NMEA Conversion Gateway Install/User Manual

Issue 3.0

For all variants:
NGW-1-ISO
NGW-1-ISO-AIS
NGW-1-STNG
NGW-1-USB

Actisense®
Award Winning **NMEA Specialists**

Contents

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Product registration
Please register your product via the online form on www.actisense.com.

Your product package includes a unit serial number. Your registration will assist Actisense Support to link your product to your details, simplifying any future assistance you may require.

Product Guarantee
This product comes with a three year 'return to base' guarantee. If you suspect that the unit is faulty please refer to the Troubleshooting Guide section of this document.

It is a requirement of the guarantee that all installations of electronic equipment follow the NMEA 0400 specification. Any connection to a battery or power supply must meet the mandatory essential safety requirements that may be imposed by local regulatory agencies.

Actisense products are intended for use in a marine environment, primarily for below deck use. If a product is to be used in a more severe environment, such use may be considered misuse under the Active Research Limited guarantee.

Product installation and operation
This product must be installed and operated in accordance with the instructions provided. Failure to do so could result in personal injury, damage to your boat and/or poor product performance.

Product disposal
Please dispose of this product in accordance with the WEEE Directive. The product should be taken to a registered establishment for the disposal of electronic equipment.

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About

The Actisense NGW-1 NMEA 2000 Gateway is the easiest way to link between a boats old and new data networks. The NGW-1 can convert NMEA 0183 data into NMEA 2000 data and vice-versa.

The NGW-1 is available to purchase in a variety of options:
NGW-1-ISO is the standard option. With an opto-isolated input and ISO-Drive output for direct NMEA 0183 device bi-directional connection.

NGW-1-ISO-AIS is the NMEA 0183 AIS option that enables the conversion of NMEA 0183 AIS data to its equivalent in NMEA 2000. This provides an 'out of the box' solution for quick installation with no configuration required.

NGW-1-USB is the NMEA 0183 USB (1.1 and 2.0) interface for bi-directional connection to a PC for use with NMEA 0183 software.

Every option of the NGW-1 is available with the SeaTalkNG to NMEA 2000 adaptor Cable - STNG-A06045. The SeaTalkNG to NMEA 2000® adaptor cable (STNG-A06045) is not available as a standalone product and must be bought as part of a bundle.

Please go to the 'Downloads' page of the Actisense website to see the up to date list of conversions the various configurations can handle.

The Actisense NMEA Reader software utility allows the NGW-1 user to view and understand (in detail) the translated NMEA 0183 sentences output by an NGW-1 directly.

Software Updates

The NGW-1 units have built-in firmware which is held in 'flash' memory, allowing quick and easy upgrades using the latest NGW-1 ActiPatch.

Actisense recommends that the NGW-1 firmware is kept up to date. The firmware version currently installed on the NGW-1 can be checked on any NMEA 2000 MFD capable of displaying all devices that are active on the NMEA 2000 network. Simply check this number against the latest version number on in the downloads section of the Actisense website.

Powering the NGW-1

ISO Variants:

All ISO variants of the NGW-1 receive their power supply when connected to a correctly powered NMEA 2000 backbone. The backbone must also be correctly terminated to allow connected devices to communicate. Refer to the "Connecting to an NMEA 2000 Network" section for more information.

USB Variants:

All USB variants will be powered by the PC/laptop USB connection once the USB drivers have been successfully installed. Depending on the settings of the PC/laptop that the NGW-1 is connected to, the latest Actisense USB drivers will install automatically from Windows update. If this does not happen, the same USB driver files are available on the CD that is included in the box with the NGW-1 or from the NGW-1 downloads web page.
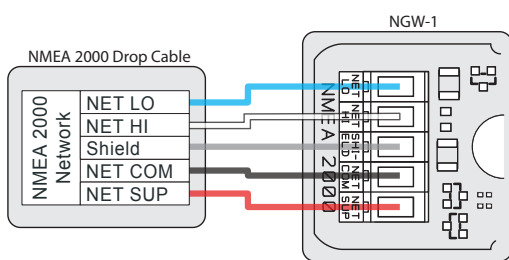
Connnecting to an NMEA 2000 Network

The illustration below provides an example of the minimum requirements for an NMEA 2000 network. If an NMEA 2000 network is not currently installed, Actisense has a variety of Starter Kits available.

