

ICOM-UK

CB2000 CLASS B AIS TRANSPONDER



INSTRUCTION MANUAL

GETTING STARTED

Thank you for the purchase of your CB2000 Class B Transponder. We want to help you get up and running as quickly as possible, so please go to the link below* to download the Full User Manual for the CB2000 and a copy of the proAIS2 Configuration Software, available for Windows and Mac.

*<http://www.icomuk.co.uk> (and navigate to the CB2000 product range).

Once downloaded, un-zip the contents to a suitable folder on your computer, so that you can start reading the CB2000 User Manual and install the proAIS2 software.

1. Introduction

Congratulations on the purchase of your CB2000 Class B AIS Transponder. It is recommended that your transponder is installed by a professional installer.

2. Before you start

You will need the following items and tools to complete the installation:

- Class B AIS Transponder (supplied)
- NMEA2000 Starter Kit (supplied)
- Dedicated VHF/AIS antenna and cable (or splitter) – not supplied.
- Four M4 screws or other fixings appropriate to the mounting location.

To configure the unit you will need:

- A PC running Microsoft Windows XP® / Windows Vista® / Windows 7 or Mac OSX with a free USB port.
- proAIS2 Class B AIS Transponder configuration software available from <http://www.icomuk.co.uk/> website.
- An MMSI number for your vessel.

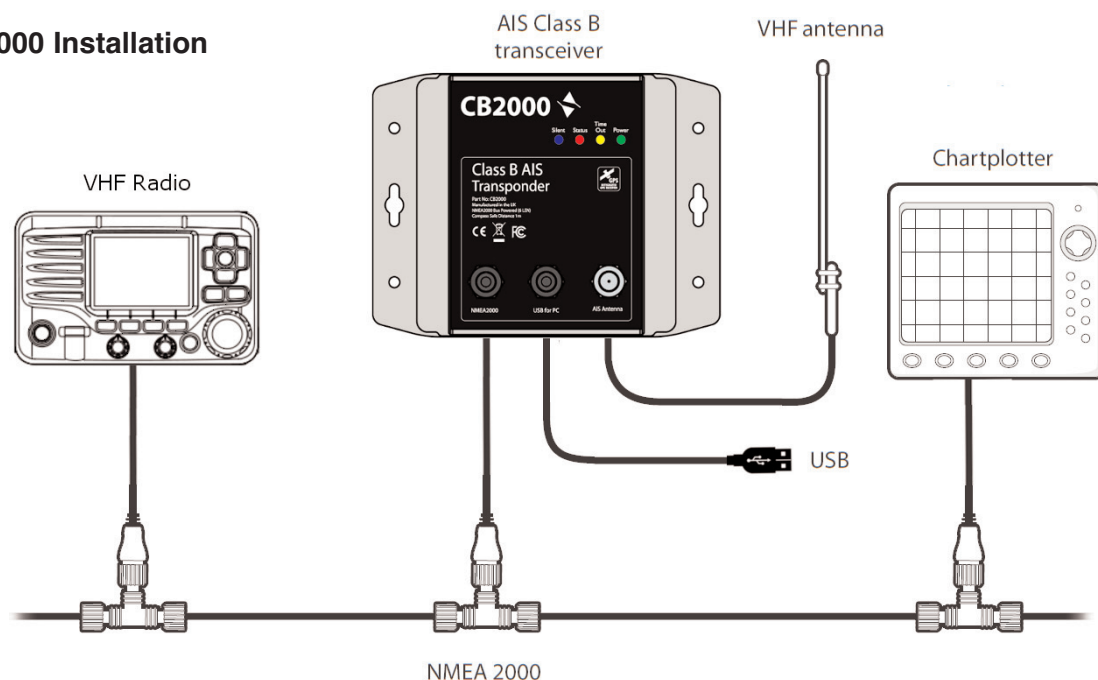
Note: You can obtain an MMSI (Maritime Mobile Service Identity) from the same authority that issues ship radio licences in your area. An MMSI may have already been provided with your existing VHF radio licence. The MMSI number used for the AIS Transponder should be the same as that programmed into your VHF DSC radio. **Do not enter an invalid MMSI number.**

3. Installation

Before starting installation, select a suitable location for the AIS Class B Transponder and NMEA2000 starter kit. When deciding on location you should consider:

- Routing of power and VHF antenna cables to the unit.
- Location and fixing of the NMEA2000 Starter Kit
- The AIS transponder must be fitted in a location where it is at least 0.5m from a compass or any magnetic device.
- There should be adequate space around the AIS transponder for routing of cables. See dimension drawing later in this document, for the AIS transponder dimensions.
- The ambient temperature around the AIS transponder should be maintained between -25°C and +55°C.
- The AIS transponder should not be located in a flammable or hazardous atmosphere such as in an engine room or near to fuel tanks.
- The AIS transponder is fully waterproof to ingress protection rating IPx5, however it is recommended that the AIS transponder is not subjected to extended periods of exposure to spray or submersion.
- It is recommended that the AIS transponder is installed in a 'below decks' environment.
- The AIS transponder should be mounted in a location where the indicators are readily visible as these provide important information on the status of the AIS transponder.

