Actisense®

NGT-1

NMEA 2000 PC Gateway
For Actisense Comms API compatible software

User Manual

AMZ YACHTING

For variant:
NGT-1-USB
NGT-1-ISO

Issue 2.01

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Important Notices

CE

The **NGT-1** has been certified to comply with the European directive for Electromagnetic 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 Limited immediately to allow the company to rectify or resolve EMC related problems in accordance with its obligations under EN60945.

If the unit is connected such that compliance failure occurs beyond the company's control, the company shall not be held responsible for compliance failure until suitable EMC guidelines for connection are seen to have been taken.

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To the best of our knowledge the information contained in this document was correct at the time it was produced. Active Research Ltd cannot accept liability for any inaccuracies or omissions.
The products described in this manual and the specifications thereof may be changed without prior notice. Active Research Ltd cannot accept any liability for differences between the product and this document. To check for updated information and specifications please contact Active Research Limited.

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

Product Registration

Please register your product via the **online form.**
Your product has a unique serial number which is needed to complete the product registration form. The serial number is six digits and can be found below the barcode on the white label on the back of the NGT-1. If your NGT-1 is inaccessible, you will find the serial number under the product information on the 'network list' page of an NMEA 2000 MFD or using the freely available Actisense NMEA Reader software available from **www.actisense.com**

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" on page 13**.
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 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.

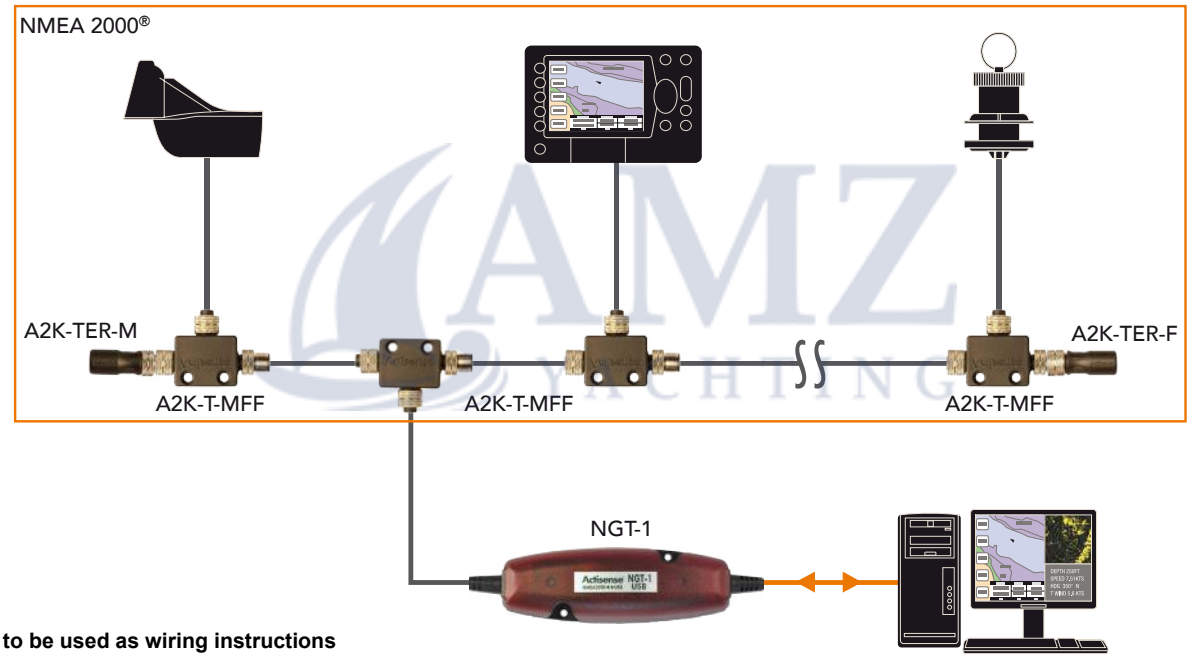


Product Overview

The Actisense NMEA 2000 to PC Interface (**NGT-1**) provides an easy way to link a PC to an NMEA 2000 network. The **NGT-1** makes it possible for software applications to read from and write to the NMEA 2000 bus whilst maintaining network integrity.