The horizontal cable illustrating the backbone is not always needed in reality as a backbone can be formed by simply connecting T-pieces directly to each other. The cable connecting a device to a T-piece must not exceed 6 metres as defined in the NMEA 2000 specification:

T-Piece   Backbone   Terminator

Instrument Drop   Power T

NMEA 0183 Network
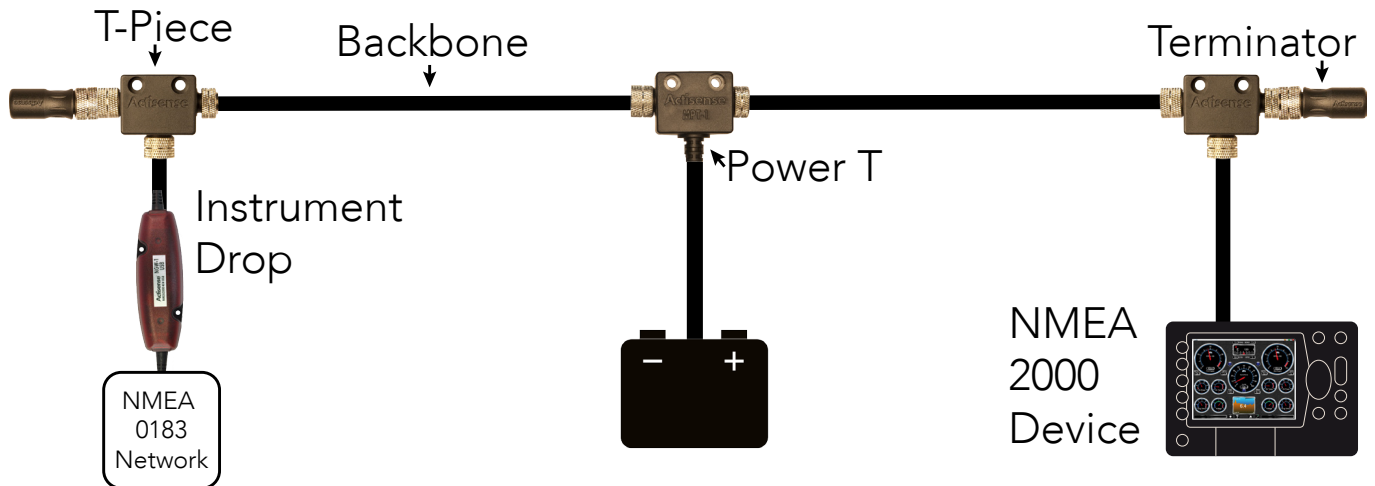
NMEA 2000 Device

NMEA 2000 Pin Out

The diagram below illustrates the standard wiring colours used by all NMEA 2000 devices (like the NGW-1):

NGW-1

NMEA 2000 Drop Cable

NMEA 2000 Network

NET LO
NET HI
Shield
NET COM
NET SUP

| Wire Colour	NMEA 2000	PCB Label
Shield/Screen	Shield	SHIELD
Blue	Net Low	NET LO
White	Net High	NET HI
Black	Net Common	NET COM
Red	Net Supply	NET SUP

Connnecting to a SeaTalkNG Network

Raymarines SeaTalkNG network uses exactly the same data as a standard NMEA 2000 network. The only difference is the physical network connections. To connect any standard NMEA 2000 device (like the NGW-1) to an STNG network, simply use an NMEA 2000 to STNG adapter cable (product code: STNG-A06045) between the device and the STNG network.

