Actisense®

NMEA Data Multiplexer

NDC-4-A
NDC-4-A-USB
NDC-4-A-ASW
NDC-4-A-AIS

Install User Manual

Issue 1.06

- Multiple talker interface for use with the NMEA 0183 standard. Serial data networking of marine electronic devices / instruments.
- RS232 & USB 1.1 & 2.0 PC interfaces to the NMEA 0183 standard.
- Actisense **ISO-Drive technology** for a fully isolated serial data system.
- Intelligent NMEA filtering on all inputs allows smart removal of NMEA data.
- Reconfigurable to work as an NDC-4-ASW Autoswitch to allow the automatic switching between upto 4 NMEA inputs.

Contents

Important Notices

The **Actisense** NMEA Data Multiplexer / Combiner / Autoswitch (NDC-4) is intended for use in a marine environment, primarily for below deck use. If the unit is to be used in a more severe environment, such use may be considered misuse under the seller's warranty.

The **Actisense** NMEA Data Multiplexer (NDC-4) 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 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.

Notices

When using this document, keep the following in mind:

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)**.

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 accidents or any other reasons during operation of the user's unit according to this document.

The NDC-4 does not validate the NMEA data it receives in any way. Neither the NMEA sentence checksum, nor the data contained within the NMEA sentence is validated. Therefore, the electronic device(s) supplying the NDC-4 with NMEA data retain(s) the sole responsibility for the NMEA data's validity.

Foreword

Actisense recognises that instructions are often skipped, so we have aimed to write this document in an informative, yet direct manner that will aid the user. We have tried to cover all the points a typical user may need to know. Please read all sections before installing and using the **Actisense** NMEA Data Multiplexer product and any related software programs.

Introduction

The **Actisense** NMEA Data Multiplexer (NDC-4) product developed out of the requirement to solve two fundamental problems with the existing marine industry NMEA 0183 communications standard.

In theory, the NMEA 0183 standard allows any suitably designed marine electronic device to share its gathered information with any other device on a vessel. Unfortunately, there is one very large drawback with this standard - only one device on a connected network can actually send data (a single talker), with multiple devices (determined by the current limit of the sending unit) listening to that data (multiple listeners).

If the vessel owner has an instrument that ideally requires the data output of two or more devices, for example a chart plotter, then the owner has no alternative but to settle on connecting only the most important device (that which supplies the most used information), normally that is the GPS unit. All other devices cannot be used.

What happens if the owner prefers the vessels gyro compass heading output to that of the GPS, or requires that the current depth be displayed on the plotted chart to help avoid the possible case of running the vessel aground on a shifting sand bank? The NMEA 0183 standard cannot supply an answer to those questions as it can handle only one transmitting device.

These two elementary problems can be solved simply and easily with the **Actisense** NMEA Data Multiplexer's very flexible design approach.

Alternately, if the vessel has two or more identical NMEA devices (e.g. GPS's or depth sounders) the system solution could be to use the **Actisense** NDC-4 as an NMEA Autoswitch to select the highest priority source.

Full information on the complete **Actisense** product range can be found on the **Actisense website**.

General features

4/5 Opto-isolated input ports

Each Opto-isolated input port has a priority level. This is fixed to the logical order that matches the port numbers, i.e. port 1 has the highest priority and port 4 has the lowest. If the USB cable is not plugged in (or not powered) and OPTO IN 0 is not used to connect to a PC, OPTO IN 0 can be used as a fifth fully compliant NMEA 0183 data input.

2 ISO-Drive output ports

These outputs combine the input data into standard NMEA outputs. If the combined Baud rate of all NMEA inputs exceed the output Baud rate, it is possible that the combined data could exceed the data carrying capacity of the NMEA output channel. The multiplexer contains special software to ensure that when the output channel is overloaded, new data of the same type as older data, still in the buffer, will overwrite the older sentence.

A PC RS232 or USB bi-directional port

The RS232 compatible Port 0 (OPTO IN 0 and ISO OUT 0) and the USB interface ensures that any device (or PC), that has an RS232 or USB port, receives all the input NMEA data, and can add its own NMEA data to the combined output. This allows for the possibility of a “virtual cockpit” of instruments displaying all available data in any manner the user requires (available from a number of manufacturers).

These connections also allow the unit to be updated via the free flash upgrade software that will be made available on the **Actisense** website when the NDC-4 firmware has been enhanced.

When the USB cable is plugged in and powered up, it disables the OPTO IN 0 on the NDC. For example this is very useful when a PC is supplying data, and you want an NMEA device to supply the same data when the PC is powered down.

Note that standard NDC-4 units can be upgraded to USB by purchasing a USB upgrade kit.

Technical features

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

Flash ROM technology that supports automatic programming for quick and easy updates, 100,000+ 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.

The NMEA 0183 inputs are floating receivers, opto-isolated to 2500 volts, protecting your system even during the most extreme fault conditions. This differential input is fully compliant with the NMEA 0183 standard specification **and** is also compatible with RS232 signal levels. Typical operating voltage is 2.0v to 15.0v. The unit can withstand +/- 35v continuously, and +/- 40v transients. The Opto-isolator can thus protect any upstream equipment (chart plotter, laptop PC, radar etc.) from up to 2500v of common mode voltage difference.

ISO-Drive output technology creates a driver, unique to Actisense, that is isolated to 1500 volts. ISO-Drive allows a completely floating output to be created, making a safe connection to a PC an easy task. The output automatically changes between differential and single ended drive depending upon the type of instrument it is connected to. The ISO-Drive output is fully compliant with the NMEA 0183 standard specification and is also compatible with RS422 & RS232 signal levels.

Wide battery input voltage range to offer maximum compatibility, the NMEA 0183 NDC-4 can operate from a battery supply anywhere between 8 and 35 volts.

USB powered option is available when the battery source is not present. When the main battery is present, the USB power drain is minimal.

A diagnostic LED indicates the operation mode of the NDC-4, if any faults have been detected, or the peak load currently on any one of the NMEA inputs.

Very tough Polycarbonate case is certified to IP66 (splash-proof). Being Polycarbonate, it is also incredibly strong, offering a wide temperature range and superior protection to the electronics inside.

Robust Nylon grommets are certified to IP68 (submersible). Note that to achieve this level of water integrity all grommets must be occupied by round-section cables.

Large range of possible cable diameters of between 4.5 mm and 10 mm, single or multi-pair wire types can be easily accepted.

Software updates

The NDC-4’s built-in firmware is held in “flash” memory, allowing quick and easy upgrades using a simple Microsoft Windows (98 SE/ME/NT/2000/XP) user interface program (ActiPatch) running on a connected PC.

It is our policy to provide these updates free on our website, **www.actisense.com**. This upgrade can be performed with the unit completely in-situ, via a PC connected to the Port 0 (OPTO IN 0 and ISO OUT 0) or the USB port.

Connecting devices together

The basics

NMEA data is transmitted from an information source such as GPS, depth sounder, gyro compass etc. These data sending devices are called "**Talkers**".

Equipment receiving this information such as a chart-plotter, radar or NMEA display is called a "**Listener**".

Unfortunately, only one Talker can be connected on to a single NMEA 0183 system at any one time. Two or more Talkers are simply not possible because they are not synchronised to each other, and will attempt to 'talk' at the same time (over each other), resulting in corruption of the NMEA data, and potentially in disaster if valuable data such as navigation information is lost or corrupted so that it is incorrect and/or misleading.