Typical CB2000 Installation



Installation Step 1 - VHF/AIS Antenna or Splitter

- Install the VHF/AIS antenna (not supplied) according to the hand book instructions supplied with the antenna.
- If you are going to share the boat's existing VHF antenna i.e. use the antenna for both the VHF and AIS, you will need to install a suitable antenna splitter.
- It is very important that this splitter is suitable for use with an AIS Transponder as some of the lower cost splitters only switch one input and are only suitable for use with an AIS receiver.
- We have tested and would recommend the SPL1500 from UK manufacturer Digital Yacht, as a suitable splitter for the Icom CB2000, which features "zero loss" technology for optimum AIS and VHF reception.

<http://digitalyacht.co.uk/product/spl1500-vhf-ais-antenna-splitter/>

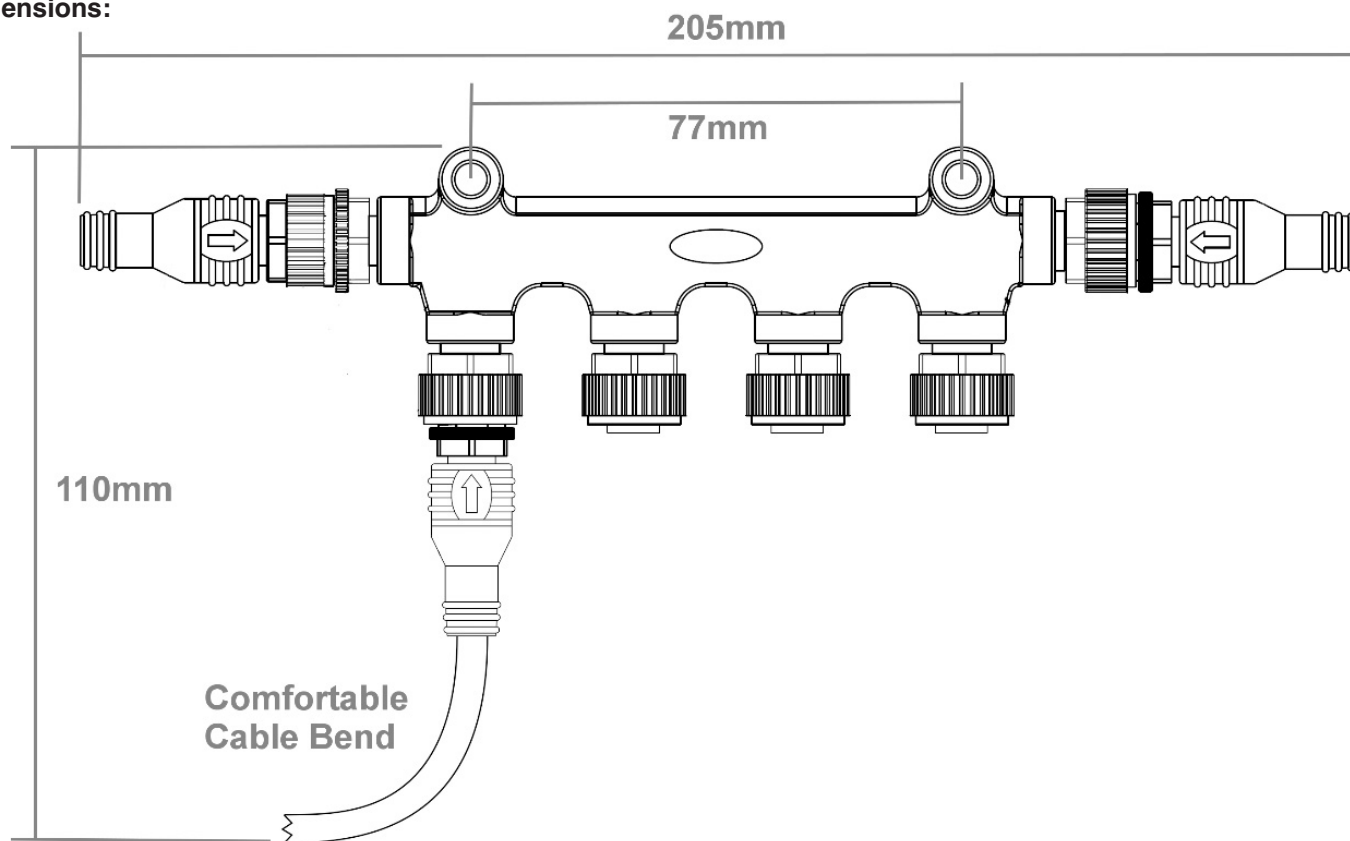
- The AIS antenna connector on the CB2000 is a BNC type but If you are connecting a normal VHF antenna to the CB2000 it may be necessary to purchase an SO239 to BNC adaptor, as these are terminated with the standard PL259 VHF connector. (see image).



