

# QK-A032

## NMEA 2000/0183 Bi-directional Converter

### Manual



Designed in UK



## Features

- Converts the most common NMEA 0183 sentences into NMEA 2000 PGNs
- Converts the most common NMEA 2000 PGNs into NMEA 0183 sentences
- Galvanic Opto-isolation on NMEA 0183 input
- Galvanic Opto-isolation on NMEA 2000 CAN bus connection
- Compatible with all NMEA 0183 versions without configuring
- Configurable baud rate
- Free Firmware updates provided when new features and conversions are added. (Update via USB from Windows PC)
- Pre-fitted cables for ease of installation
- NMEA 0183 sentences output through WiFi/USB
- NMEA 2000 PGNs output through WiFi/USB (in PCDIN format)
- WiFi supports Ad-hoc and station mode

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## 1. Setup Overview

### 1.1. Before leaving home:

**Drivers and Configuration software are optional and only needed for specific features.** The Configuration Software and specific instructions are included on the FREE CD and as a download from [www.quark-elec.com](http://www.quark-elec.com).

**Consider if there is a CD reader/internet access on site, if you will use the features below.**

#### Accessing data on a Mac/Linux/Windows PC

- Driver required if using Windows and should install automatically, if not, it is included on the free CD and at Quark-elec.com. Drivers not required for Mac or Linux.
- 12.0V power from N2K bus

**Connecting wirelessly to the A032 through Station mode WiFi** (through a router, not just peer-to-peer directly from the device)

- Configuration software (Windows PC Required). Driver may be required as above
- 12.0V power from N2K bus

**Adjusting NMEA 0183 baud rates.** The NMEA 0183 baud rates are set to different settings depending on the A032 version (A032-S: 4800bps / A032-AIS: 38400bps). These are simply the default setting; users can adjust the baud rates using the Configuration software.

- Configuration software (Windows PC Required). Driver may be required as above
- 12.0V power from N2K bus

### 1.2. Installation and Setup

#### 1. Mounting: Consider the location...

- Dry, sturdy location 0.5m from other WiFi equipment.
- Ensure there is the correct length of wires needed. If drilling holes for cabling, seal around any holes to prevent damage to the vessel or equipment. Keep USB dust cover on if USB is not used

#### 2. Connect to the NMEA 2000 backbone (12.0V power)

The A032 draws 12.0V power from the NMEA 2000 backbone. Users will need an N2K backbone and 2 termination resistors (1 on each end).

#### 3. Connect the NMEA 0183 device following the colour code below

Wire Colour	Wire Function
Blue	NMEA out-
White	NMEA out+
Black	NMEA in-
Grey	NMEA in+
Brown	GND

#### 4. Check LED lights are working on the A032.

- Power: Top LED (red) flashes at 3 second intervals.
- NMEA 2000 input: Middle LED flashes for each valid message received.
- NMEA 0183 input: Bottom LED flashes for each valid message received.

**Please note: the NMEA LEDs will flash when their respective data is received, not sent.**

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### 5. Need to connect wirelessly without a router?

- **On personal device (phone, laptop etc.):** 15 seconds after the A032 has powered up, users can scan for a WiFi network with an SSID similar to 'QK-A032xxxx'. Connect the device to 'QK-A032xxxx' with the default password: '88888888'.
  - **In Chart software:** set the protocol as 'TCP', IP address as '192.168.1.100' and the port number as '2000' in the chart software.
6. To connect wirelessly through a router (Station mode) see [Wireless Connections](#) chapter.

### 7. Optional: Configure your device's Baud rates or WiFi settings

- The A032 is pre-set to frequently used WiFi and Baud rate settings for your convenience. If you wish to use other settings you can adjust these using the Configuration tool. See the configuration section of the manual and the configuration instructions on the CD provided.

#### Default Baud Rate settings:

Version	Default NMEA 0183 Baud Rate	Converts
A032-S	4800bps as default, adjust if required	Converts the most common NMEA 0183 sentences into NMEA 2000 PGNs and vice-versa. See <a href="#">Conversion Lists</a> chapter of this manual for full conversion lists.
A032-AIS	38400bps as default, adjust if required	Converts the full A032-S conversion list plus AIS messages. See <a href="#">Conversion Lists</a> chapter of this manual for full conversion lists.

**Default WiFi settings:** The device is set to connect wirelessly in Ad-hoc mode ('peer-to-peer' without a router or access point). You can change to Station mode (connecting through a router) using the Configuration software.