Actisense produces a full range of products to solve all NMEA interfacing requirements.

Please visit the **Actisense website** for full details on these and other **Actisense** interfacing, Depth sounding and Sonar products.

The NMEA signals

The NMEA 0183 system v2.0 and later uses a "differential" signalling scheme, whereby two wires are used to transmit the NMEA data. These connections will be labelled as either NMEA "**A**" and "**B**" or NMEA "**+**" and "**-**" respectively, depending on the instrument and manufacturer.

When connecting between different manufacturers, there can be some confusion, but it is simple and easy to remember: NMEA "**A**" connects to NMEA "**+**" and NMEA "**B**" connects to NMEA "**-**".

The different NMEA standards

The NMEA 0183 specification has slowly evolved over the years, so connecting one device to another is not always a straightforward matter. The earlier versions of NMEA 0183 (before v2.0, as detailed above), used slightly different connection methods and signal levels: the instruments had just one "NMEA" data line ('**Tx**' or '**Out**'), and used the ground as the other line - similar to the way a computer serial port works. This connection method is referred to as "single ended" instead of the "differential" method used by NMEA 0183 v2.0 devices.

The data format is largely the same between both systems, with v2.0 adding some extra sentence strings, and removing older (redundant) sentence strings from the specification. The situation is further complicated, as many manufacturers still use the old ("single ended") method of connection because it is cheaper to implement.

So how can an older type NMEA device be connected to a newer type device?

Care is needed – it is possible to damage or overload the output of a newer differential device if it is incorrectly connected to an older device. This is because the older devices used ground as the return, whereas the newer devices actually drive the NMEA "**-/B**" line between 5v and 0v. Thus, connecting this output to ground will result in high currents being drawn by the driver instrument, resulting in potential overheating and damage to the driver circuits.

However, the new **Actisense** ISO-Drive technology allows the user not to worry about this potentially damaging incompatibility. Instead, an ISO-Drive output can be connected to an old type single-ended system, by connecting the NMEA "**+/A**" output from the ISO-Drive to the single-ended NMEA "**Rx**" or "**In**" input of the device. Connect the NMEA "**-/B**" output of the ISO-Drive to the ground of the single-ended device. This provides the required data signal return current path.

To connect an old type single-ended device to an OPTO IN input, connect the NMEA "**Tx**" or "**Out**" output from the single-ended driver to the OPTO IN "**+/A**" input of the NDC. Connect the ground line of the single-ended output device to the OPTO IN "**-/B**" input of the NDC. This provides the data signal return current path. If the NMEA "**-/B**" input is left floating, then data corruption / errors may occur.

Please refer to the **Output Connections** section for example of these connection methods.

Connections

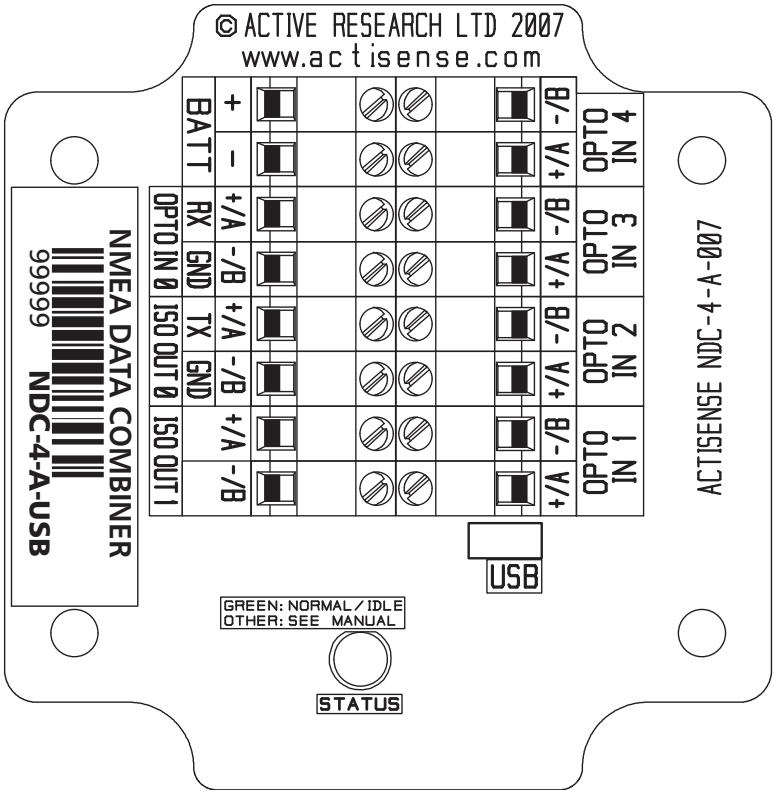


Figure 1 – All external connections

The NMEA Data Multiplexer (NDC-4) has screw-terminal “Phoenix” type external connections for: -

1. Five Opto-isolated inputs.
   All inputs are of the differential opto-isolated type and use the unique **Actisense** low current drain circuitry (2mA @ 2.0v) to conform in full with the NMEA 0183 marine electronic device network communication standard, and are flexible enough to interface to most fully and partially compliant devices.

2. Two ISO-Drive outputs.
   The ISO-Drive outputs comprise of two connections: ‘**+/A**’ and ‘**-/B**‘ and conform in full to the NMEA 0183 standard.

3. RS232 compatible input/output option.
   The ISO OUT 0 and OPTO IN 0 connections can be used as a bi-directional RS232 compatible port and is designed for direct connection to a Personal Computer (PC) or other marine device capable of interfacing to a standard RS232 port.

   When a USB cable is powered and plugged into the NDC-4, this port switches to output only - i.e. the RS232 input (OPTO IN 0) no longer operates.

4. A USB input/output (NDC-4-USB Only).
   The standard USB 1.1 port is designed for direct connection to a PC’s USB port. Once the USB cable is powered and plugged into the NDC-4, Port 0 switches to an output only mode - this allows the USB port to take over bi-directional control of the NDC-4.

   USB 2.0 is backwardly compatible with USB 1.1.

5. Battery supply input.
   Standard battery power connections.

Note:

1. To complete the NMEA 0183 standard all device interconnection NMEA cables used should meet the two-conductor, shielded, twisted pair configuration specification. The shield connection of these wires should be connected at the instrument end only to prevent ground loops.

