave programming mode, wait about 10 seconds. The Device will save your setting and issue a normal mode flash sequence (four flashes, see Section IV). Please note that your new settings will be applied only after saving and leaving programming mode.

2. RPM divider programming

To enter divider programming mode, click the button twice. A single flash in the response sequence means that the divider is 0.5 (multiply to 2), two flashes mean divider 1 (factory setting) and so on. Nine flashes indicates a divider of 8.

All processes are identical to engine number programming. Note that a NMEA 2000 data field is limited to 16383 RPM and with an incorrect divider the data may be unavailable at high revolutions (e.g., you need a divider of 4, but set the divider to 1 and NMEA 2000 data field will have an “out of range” value at 4100 RPM).

3. Algorithm selection

To enter the algorithm selection mode, click the button 3 times. The single flash in the response sequence means algorithm 1 (provides better noise filtering, but counts up to 15000 pulses per minute), two flashes mean algorithm 2 (counts up to 70000 PPM) and so on. Algorithms 3 and 4 are experimental and will be changed in future versions. All processes are identical to engine number programming.

4. Reset to factory settings

To reset Device to factory settings, click the button 8 times. The Device will confirm the command with a 1-second GREEN flash, reset the settings, and return to a normal flashing sequence.

5. Wrong command

When the wrong number of clicks is entered (e.g. 5 or 9) and the user command is not recognized, the Device responses with 1-second RED flash and then returns to a normal flashing sequence.

VI. Configuration with Installation Description Strings

Installation description strings are stored in the Device's memory and are usually written by installers to specify the device location or to leave notes or contact information. They can be set with a PC software and a hardware gateway to the NMEA 2000 network. Some models of chart plotters also allow editing of installation description strings. Please refer to your software or chart plotter documentation for details.

The screenshot shows the 'Device Properties' dialog box with the following data:

Section	Field	Value
Address Claim	Address	67 (HEX) 43
	Unique number	840001
	Manufacturer code	717
	Device instance	0
	System instance	0
	Class / function	80 / 80
	Industry	4: Marine
	Self-configurable	Yes
	Update	
	Product Information	Database version
Product code		11163
Model version		Outboard Gateway / YACHTD.COM
Model ID		YDOG-01
Software version		0.95 26/07/2021
Serial		00840001
Certification		Not applicable
LEN (mA)		1 [50 mA]
Heartbeat	CAN1	<input checked="" type="checkbox"/>
	CAN2	<input type="checkbox"/>
	Equipment	<input checked="" type="checkbox"/>
Updated		00:56:57.337
Configuration Information	Installation description 1	
	Installation description 2	YD-DEV 1
	Manufacturer information	Yacht Devices Ltd., www.yachtd.com
Update		
Refresh		
More...		

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 this installation description field. If a command is entered without the last parameter, the device replies with the current value of the parameter.

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/>

A Yacht Devices NMEA 2000 Wi-Fi Gateway, Yacht Devices NMEA 2000 Ethernet Gateway, Yacht Devices NMEA 2000 USB Gateway or Yacht Devices NMEA 2000 Wi-Fi Router is required to connect the PC to the NMEA 2000 network. The CAN Log Viewer also allows you to 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 the «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».

Parameters in square brackets [] described below can be omitted to obtain the current setting's value.

1. Reset and NMEA 2000 specific commands

1.1 YD:RESET

This command resets Device settings to default values. Unlike all other commands, it leaves Installation Description String 2 empty.

1.2 YD:DEV [0..255]

Switches NMEA 2000 device's instance to specified value. This setting is used in large NMEA 2000 networks and does not effect the Device's behavior.

1.3 YD:SYS [0..15]

Switches the NMEA 2000 system instance of the Device to the specified value. This setting is used in large NMEA 2000 networks and does not affect the Device's behavior.

1.4 YD:PGN <pgn> [OFF | 0 | 50..60000]

Where: <pgn> is 127488, 127489 or 126993

Set transmitting interval for specified PGN, the value is in milliseconds. OFF or 0 disable periodic PGN transmission. For default transmission intervals and PGNs description see Appendix B.

Example 1. Set the periodic transmission interval for “Engine Parameters, Dynamic” PGN to 1 second:

```
YD:PGN 127489 1000
```

Example 2. Obtain the transmission interval for “Heartbeat” PGN:

```
YD:PGN 126993
```

1.5 YD:ZERO_RPM [ON|OFF]

Factory setting is ON. With the OFF value, the Device does not send messages with engine data (PGN 127488, 127489; they also contain engine warnings and alerts) when RPM is 0.

2. Settings required at initial setup

Settings in this group can also be programmed with the hidden button (see Section V).