Connnecting to NMEA 0183 Devices

The diagram and table below illustrate how to connect the loose wires from any ISO variant NGW-1 to the TX/RX terminals of any NMEA 0183 Talker/Listener.
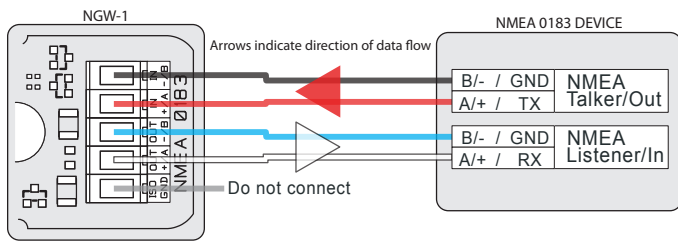
Wire Colour	Label	Connnects To
Black	IN B / -	Talker OUT B / - / GND
Red	IN A / +	Talker OUT A / + / Data
Blue	OUT B / -	Listener OUT B / - / GND
White	OUT A / +	Listener OUT A / + / Data
Shield / Screen	ISO GND	Not Connected

Connnecting to a PC/laptop

The diagram and table below illustrate how to connect the loose wires from any ISO variant NGW-1 to a serial cable (DB9F). If the PC/laptop does not have a serial port, a USB-serial converter will also be needed.

Wire Colour	Label	Connnects To
Black	IN B / -	GND (Pin 5)
Red	IN A / +	TX (Pin 3)
Blue	OUT B / -	GND (Pin 5)
White	OUT A / +	RX (Pin 2)
Shield / Screen	ISO GND	Not Connected

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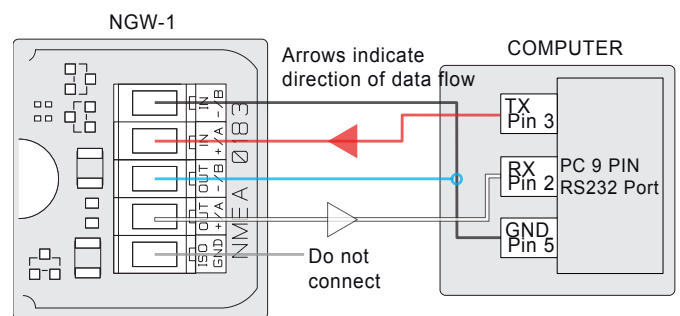
LED Behaviour and Troubleshooting

There are 2 LEDs inside the NGW-1, one on the NMEA 0183 side, one on the NMEA 2000 side. On start up, these LEDs will flash alternately and very quickly for 2 seconds.

The primary function of the NGW-1 NMEA 0183 LED is to indicate reception of a valid NMEA 0183 sentence. The NMEA 2000 LEDs main function is to indicate reception of a PGN on the NGW-1 conversion list. It is normal for the NMEA 0183 LED to flash faster than the NMEA 2000 LED due to the smaller bandwidth available to NMEA 0183.

If the NGW-1 is not receiving any data on either side, both LEDs will flash together every 10 seconds. This could be a result of incorrect wiring, mismatched baud rates or a lack of data available to the NGW-1.

If any irregular behaviour is observed, please consult the video in the Actisense Support Centre or the table below.

Behaviour	Solution
USB only: The LEDs do not light	The USB driver has not been installed correctly.
The NMEA 2000 LED does not flash when the NMEA 2000 network is active	Check that the NGW-1 is connected to the NMEA 2000 network and that the NMEA 2000 network is operational. Confirm that the PGN messages are available on the network (using an Actisense NGT-1 or similar device) and that the required PGNs are supported on the latest NGW-1 Conversion List.
The NMEA 0183 LED does not flash when connected to an NMEA 0183 Talker	Check that the NGW-1 is connected correctly to the NMEA 0183 device and that the same Baud rate has been set on both devices.
Both LEDs flash together, once every 10 seconds	Indicates that the NGW-1 is powered but no data is received from either connection. If valid data should be present and converted by the NGW-1 on one or both inputs, refer to the two rows above.
The LEDs flash alternately very fast (4 times per second). This sequence repeats continuously	Indicates that the NGW-1 has lost its Firmware, please connect the unit to the latest NGW-1 Actipatch and re-install the Firmware.

Technical Support and the Returns Procedure

All installation instructions and any warnings contained in this manual must be followed before contacting Actisense technical support. If the troubleshooting guide did not help resolve the problem and an error persists, please contact Actisense technical support to help trace the issue before considering the return of the product. If Actisense support concludes that the NGW-1 unit should be returned to Actisense a Returns Number will be issued by the support engineer.

The Returns Number must be clearly visible on both the external packaging and any documentation returned with the product. Any returns sent without a Returns Number will incur a delay in being processed and a possible charge.