- Able to transfer all NMEA 2000 PGNs
- Firewall enforces NMEA 2000 bus rules
- Galvanic Opto-isolation between the PC and the NMEA 2000 network
- ISO variant: ISO-Drive™ output compatible with RS422 and RS232
- Transfer list for selecting which NMEA 2000 PGNs are sent and received
- Free Firmware updates provided when new features are added - update in the field via PC
- Two available variants for different installation situations (see part code list on next page)
- Pre-fitted cables for ease of installation
- Screw terminals for easy installation of custom cables if required
- Free SDK for software developers
- NMEA 2000 certification of software not mandatory; no certification cost
- Only required to purchase NMEA 2000 Appendix B to develop software
- Reduced software development time with Windows API
- Suitable for Windows, MAC and Linux applications
- Suitable for PC, mobile or embedded systems
- NMEA 'Third Party Gateway' status pending

Figure 1 - Example of an NGT-1 Installation



Note: Not to be used as wiring instructions

Package Contents USB

1 x **NGT-1**-USB with NMEA 2000 Micro Male cable and USB male type A cable
1 x Actisense CD in sleeve (Documents and Software)
1 x **NGT-1** User Manual
1 x Mounting Guide sheet
2 x Mounting screws

Package Contents ISO

1 x **NGT-1**-ISO with NMEA 2000 Micro Male cable and bare wire cable
1 x Actisense CD in sleeve (Documents and Software)
1 x **NGT-1** User Manual
1 x Mounting Guide sheet
2 x Mounting screws
1 x Spare cable grommet (used if replacing the ISO/PC cable)

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Installation Warnings



All warnings and notices must be followed to ensure the correct operation of the NGT-1. Incorrect installation may invalidate the guarantee.
It is highly recommended that all of the installation instructions are read before commencing the installation. There are important warnings and notes throughout the manual that should be considered before the installation is attempted.

Warning 1: Accuracy
The Actisense **NGT-1** is designed to reliably transfer NMEA 2000 PGNs between the PC and the NMEA 2000 bus; the accuracy of data contained in each PGN is the responsibility of the generating device or software application. Furthermore for each installation requirement the **NGT-1** must be configured correctly by the software application. Therefore, the **NGT-1** should only be used as an aid to vessel monitoring, control or navigation and should not be used as a replacement for traditional aids and techniques.

Warning 2: 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.

Warning 3: Installation Code of Practice
All wiring should be in accordance with the regional code of practice for installations and meet the NMEA 0400 specification.

Warning 4: Firmware Updates
It is highly recommended that the Firmware is kept up to date in the NGT-1. The latest firmware version number and details of supporting software such as NMEA Reader can be found on the **NGT-1 downloads** web page. You can check the firmware version currently installed in your NGT-1 by locating the manufacturers software ID on the network list found in most NMEA 2000 MFDs or NMEA Reader.

Warning 5: Mounting Requirements
Select a flat location to mount the **NGT-1**. Mounting on a contoured surface may cause damage to the case.
Do not mount the **NGT-1** while the device is powered.
Do not mount the **NGT-1** while the NMEA 2000 cable is connected.
Do not mount the **NGT-1** while the PC cable is connected.

Warning 6: Mounting Locations
Do not mount the **NGT-1** in the same plane as transmitting or receiving antennas.
Do not mount the **NGT-1** close to an electronic compass.

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Mounting the NGT-1

- Use the **NGT-1** as a template to locate and mark the drill holes for mounting. Do not attempt to drill the holes while the **NGT-1** is in position. A mounting guide is provided and can be used to mark the mounting holes if preferred.
- Refer to **"Warning 5: Mounting Requirements" on page 7**.
- Secure directly to a bulkhead using the two M3.5 stainless steel pan-head screws provided. If these screws are lost, suitable alternatives may be used instead. **Note:** Using larger screws can damage the housing and invalidate the guarantee.
- Secure directly to a bulkhead using the mounting screws provided with the unit.