2. Refer to the **Specifications** section for the full details on input/output specifications.

Connecting to NMEA devices

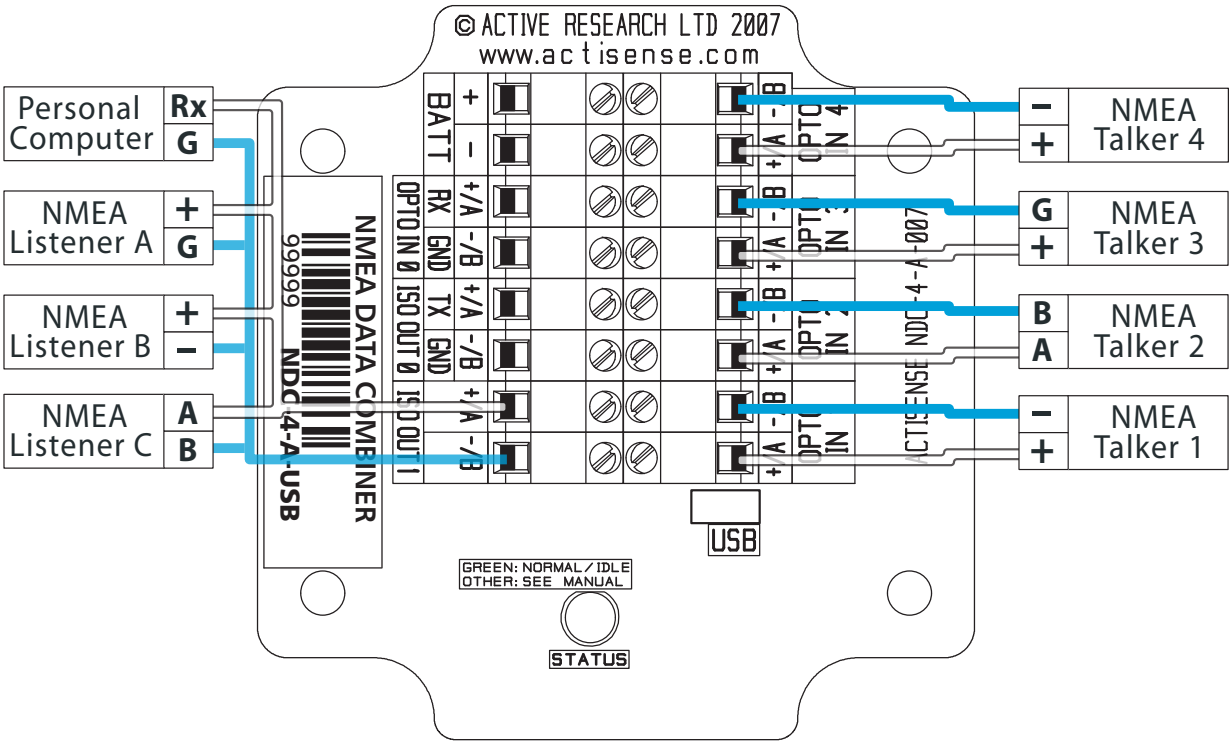


Figure 2 – NMEA 0183 connections

OPTO Inputs

The differential opto-isolated inputs are designed to handle a variety of NMEA 0183 device output specifications. Please determine (from device manufacturer's information) if the device(s) required to be connected to the **Actisense** NDC-4 conforms in full to the NMEA 0183 network communication standard. If it does not, the flexible **Actisense** NDC-4 inputs should still be capable of interfacing with the device, though this is not guaranteed.

The diagram above shows a typical installation with both fully compliant NMEA devices with differential inputs/ outputs, and non-differential output devices.

NMEA Talker devices 1, 2 and 4: These devices conform in full to the NMEA 0183 standard. Devices 1 and 4 share the same connection ID's as the **Actisense** NDC, so connection is a simple matter of matching the ID's (refer to figure 2). Device 2 uses the RS485 convention connection ID's. Simply connect '**A**' to '**+/A**' and '**B**' to ' **-/B**' (refer to figure 2).

NMEA Talker device 3: This device does not conform completely to the NMEA 0183 standard. However, by connecting '**+**' to '**+/A**' and its '**G/Ground**' to the NDC "**-/B"** the NDC should receive the NMEA data correctly.

ISO-Drive Outputs

The ISO-Drive outputs are capable of driving up to 10 NMEA 0183 fully compliant listening devices, or a mixture of NMEA 0183 devices and a Personal Computer (PC) communication port. However, if you wish to maintain isolation between all devices, then only **one** listening device should be connected to an ISO-Drive output.

NMEA Listener device's B and C: These devices conform in full to the NMEA 0183 standard and their connection ID's match that of the NDC.

Personal Computer: Whilst the OPTO IN 0 and ISO-Drive 0 provide a bi-directional RS-232 compatible port for connection to a PC, the ISO-Drive 1 output is also capable of being read by a PC's RS232 port. Simply connect '**+/A**' to '**Rx**' and '**-/B**' to **'G/Ground**' on a standard D-type (probably male) connector.

NMEA Listener device A: This device does not conform in full to the NMEA 0183 standard. However, by connecting '**+/A**' to '**+**' and '**-/B**' to '**G/Ground**' the device should be able to receive the NMEA data correctly, though this is not guaranteed.

Note:

1. Wire colours are for guidance only.

Other Connections

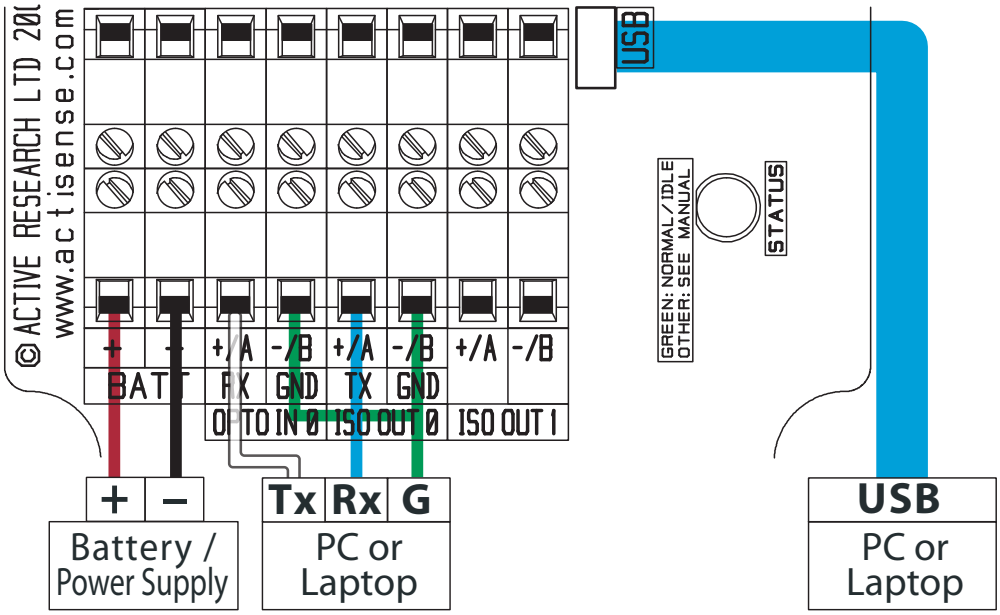


Figure 3 – RS232, USB and Battery connections

CAUTION!

The USB power and battery power are NOT isolated from each other. The USB and external battery should NOT be connected at the same time unless an isolated power supply is used.

For installs where the NDC-4 must still operate when the PC is switched off, full PC isolation can be maintained by using Port 0 ('OPTO IN 0' and 'ISO OUT 0') as the PC connection.

Connecting to a Personal Computer

The USB port can be used to connect a PC to the NMEA 0183 system.

The NDC-4 should be used with the 2 metre USB cable supplied as standard. If a longer cable length is required, a standard USB 1.1/2.0 extension cable should be used in conjunction with the existing USB cable. This extension cable would have **female** '**A**' and **male** '**A**' connectors.

Alternatively, Port 0 (OPTO IN 0 and ISO OUT 0) can be used to connect a PC into the NMEA 0183 system by using a serial port cable conforming to the following specification:

1. A D-type female (socket) connector for the PC end of the cable.
2. A minimum of 3 cores are required in a shielded cable. Higher quality cable will yield higher performance (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. Please note that both the Rx and Tx grounds on the NDC-4 must be connected to the PC's ground, as shown in figure 3 above.
3. The **TX** of the NDC-4 should be connected to the **RX** of the computer (standard D-type, pin 2) and the NDC-4 **RX** should be connected to the **TX** of the computer (pin 3). The **GND** of the NDC-4 should be connected to the PC's serial port ground (pin 5).