Installation Step 2 - Installing the NMEA2000 Starter Kit

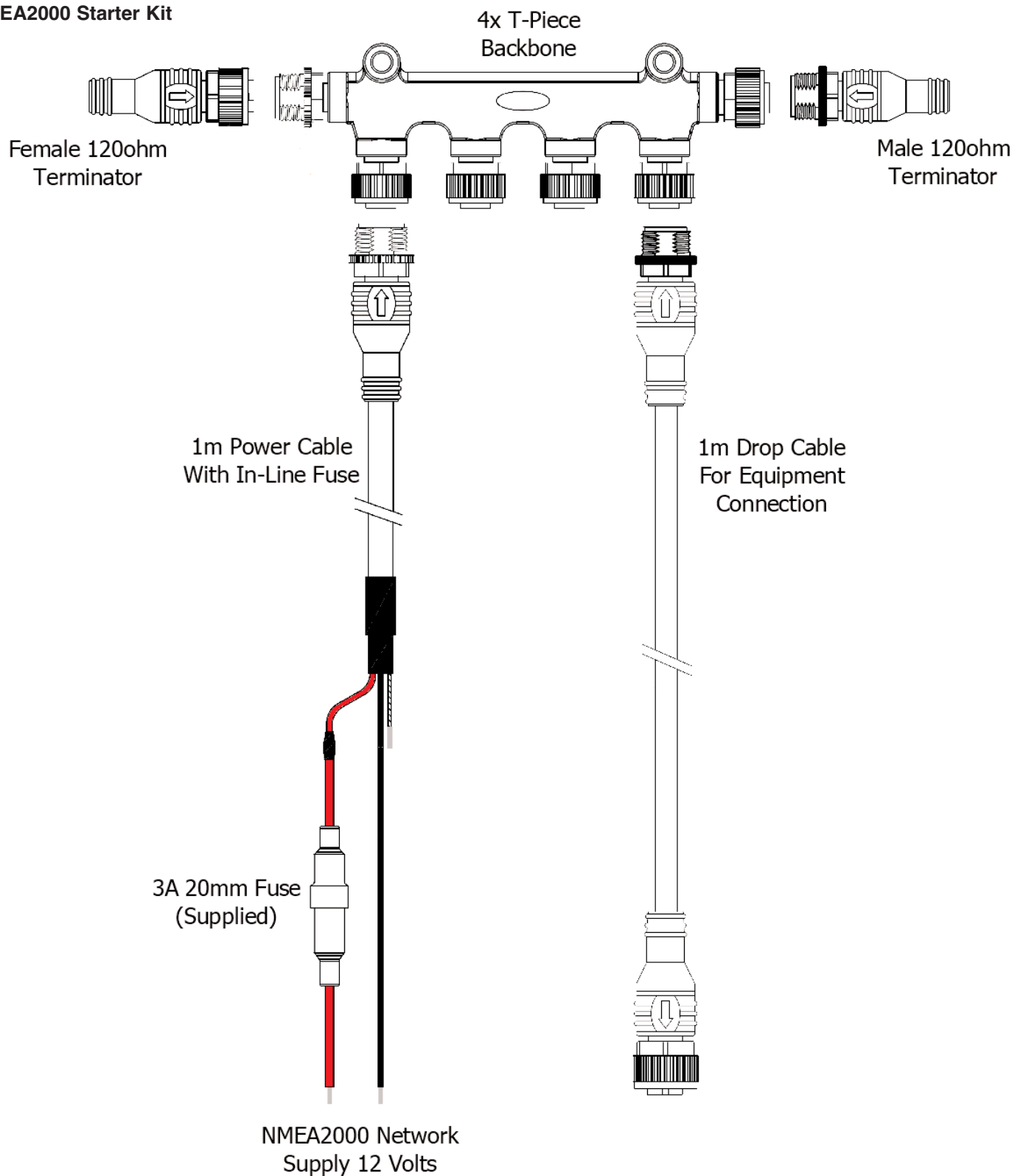
- The CB2000 is supplied with an NMEA2000 Starter Kit that will allow you to create an NMEA2000 "back bone" to which the CB2000 and ICOM VHF can connect to.
- Decide which 12v DC electrical circuit the NMEA2000 network and CB2000 will be powered from and ensure that this circuit has enough capacity to provide the additional 3 Amps of current that the NMEA2000 Starter Kit can draw.
- Connect the NMEA2000 Starter Kit's Power cable to the electrical circuit. If you need to extend this power cable, ensure that you use suitable cabling whose current rating is equal or higher to the fuse/circuit breaker fitted to this circuit.
- The NMEA2000 Starter Kit's power cable includes an in-line 3A fuse (20mm), which protects its NMEA2000 connectors and cabling. Connect the Red (+) and Black (-) wires in the Power cable to the 12v DC electrical circuit you have chosen.
- Fix the 4-way T-Piece Backbone to a vertical bulkhead using suitable fixings (x2). The Backbone should be mounted vertically (as shown below) with the drop cables pointing down, ensuring that any moisture or water droplets drip away from the connectors. Vertical dimension shows required height for drop cables to be fitted without putting the cables under any stress.