Powering the NGT-1

The NGT-1 does not need external power. Power is taken from the NMEA 2000 network (for ISO variant) or from the USB port (USB variant).

Connecting to a USB Port

For USB variants of the NGT-1, simply plug the USB cable on the NGT-1 in to a PC USB port and the USB driver installation will begin. For ISO variants of the NGT-1, a USB to serial converter cable can be used to connect to a PC USB port. For wiring the converter cable refer to **"Connecting the ISO cable" on page 10**.

Note: Refer to **"Status LEDs" on page 13** for LED behaviour.

USB Driver Installation

Windows 7, 8 and 10 will automatically install the drivers from Windows Update if there is an active Internet connection the first time the **NGT-1** is plugged in.

If the PC is not connected to the Internet or if the USB driver does not install automatically on the first installation of the **NGT-1**, the '**Update Driver Software**' option in Device Manager will need to be used to install the USB drivers manually.

Windows versions that use the '**Found New Hardware Wizard**' should be directed to automatically search for the best driver. Include '**Search Windows Update**' or ensure the Actisense CD is inserted.

For other operating systems and step-by-step guides refer to the **'USB Install Manual'.**

Windows Port Number Configuration

The port number for the **NGT-1** can be found in Windows 'Control Panel->System->Device Manager' under 'Ports (COM & LPT)'. Find the **NGT-1** in the list for the USB variant. When using a USB to serial converter cable you will see the name of the converter cable with no reference to the **NGT-1**. If you have connected to an RS232 port on the PC this will be listed as a 'Communications Port', again with no reference to the **NGT-1**.

To change this number, double click the **NGT-1** and select the 'Port Settings' tab. Click the 'Advanced' button and change the port number to the one required.

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Connecting to an NMEA 2000 Network

The **NGT-1** has a male Micro connector as specified by the NMEA 2000 standard. This allows the **NGT-1** to be connected directly to an NMEA 2000 bus without complication. If you are using an alternative proprietary CAN bus network, a suitable adapter cable will be required. It is recommended that the manual for any proprietary CAN bus network devices be consulted to determine the suitability of connecting an NMEA 2000 device such as the **NGT-1**.
The NMEA 2000 drop cable on the NGT-1 is 1.5 meters long, which can be extended as required up to a maximum of 6 meters (from the NMEA 2000 backbone), see **"Table 1 - NMEA 2000 Cable Length Rules"**. Any drop cable extension should be securely connected to ensure reliable operation.
Please refer to, **"Status LEDs" on page 13**

NMEA 2000 Networks

NMEA 2000 devices will only communicate with each other when connected to a powered and correctly terminated NMEA 2000 network. It is not enough to simply connect two NMEA 2000 devices directly together.

All networks need to be powered and terminated correctly to allow data to be transmitted reliably on the network. T-Pieces are needed to connect each device to the network. Additional cable lengths can be used between any of the connectors to extend the length of the network. Ensure the NMEA 2000 rules for cable length are adhered to, see **"Table 1 - NMEA 2000 Cable Length Rules".**

Table 1 - NMEA 2000 Cable Length Rules

Cable Type	Max Length
Per drop cable	6m
Sum of all drop cables	72m
Micro Backbone (terminator to terminator)	100m
Mini Backbone (terminator to terminator)	200m

NMEA 2000 Minimum Network Requirements

All NMEA 2000 networks require a 12V DC supply.