Changing Firmware

Both the standard and AIS versions of NGW-1 firmware can be installed in any hardware variant. The NGW-1 downloads web page contains a list of options that allows the device name to display accurately on an NMEA 2000 network device list. All standard versions operate in the same way and all AIS versions operate the same way regardless of the name.

Here's how to change the firmware:
Locate and download the required ActiPatch from the Actisense website. For example, if you have an NGW-1-STNG and you wish to enable AIS conversions, you will need "NGW-1-STNG-AIS v2.420 ActiPatch Setup"

To connect your NGW-1 (ISO Variants) to a PC (to update its firmware) you have the following options:

1.   Wire a D-type 9-pin connector to your NGW-1's NMEA 0183 port (you can connect that directly to the NGW-1 terminals inside the case if that is more convenient), and then connect to a standard "USB to Serial" adapter cable if your computer does not have an RS232 port on it. Please refer to "Connnecting to a PC/laptop" on page 6.

2.   You might want to consider our Actisense DB9-F and USB-1 products if do not have cables already.

3.   For a quick and easy connection, use our Actisense USG-2 product for direct wiring to the NGW-1's terminals whilst keeping your PC safe with 1500 volts of isolation.

You can use the USG-2 as a safe way to connect any NMEA 0183 signal to your PC so it is great as an NMEA 0183 diagnostic tool when used with our freely available NMEA Reader software

Note that with the ISO variants of the NGW-1, power needs to be present on the NMEA 2000/SeaTalkNG side of the NGW-1 for the PC connection to be powered and active. The USB variants are powered once the latest USB drivers have been successfully downloaded and installed.

With the NGW-1 connected to your PC, select the correct COM port for your NGW-1 from the drop down menu in the Actipatch you just downloaded.

Click on the 'Program' button when it goes green and you will see the progress bar indicating the installation of the firmware to your NGW-1.

When the installation is completed successfully, the 'Patch ID' box and 'Device ID' box will contain identical information.

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Configuring using NMEA Reader

In the majority of cases, configuration of an NGW-1 is not required as it communicates at the standard 4800 baud rate for NMEA 0183 devices (38400 for the AIS firmware) by default. All available conversions are enabled by default so the only conversion related configuration option is to reduce the number of conversions carried out by the NGW-1. Checking extra boxes in the PGN enable lists in NMEA Reader that weren't initially checked will have no effect.

All available conversions being enabled on the NGW-1 should not cause conflicts as NMEA 0183 devices are usually good at recognising data that they don't require and ignoring it. NMEA 2000 is also very good at handling data.

If you still wish to configure the NGW-1, this can be done using the freely available NMEA Reader.

Connecting the NGW-1 to NMEA Reader

Connect the NGW-1 to the PC (refer to "Connnecting to a PC/laptop" on page 6) and run the NMEA Reader program. Select the port number the Baud rate for the NGW-1. The default Baud rate for the NGW-1 is 4800 with the standard Firmware and 38400 with the AIS Firmware. NMEA Reader will attempt to communicate with the NGW-1. Once successful the 'Hardware Config' tab will become available and the green LED indicator next to the Baud selection will flash.

Note: You must open the port at the Baud rate the NGW-1 is configured to use, there is no auto Baud feature.

Changing the Baud rate
At the bottom of the 'Hardware Config' tab there is a 'Port Config' section. Under 'Serial Baud Rate' there are 2 drop down boxes, one of which is disabled. Select the new Baud rate you require for the device and click 'Apply'. The new setting will be sent to the NGW-1 which will reboot. NMEA Reader will re-open the connection at the new Baud rate.

It is not possible to configure the inputs and outputs of the NGW-1 to operate at separate baud rates.

Note: Do not make any other configuration changes when setting the Baud rate. Some changes may be lost when setting the new Baud rate.

Note: Only the USB variant of the NGW-1 is capable of Baud rates above 115200. Do not change the Baud rate of the other varients to above 115200. Doing so may prevent the NGW-1 from communicating and may require the return of the unit.

Selecting PGNs for Conversion

NB: If making more than a few changes to the enabled conversions in the NGW-1, you will need to temporarily increase the Baud rate. Remember to change it back when finished.