2.1 YD:ENGINE [0..3]

Factory setting is 0 (port or single engine). Set to 1 for starboard engine in twin engines configuration or for middle engine in 3 engines configuration.

2.2 YD:DIVIDER [0.5 .. 8]

Factory setting is 1. The divider for counted pulses, from 0.5 (multiply to 2) till 8. Allowed values are 0.5, 1, 2, 3, 4, 5, 6, 7, 8. See Section III.3 for details. If you set the RPM divider to 3 or higher value, do not forget to change the algorithm of pulse counting (next setting).

2.3 YD: ALG [1..4]

Factory setting is 1, the number of built-in algorithm for pulse counting. The first algorithm has better noise filtering, but counts up to 15000 pulses per minute. The second algorithm counts up to 70000 pulses per minute and is recommended if you have an RPM divider of 3 or higher.

3. Calibration

3.1 YD:HOURS [-12000000.00 .. 12000000.00]

The factory setting is 0. The offset in minutes for engine hours is counted by the Device. Note that a negative number of engine hours (when the negative offset is greater than hours counted by the Device) will be sent to NMEA 2000 as zero.

Example 1. Set the 1 hour 3 minutes and 30 second offset:

YD:HOURS 63.5

3.2 YD:VOLTMETER [-1.25 .. 1.25]

Factory setting is 0. Fixed offset for voltage measurements in Volts, can be used to compensate voltage dropout in wires.

3.3 YD:24V [ON | OFF]

Factory setting is OFF. Turn the setting ON if the NMEA 2000 is powered from 12V battery from a 24V batteries bank to double voltage readings. This setting is applied after YD:VOLTMETER. After turning on, do not forget to adjust the levels of low battery warning and charging indicator (VI.5).

3.4 YD:DAMPING_VOLT [0 .. 3.0]

Factory setting is 2.0, the damping time for voltage readings in seconds. The damping works smart and does not average readings if the value changes sharply. When the Device is located inside the engine and far from the battery, its power supply circuit may have interference that interferes with accurate measurements. A bigger damping value can solve this problem. The Device measures the voltage 6 times per second: settings of 0.2 or 0.3 are equal to 0 and turns the damping off, and a setting of 0.4 will count the two last measurements.

3.5 YD: DAMPING_RPM [0 .. 3.0]

Factory setting is 1.0, the damping time for RPM readings in seconds. The damping works smart and does not average readings if the value changes sharply. The Device measures engine revolutions 6 times per second: settings 0.2 or 0.3 are equal to 0 and turn the damping off, the setting 0.4 will count the two last measurements, and the setting 1.0 will count 6 last measurements.

4. External sensors

The Device can take temperature and pressure data from external NMEA 2000 sensors and send them as engine data. The data can also be used to generate engine alerts. The syntax of the command is:

```
YD:sensor [instance | OFF]
```

Where the “sensor” can be: CLNT_T – coolant temperature, CLNT_P – coolant pressure, OIL_T – engine oil temperature, OIL_P – engine oil pressure, BOOST – boost pressure, FUEL_P – fuel pressure. The factory setting for all sensors is OFF.

“Instance” is a number from 0 till 253, it is NMEA 2000 data instance of the sensor, do not confuse this with the data source. For example, you may have two temperature sensors with the data source 13 (Freezer Temperature), and instances 0 and 1. These can be interpreted as first and second freezers, or port and starboard freezers.

For temperature and pressure data, most of MFDs usually displays data with the instance 0 only. For example, your thermometer’s data source is configured to “Air Temperature”. In this case, you can use an instance between 1 and 253 to “hide” this sensor from the MFD.

For example, to configure the Yacht Devices Digital Thermometer YDTC-13 as a coolant temperature sensor, type the first command in thermometer properties, and the second command in the Gateway’s properties (instance 10 was randomly chosen):

```
YD:DAT 10
```

```
YD:CLNT_T 10
```


5. Warnings and indicators

5.1 YD:WARNINGS [ON | OFF]

Factory setting is ON. Globally turns on/off all warnings described below.

5.2 YD:OVERSPEED [50..12700 | OFF]

Factory setting is OFF. To turn on the engine speed warning (revolutions exceeded the limit), set the value in the specified range with a step of 50 RPM.

5.3 YD:HIGHTEMP [90..344 | OFF]

Factory setting is OFF. To turn on the over temperature warning, set the value in the specified range in degrees Celsius. If a coolant temperature sensor is linked, then its data will be used; otherwise, oil temperature data will be used. This warning can only be issued when the engine is running.