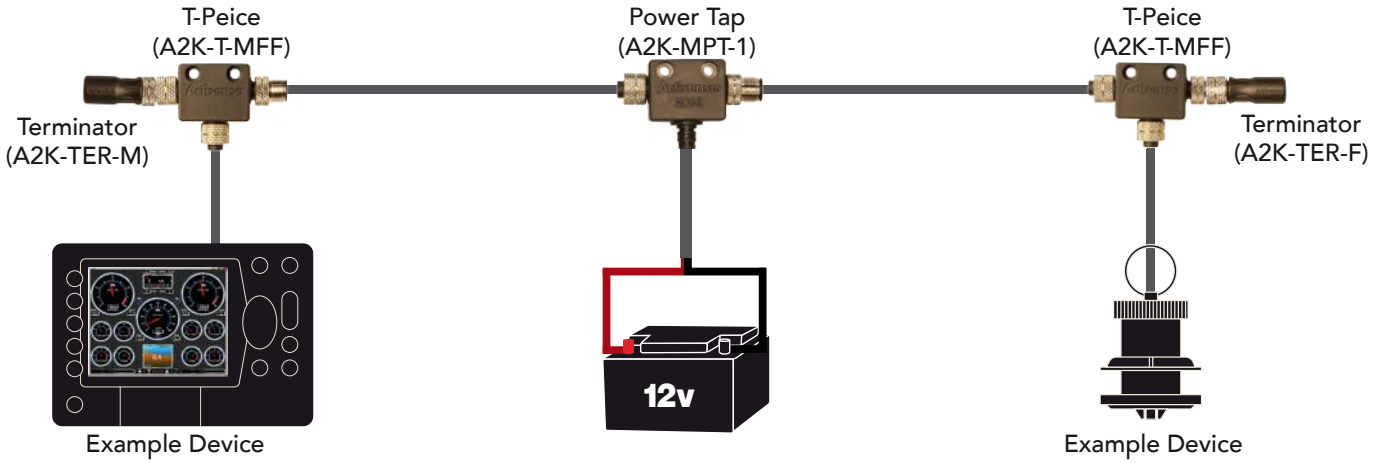
In addition, a correctly functioning network will require the following components :

- 1 x Power-T
- 2 x Terminating Resistors
- 2 x T-Pieces (one per connected device)
- 2 x NMEA 2000 Devices (such as the **NGT-1**)

All the required network parts can be supplied by the Actisense **A2K** range.

Refer to **"Figure 2 - NMEA 2000 Minimum Network Requirements Diagram"** for an example network. Note that the diagram should not be used as an installation guide. NMEA 2000 networks should only be installed following the NMEA 0400 specification and all wiring should be in accordance with the regional code of practice for installations.

Figure 2 - NMEA 2000 Minimum Network Requirements Diagram



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Connecting the ISO cable

On the ISO variants of the NGT-1, a pre-fitted four-core screened cable for connecting to a variety of devices. Actisense ISO-Drive output circuitry and OPTO input circuitry allows many different types of device to be connected without the need for configuration. Voltage levels are managed automatically as well as accepting both differential and ground referenced connections safely. This allows connection to a standard RS232 PC port and the flexibility to connect to an RS422 system if required for an embedded application. **"Table 2 - ISO Cable Connections"** shows the cable assignments used.

Table 2 - ISO Cable Connections

Wire Colour	Wire Name	PCB Label	Connects To
Black	Opto In B / -	IN B / -	RS232 ground or RS422 OUT negative
Red	Opto In A / +	IN A / +	OUT positive
Blue	ISO Out B / -	OUT B / -	RS232 ground or RS422 IN negative
White	ISO Out A / +	OUT A / +	IN positive
Bare/Silver	Ground	ISO GND	Not Connected

Connecting to an RS232 (PC) port

When connecting to a standard 9-pin RS232 serial PC port, the cable and a connector must meet the following specification:

1. A minimum of 3-cores are required in a shielded cable. Higher quality cable will naturally yield higher performance/ higher Signal-to-Noise Ratio (SNR). Most typical cables have two twisted pairs inside. In this case, use one pair for the TX line and one for the RX line. Use the spare wire in each pair as ground, and connect the cable shield to ground only at the computer end.

2. A DB9 (9 pin D-type) type female (socket) connector for the PC end of the cable.

3. The OUT +/A of the NGT-1 should be connected to the RX of the computer (standard 9 pin D-type, pin 2) and the NGT-1 IN +/A should be connected to the TX of the computer (standard 9 pin D-type, pin 3).