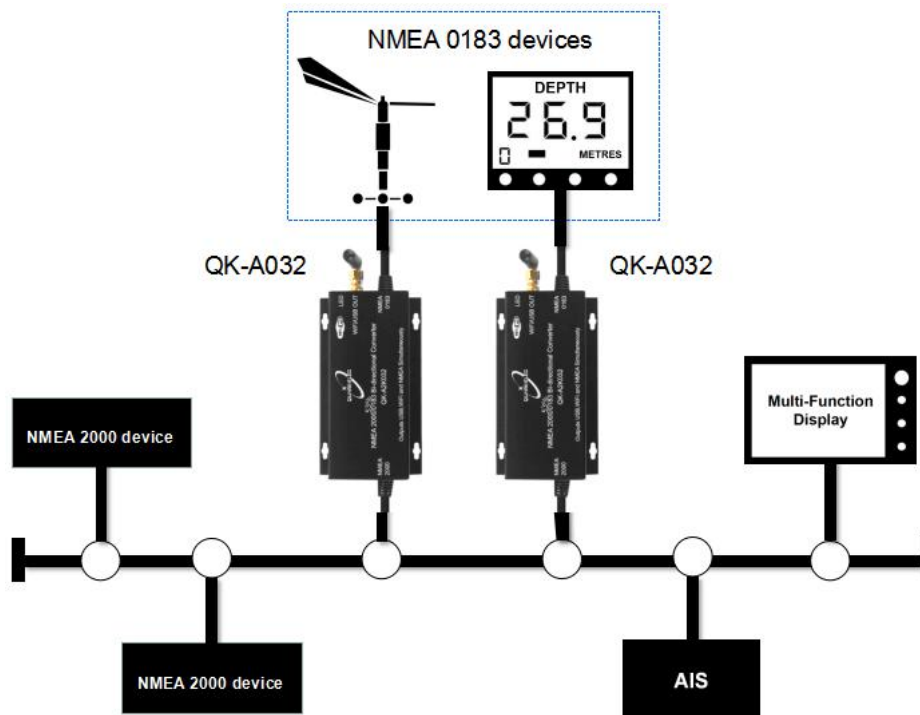


Figure 1: Example setup

## **2. Introduction**

The A032 is intended for use in a marine environment. It provides an easy way to link between users' boat's old and new data networks. The A032 allows the user to connect NMEA 0183 equipment to a NMEA 2000 network and vice versa. It has a bi-directional converter with wide support of message types. This will let the boat adopt a NMEA 2000 network, whilst connecting any existing NMEA 0183 devices to the new bus standard.

**Please refer to the A032 Conversion List chapter for details of conversions that can be performed by the A032 (and just as importantly those that cannot).**

The A032 has one NMEA 2000 connection and one NMEA 0183 port which transmit and receive data lines. The configurable baud rate from 4800bps to 38400bps allows connection of standard NMEA 0183 equipment. The A032 is powered by the NMEA 2000 backbone and provides high voltage galvanic isolation between The NMEA 2000 and NMEA 0183 ports.

## **3. NMEA 2000 and NMEA 0183**

NMEA 0183 is a serial data interface operating at 4800 bit/second utilizing standard asynchronous communications.

NMEA 2000 is a serial data network operating at 250 Kbit/second utilizing the Controller Area Network (CAN). The CAN bus was originally developed for the automotive industry but is now used in numerous industrial applications.

The key difference, apart from the obvious one of operating speed, is that NMEA 0183 is an interface while NMEA 2000 is a network.

The NMEA 2000 network allows multiple electronic devices to be connected together on a common channel for the purpose of easily sharing information. Because it is a network, and because multiple devices can transmit data, a more comprehensive set of rules is required that dictate the behaviour of the members of the network. The CAN automatically provides some of these rules – mostly for control of access to the network, packet transmission, and for error detection.

Similar to NMEA 0183, NMEA 2000 defines standard data formats and definitions, but in addition provides more extensive network management rules for identifying nodes on the network, sending commands to devices, and for requesting data. Besides the greater amount of control and integration provided, NMEA 2000 replaces with a single cable the wiring of up to 50 NMEA 0183 interconnections and can handle the data content of 50 to 100 NMEA 0183 data streams.

## 4. Mounting

The A032 is aimed at the commercial, leisure, fishing boat and vessel monitoring markets.

It is not waterproof so should be mounted in a dry place such as behind the instrument panel on a flat surface. **Please allow 0.5m between the A032 and other WiFi devices.** This will help avoid interference problems.

If USB is not being used then please use the USB dust cover provided. This will help maintain the port and keep dust out of A032.