Dimensions:



- Route and fit the CB2000's integral NMEA2000 drop cable to NMEA Starter Kit. The CB2000 drop cable and the Starter Kit's power cable can be fitted to any of the four T-Piece Backbone sockets, they are all the same.
- Fit the Power cable and Terminators (see diagram).
- Use the included 1m drop cable to connect the Icom VHF radio to the NMEA2000 Starter Kit.
- Ensure all cable connectors are fully screwed together, but avoid excessive over tightening, finger tight is fine.

NMEA2000 Starter Kit



Installation Step 2 - Locating and Fixing the unit

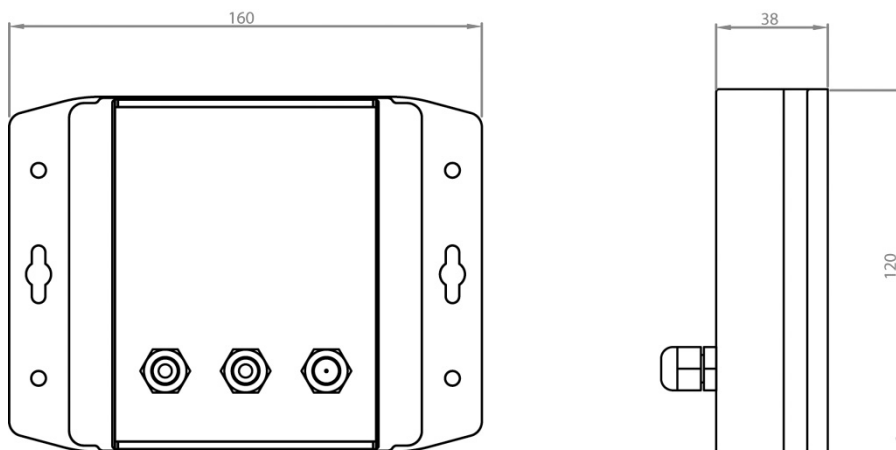
- The CB2000 has a high-sensitivity GPS receiver with an internal antenna which is designed to be used below deck in GRP Fibreglass hulled boats.
- The GPS antenna is located in the top left corner of the unit behind the CB2000 Logo (see image).
- The CB2000 unit must be mounted on a vertical bulkhead so that the GPS antenna is pointing towards the sky.
- Care should be taken to ensure that only GRP fibreglass is between the GPS antenna and the sky, with no metallic or electrical objects above the antenna.
- Location of the CB2000 is critical for good GPS reception and it is strongly recommended that before fixing the CB2000 in the chosen location, that the GPS reception is checked.

- The supplied proAIS2 software for PC/MAC is ideal for this purpose. With the unit powered up (from the boat's NMEA2000 network) and connected via the USB cable to a PC/MAC running the proAIS2 software, view the 'GNSS Status' page and ensure there is a good GPS reception with the CB2000 in the desired location.



Unit Dimensions

- Once you are confident that the CB2000 is in the best location for good GPS reception, secure the AIS Transponder to a flat vertical surface in the selected location, using four M4 wood screws or other fixings suited to the material the unit is being fixed to.



Installation Step 4 - NMEA2000 Interfacing

- The CB2000 receives all current AIS message types including; Class A, Class B, AIS MOB, AIS SARTs, AtoNs, SAR aircraft, base stations, etc., all of these messages are output on the NMEA2000 network.
- The CB2000 does not output GPS data on the NMEA2000 network and in order for the AIS data to be correctly received and displayed by an ICOM VHF/AIS radio it is important that another NMEA2000 GPS source is available on the NMEA2000 network or that an NMEA0183 GPS is connected to the radio.
- A table showing all of the NMEA2000 PGNs (messages) that the CB2000 transmits on to the NMEA2000 network is shown below. Some chart plotters do not support all of these PGNs, so please contact the chart plotter manufacturer if not all AIS target types are being displayed.

PGN No. PGN Title

129038	Class A Position Report
129039	Class B Position Report
129040	Class B Extended Position Report
129793	AIS UTC and Date report
129794	AIS Class A Static and Voyage Related Data
129800	AIS UTC/Date Inquiry
129801	AIS Address Safety Message
129802	AIS Broadcast Safety Message
129810	AIS Class B static data part B
129809	AIS Class B static data part A
129041	AtoN position report
129025	Position – rapid update
129026	COG/SOG – rapid update

Installation Step 5 - USB Interface

- When connected to a PC or MAC via the USB cable, the CB2000 will only get enough power from the computer to power the microprocessor and the AIS receiver. This allows you to program the MMSI number and other static data at home or in the office prior to installation. The CB2000 will not transmit or get a valid GPS position fix when only powered from the USB interface and the RED Status LED will always be lit when powered from the USB cable.
- If you need to extend the USB cable, please use a USB extension cable that is no more than 4m in length. The maximum length of USB cable without the use of a powered extender cable or hub is 5m.
- Please do not plug in the USB cable of the CB2000 to your PC until after you have installed the proAIS2 software, which also installs the USB drivers for the CB2000. Installing proAIS2 is covered in section 4 - Configuration.
- After the CB2000 is configured, the USB connection can be used to provide data to a navigation program running on a PC or Mac. Please note that only one navigation program at a time can receive data from the CB2000.
- The CB2000 USB interface is not fully isolated and high levels of static or large differences in ground voltages between the PC supply and the boat's DC supply can damage the CB2000's USB interface. For maximum reliability, if you intend to permanently connect the CB2000 to a computer, we recommend using an NMEA2000 to USB adaptor (such as an Actisense NGW-1-AIS) connected to the NMEA2000 network which provides an extra level of protection/isolation and can avoid costly damage to the CB2000.