Connecting to the battery supply

The **Actisense** NDC-4 can be powered either by the USB connection or through an external power source. If both power sources are available, the current drawn from the USB supply will be reduced to a trickle. If the external power source is removed, the USB power will seamlessly take over, without loss of data.

If the NDC-4 is powered from an external power source, like a battery, it should be wired to the vessel's battery supply in the most direct manner possible, to minimize interference from other electronic devices. The cable used should be of sufficient gauge to handle the power requirements of the **Actisense** NDC-4 (refer to the **Specifications** sections).

Note:

1. Wire colours are for guidance only.

USB Driver Installation

(NDC-4-A-USB Only - Note standard NDC-4 units can be upgraded to USB by purchasing a USB upgrade kit).

The **Actisense** NDC-4 makes use of a virtual serial port driver (know as the Virtual COM Port Driver) to interface between the USB port on the PC and the **Actisense** product. This driver allows software running on a PC to communicate with the **Actisense** NDC-4 as if it was connected to a standard serial port on the PC, when in fact all communication is done over the USB connection.

The required driver installation comes in two seperate packages. The first driver is a called the 'Serial Converter' which converts the USB data packets to a serial data stream. The second driver, called the 'Actisense NDC USB Serial Port', makes the USB connection appear as a COM port in the Windows Device Manager.

The NDC-4 with USB connection has been extensively tested with both Windows XP and Windows 98 SE.

For the experienced Windows XP user who is used to installing drivers, this section will be very familiar. To all other Windows users, the required steps are detailed below to help with installation.

The steps for Windows 98 SE are very similar to those of Windows XP and so are not detailed here.

The **Actisense** CD also contains the USB drivers for Windows 2000. These drivers have not been tested by **Actisense**, but should operate in the same manner as the Windows 98 SE and XP drivers.

The required Linux drivers are already included in the Linux kernels from v2.4.20 and onwards. However, **Actisense** has not been able to test the compatibility of the NDC-4 with USB and this driver.

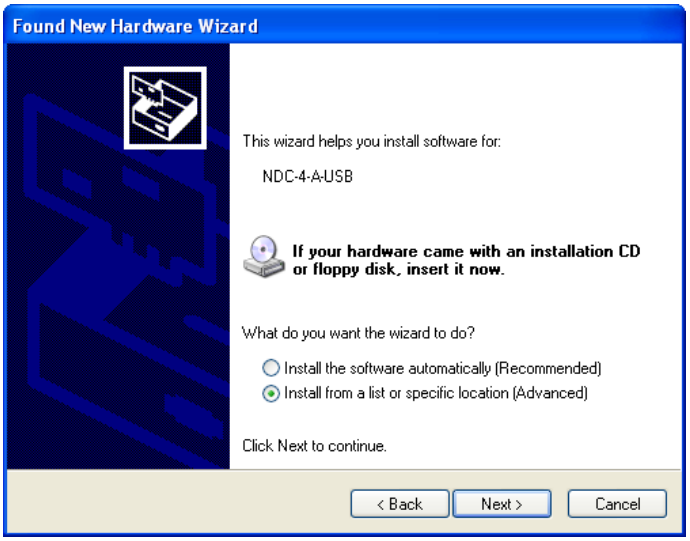
For MAC OS 8, 9, and X please contact **Actisense** for details (refer to the **Contact Information** section).

Step by step guide

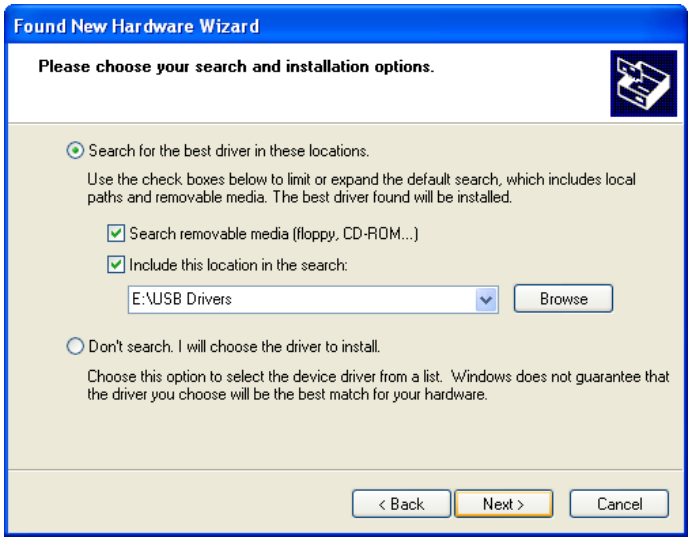
1. Connect the **Actisense** NDC-4 to an available USB port on the PC. The standard Windows 'Found New Hardware Wizard' window will then appear.

Select the '**No, not this time**' option, to allow driver installation from the **Actisense** CD which was supplied with your Actisense product.

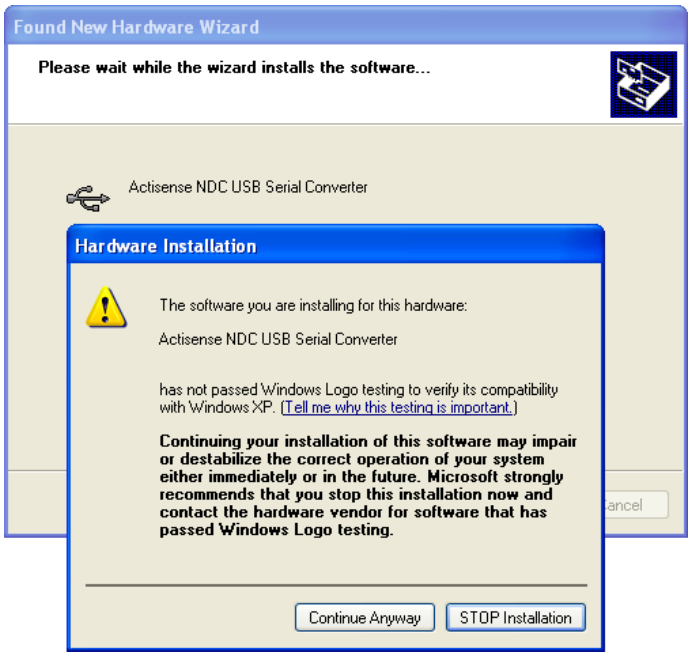
2. Insert the **Actisense** CD, choose the '**Install from a list or specific location**' option, and click '**Next**'.