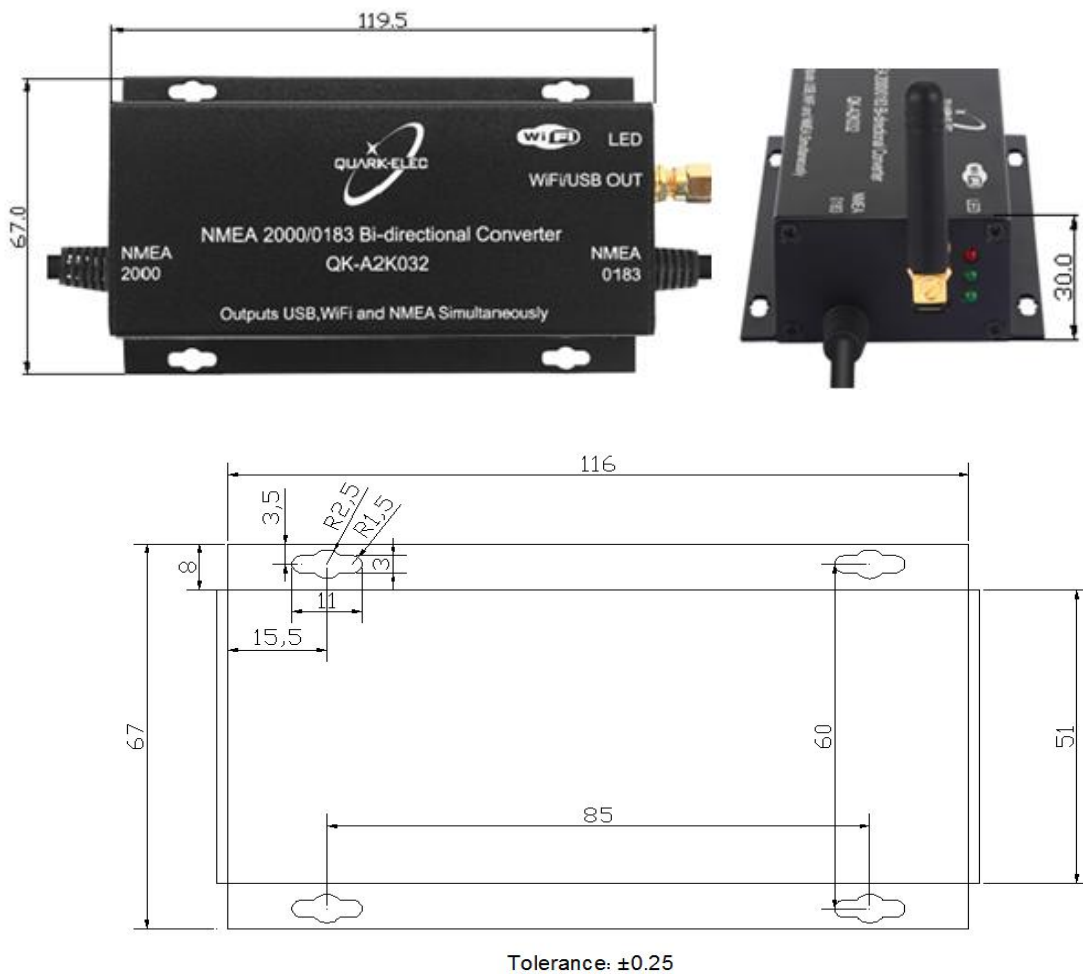


Figure 2: A032 Dimension in mm

## 5. Connecting



**Disconnect all power sources before connecting your equipment!**

### 5.1. Connecting to the NMEA 2000 network

A032 is pre-fitted with a five-core screened cable for the NMEA 2000 connection, fitted with a male micro-fit connector. Simply connect the cable to the network backbone using a T-piece connector.



Figure 3: Pin NMEA 2000 male micro-fit connection

The main communication channel of a NMEA 2000 network is a NMEA 2000 backbone to which NMEA 2000 devices connect. Each NMEA 2000 device connects to the backbone with a T- piece connector. **A NMEA 2000 backbone must be connected to power the A032. An NMEA backbone always required two termination resistors, one at each end.**

**Please note 12.0V power for the A032 unit comes from the NMEA 2000 backbone.**

### 5.2. Connecting to a NMEA 0183 Device

A pre-fitted five-core screened cable is provided for connecting to the NMEA 0183 devices. The user can use the configuration tool to setup NMEA 0183 input and output baud rate.



Figure 4: Cables for NMEA 0183 connection

Wire Colour	Wire Function
Blue	NMEA OUT -
White	NMEA OUT +
Black	NMEA IN -
Grey	NMEA IN +
Brown	GND

**Default Baud Rate settings:** The A032 is pre-set to frequently used Baud rate settings for your convenience. If you wish to use other settings you can adjust these using the Configuration tool. See the configuration section of the manual and the configuration instructions on the CD provided.

Version	Default NMEA 0183 Baud Rate
A032-S	4800bps as default
A032-AIS	38400bps as default, adjust if required

## 6. Status LED'S

A032 features three LEDs which indicate power, NMEA 2000 input and NMEA 0183 input status respectively. Three LEDs turn on and then off after initialization. When operating, these LEDs flash as below:

- **Power:** Top LED (red) flashes at 3 second intervals.
- **NMEA 2000 input:** Middle LED (green) flashes for each valid NMEA 2000 PGN input.
- **NMEA 0183 input:** Bottom LED (green) flashes for every valid NMEA 0183 sentence input.

Please note: the NMEA LEDs flash when their respective data is received, not converted or sent.



Figure 5: LED functions

## 7. Configuration

The Windows configuration tool can be used to setup the NMEA 0183 baud rate and WiFi settings.

**The Configuration tool** can be found on the free CD and as a download from our website below.

<https://www.quark-elec.com/product/qk-a032-nmea-2000-0183-bi-directional-gateway/>

**The configuration tool instructions** can be found on the free CD and as a download from our website.

[http://www.quark-elec.com/doc/QK-A0xx\\_GUI\\_application\\_note.pdf](http://www.quark-elec.com/doc/QK-A0xx_GUI_application_note.pdf)

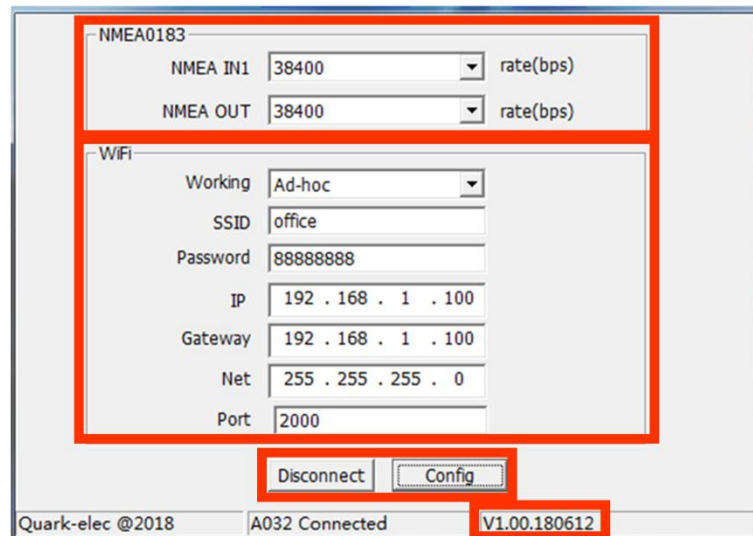
When the A032 is connected to a Windows PC and powered up, 'A032 connected' will be shown at the bottom of the Configuration software window. The software version will be shown in bottom right hand corner.

### NMEA 0183

NMEA 0183 input and output baud rates can be set up from dropdown menu. The A032 can work with standard NMEA 0183 devices (4.8kbps) or the high-speed NMEA 0183 devices (38.4kbps).

### WiFi

The A032 can be set up in either Ad-hoc (p2p) or Station mode (Access Point). See [wireless connections](#) chapter for information.



**Once settings are complete the user must click 'Config' and then click 'Disconnect'. Please restart unit by un plugging the unit from Power. The unit is now ready for use.**

## 8. Wireless Connections

The A032 allows users to view their data through WiFi on a PC, tablet, smartphone or other WiFi enabled device. Users can access marine network data including vessel course, speed, position, wind speed, direction, water depth etc. These can be viewed in the chart software (see chapter [chart software](#))

The IEEE 802.11b/g wireless standard has two basic modes of operation; Ad-hoc mode (peer to peer) and station mode (also called infrastructure mode).

