



# NMEA 2000 to NMEA 0183 Gateway

## NGW-1-USB

(Hardware revision A)

# Installation Manual

Issue 1.00

- Gateway between the NMEA 2000 network and the USB port of a computer running NMEA 0183 compatible software, or a USB compatible NMEA 0183 device
- Complete electrical isolation (of 2500 volts) between USB and NMEA 2000
- Fully configurable via USB port or through the NMEA 2000 network



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## Important notices

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The **Actisense** NMEA 2000 to NMEA 0183 Gateway (NGW-1-USB) is intended for use in a marine environment, primarily for below deck use. If the NGW-1-USB is to be used in a more severe environment, such use may be considered misuse under the seller's guarantee.

The NGW-1-USB has been certified to comply with the European directive for Electro-Magnetic Compatibility (EN60945), and is appropriately CE marked. Operation of the unit should be in conjunction with appropriate CE approved shielded connectors and cabling used in accordance with the CE directive EN60945. Any EMC related issues should be reported to Active Research immediately to allow the company to rectify or resolve EMC related problems in accordance with its obligations under EN60945.

If the unit is misconnected so that compliance failure occurs, the company shall not be held responsible for compliance failure until suitable EMC guidelines for connection are seen to have been taken.

## Notices

When using this document, please note the following:

The products described in this manual and the specifications thereof may be changed without prior notice. To obtain up-to-date information and/or specifications, contact Active Research Limited or visit the **Actisense website ([www.actisense.com](http://www.actisense.com))**.

Active Research Limited will not be liable for infringement of copyright, industrial property right, or other rights of a third party caused by the use of information or drawings described in this manual.

Active Research Limited will not be held responsible for any damage to the user that may result from an accident during operation of this unit when used in accordance with this document.

## Foreword

At Active Research Limited, we recognise that instructions are often skipped, so we have aimed to write this document in an informative and direct manner that will aid the user. We have covered all the points a typical user needs to know.

Please read all sections before installing and using the NGW-1-USB, and any referenced software programs.

## Introduction

The NGW-1-USB allows computers and USB compatible NMEA 0183 electronic equipment to be connected to a vessel's NMEA 2000 network. This can allow equipment installers to adopt the NMEA 2000 network early, whilst connecting any existing NMEA 0183 devices to the new bus standard.

The NMEA 2000 network can reduce installation costs of marine equipment and greatly reduce a boat's wiring harness complexity, leading to improved reliability and reduction in unnecessary weight. Now only a single cable is required from the bridge to the engines, sensors and all other NMEA 2000 instruments on the boat

NMEA 2000 uses the "CAN Bus" system (prevalent in most modern cars), to provide the quality and security of data transmissions that the NMEA 0183 bus can never hope to provide. This enables NMEA 2000 products to achieve better transmission reliability in the passage of data through the vessel.

The NMEA Gateway can transfer data from an NMEA 0183 source and place that data on the NMEA 2000 bus, or it can take NMEA 2000 data from the NMEA 2000 bus and make it available to the NMEA 0183 instrument.

Full information on the complete **Actisense** product range and supporting software packages can be found on the **Actisense website ([www.actisense.com](http://www.actisense.com))**.

## Technical features

**High-speed 32-bit ARM processor** capable of up to 40 million instructions per second.

**Flash ROM technology** that supports automatic programming for quick and easy updates, 10,000+ erase cycles and a 10-year Data Retention provides carefree user configuration.

**On-chip memory store** allows buffering of short term NMEA data, allowing the unit to smooth short-term peaks in the NMEA data flow.

**Fully configurable** via the USB or over the NMEA 2000 network allowing optimisation of the PC interface to better suit the system it is a part of.

**NMEA 2000 interface** offers 2500 volts of opto-isolation, protecting the system even during the most extreme fault conditions and fully compliant with the NMEA 2000 standard for interfacing with the NMEA 2000 network.

**Separate USB and NMEA 2000 network power** offer easy installation with no need for a direct connection to the vessels main battery supply. The NGW-1-USB takes power from the USB connection to power its USB circuitry, and power from the NMEA 2000 connection to power its NMEA 2000 circuitry. This creates total isolation between both power sources to completely eliminate the risk of ground loop faults occurring.

## Software updates

The NGW-1-USB's built-in firmware is held in "flash" memory, allowing quick and easy upgrades using either the latest **NGW-1-USB ActiPatch**, or alternatively the **NMEA 2000 Gateway Configuration Tool** running on a PC connected to the NGW-1-USB.