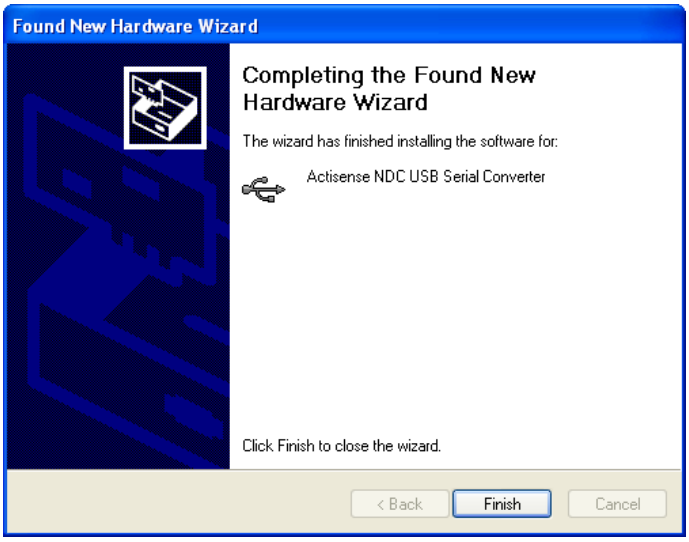
3. Make sure the '**Include this location in the search**' option is ticked, and use the '**Browse**' button to locate the '**USB Drivers**' directory on the **Actisense** CD.



4. The '**Actisense NDC USB Serial Converter**' driver is not Microsoft Windows certified, but it has been 'tried and tested' for stable and reliable operation with the **Actisense** NDC-4. Click '**Continue Anyway**' to carry on with the installation.



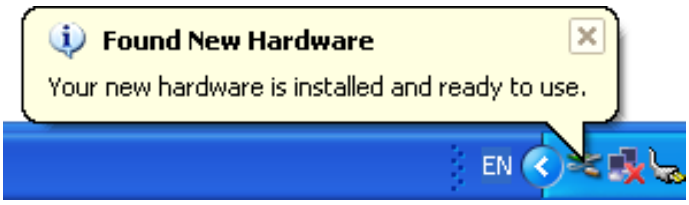
5. The '**USB Serial Converter'** driver is now installed, click '**Finish**' to complete the wizard, and wait for the '**Found New Hardware Wizard**' to appear again.



This second wizard will guide you through the '**USB Serial Port**' driver installation.

6. Follow steps **1** to **5** above for the '**USB Serial Port**' driver installation and click '**Finish**' to complete.

'**Your new hardware is installed and ready to use**' will appear in the bottom right corner of your screen when the installation is complete. See the **USB Driver Configuration section** for details on how to find out which COM port number has been allocated to your **Actisense** device as well as how to change to a different COM port and configure the Baud rate.



USB Configuration

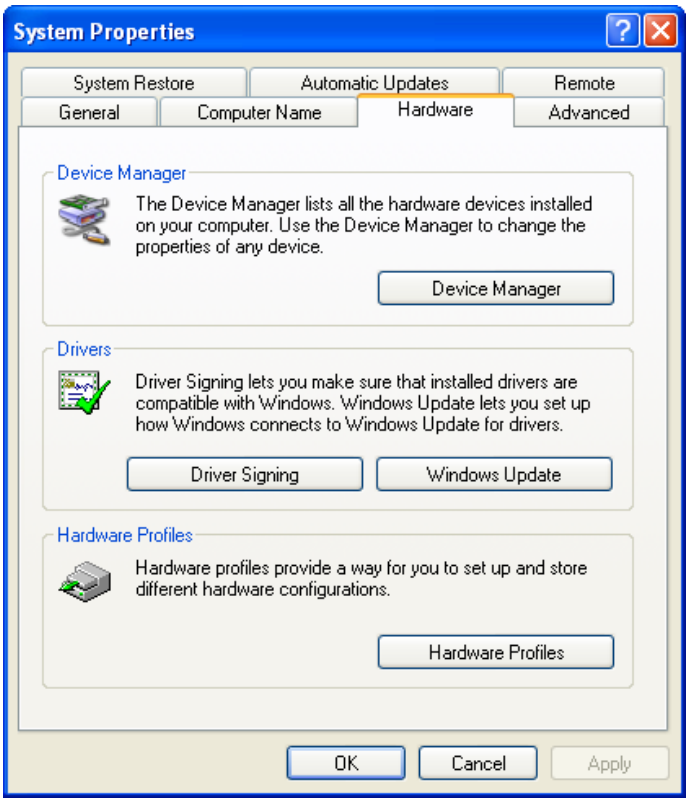
To communicate with the NDC-4, the COM port number that Windows has allocated to the USB port needs to be determined. The following guide will walk the user through this standard operation.

The **Actisense** NMEA Data Multiplexer, NDC-4 is completely USB port independent: it can be easily unplugged from one USB port and connected to another available USB port on the same PC without the COM Port number changing.

This is very useful when the NDC-4 is working in unison with a software program that is set up to use a particular COM port, as the user does not need to reselect a different COM port everytime the PC reboots, or the cable is swapped between two USB ports.

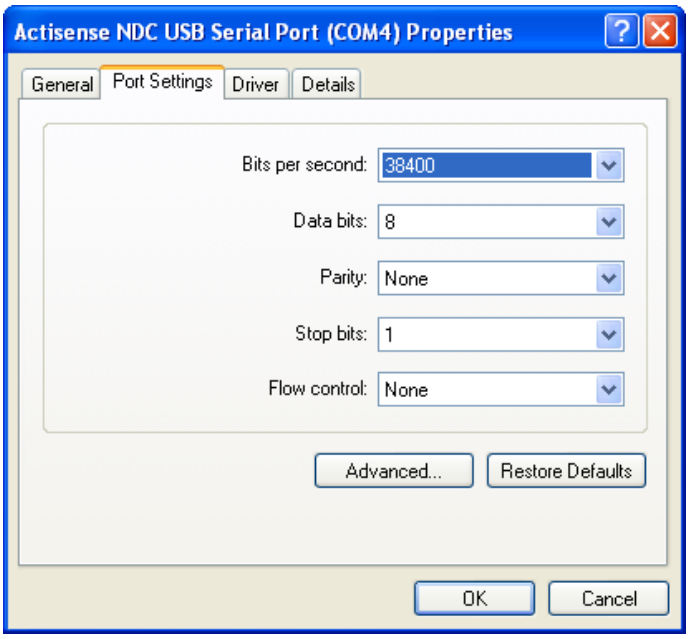
Step by step guide

1. Make sure the **Actisense** NDC-4 is powered up (indicated by a green LED) and connected to an available USB port on the PC. From the Windows '**Control Panel**', open the '**System Properties**' window and click on the '**Hardware**' tab.

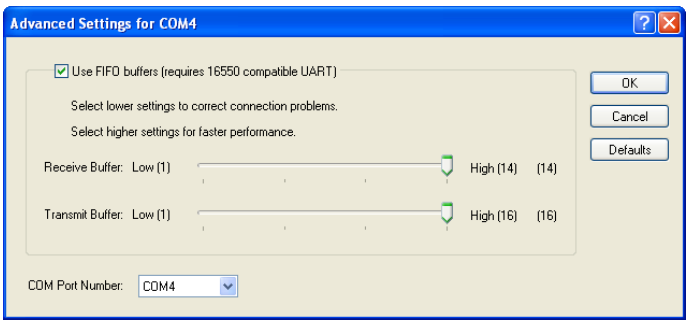


2. Click on '**Device Manager**' and expand the '**Ports (COM & LPT)**' list by clicking on the '**+**' sign next to it. You will find the '**Actisense NDC USB Serial Port**' in the list, followed by the allocated COM port number.

3. Double click on the port icon for the '**Actisense NDC USB Serial Port**' and the port properties window will appear. Click on the '**Port Settings**' tab. Select a Baud rate of 38400 for the '**Bits per second**' option. This is the fixed Baud rate for the **Actisense** NDC-4 device. Leave the other settings as they are.