Installation Step 6 - Power Up

- Turn on the power to the NMEA2000 network which the CB2000 is connected to.
- Verify that the green LED illuminates for a short period and then all four LED indicators on the front of the unit flash once, followed by illumination of the amber and red LED's.
- Installation is now complete. The CB2000 needs to be configured using the proAIS2 software – see next section.

4. Configuration

Until correctly configured your AIS class B transponder will only receive AIS messages and will not transmit AIS messages. Before you can configure your Class B Transponder, it is necessary for you to have a unique MMSI number that has been issued to you by the relevant radio or marine authority in your country. If you already have an MMSI number for your DSC VHF Radio, then this is the MMSI number that you will also program in to the Class B Transponder.

There are two potential ways in which your AIS transponder can be configured:

- Configuration in advance by your dealer or installer, in which case you will need to provide them with the boat's data i.e. MMSI number, call sign, vessel name, etc.
- Configure using proAIS2

Providing it is acceptable to do so under your local legislation it is possible to configure your AIS transponder yourself using the proAIS2 software provided with the product. proAIS2 is available for both Windows and Mac OSX and setup/installer programs for each operating system can be downloaded from <http://www.icomuk.co.uk>

The proAIS2 software provides the facility to configure, monitor and diagnose issues with your AIS transponder. proAIS2 can provide assistance when ensuring that a satisfactory GPS signal is being received. It can also display alarm messages generated by the transponder regarding poor VHF antenna quality or that the power being supplied is outside the range specified for operation. proAIS2 can also be used to activate 'silent mode' which disables AIS transmissions.

Once your Class B Transponder is configured, it is not necessary to run proAIS2 again unless you want to use it for controlling or fault finding the Class B Transponder.

If your AIS transponder has been configured for you by your dealer or installer you can proceed to the Operation section.

For configuration purposes only, it is possible to power the CB2000 via its USB connection. This is useful if you wish to configure your AIS transponder away from the vessel's power supply. The AIS transponder will not transmit any data or acquire a GPS position fix whilst powered by USB, but it will receive AIS targets if the AIS/VHF antenna is connected and you are in range of other AIS equipped vessels.

Installing proAIS2 on a Windows PC

Download the proAIS2 for Windows ZIP file from <http://www.icomuk.co.uk>, un-zip the contents of the file in to a suitable folder on your PC and then navigate to this folder and run the Setup.Exe file by double clicking on it.

Follow the on-screen instructions, until the Setup program finishes installing the proAIS2 application and the USB drivers for the transponder.

Installing proAIS2 on a Mac

Download the proAIS2 for Mac dmg file from <http://www.icomuk.co.uk> to a suitable folder on your Mac and then navigate to this folder and mount the dmg file by double clicking on it.

Now click and drag the proAIS2 icon in the dmg folder to your Desktop or Applications folder - which ever you prefer. You can now run the proAIS2 program by double clicking on the proAIS2 icon.

Running proAIS2

When you launch the proAIS2 application on your PC or Mac you will see a screen like the one shown in Fig.1.

To communicate with the Class B Transponder, proAIS2 needs to know which port the USB interface has been allocated by the computer's operating system. For Windows and OSX, the Class B Transponder USB interface will be installed as an 'AIS Virtual COM Port'.

In most cases the proAIS2 software will show the 'AIS Virtual COM Port' as the default device to connect to, but if you have other serial port adaptors on your computer, you may have to click on the selection box and select 'AIS Virtual COM Port' as the device to connect to.

Once selected, click the 'Connect' button and the proAIS2 software will start querying the Class B Transponder to see what settings it has. Assuming that the Class B Transponder is a new unit, the Data boxes will all be blank and you are now ready to enter your own vessel's static data and program it in to the Class B Transponder.