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NMEA Conversion Gateway - NGW-1

As a quick description: Using NMEA Reader, you can choose which PGN's are received (Rx) or transmitted (Tx) by the NGW-1. For example, turning off PGN 127251 from the "Rx PGN Enable List" will stop all ROT sentences appearing on the NMEA 0183 output of the NGW. However, turning off PGN 128267 from the "Rx PGN Enable List" will stop both DPT and DBT sentences appearing on the NMEA 0183 side of the NGW. There is currently no way of choosing DPT or DBT, you can only get or stop both.

The "Tx PGN Enable List" works in a similar way, DBT and DPT are used to generate PGN 128267 you cannot choose data from one sentences and not the other. Please refer to the NGW-1 Conversion List document to fully understand the relationship between the NMEA 2000 PGN and the NMEA 0183 Sentences.

For full instructions on how to use NMEA Reader, please refer to the NMEA Reader & EBL Reader User Manual. In the manual it shows the hardware configuration option as a window, however with the latest edition of NMEA Reader it is a tab that can be selected at the bottom left side of the NMEA Reader window.

Special ARL P-codes
he Active Research Ltd P-codes option turns on or off the special Actisense system status sentences from the 0183 output. The default is the 'permanently disabled' to conserve output bandwidth. Once you have selected the new behaviour click 'Apply'.

Tech Tips from our Support Team

Using the NGW-1 with waypoints

If you want to use the NGW-1 with NMEA 0183 waypoint names, they have to be purely numeric – e.g. a valid waypoint name is "73", an invalid name is "waypoint 73" in order for the NGW-1 to correctly convert it to NMEA 2000. This is because NMEA 2000 waypoint names can only be numeric (at their lowest level). Converting NMEA 2000 waypoint names to NMEA 0183 is simple as they will automatically use the numeric value defined in NMEA 2000.

Multiple sources of NMEA 0183 data

Unfortunately it is not possible in any NMEA 0183 networking situation to connect the output of more than one Talker to the input of one or more Listener/s. To convert data from more than one NMEA 0183 Talker to NMEA 2000 you have two choices.

1. Use an NMEA 0183 multiplexer like the Actisense NDC-4 to combine the output of the two Talkers. Then use an NGW-1 to convert the output from the NDC-4 to NMEA 2000.

2. Use a dedicated NGW-1 for each NMEA 0183 Talker.

We always recommend number two as multiplexing can become complicated and the cost for one NDC-4 and an NGW-1 is approximately the same as the cost for three NGW-1's.

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NGW-1 Prioritisation of NMEA 2000 Talkers

When there is more than one device of the same type (like a GPS) on the NMEA 2000 network, the NGW-1 will use the data from the highest priority (lowest source address) device on the bus. If the device that you wish to use as the primary data source for the NGW-1 claims a lower source address than the device(s) you do not wish use, everything will be fine, the NGW-1 will convert the data from your preferred device. If a device you'd rather use as a secondary Talker for the NGW-1 claims a lower source address then unfortunately there is no easy way to change this. The first step would be to try changing the device instance of the secondary Talker to 'instance 1' (leaving the primary at 'instance 0').

To change an NMEA 2000 device instance, first of all the device manufacturer must have enabled this feature in the device firmware. Once you know the device instance can be changed, you will need an Actisense NGT-1 (We recommend the USB variant for simple PC connections) as well as our freely available NMEA Reader software.

The NGT-1 is compatible with a wide range of software. To view a list of software that can be used with the NGT-1, please visit our NGT-1 compatibility page.

If using the 'ISO' variant of the NGT-1, please contact the software developer to ensure that they support this option.

Difference between NGW-1 and NGT-1

1.   NGT-1: NMEA 2000 PC Interface – allows NMEA 2000/SeaTalkNG messages to be read by an application and also allows that application to send NMEA 2000 messages back to the network.
The NGT-1 does not understand NMEA 0183.

The most common variant sold is the NGT-1-USB as that is the easiest method of getting NMEA 2000 data to a PC. We also sell the NGT-1-ISO for customers who do not want USB (and its drivers) in their system.