4. Connect the IN -/B and OUT -/B together and connect to the PC's serial port ground (standard 9 pin D-type, pin 5).

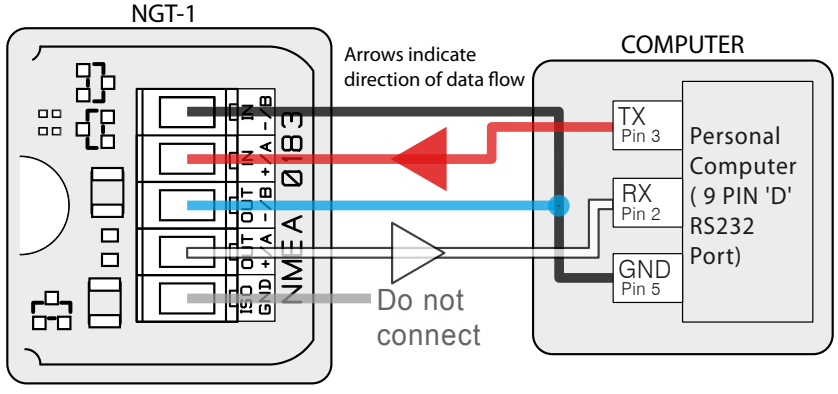
Note: To change the port number used in Windows refer to **"Windows Port Number Configuration"**.

Note: Refer to **"Status LEDs" on page 13** for LED behaviour.

Note: Actisense supply a cable with the 9 pin connector already fitted, Actisense part 'DB9-F'.
To fit the DB9-F cable refer to **"Connecting a Custom Cable" on page 11**.

Note: The NGT-1-ISO PCB is labelled 'NMEA 0183' on the RS232 side as the PCB shares the same design with the **Actisense NGW-1-ISO**

Figure 3 - PC / RS232 Port Connections



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Connecting a Custom Cable

The ISO/PC cable is connected inside the NGT-1 case to screw terminals. It is possible to replace the supplied cable with a custom cable for different applications. A spare cable gland is supplied for strain relief and splash proofing.
The NMEA 2000 cable is also connected using screw terminals. It is recommended that certified NMEA 2000 drop cables are used to extend the existing cable rather than replacing it. The supplied grommet is not suitable for correctly specified NMEA 2000 micro cable.

Opening the NGT-1 Case

To open a **NGT-1** case, remove the two screws in the base of the unit, then carefully lift off the top of the case. The cable glands must be slid out from the top of the case in order to access the internal connections. Pulling the lid off too roughly without sliding the glands out may damage to the cable connections. The **NGT-1** circuitry will be left attached to the base of the unit and the two supplied cables attached to their connectors.

Note: When opening an **NGT-1** case, be aware that the circuitry inside is not 100% protected against static electricity. Please ensure that you use precautions against static damage by only touching the connector block and by holding the unit by its plastic base.

Note: Any damage caused to the unit while the case is open is not covered by the guarantee.

Custom ISO/PC Cable

The cable should have two shielded twisted pairs: one pair for the input and one pair for the output. The maximum length of the cable is dependent on the input/output specifications of the connected device and the cable quality. Using an unsuitable cable may result in data loss. A spare cable grommet is supplied for strain relief and splash proofing a replacement ISO/PC cable.

Custom NMEA 2000 Cable

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

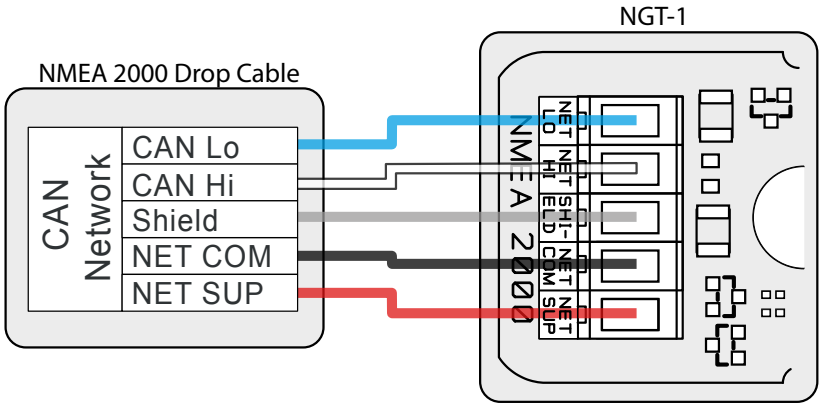
Refer to **"Figure 4 - NMEA 2000 PCB Connections"** and **"Table 3 - NMEA 2000 Connection Table"**.