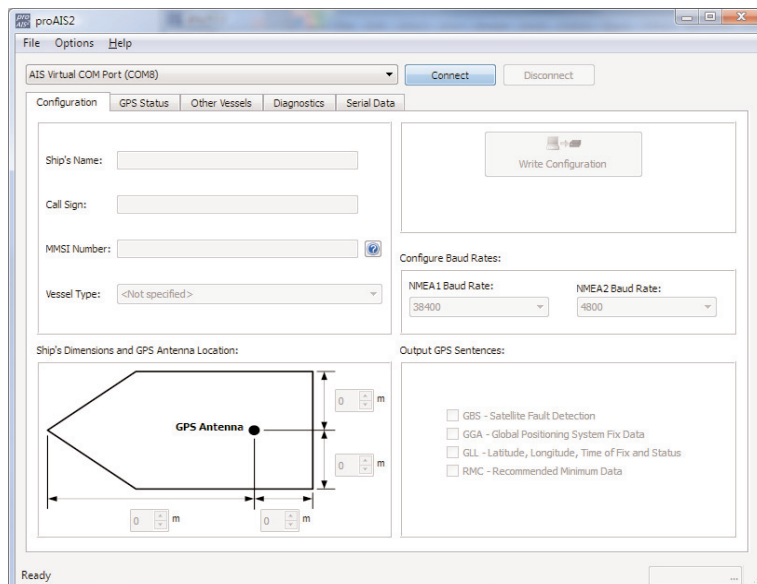


Fig. 1.

You should enter the following information to configure your transponder:

- Your unique MMSI number
- The Vessel's registered name
- Vessel type
- VHF Call sign
- Vessel dimensions and position of your GPS antenna installation (to the nearest meter).

The screen shot in Fig.2 shows how the data can be entered.

It is recommended that all Baud Rates and GPS Output Sentences are not changed from these defaults, which have been chosen for maximum compatibility with the most common installations.

Once this data is entered, please double check all of the values, paying particular attention to the MMSI number as once set this cannot be changed without the unit being returned to Icom UK.

Once you have checked that the data is correct, click the 'Write Configuration' button. You will now see a final warning window showing the MMSI number you have entered, asking you to check it one last time and reminding US customers of the additional FCC restrictions on using properly assigned MMSI numbers.

If your Class B Transponder is installed and fully powered up from the boat's 12v or 24v supply, then the Class B Transponder's GPS will now start to operate. Click on the 'GPS Status' tab, to see the satellite signal strengths (see Fig.3). You need a minimum of 4 satellites with >20dBHz signal strength to get a position fix.

Once a GPS position fix is received, the Class B Transponder will attempt to make a transmission report. To see this occur, click on the 'Diagnostics' tab and within a few minutes, the Class B Transponder should make its first transmission report, five green ticks should be displayed as shown in Fig.4.

From this screen it is also possible to control the Class B Transponder and stop it transmitting your position by clicking on the 'Silent Mode' button. To start it transmitting again, simply click the same button again which is now labelled 'Stop Silent Mode'.

For further assistance in configuring your AIS transponder please refer to the Help menu within proAIS2.

5. Operation

The following section assumes that the CB2000 Transponder has either been pre-configured by a dealer or that you have configured it yourself using proAIS2. If this is not the case, please consult Section 4 before continuing.

When the CB2000 powers up, the Green LED will illuminate briefly as it loads and initialises its software and then all four LEDs will flash once, if everything is OK, before starting normal operation.

Assuming that everything is OK and there is a good 12v supply voltage, the Yellow LED will now flash whilst the Class B Transponder searches for GPS satellites to get its first position fix. This usually takes about 1-2 minutes and once a GPS position fix is available the Yellow LED will stay ON. There will now be a short period (less than 30 seconds) before the Transponder makes its first transmission and if this is successful the Green LED will illuminate and stay ON while the Yellow LED will go OFF.

The Class B Transponder is now transmitting your position and as long as the Green LED is illuminated, you can be sure that the Class B Transponder is working correctly. The unit is constantly monitoring the supply voltage, GPS position and AIS transmission and if any of these go outside of the normal operating specification, the Class B Transponder will turn off the Green LED and turn on the Red or Yellow LED.

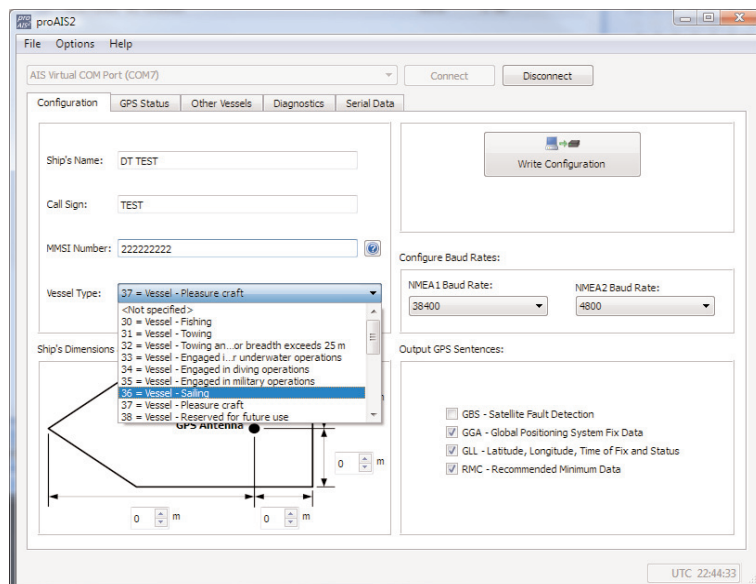


Fig. 2.