The A032 supports both:-

- In **Ad-hoc mode WiFi**: mobile devices connect directly (peer to peer) to another device, without a router or access point. For example; PC, tablet or smartphone can connect directly to the A032 to receive marine data.
- In **Station mode WiFi**: wireless devices communicate through an access point (AP) such as a router that serves as a bridge to other networks (such as the Internet or LAN). This allows the router to handle the data and traffic from the device. This data can then be picked up through the router anywhere on the local area network. This is similar to plugging the device directly into the router by wire, but instead using wireless technology. In this way, the mobile devices receive both the marine data and other AP connections for example Internet.

**The A032 is set to Ad-hoc mode as a default setting, but can be easily setup to station mode through the configuration tool software.**

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### 8.1. WiFi Ad-hoc mode

#### ON THE DEVICE (phone, laptop etc.):

About 15 seconds after the A032 has powered up, a WiFi network with an (SSID) similar to 'QK-A032xxxx' can be found.

Connect the device to 'QK-A032xxxx' with the default password: '88888888'.

Device SSID	Similar to 'QK-A032xxxx'
WiFi password	88888888

#### IN THE CHART SOFTWARE:

Set the protocol as 'TCP', IP address as '192.168.1.100' and the port number as '2000' in the chart software.

Protocol	TCP
IP address	192.168.1.100
Data Port	2000

With the above settings, a wireless connection should be established and the user will be able to receive the data through the chart software.

**Note: In Ad-hoc mode, the IP address should not be changed.**

**SSID and password can be changed using the configuration software; the password should be between 8 to 12 characters.**

Users can check the wireless connection with TCP/IP port monitoring software as shown below:

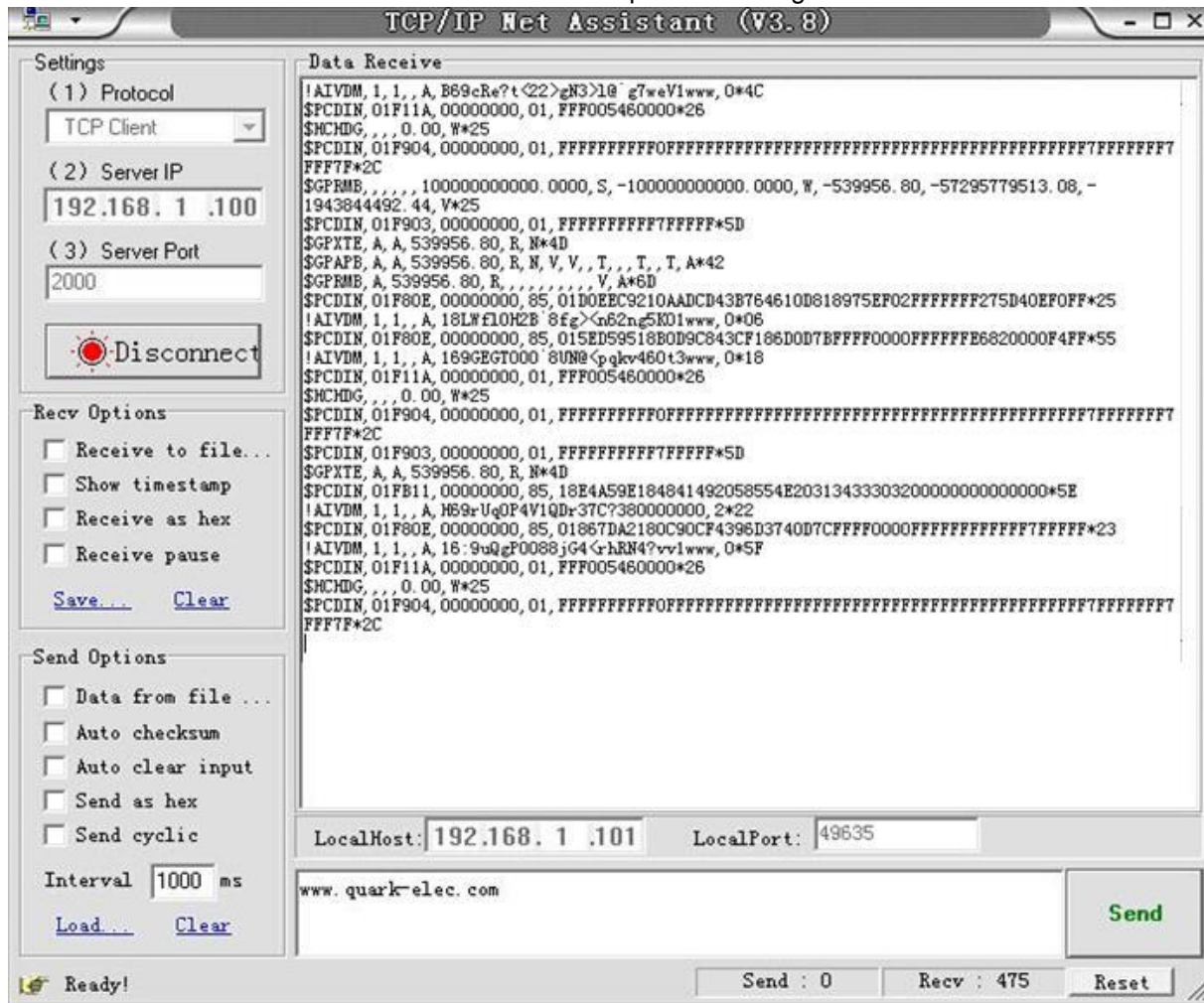


Figure 6: TCP/IP Net Assistant

## 8.2. WiFi Station mode

Station mode WiFi allows the router to handle the data and traffic from the device. This data can then be picked up through the router anywhere on the local area network. Similar to plugging the device directly into the router by wire, but instead using wireless technology.

This allows the main mobile device to still receive internet and for users to be able to view the data.

To begin using station mode the Quark-elec instrument should be attached to a computer running windows (for Mac user's windows boot camp) via USB.