It is our policy to provide these updates free on the [Actisense website \(www.actisense.com\)](http://www.actisense.com), so that the NMEA 2000 to NMEA 0183 Gateway (NGW-1-USB) can be further developed over time, and should there be any bugs reported in the firmware, they can be promptly fixed without the unit requiring to come out of commission.

## Connecting devices together

### The NMEA 2000 standard

The NMEA 2000 system is a low-cost data network operating at 250 kbits/sec utilizing the Controller Area Network (CAN). Multiple devices can be connected together on a single trunk cable to simply and easily share information between themselves.

NMEA 2000 uses a shielded cable and a "differential" signalling scheme, whereby two wires are used to transmit the NMEA data named CAN High and CAN Low. These connections will be labelled as "NET HI" and "NET LO" respectively. Power is also supplied through the NMEA 2000 cable named NET Supply and NET Common. These connections will be labelled "NET SUP" and "NET COM" respectively on the PCB.

Please refer to the [Connecting to the NMEA 2000 Network](#) section for an example of these connection methods.

# Connections

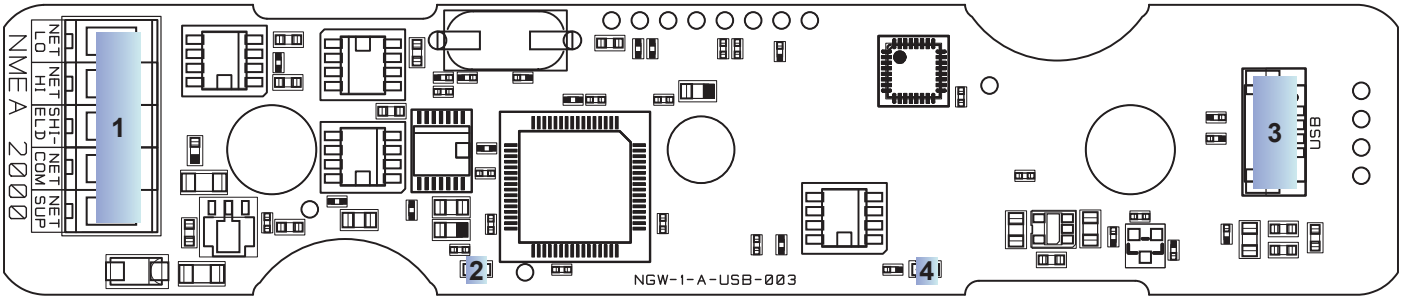


Figure 1 – All external connections

Figure 1 shows an internal view of the NGW-1-USB Printed Circuit Board (PCB).

**1. NMEA 2000 Interface**

A five way screw terminal block is supplied for connecting the NMEA 2000 cable. The CAN interface is fully compatible with the NMEA 2000 standard.

Actisense supplies a pre-fitted four-core screened cable for the NMEA 2000 connection, fitted with a male micro-fit connector. The colour codes used for this cable are:

Wire colour	NMEA 2000
Shield / Screen	SHIELD
Blue	NET LO
White	NET HI
Black	NET COM
Red	NET SUP

If you need to use your own NMEA 2000 cable, the five way screw terminal block is provided within the NGW-1 to allow easy connection, along with a spare cable gland that should be fitted on to the new cable to help maintain the water protection level.

**Any such cable is required to conform in full to the NMEA 2000 specification and be no longer than 6 metres (maximum drop length).**

**2. NMEA 2000 indicator LED**

This LED flashes when NMEA 2000 data set to be transferred is **received** by the NGW-1-USB. It can be clearly seen through the NGW-1-USB's translucent lid when the case is closed.

**3. A micro-connector to connect to the supplied USB type A cable**

This connector should not normally be removed: it is installed at the factory and is not customer serviceable.

**4. USB indicator LED**

This LED flashes when USB data set to be transferred is **received** by the NGW-1-USB. It can be clearly seen through the NGW-1-USB's translucent lid when the case is closed.

To open the NGW-1-USB, remove the two screws in the base of the unit, then slide off the top of the case. The cable glands need to be slid out from the top of the case in order to access the internal connections. The NGW-1-USB circuitry will be left attached to the base of the unit and the two supplied cables attached to their connectors.