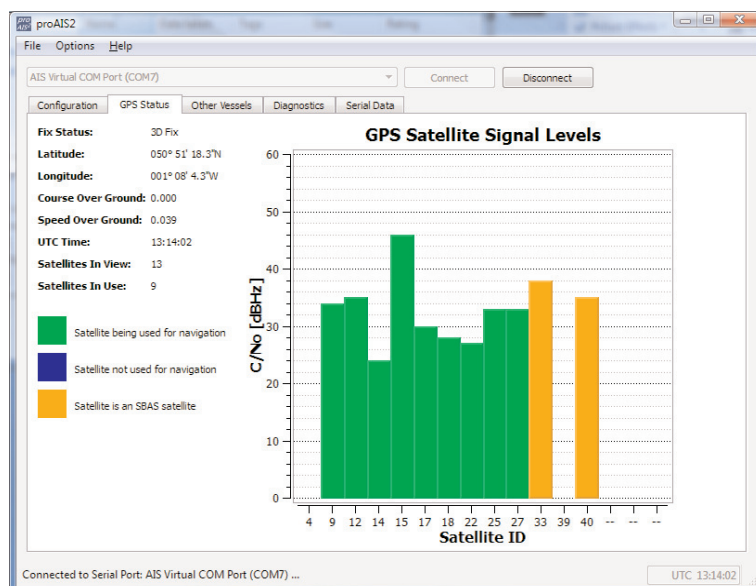


Fig. 3.

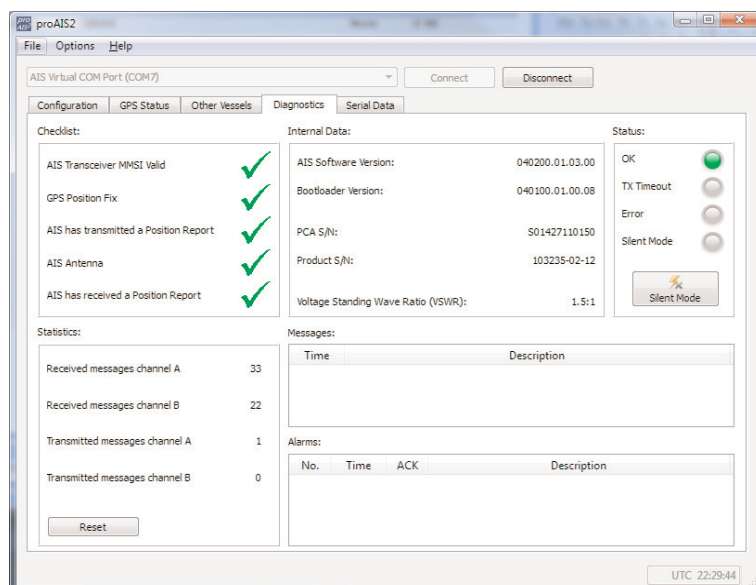


Fig. 4.

The CB2000 conforms to the international standard for Class B AIS transponders and transmits its position every 30 seconds whilst underway (SOG > 2 knots) and every 3 minutes when stationary (SOG < 2 knots). Every 6 minutes the CB2000 will transmit its 'static' data i.e. Boat Name, Call Sign, Dimensions, etc.

Every time the CB2000 transmits, it measures the 2 Watts of power sent to the antenna and also the level of power reflected back due to poor antenna connections or performance. This VSWR reading is a ratio and is displayed on the Diagnostic page of the proAIS2 software. Typically, in a good installation we would expect a VSWR ratio of between 1:1 and 2:1 and if the ratio is 5:1 or higher it will cause an alarm and the Red Status LED to illuminate,

The CB2000 is constantly receiving the positions of other AIS targets and this data is simultaneously sent to the NMEA2000 network and the USB interface.

'Silent Mode'

If you are using the proAIS2 software to control the CB2000, you can put the Class B Transponder into 'silent mode'. In silent mode the transmission of your own vessel position ceases, whilst the reception of other vessel's AIS position continues.

With the number of AIS equipped vessels increasing, it is good etiquette to only transmit in poor visibility, when crossing a busy shipping lane or if taking part in a yacht race. At all other times you should use silent mode to stop your AIS transmission from creating unnecessary clutter on other vessels chart systems.

Whilst the 'Silent Mode' is active the blue indicator will be illuminated. As soon as you turn off 'Silent Mode' the Blue LED will go OFF and the Yellow LED will come ON until the CB2000 makes its next transmission, at which point the Yellow LED will go OFF and the Green LED will come ON.

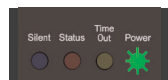
Indicator functions

The CB2000 AIS transponder includes four coloured indicator LEDs that show the status of the AIS transponder. The meaning of typical indicator configurations is shown in the following Table 1.



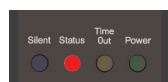
Green indicator only

- The AIS transponder is powered up, has a position fix and has transmitted at least one vessel information report. Everything is working correctly.



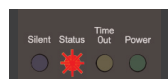
Green indicator flashing

- Indicates possible Boot Loader (software corrupted) or PA Transmitter fault. Contact ICOM UK for advice on this condition.