4. Click on the '**Advanced**' button and choose a different COM Port number if required (to make it compatible with the software requiring the NDC-4 NMEA data).



The other settings are already optimised for the **Actisense** NDC-4 and should be left in the default values. Click on '**OK**' button to save the new settings.

Actisense PC Software suites

The **Actisense** NMEA Data Combiner hardware can be configured, monitored and tested using its own dedicated Control Centre software suite. The **Actisense** NDC can be updated / upgraded using the latest Flash Centre software suite. This section provides a complete users guide to installing and uninstalling these two software suites.

These programs are currently only available for Windows platforms (98 SE/ME/NT/2000/XP), however, it has been proven possible to use the NDC Control Centre / ActiPatch on a Mac running Windows emulation software.

To install Actisense PC software

Replace the generic "<Product Name>" text below with the name of the actual software you are installing: "NDC Control Centre", or "ActiPatch".

1. Download the latest version of the software from the **Actisense** website, or locate the files on the **Actisense** CD included with the NDC-4.

2. If a previous version of the software has already been installed, uninstall the previous version and delete the program directory **before** installing the new version. Refer to the **To uninstall Actisense PC software** section for full details.

3. If the program is contained within a zip file, extract the three files ('<Product Name>.001,' '<Product Name>.002' and 'setup.exe') that are contained within the zip file using any available unzip program to a temporary directory (e.g. "C:\Temp").

4. Double click on the 'setup.exe' program file and follow the on-screen instructions of the standard Windows install program. The install location can be change at this point, however, the default location is normally acceptable (refer to figure 4 and 5).

   Once the install operation is complete, the temporary files and/or directory can be deleted. Keep the original zip file safe.

5. To start / run the program, use the Windows 'Start' menu and navigate to the installed program's directory. There will be a program icon - double click on it (refer to figure 6 and 7).

Useful Tip: If you access the program regularly you can 'copy and paste' the program icon from the Windows 'Start' menu on to the desktop or the 'Quick Launch' short-cut bar to create a easy to access short-cut.

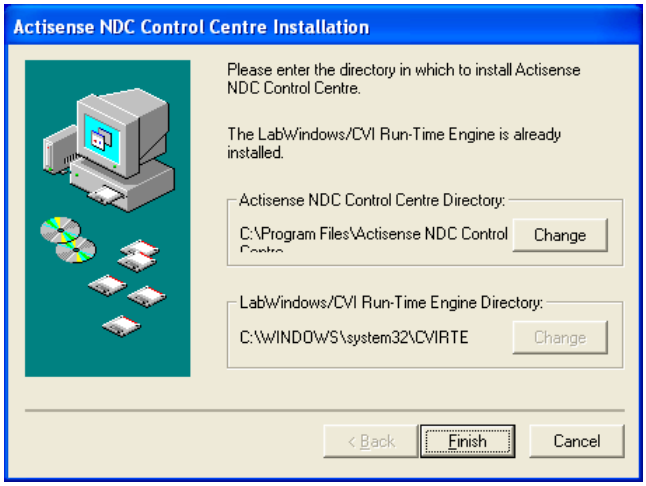


Figure 4 – Install options

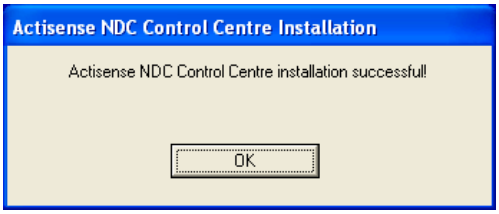


Figure 5 – Installation complete

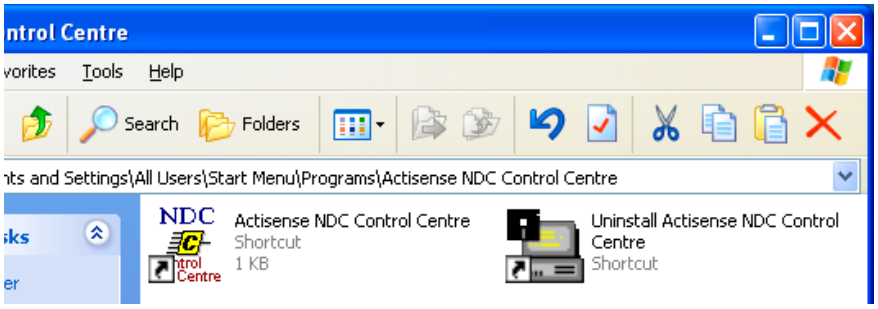
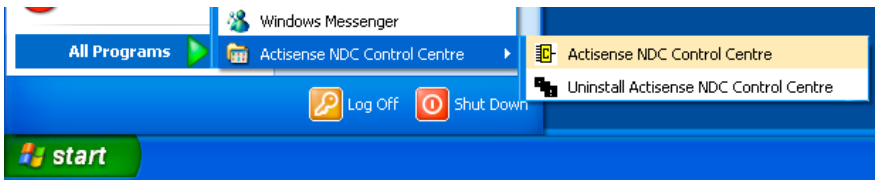


Figure 6 & 7 – 'Start' menu short-cuts



To uninstall Actisense PC software

Replace the generic "<Product Name>" text below with the name of the actual software you are installing: "NDC Control Centre", or "ActiPatch".

1. If at any time you wish to remove the installed Actisense program, simply use the standard Windows **'Start → All Programs → Actisense <Product Name> → Uninstall Actisense <Product Name>'** menu option to perform this operation (refer to figure 7).

2. Alternatively, there is a very convenient uninstall icon included in the program's folder (see figure 6).

3. Once the uninstall operation has been requested, the confirmation box (figure 8) will be displayed. Answer 'Yes' and the uninstall operation will be performed automatically. After successfully uninstalling the Actisense PC software, the uninstall completion box will appear (refer to figure 9).

3. In addition, the program directory can also be deleted to completely remove the program. In this way all the program files will be uninstalled in a clean and complete manner.

   If however, you are going to install a new version after this uninstall, you can keep the program directory and the configuration file stored within it. In this way, all the user settings you had for the previous version will be immediately available with the new version.

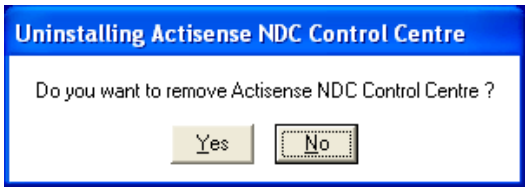


Figure 8 – Uninstall confirmation

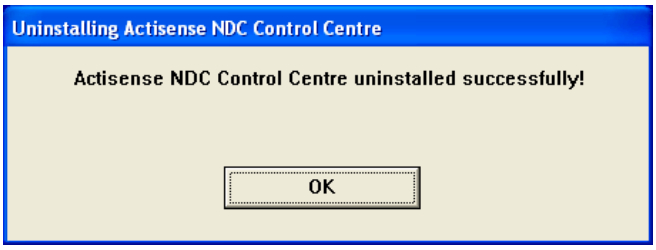


Figure 9 – Uninstall complete

Using Actisense PC software suites

The complete explanation of how to use the **Actisense** NMEA Data Combiner (NDC) software suites is contained within the full user manual available from the **Actisense website** and the **Actisense** CD.

NDC Control Centre

The **Actisense** NDC Control Centre enables the user to modify all available configuration options:

- NMEA sentence filter settings.
- Input priorities.
- Input / output Baud rates.
- Various other options.