**Note: When opening the NGW-1-USB case, be aware that the circuitry inside is not 100% protected against static electricity. Please ensure that, when opening the case, you use precautions against static damage by only touching the connector block and by holding the unit by its plastic base. In this way, the risks of static damage will be minimised.**

## Connecting to the NMEA 2000 Network

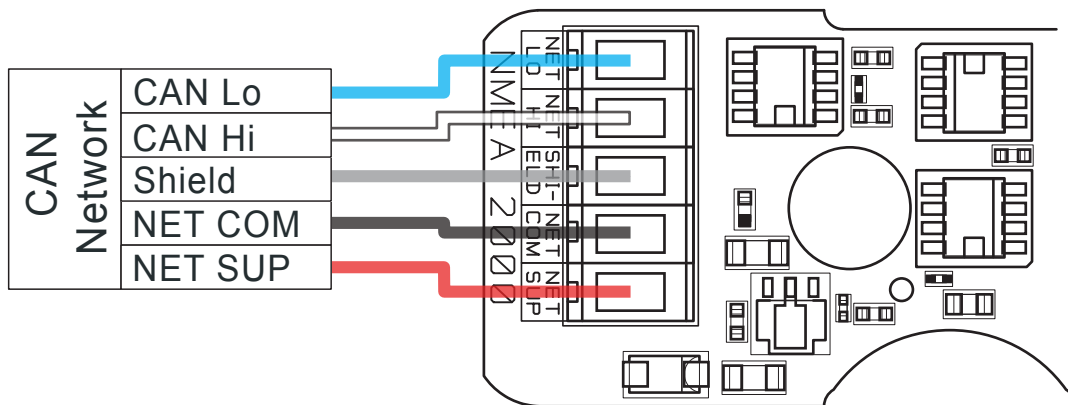


Figure 2 – NMEA 2000 connections

### NMEA 2000 connections

The **Actisense** NGW-1-USB is designed to be connected to the vessel's NMEA 2000 network using the supplied, pre-fitted Actisense cable.

If a different length cable is required, an NMEA 2000 certified cable of the required length (maximum 6 metres) should be connected to the vessel's NMEA 2000 network using a standard male NMEA 2000 connector.

The standard wiring connection can be seen in Figure 2.

#### Note:

1. Wire colours are for guidance only. The colours given relate to the supplied Actisense cable and the NMEA 2000 standard cable definition.

### Driver Installation Guide

The NGW-1-USB makes use of a virtual serial port driver (known as the 'Virtual COM Port' (VCP) driver) to interface between the USB port on the PC and the **Actisense** product (NGW).

This driver allows software running on a computer to communicate with the NGW-1-USB as if it was connected to a standard serial port on the computer, when in fact all communication is done over the USB connection.

**Please read the "USB Driver Install Manual" document that accompanies this NGW Install Manual for full details on how to install the NGW-1-USB drivers.**

# Specifications

Parameter	Conditions	Min.	Max.	Unit
<b>Supply</b>				
Supply voltage		8	35	V
Supply current (see note 1)	Supply voltage = 12v	26	30	mA
	Supply voltage = 24v	16	18	mA
<b>NMEA 2000 CAN Bus line (CAN-H; CAN-L) Transmitter</b>				
Recessive bus voltage	VTXD = VDD; no load.	2.0	3.0	V
Dominant bus voltage CAN-H	VTXD = 0.8V	2.75	4.5	V
Dominant bus voltage CAN-L	VTXD = 0.8V	0.5	2.25	V
Recessive differential output voltage	VTXD = 2V; no load	-500	50	mV
Dominant differential output voltage	40Ω < RL < 60Ω	1.5	3.0	V
Short circuit output current CAN-H	VCAN-H = -5V	-	-200	mA
Short circuit output current CAN-L	VCAN-H = -40V, +40V. (see note 2)	-	200	mA
<b>NMEA 2000 CAN Bus line (CAN-H; CAN-L) Receiver</b>				
CAN-H, CAN-L common-mode input Resistance		5	50	KΩ
Differential input resistance		20	100	KΩ
<b>USB Comms Input/Output</b>				
Input to Ground	Full Galvanic Opto-isolation protection	-	2500	V
Baud rate	Configurable Baud rate	4800	230400	bps
<b>General</b>				
Ambient operating temperature		-20	+70	°C

**Table 2 – NGW-1-USB specifications**

All specifications are taken with reference to an ambient temperature ( $T_A$ ) of +25°C.

**Note:**

1. Current consumption measured under no-load conditions
2. This parameter is periodically sampled and not 100% tested.



## Troubleshooting guide

This guide will concentrate on all relevant troubleshooting issues above simple cable connection faults. Therefore, the cables between the NGW-1-USB hardware and any other devices should be checked as a matter of course, before continuing with this guide.

### Status LEDs

The NGW-1-USB hardware has two bright LEDs that can be seen through the case to indicate when data is **received** from either the USB device or NMEA 2000 network connection. It is an important point to note that these two LEDs can only show when their respective data is RECEIVED; it is not possible to show both transmit and receive simultaneously on a single colour LED.