Note: The colours given relate to the supplied Actisense cable and the NMEA 2000 standard cable definition.

Table 3 - NMEA 2000 Connection Table

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

Figure 4 - NMEA 2000 PCB Connections



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Configuring the NGT-1

Configuration Requirements

It is the responsibility of the software application to configure the NGT-1 being used in order to meet its NMEA 2000 requirements. This means that the NGT-1's configuration will be dependant on the software application's last used settings. It is possible to manually configure the NGT-1 using Actisense NMEA Reader, as long as it is understood that any such modifications could be lost when using the NGT-1 with another software application.

Connecting the NGT-1 to NMEA Reader

Connect the **NGT-1** to the PC (by USB cable or RS232 cable depending on variant) and run the NMEA Reader program. Select the port number for the **NGT-1** and select the Baud rate. The default Baud rate for the **NGT-1** is 115200. NMEA Reader will attempt to communicate with the **NGT-1**. Once successful the 'Hardware Config' tab will become available and the green LED indicator next to the Baud selection will flash.

Note: The COM port must be opened at the baud rate the NGT-1 is configured to use as there is no auto baud feature in NMEA Reader. This will typically be 115200 or 230400 baud.

The 'Hardware Config' tab shows the 'Tx PGN Enable List', 'Rx PGN Enable List', 'Serial Baud Rate' and 'ARL P-Codes' options".

Selecting PGNs for transfer

The NGT-1 has two modes of operation: 'Transfer: Normal' and 'Transfer: Receive All'. In the NGT-1 default 'Transfer: Normal' mode, the PGNs that are received from the NMEA 2000 bus and transferred to the PC software application are specified in the 'Rx PGN Enable List'. Disabling a PGN in the Rx list will stop its transfer to the PC.

However, by default many software applications (including NMEA Reader) will put the NGT-1 in to 'Transfer: Receive All' so that all NMEA 2000 PGNs can be transferred to the PC software application. In this mode, the 'Rx PGN Enable List' is not used and any user modifications to it will not result in any change of the NGT-1's behaviour.

The PGN Enable Lists can be refreshed with the NGT-1's current values using the 'Update from hardware" button and reset back to the factory defaults using the 'Apply defaults to hardware' (there is no need to press the 'Apply' button to complete this operation).

Changing the Baud rate

The top 'Serial Baud Rate' drop down menu is used to change the NGT-1 ISO/PC connection baud rate. The bottom drop down menu is disabled as it is currently not required. Select the new NGT-1 baud rate and click the 'Apply' button. The new configuration will be sent to the NGT-1, forcing a reboot so the new baud rate can be enabled. NMEA Reader will re-open its COM port to the new baud rate to continue communication with the NGT-1. Refer to the log tab to confirm the reboot and reconnect process has completed before attempting to edit any further configuration options.

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 USB variants of the NGT-1 are capable of operating at baud rates above 115200. Do not change the baud rate of ISO variants above 115200, as doing so will prevent the NGT-1 from communicating and may require the device be 'returned to base' for reconfiguration.

Note: Changing the baud rate to less than 115200 Baud may result in some NMEA 2000 PGN messages being lost due to overloading.

Special ARL P-codes

The 'ARL (Active Research Ltd.) P-codes' option enables/ disables transmission of special proprietary messages from the NGT-1 to the PC. There should not be any reason to disable this in an NGT-1, however if required to select the new behaviour and click the 'Apply' button.

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Troubleshooting Guide

This guide will concentrate on all relevant troubleshooting issues, that may arise on your **NGT-1**. Therefore, the cables between the **NGT-1** hardware and any other devices should be checked as a matter of course, before continuing with this guide.

Status LEDs

The NGT-1 hardware has two bright LEDs that can be seen through the case to indicate when data is received from either the serial 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 using the 'Behaviour' and 'Solution' details in Table 4 using NMEA Reader as a diagnostics tool.