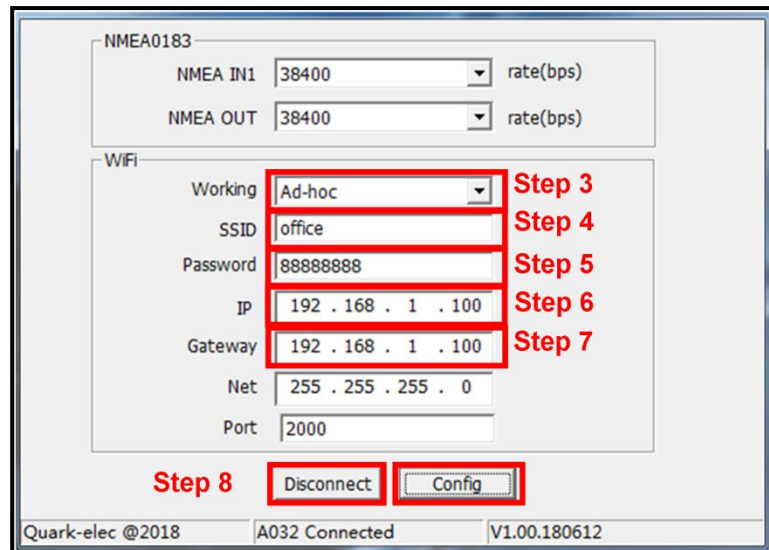
1. Connect A032 to computer via Micro USB connection.
2. Run the Configuration tool and check connection to A032 at the bottom of configuration tool.

3. Change working mode to 'Station mode'

4. Enter the router's SSID.

5. Enter the password for the network.

6. Enter the IP address to assign to the A032. Start with 192.168. The third group of digits depends on the router's configuration (Commonly 1 or 0). The fourth group must be a unique number between 0 and 255. This number must not be used by any other equipment connected to the router.



7. Enter the router's IP address in the Gateway section. This can usually be found under the router. Leave the other settings as they are.
8. Click 'Config' in the bottom right hand corner and wait about 60 seconds. After 60 seconds Click 'Disconnect'.
9. Repower the A032. The A032 will now attempt to connect to the router.

10. In the chart software set the protocol as 'TCP'
  - Insert the IP address that was assigned the A032
  - Enter the Port number as '2000' in the chart software.

Protocol	TCP
IP address	(check the router)
Data Port	2000

Users should now be connected and see marine data on chart software.

If not, check the router's IP address list and check the IP address that the router has given the A032. Occasionally, a router assigns a different IP address to a device than the one chosen. If this is the case, copy the IP address from the router into the chart software. If the IP address in the router's IP address list is the same as the one input into the chart software then everything will work in station mode. If users are unable to see any data repeat the steps, and check all the data has been input correctly.

If users are not able to view the data in station mode, the likely cause is either the data has been input incorrectly, or the IP address is different in the chart software to that of the router.

## 9. Connecting Via USB Port

A032 is supplied with a USB connector. This connector provides data output as standard (multiplexed information from other instruments will also be sent via these connections). This USB connector can be linked directly to a USB port on the PC. It can also be connected to other mobile devices via an USB OTG (On the Go) connection using the supplied cable.

**Windows 7, 8, 10:** To enable the USB data connection of A032 to other devices, related hardware drivers may be needed, dependent on the system requirements. The driver can be found on the CD in the packing box or be downloaded from <https://www.quark-elec.com>

The drivers usually install automatically to the device if it is running Windows 10 (non-upgraded version). The A032 registers itself to the computer as a virtual serial com port. A new COM port will automatically show up in the device manager after plug in.

**Mac:** For Mac OS X, the A032 will be recognized and shown as a USB modem. The ID can be checked with the following steps:

1. Plug the A032 into a USB port and launch Terminal.app.
2. Type: `less /dev/*sub*`
3. The Mac system will return a list of USB devices. A032 will display as - `"/dev/tty.usbmodemXYZ"` where XYZ is a number. Nothing further needs to be done if it is listed.

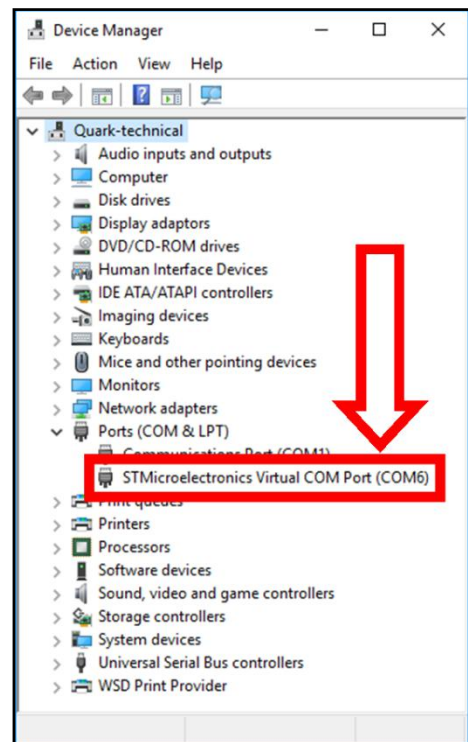
**Linux:** No driver is required for Linux. When plugged into the computer, A032 will show up as a USB CDC device on `/dev/ttyACM0` or similar.

### 9.1. Checking the USB connection (Windows)

After the driver is installed, run the Device Manager and check the **COM number** (this is the number associated with the USB port being used. The port number is the number that Windows assigns as an input device. These can be generated randomly by the computer). The chart software may require the COM number in order to access the data.

The port number for the A032 can be found in Windows 'Control Panel->System->Device Manager' under 'Ports (COM & LPT)'. Find the A032 in the list for the USB variant. To change this number, double click the A032 and select the 'Port Settings' tab. Click the 'Advanced' button and change the port number to the one required.