In addition, the Control Centre also allows the user to:

- Monitor all NMEA 0183 data going through the NDC hardware. This is an invaluable tool in determining whether an NMEA 0183 system is working correctly, and if any NMEA data is being lost due to an overload condition on an input and/or output.
- Retrieve all hardware information (firmware version).

NDC ActiPatch

The **Actisense** "ActiPatch" enables the user to flash update / upgrade their NDC-4 hardware. This new firmware could enable new features, modify existing ones, or remove 'bugs' that have been found since the product was manufactured.

The update process is a simple one button operation that only takes a couple of minutes to perform.

It is worthwhile to keep your NDC's firmware up to date by monitoring the **Actisense website**, or alternatively, by signing up to the Actiscope newsletter. Actiscope will keep you up to date on any new firmware versions available for all **Actisense** products (only sent out once every 2-4 months on average).

Configuration of AIS

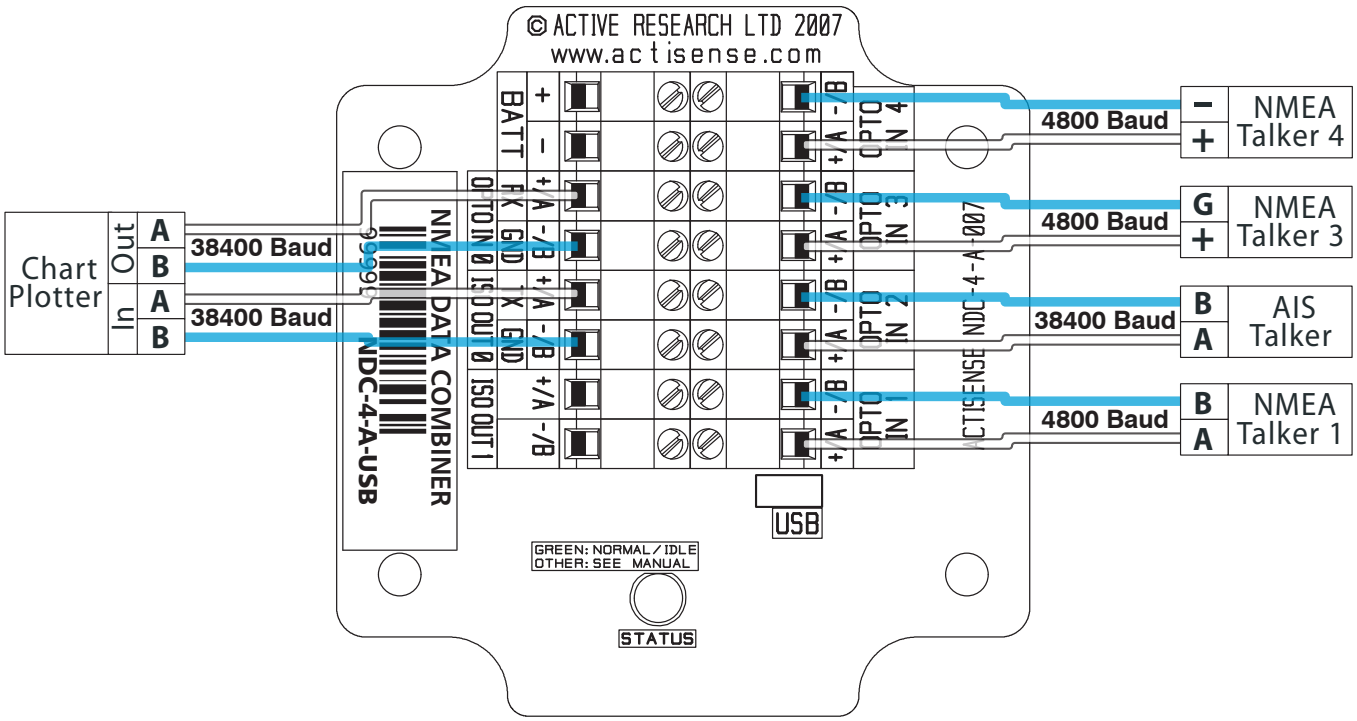
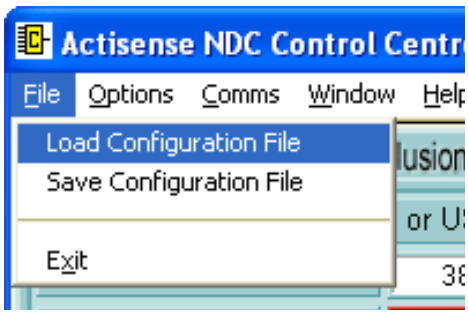


Figure 10 – AIS Configuration with Baud Rate

Setting up the Hardware for AIS

NDC Control Centre, supplied on the CD (or available for download from Actisense website) allows a quick set-up for AIS using the configuration file included.



From the menu select 'File' → 'Load Configuration File' and select 'NDC-4 config for AIS.ini' file from the install directory. This will set input port 2 to the AIS required Baud rate of 38400, and configure OPTO IN 2's Inclusion List to filter out all AIS data from being sent to ISO OUT 1 which is typically kept at 4800 Baud.

The use of AIS at Baud rates lower than 38400 cannot be recommended as this could cause random AIS target data to be lost in areas of high target density.

To enable these settings on the NDC-4 click on the 'Send to Hardware' button on both the 'Port Config' and 'Inclusion List' tabs.

The AIS device should then be connected to the NDC-4's 'OPTO IN 2' as shown in Figure 21, with any other talkers connected as required. The device for receiving the AIS data (chart plotter or PC) should be connected to 'ISO OUT 0', or the USB port.

The remaining ports can be re-configured by the user as needed using NDC Control Centre. Refer to the 'NDC-4 Full User Manual' available on the CD (or on the Actisense website) for detailed information on how to use the NDC Control Centre in full.

The NDC-4-ASW Autoswitch

The **Actisense** NMEA Data Multiplexer / Combiner / Autoswitch (NDC-4) has been designed with the ability to operate as a Multiplexer / Combiner **OR** an Autoswitch.

For systems that have multiple NMEA devices of an **identical** type (e.g. two GPS's or two depth sounders), automatic selection of the highest priority device is normally a vital requirement. However, the NMEA 0183 standard has no method of automatically switching between different devices, so this requirement is usually fulfilled with a manual changeover switch: not a very good solution, but the only one available until now.

If the NMEA data from two (or more) devices are simply combined together, the NMEA listener(s) will not be able to differentiate between the various sources and will get very confused, often jumping between them. If this creates a 'jumping' position fix, vessel safety is seriously affected.

The **NDC-4 Autoswitch mode** is the perfect solution to this problem - automatically **selecting a single device** from the multiple 'same data type' devices available.

Autoswitch mode will automatically select the highest priority device from up to 4 connected input devices, with NMEA port 1 as the highest priority through to NMEA port 4 as the lowest. This creates a system capable of automatically selecting the next priority device if the higher priority device fails for one of three reasons:

1. A complete failure to send any NMEA data
2. An invalid NMEA sentence checksum
3. If the validity flag(s) contained within the received NMEA sentence indicate that this data is not valid and should only be used with caution.