5.4 YD:LOWVOLT [8.0 .. 33.4 | OFF]

This setting turns the low voltage warning on and OFF. Factory setting is 11.5V. This warning can be set whether the engine is running or not. Note that the Gateway does not send data messages (including warnings) when the engine is not running and the ZERO_RPM setting is set to OFF (see VI.1.5, factory setting is ON).

5.5 YD:CHARGE [8.0 .. 33.4 | OFF]

Turns the battery charging indicator on and OFF on MFDs and NMEA 2000 displays. Factory setting is 13.6V. Charging indicator is displayed only when the engine is running.

VII. Firmware Updates

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 Yacht Devices NMEA 2000 USB Gateway YDNU-02, Wi-Fi Gateway YDWG-02, Ethernet Gateway YDEN-02 or Wi-Fi Router YDNR-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 YDOGO1.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 RED signals and the CAN Log Viewer also informs you that the update is successfully done.

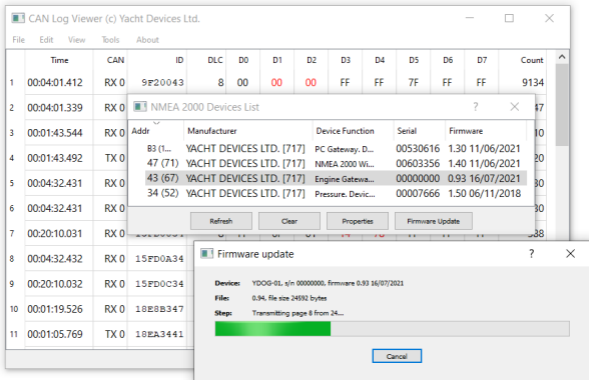


Figure 1. Firmware update of Outboard Gateway

APPENDIX A. Troubleshooting

Situation	Possible cause and required actions
LED does not signal when NMEA 2000 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 cannot 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>
Device flashes GREEN-GREEN-RED-GREEN, but no data is available on MFD	<p>1. Network error. Check the list of external devices or NMEA 2000 devices on MFD and be sure that Outboard Gateway (and other devices, if you have) is present in the list. 2. Wrong settings. Reset the Device to factory settings (see the Section V) and run the engine at idle revolutions.</p>
RPM readings are several times higher or lower	<p>1. Wrong divider. Check the RPM divider setting (Section III.3).</p>
No RPM readings at high revolutions	<p>1. Wrong algorithm. Check the pulse counting algorithm setting (Section III.3), set the algorithm 2 for RPM divider 3 or higher. Set algorithm 1 for RPM dividers 0.5, 1 and 2.</p>

Situation	Possible cause and required actions
Non-stable RPM readings	1. Wrong algorithm. See above. 2. The signal is overamplified. See the III.2. 3. The power circuit is susceptible to EMI. Use proper NMEA 2000 data and power cables and avoid routing near EMI sources.
Non-stable voltage readings	1. The power circuit is susceptible to EMI. Use proper NMEA 2000 data and power cables and avoid routing near EMI sources. 2. Non-stable output from engine's voltage regulator. Increase damping setting (Section VI.3).

APPENDIX B. NMEA 2000 Messages Supported by Device

Message	Receive	Transmit
ISO Acknowledgment, PGN 59392 (0xE800)	Yes	Yes
ISO Request, PGN 59904 (0xEA00)	Yes	No
ISO Transport Protocol (DT), PGN 60160 (0xEB00)	Yes	No
ISO Transport Protocol (CM), PGN 60416 (0xEC00)	Yes	No
ISO Address Claim, PGN 60928 (0xEE00)	Yes	Yes
ISO Commanded Address, PGN 65240 (0xFED8)	Yes	No
NMEA Group Function, PGN 126208 (0x1ED00)	Yes	Yes
PGN List, PGN 126464 (0x1EE00)	No	Yes
Heartbeat, PGN 126993 (0x1F011)	No	60 sec
Product Information, PGN 126996 (0x1F014)	No	Yes
Configuration Information, PGN 126998 (0x1F016)	No	Yes
Engine Parameters, Rapid Update, PNG 127488 (0x1F200)	No	100 ms
Engine Parameters, Dynamic, PGN 127489 (0x1F201)	No	500 ms
Temperature, PGN 130312 (0x1FD08)	Yes	No
Actual Pressure, PGN 130314 (0x1FD0A)	Yes	No
Temperature, Extended Range, PGN 130316 (0x1FD0C)	Yes	No

Note: 1) NMEA 2000 Device Instance, System Instance, Installation Description Field 1 and Installation Description Field 2 can be changed with PGN 126208 (professional NMEA 2000 installer software and hardware may be required).

2) Periodic transmission intervals can be changed with YD:PGN and YD:ZERO_RPM commands (see Section VI).