**Checking the USB data flow:** If desired, the USB data can always be checked with a terminal monitor application, like Putty or HyperTerminal. To do this, enter the following into the COM port settings: **Bits per second: 38400bps, Data bits: 8, Parity: None, and Stop bits: 1** as shown below using HyperTerminal on Windows as an example



## 10. Chart Software

A wide range of free and paid chart software is available.

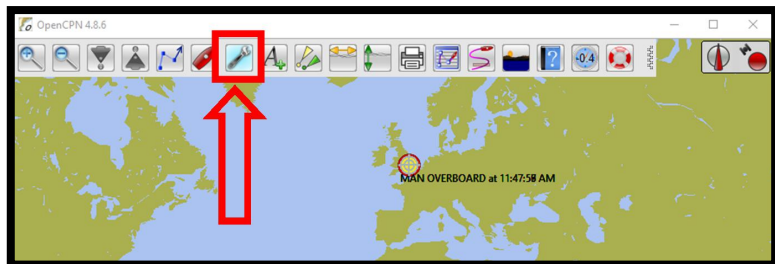
We will use OpenCPN for our example chart software; other software will require similar setup.

OpenCPN (Open Chart Plotter Navigator) is a free software project creating concise chart plotter and navigation software, for use underway or as a planning tool. OpenCPN is developed by a team of active sailors using real world conditions for program testing and refinement. <https://opencpn.org/>

### 10.1. OpenCPN example USB setup

1. When OpenCPN is first opened, the software will greet users with a page similar to the one below.

This is the main view of openCPN software. Users now need to add data to openCPN via the Quark-elec instruments. Click on the 'Options' tab at the top. The 'Options' tab looks like a spanner as seen below in the highlighted image.



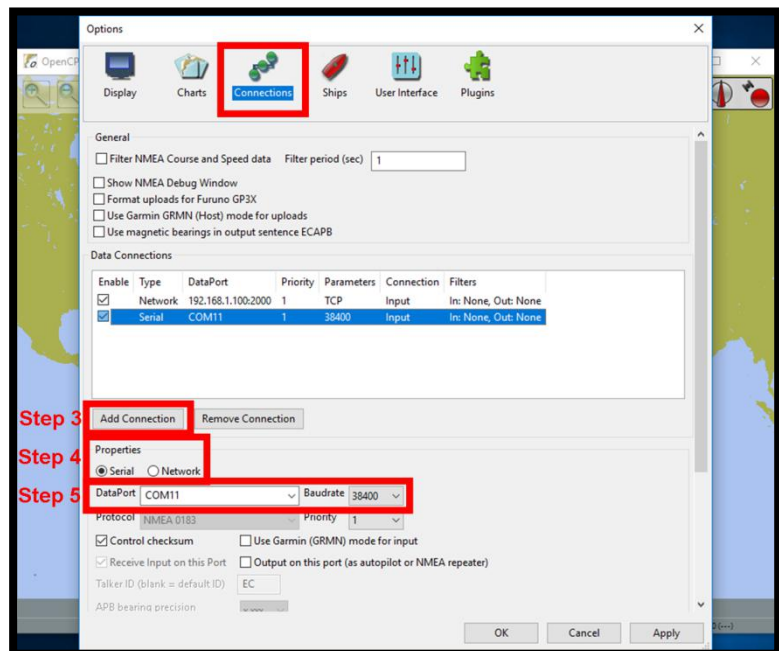
2. In the options at the top of the menu will be a tab/button that says 'Connections'. Click on this

3. Click on 'Add Connection' button highlighted in the picture below.

4. Select 'Serial'

5. Select from the drop down list the **COM** number assigned to A032 (See [connecting via USB](#) to find COM port in device manager). Adjust the Baud rate to match your default or configured baud rate.

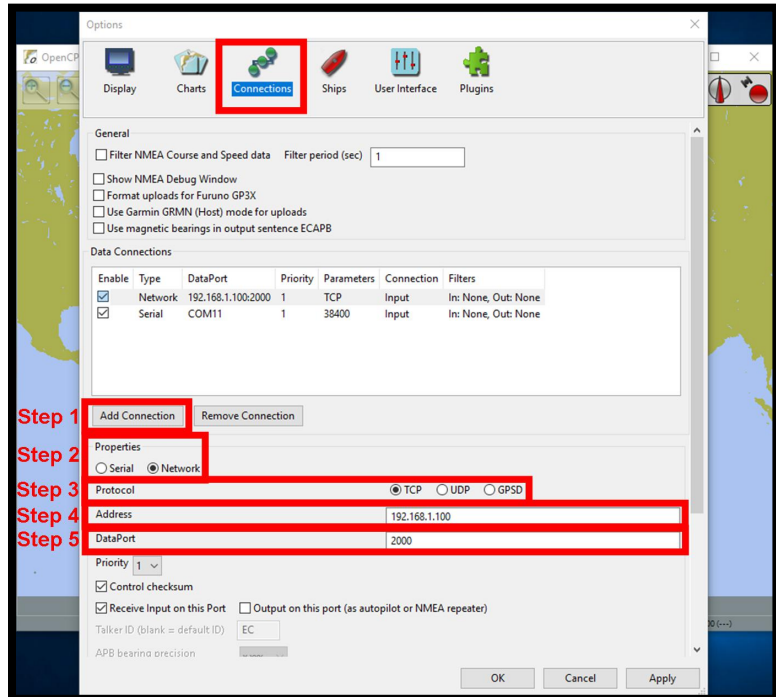
6. Click 'Apply' and then 'OK'



### 10.2. OpenCPN example Network setup (WiFi)

Using the same options tab as above we can set up a wireless network connection via Ad-hoc or station mode. Go to the 'Connections' tab at the top of the options menu and click.