Figure 5 - Diagnostic LED

Behaviour	Solution
USB only: The LEDs do not light	The USB driver has not been installed correctly, refer to **"USB Driver Installation" on page 8**
The NMEA 2000 LED does not flash when the NMEA 2000 network is active	Check that the **NGT-1** is connected to the NMEA 2000 network and that the NMEA 2000 network is operational refer to **"Connecting to an NMEA 2000 Network" on page 9**. Confirm that at least one periodic PGN message is being sent on the NMEA 2000 network and there are at least two NMEA 2000 devices on the network. If another NGT-1 is available, NMEA Reader can be used to prove the status of the NMEA 2000 network.
The serial LED does not flash when connected to a PC software application	Check that the NGT-1 is connected correctly to the PC (via USB or RS232 port) and the software application has opened the COM port connected to the NGT-1 at the matching baud rate. Refer to the relevant connection option from those described on **page 8** onwards.
Both LEDs flash together, once every 10 seconds	Indicates that the **NGT-1** is powered but no data is received from either connection. If valid data should be present and transferred by the **NGT-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 **NGT-1** has lost its Firmware, please connect the unit to the latest **NGT-1** Actipatch and re-install the Firmware. The latest Firmware can be found on the **NGT-1 downloads** web page.

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 **NGT-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.

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Specifications

Table 4 - Specification Table

Power Supply (ISO Variant)	
Supply Voltage (NMEA 2000 Port)	9.5 to 35V DC
Supply Current (NMEA 2000 Port)	35mA @ 12V DC Max 50mA
LEN	1
Power Supply (USB Variant)	
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
LEN	1
Mechanical	
Housing Material Lid	Polycarbonate
Housing Material Base	Flame retardent ABS (UL V-0)
Weight NGT-1-ISO	220g
Weight NGT-1-USB	210g
Approvals and Certifications	
Fully NMEA 2000 Certified	
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

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

NMEA 2000 Port (All Variants)	
Compatibility	Fully NMEA 2000 certified
Galvanic Isolation	Refer to 'PC 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 (1.9 with NMEA 2000 cable connected)
PC Port (ISO Variant)	
Compatibility	Full RS232 & RS422 compatible.
Galvanic Isolation	2500V input to ground 1500V output to ground using **ISO-Drive**
Speed/Baud Rate	4800 to 115200 Baud Default setting - 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 40V DC
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 Default setting - 115200 Baud
Connectivity	Male type A plug moulded onto cable
Cable Length	1.5m
Drivers (Latest OS)	Windows XP, Vista, 7, 8, 8.1 & MAC OS X supplied on CD & via the **NGT-1 downloads** web page.
Drivers (Legacy OS)	Contact Actisense for full details of the legacy OS versions supported **support@actisense.com**

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Minimum NMEA 2000 PGN List

The **NGT-1** is capable of transferring any PGN in the NMEA 2000 specification to or from the NMEA 2000 bus depending on the configuration of the **NGT-1**. Optionally, the NGT-1 can be put in “Transfer: Receive All” mode, which allows the **NGT-1** to transfer any and all PGN messages from the NMEA 2000 bus without limitation. It is impractical to publish the entire NMEA 2000 PGN list, **“Table 5 - Minimum NMEA 2000 PGN List”** shows the PGN messages that cannot be disabled by software configuring.

Table 5 - Minimum NMEA 2000 PGN List

PGN	PGN Name	Rx	Tx
59392	ISO Acknowledge	NO	YES
59904	ISO Request	YES	NO
60160	ISO Transport Protocol, Data Transfer	YES	YES
60416	ISO Transport Protocol, Connection Management	YES	NO
60928	ISO Address Claim	NO	YES
65240	ISO Address Command	YES	NO
126208	NMEA - Request Group Function	YES	NO
126464	PGN List (Tx List and Rx List)	NO	YES

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NGT-1 Product Order Codes

Product Code	Product Description
NGT-1-ISO	NMEA 2000 PC Interface, special version with RS422 serial
NGT-1-USB	NMEA 2000 PC Interface, standard version with USB
STNG-A06045	SeaTalkNG to NMEA 2000 adaptor cable (drop). Only for purchase with Actisense NMEA 2000 devices

AMZ YACHTING

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