An NGT-1 working with NMEA Reader is a very powerful NMEA 2000 network diagnostic tool.
2.   NGW-1: NMEA 2000 to NMEA 0183 Gateway – converts between the old and the new NMEA protocols bi-directionally. It cannot be used to transfer NMEA 2000 messages to the PC; the serial port only understands NMEA 0183.

The most common variant sold is the NGW-1-ISO for direct connection to an NMEA 0183 Talker/Listener device. We also sell the NGW-1-USB for customers who want an easy method of getting NMEA 0183 data to their PC.
An NGW-1 makes it possible for new and old NMEA devices to share data.

Sadly it is not possible to change an NGW-1 to an NGT-1 or vice versa.

Power Supply (ISO, ISO-AIS & STNG Variants)	
Supply Voltage (NMEA 2000 Port)	9.5 to 35V DC
Supply Current (NMEA 2000 Port)	35mA @ 12V DC, Max 50mA
Load Equivalent Number (LEN)	1

Power Supply (USB Variants)	
Supply Voltage (NMEA 2000 Port)	9 to 29V DC
Supply Current (USB Host Port)	85mA @ 5V DC
Supply Current (NMEA 2000 Port)	15mA @ 12V DC, Max 50mA
Load Equivalent Number (LEN)	1

NMEA 2000 Port (All Variants)	
Compatibility	Fully NMEA 2000 certified
Galvanic Isolation	Refer to 'ISO port' or 'USB port'
Speed / Baud Rate	250kbps
Connectivity	M12 Male (A polarised) connector moulded on cable
Cable Length NMEA 2000	1.5m
Cable Length STNG Adapter	0.4m (1.9m with NMEA 2000 cable connected)

ISO Port (NMEA 0183 port - ISO, ISO-AIS & STNG Variants)	
Compatibility	Full NMEA 0183, RS232 & RS422 compatible. RS485 Listener compatible
Galvanic Isolation	2500V input to ground, 1500V output to ground using ISO-Drive
Speed/Baud Rate	4800 to 115200 Baud
Output Voltage Drive	>= 2.1V (differential) into 100Ω
Output Current Drive	20mA max.
Output Protection	Short circuit and ESD
Input Voltage Tolerance	-15V to +15V continuous -35V to +35V short term (< 1 second)
Input Protection	Current limited and overdrive protection to 40VDC
Connectivity	5mm stripped and tinned wire
Cable Length	1.5m

USB Port (USB Variant)	
Compatibility	USB 1.1, 2.0 and 3.0
Galvanic Isolation	2500V input to ground
Speed / Baud Rate	4800 to 230400 Baud
Connectivity	Male type A plug moulded onto cable
Cable Length	1.5m
Drivers (Latest OS)	Windows XP, Vista, 7, 8 & MAC OS X supplied on CD & the 'Downloads' section of the Actisense website
Drivers (Legacy OS)	Contact Actisense for full details of the legacy OS versions supported: support@actisense.com

Mechanical	
Housing Material Lid	Polycarbonate
Housing Material Base	Flame retardent ABS
Weight NGW-1-ISO & ISO-AIS	220g
Weight NGW-1-USB	210g
Weight NGW-1-STNG	260g

Approvals and Certifications	
Fully NMEA 2000 Certified	
Meets all IEC 61162-1 & 61162-2 requirements	
Meets all IEC 61162-3 requirements	
EMC	IEC 60945 (sections 9, 10 & 11.2)
Environmental Protection	IP54
Operating Temperature	-20°C to +55°C
Storage Temperature	-30°C to +70°C
Recommended Humidity	0 - 93% RH
Guarantee	3 years

NGW-1 Product Order Codes

Product Code	Product Description
NGW-1-ISO	NMEA 0183 to NMEA 2000 Gateway, standard configuration
NGW-1-ISO-AIS	NMEA 0183 to NMEA 2000 Gateway, pre-configured with AIS conversions
NGW-1-STNG	NMEA 0183 to SeaTalk NG Gateway
NGW-1-USB	NMEA 0183 to NMEA 2000 Gateway with USB, standard configuration
STNG-A06045	SeaTalkNG to NMEA 2000 adaptor cable (drop). Only for purchase with Actisense NMEA 2000 devices