1. Click the 'Add connection' button.
2. Select 'Network'
3. Input the Protocol: **TCP**
4. Insert IP address. In Ad-hoc this is 192.168.1.100. In Station mode then this will be a different IP address
5. Input the Dataport: **2000**
6. Click 'Apply' and then 'OK'



<b>Protocol</b>	<b>TCP</b>
<b>IP address</b>	<b>192.168.1.100</b> This is the IP address for Ad-hoc WiFi. In Station mode, simply replace with the relevant IP (See Station mode.).
<b>Data Port</b>	<b>2000</b>

### 10.3. Maps

The OpenCPN interface comes with a basic map view. This can easily download more detailed maps.

There is a wide range of free and licensed charts available in different formats via the OpenCPN website at <https://opencpn.org/OpenCPN/info/chartsources.html>.

A worldwide directory of free nautical charts can also be found on [openstreetmap.org](http://openstreetmap.org). The collection and the updates are community driven.

**Disclaimer:**

Quark-elec cannot vouch for the quality of any particular maps or chart software. The above is an example only.

## 11. Updating/ upgrading Firmware

From time to time, Quark-elec updates firmware to support additional NMEA 2000 PGNs and NMEA 0183 messages. Users can update the software on the device to the latest available version. The firmware can be upgraded through the following process. Firmware can also be used to upgrade from the A032-S to the A032-AIS version.

1. **Power OFF** the A032 (**Disconnect from NMEA 2000 network**).
2. Connect the NMEA 0183 NMEA IN – (black) and NMEA 0183 NMEA OUT – (blue). Ensure the correct cables are attached before continuing.

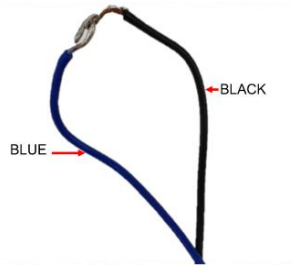


Figure 7: Blue and black wires joined together

3. Connect NMEA 0183 NMEA IN + (Gray) and NMEA 0183 NMEA OUT + (White). Ensure the correct cables are attached before continuing.

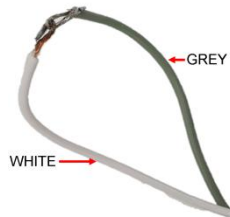


Figure 8: Grey and white wires joined together



**Check you have connected the correct wires before powering up. Connecting the wrong wires will damage the device!**

4. Connect A032 to a Windows PC via USB cable.
5. **Power ON** the A032 (**connect to NMEA 2000 network**).

In 'my computer' 2 new drives, 'STM32 APP' and 'STM32 WiFi' will appear.



**WARNING: The firmware must be placed in 'STM32 APP' folder. NOT any other folder/window/drive that appears. Saving to the wrong location will damage the device.**

6. Copy the upgraded firmware to the 'SMT32 APP' folder.
7. **Once copied successfully, Power OFF** the A032 (**disconnect from NMEA 2000 network**)
8. Remove the short connections. (disconnect the wires you connected in step 2 and 3) and **Power ON** the A032 (**connect to NMEA 2000 network**)
9. Wait at least 10 seconds and **Power OFF** A032 (**disconnect from NMEA 2000 network**)
10. Finally, **RE-POWER ON** the A032 (**connect to NMEA 2000 network**) (This ensures settings are stored).

The upgrading process is complete.

## 12. Conversion Lists

The following tables list the supported NMEA 2000 PGN's (parameter group numbers) and NMEA 0183 sentences. It is important to check the table to confirm that the A032 will convert the sentences/PGNs requires.

Through USB and WiFi the A032 will output in NMEA 0183 format, including all NMEA 0183 messages received and NMEA 0183 messages converted from the NMEA 2000 network.

The following is a typical PCDIN message format outputted through WiFi and USB. The chart software will convert this into more meaningful information.

---Received message: \$PCDIN, 01F119, 00000000, 16,0064050800FFFF0C\*5B---

Header	PGN	Time Stamp	Source ID	Data	Termination	Check Sum
\$PCDIN	01F119	00000000	16	0064050800FFFF0C	*	5B

### 12.1. A032-S Conversion List (standard non-AIS version)

#### A032-S NMEA 0183 to NMEA 2000 conversions

The following NMEA 0183 to NMEA 2000 conversions are currently available.

NMEA 0183 sentence	Function	Converted to NMEA 2000 PGNs
DBT	Depth Below Transducer	128267
DPT	Depth	128267
GGA	Global Positioning System Fix Data	126992, 129025, 129029
GLL	Geographic Position Latitude/Longitude	126992, 129025
GSA	GNSS DOP and Active Satellites	129539
GSV	GNSS Satellites in View	129540
HDG	Heading, Deviation & Variation	127250
HDM	Heading, Magnetic	127250
HDT	Heading, True	127250
MTW	Water Temperature	130311
MWD	Wind Direction & Speed	130306
MWV	Wind Speed and Angle (True or relative)	130306
RMB	Recommended Minimum Navigation Information	129283, 129284
RMC*	Recommended Minimum Specific GNSS Data	126992, 127258, 129025, 12902
ROT	Rate Of Turn	127251
RPM	Revolutions	127488
RSA	Rudder Sensor Angle	127245
VHW	Water Speed and Heading	127250, 128259
VLW	Dual Ground/Water Distance	128275
VTG*	Course Over Ground and Ground Speed	129026
VWR	Relative (Apparent) Wind Speed and Angle	130306
XTE	Cross Track Error, Measured	129283
ZDA	Time & Date	126992

\*please note: some PGN sentences that are received require additional data before being send.

## A032-S NMEA 2000 to NMEA 0183 conversions

The following NMEA 2000 to NMEA 0183 conversions are currently available.