Red indicator only

- During normal operation the AIS transponder has detected a system error.
- Usually indicates low supply voltage but check cause of the error in proAIS2.



Red indicator flashing

- During normal operation the AIS transponder has detected a high VSWR reading, which usually indicates a VHF antenna or Splitter (if fitted) problem.



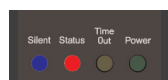
Green and Blue indicators

- The 'Silent' switch has just been operated and transmitting has stopped.
- Within 3 minutes the LED combination will change to Yellow and Blue.



Yellow and Blue indicators

- 'Silent mode' has been activated using proAIS2 and this combination of indicators is illuminated to show that the transmitter is disabled.



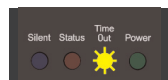
Red and Blue indicators

- This indicates that a system error has occurred whilst the unit is in 'Silent mode' unless the cause of the error is removed, the unit will not be able to start transmitting again when 'Silent mode' is exited.



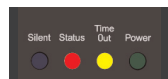
Yellow indicator only

- The AIS radio channels are exceptionally busy so there is currently no available timeslot for transmission.
- The unit has just exited silent mode, yellow indicator will illuminate until the first AIS message is sent.
- AIS transponder commanded by the local authority (via an AIS base-station) to cease transmissions.



Yellow indicator flashing

- The unit has just turned on and is obtaining a position fix prior to transmitting its first vessel information report (typically takes 1-2 minutes).
- Position fix has been lost. The AIS transponder will attempt to regain position fix for 30 minutes before entering an error state.



Red and Yellow indicators

- This is a new Class B Transponder unit that has not yet been properly configured with an MMSI number.
- The unit is only getting power via the USB cable.

6. Troubleshooting

Issue

No AIS data is being received by the ICOM VHF Radio or Chart Plotter

Possible cause and remedy

- Check that the CB2000 and NMEA2000 Starter Kit are correctly connected to the boat's 12v DC supply.
- Check the 12V supply voltage on the NMEA2000 network.
- Check that the CB2000, ICOM VHF Radio and Chart Plotter are correctly connected to the NMEA2000 Starter Kit.

No indicators are illuminated

- Check that CB2000 is selected as the AIS source on the ICOM VHF Radio and Chart Plotter and that all AIS display options are turned on.
- Check that the CB2000 and NMEA2000 Starter Kit are correctly connected to the boat's 12v DC supply.

The Red 'Status' indicator is illuminated or flashing

- Check the 12V supply voltage on the NMEA2000 network.
- The unit may not have a valid MMSI. Check that the CB2000 is correctly configured with a valid MMSI.
- The VHF antenna may be faulty. Please check the connection to the VHF antenna and that the VHF antenna is not damaged. The red indicator may illuminate briefly if the power supply is interrupted or the VHF antenna characteristics are briefly affected.
- The power supply is outside the allowable range. Check that the power supply is within the range 9.6V to 31.2V.
- Check for error and alarm messages in proAIS2.

The Yellow 'Time Out' indicator is constantly flashing

- No GPS position fix can be obtained. Please check the transceiver is located where the internal GPS antenna has a clear sky view or that an external GPS antenna is properly connected and installed. Review the GPS signal strength graph available in proAIS2.

My MMSI is being received by other vessels but my vessel name is not shown on their chart plotter or PC

- As per the AIS specification, the boat's static data; Boat name, call sign, dimensions, etc. are only output every 6 minutes, so wait for 6 minutes to see if they appear.
- Some newer chart plotters do not accept the Class B static data PGN via NMEA2000. Contact the manufacturer of your chart plotter to see if a software upgrade to fix this problem is available.

For further support information on the CB2000 transponder please email - service@icomuk.co.uk

7. Specifications

Parameter

Value

Dimensions:

160mm x 120mm x 37.5mm (W x H x D)

Weight:

850g (transponder unit only)

GPS Receiver (Internal):

50 channel IEC 61108-1 compliant

Electrical Interfaces:

USB
2 x NMEA0183 Ports (38.4k + 4.8K baud)
NMEA2000 – LEN = 1 (Load Equivalency Number)

Connections:

VHF antenna connector (BNC)
USB type A 1m cable
NMEA2000 standard connector with 1m cable

VHF Transponder:

Transmitter x 1
Receiver x 2 (One receiver time shared between AIS and DSC)
Frequency: 156.025 to 162.025 MHz in 25 kHz steps

Output Power:

33dBm ± 1.5dB

Channel Bandwidth:

25kHz

Channel Step:

25kHz

Modulation Modes:

25kHz GMSK (AIS, TX and RX). 25kHz AFSK (DSC, RX only)

Bit Rate:

9600 b/s ± 50 ppm (GMSK) RX Sensitivity

RX Sensitivity:

Less than -107dBm at 20% PER. Co-channel 10dB. Adjacent channel 70dB. IMD 65dB
Blocking 84dB

Environmental:

Water resistant to IPX5. Operating temperature: -25 C to +55 C

Indicators:

Power, TX timeout, Status, Silent Mode Status

E&E.O.