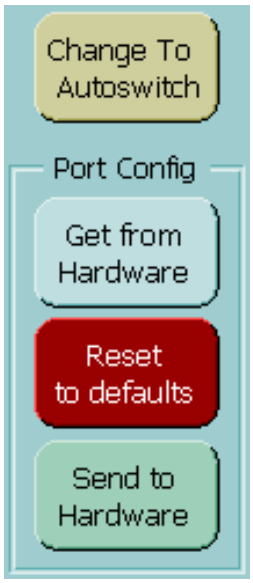
With the addition of two fully Baud rate configurable outputs protected by **ISO-Drive technology**, that can also incorporate NMEA filtering to remove any unwanted sentences before the switching process, the Actisense NDC-4 Autoswitch mode is the most flexible available.

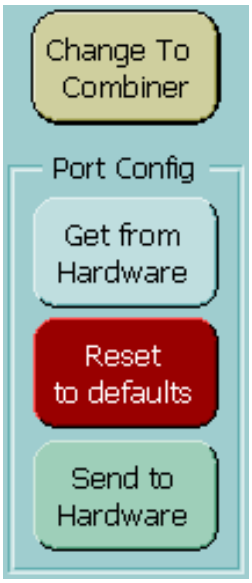
Having the ability to filter out NMEA data **before** the autoswitch process can be particularly useful to avoid unwanted sentences from causing the Autoswitch to change input channels due to invalid data, leaving only the required sentences to switch on.

If ordered as an Autoswitch, the NDC-4 will be pre-configured as an NDC-4-ASW and be ready to work out of the box. Alternatively, any NDC-4 can be configured using the NDC Control Centre to operate in Autoswitch mode.

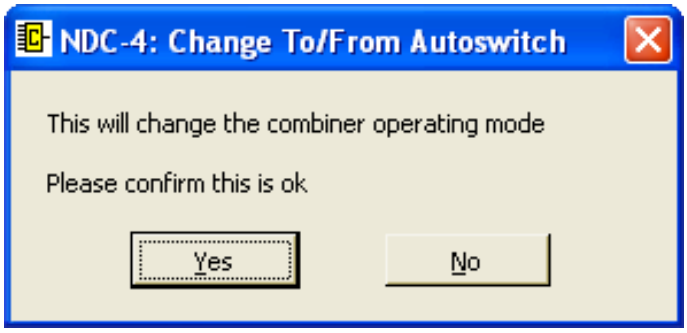
Setting the NDC-4 as an Autoswitch

The NDC-4 can easily be changed between being a NMEA Data Multiplexer / Combiner and an NMEA Autoswitch using NDC Control Centre.





In the 'Port Configure' tab click on the button labelled "Change To Autoswitch" to change the NDC-4's operation mode to Autoswitch.



A warning message will be displayed, requesting that the user confirm the request to change to Autoswitch mode. Selecting "Yes" will automatically send the new configuration to the unit, and the NDC-4 will now **Autoswitch** its inputs instead of **Combining** them.

To revert back to Combiner mode, click on the (same) button (now labelled "Change To Combiner"). Again, the user must confirm the operating mode change is required and the NDC-4 will now **Combine** its inputs instead of **Autoswitching** them.

Troubleshooting guide

This guide will concentrate on all relevant troubleshooting issues above simple cable connection faults. Therefore, the cables between the NDC-4 hardware and any other devices should be checked as a matter of course, before continuing with this guide.

Diagnostic LED

The NDC-4 hardware supports a tri-colour diagnostic LED that indicates the current operating mode of the hardware, or if an error has been detected during the self-test initiation process. Table 1 details what each LED colour represents and if any user interaction is required.

LED Colour / Flash Count	Mode / Error condition	Required user response
	Normal operation modes	The sequence below indicates a successful power-up of the NDC-4 and the commencement of data combining.
Red, No flashing	Start-up mode, No error	No response required. A normal operation mode that should last for no more than 1.5 seconds. Any longer indicates an error with the main program.
Red, No flashing	Flash updating mode, No error	No response required. LED will stay red for the duration of the flash update operation (using Flash Centre). Once operation complete, NDC hardware will be automatically reset.
Amber, No flashing	Initialise and self-test mode, No error	No response required. A normal operation mode that follows after the Start-up mode and should last for approximately 1 second.
Green, No flashing	Normal and no data mode, No error	No response required. A normal operation mode that follows the Initialise and self-test mode. Indicates that no error was detected during the self-test operation. Also indicates that no data is currently being received by the NDC-4 hardware.
Green, Flashing (1-10 per second)	Normal and data Rx mode, No error	No response required. A normal operation mode that indicates that data is currently being received (on at least one channel) by the NDC-4 hardware. Flash rate proportional to Rx rate.
	Error conditions	If the error persists, the NDC-4 unit should be returned to **Actisense** (refer to the **Company Information** section). **Please contact Actisense before returning the unit in order to obtain a Returns form. Any returns sent without a Returns form will incur a delay in being processed.**
Amber, Flashing (Once every 4 seconds)	Error trap mode, EEPROM memory error	An error with the EEPROM memory has been detected during the self-test mode. Reset the NDC-4 hardware.

Table 1 – Diagnostic LED colours

Specifications

The NDC-4 ISO-Drive output is a very flexible output that is RS485, RS232, RS422 and NMEA 0183 compatible.

Parameter	Conditions	Min.	Max.	Unit
Supply				
Supply voltage	External power supply	8	35	V
Supply current from external source (see note 1)	Supply voltage = 12v	30	40	mA
	Supply voltage = 24v	15	20	mA
Supply voltage	USB powered	4.75	5.25	V
Supply current from USB (see note 1)	Supply voltage = 5v	67	75	mA
Opto-isolated Flexible Input				
Input voltage between +/-	Logical '1'/stop bit	-15.0	0.5	V
	Logical '0'/start bit	4.0	15.0	V
Input current	Maximum is under +35v overload condition, Min @ 2.0v input level	1.6	9.0	mA
Differential input voltage	Required level for NMEA to be detected	1.8	2.0	V
Galvanic isolation	Between input & output		2500	V
Overdrive protection			40	V
Input Baud rate		4800	57600	bps
ISO-Drive Flexible Output				
Output voltage between ISO Out +/A and ISO Out -/B (under no load)	Logical '1'	-4.6	-5.0	V
	Logical '0'	4.6	5.0	V
Output current at max load of 100 ohm	At maximum load, differential drive voltage reduces to 2.1v	-	21	mA
Output short circuit current (note 2)	Due to short circuit protection	50	55	mA
Galvanic isolation	From Opto-input and (USB) ground		1500	V
Output Baud rate			115200	bps
Data propagation delay	Under no-overload conditions	1.0	100	ms

General				
Ambient temperature		-20	+70	°C

Table 2 – NDC-4 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. Short circuit may be applied indefinitely. The ISO-Drive output may be short-circuited directly to a 30 volt battery supply without damage. A maximum current of 50mA will flow due to "polyfuse" auto-resetting fuse technology being used in each output.

Note:

Order codes:

NDC-4	Standard NDC-4 (5 isolated inputs, 2 ISO-Drive outputs)
NDC-4-USB	USB capable NDC-4 (4 isolated inputs, 2 ISO-Drive outputs & USB port)
NDC-4-AIS	Standard NDC-4 preconfigured for AIS use (Input 2 set to 38400 Baud and Input 2's NMEA Filter list set to block AIS data going out standard Baud rate Output 1)
NDC-4-ASW	Standard NDC-4 preconfigured for Autoswitch use (Operating mode set to "Autoswitch" instead of standard "Combiner" mode)

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