These LEDs can be used to debug potential problems. If both an NMEA 0183 'talker' and a 'listener' are connected, it is possible to analyse which is working by disconnecting one of them or by stopping the computer from sending data.

Sequence	Description
NMEA 2000 LED does not flash when the data is received from the NMEA 2000 network	Check that the NGW-1-USB is connected to the NMEA 2000 network, that the NMEA 2000 network is operational, and that the required PGN messages are selected for transfer by using the <b>NGW Configuration Tool</b> .
USB LED does not flash when the USB data is received	Check that the NGW-1-USB is connected to a PC USB port, that the device is recognised in the Windows Control Panel with the correct COM port (refer to <b>USB Configuration section in USB Install User Manual</b> ) and that the required messages are selected to be transferred by using the <b>NGW Configuration Tool</b> .
Both LEDs flash together, once every 10 seconds	Indicates that the NGW-1-USB is powered but no data is received from either connection. If data should be being transferred through then check that the required PGN messages are selected by using the <b>NGW Configuration Tool</b> .
	<p>If the error persists, <b>please contact Actisense support to help trace the issue before considering the return of the product</b>. If Actisense support concludes that the NGW-1-USB unit should be returned to <b>Actisense</b> (refer to the <a href="#">Company Information</a> section), a <b>Returns Number will be issued by the support engineer</b>.</p> <p><b>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.</b></p>

Table 3 – Diagnostic LED

## Product order codes

<b>NGW-1-USB</b>	<b>NMEA 2000 ↔ USB Interface</b> Special version required to connect the <b>NMEA 2000</b> network to the USB port of a computer running <b>NMEA 0183</b> compatible software
<b>NGW-1-ISO</b>	<b>NMEA 2000 ↔ Serial Interface with ISO-Drive</b> Standard version required to connect the <b>NMEA 2000</b> network to an <b>NMEA 0183</b> device or computer serial port

## Company Information

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Website: [www.actisense.com](http://www.actisense.com)

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The Actisense NGW-1-USB allows NMEA 0183 software to talk and listen to NMEA 2000 devices on an NMEA 2000 network.

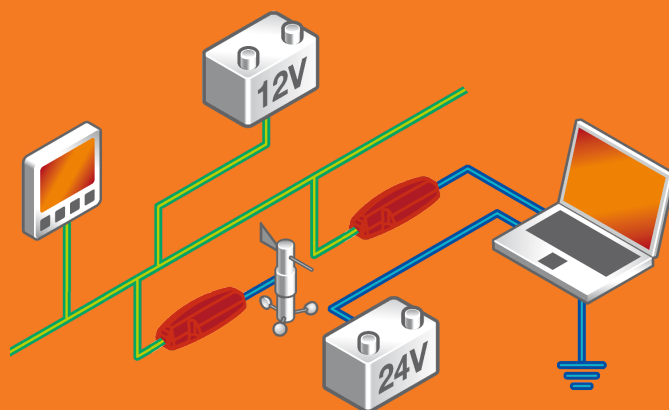
By translating NMEA 2000 data into the NMEA 0183 equivalent (and vice-versa), the NGW-1-USB enables information to be shared between NMEA 0183 based PC navigation software and any instrument on the NMEA 2000 network.

The NGW-1-USB's isolated USB connection makes it one of the best and safest ways to connect your computer to an NMEA 2000 network.

Just connect and relax, knowing that Actisense has it secured.

## Benefits

- All NMEA 2000 instruments on the network can see translated NMEA 0183 data sent from the PC software
- PC software can receive translated data from any NMEA 2000 instrument
- Electrical isolation separates the two networks, protecting against ground loop faults. This creates a protected computer and a safe installation
- The NGW-1 device appears as a 'Virtual COM Port' (VCP), compatible with almost all NMEA 0183 software



## Specifications

### NMEA 2000 Connection

- NMEA 2000 network is opto-isolated from the USB connection to offer 2500 volts of protection
- NMEA 2000 current draw 20 mA typical
- Terminal block available for user cable connection
- Cable length 1.5 metres

### USB Specification

- v1.1 and v2.0 compliant
- Up and downstream buffers for smoother data transfer
- Current draw 30 mA typical
- Baud rates 4800 to 230400
- Cable length 1.8 metres

### System Requirements

- Supported OS's: Windows (2000, XP and Vista) and MAC OS X (check website for other versions)
- USB drivers included on CD

### Environmental

- Recommended operating temperature: -20°C to +70°C
- Splash proof plastic casing provided with sealing cable glands certified to IP54
- Stainless steel case screws
- Humidity: 0-80% RH

### Guarantee

- 3 years return to base

### Certifications

- CE (EN60945)
- Tested and certified NMEA 2000 compliant



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