NMEA 2000 PGN	HEX code	Function	Converted to NMEA 0183 Sentences
126992	1F010	System Time	ZDA
127245	1F10D	Rudder	RSA
127250	1F112	Vessel Heading	HDG, VHW
127251	1F113	Rate of Turn	ROT
127258	1F11A	Magnetic Variation	HDG
128259	1F503	Speed, Water referenced	VHW
128267	1F50B	Water Depth	DBT, DPT
128275	1F513	Distance Log	VLW
129025	1F801	Position, Rapid Update	GLL
129026	1F802	COG & SOG, Rapid Update	VTG
129029	1F805	GNSS Position Data	GGA, GLL, GSA, RMC, ZDA
129033	1F809	Time & Date	ZDA
129044	1F814	Datum	DTM
129283	1F903	Cross Track Error	APB, RMB, XTE
129284	1F904	Navigation Data	RMB
129291	1F90B	Set & Drift, Rapid Update	VDR
129539	1FA03	GNSS DOPs	GSA
129540	1FA04	GNSS Sats in View	GSV
130306	1FD02	Wind Data	MWV
130310	1FD06	Environmental Parameters	MDA, MTW
130311	1FD07	Environmental Parameters	MDA
130312	1FD08	Temperature	MDA, MTW

\*please note: some of the NMEA 0183 sentences that are received require additional data before being sent.

### A032-S does not convert AIS messages



**Please note: On the A032-S (standard non-AIS version), AIS messages are not converted.**

The A032-S can be connected to an AIS receiver. NMEA 0183 AIS messages are transferred to USB and WiFi from the 0183 connection but not converted to or from the NMEA 2000. For AIS conversions select the A032-AIS version

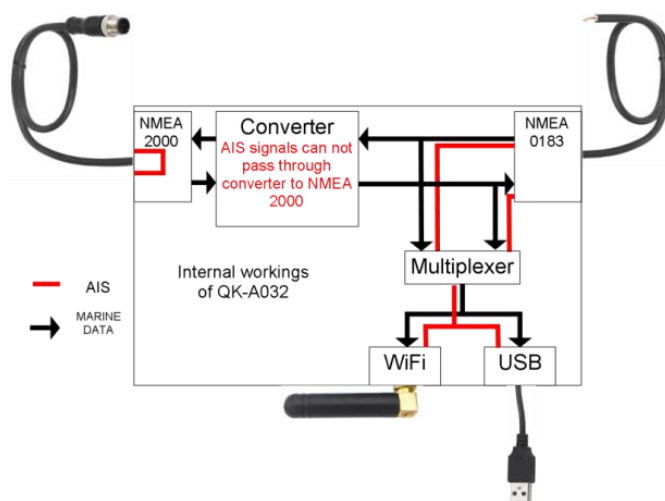


Figure 9: Diagram shows A032-S transfers AIS messages without converting.

**12.2. A032-AIS Conversion List (all standard version conversions plus AIS conversions)**

The A032-AIS converts all the messages/PGNs from the A032-standard plus AIS messages.

**AIS (NMEA 0183) to NMEA 2000 conversion list**

The following NMEA 0183 to NMEA 2000 conversions are currently available.

NMEA 0183 sentence	Function	Converted to NMEA 2000 PGNs
DBT	Depth Below Transducer	128267
DPT	Depth	128267
GGA	Global Positioning System Fix Data	126992, 129025, 129029
GLL	Geographic Position Latitude/Longitude	126992, 129025
GSA	GNSS DOP and Active Satellites	129539
GSV	GNSS Satellites in View	129540
HDG	Heading, Deviation & Variation	127250
HDM	Heading, Magnetic	127250
HDT	Heading, True	127250
MTW	Water Temperature	130311
MWD	Wind Direction & Speed	130306
MWV	Wind Speed and Angle (True or relative)	130306
RMB	Recommended Minimum Navigation Information	129283,129284
RMC*	Recommended Minimum Specific GNSS Data	126992, 127258, 129025, 12902
ROT	Rate Of Turn	127251
RPM	Revolutions	127488
RSA	Rudder Sensor Angle	127245
VHW	Water Speed and Heading	127250, 128259
VLW	Dual Ground/Water Distance	128275
VTG*	Course Over Ground and Ground Speed	129026
VWR	Relative (Apparent) Wind Speed and Angle	130306
XTE	Cross Track Error, Measured	129283
ZDA	Time & Date	126992
VDM	AIS Message 1,2,3	129038
VDM	AIS Message 4	129793
VDM	AIS Message 5	129794
VDM	AIS Message 9	129798
VDM	AIS Message 14	129802
VDM	AIS Message 18	129039
VDM	AIS Message 19	129040
VDM	AIS Message 21	129041
VDM	AIS Message 24	129809, 129810

\*please note: some PGN sentences that are received require additional data before being send.

**A032-AIS NMEA 2000 to NMEA 0183 conversions**

The following NMEA 2000 to NMEA 0183 conversions are currently available.

NMEA 2000 PGN	HEX code	Function	Converted to NMEA 0183 Sentences
126992	1F010	System Time	ZDA
127245	1F10D	Rudder	RSA
127250	1F112	Vessel Heading	HDG, VHW
127251	1F113	Rate of Turn	ROT
127258	1F11A	Magnetic Variation	HDG
128259	1F503	Speed, Water referenced	VHW
128267	1F50B	Water Depth	DBT, DPT

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128275	1F513	Distance Log	VLW
129025	1F801	Position, Rapid Update	GLL
129026	1F802	COG & SOG, Rapid Update	VTG
129029	1F805	GNSS Position Data	GGA, GLL, GSA, RMC, ZDA
129033	1F809	Time & Date	ZDA
129044	1F814	Datum	DTM
129283	1F903	Cross Track Error	APB, RMB, XTE
129284	1F904	Navigation Data	RMB
129291	1F90B	Set & Drift, Rapid Update	VDR
129539	1FA03	GNSS DOPs	GSA
129540	1FA04	GNSS Sats in View	GSV
130306	1FD02	Wind Data	MWV
130310	1FD06	Environmental Parameters	MDA, MTW
130311	1FD07	Environmental Parameters	MDA
130312	1FD08	Temperature	MDA, MTW
129038	1F80E	AIS Message 1,2,3	VDM
129793	1FB01	AIS Message 4	VDM
129794	1FB02	AIS Message 5	VDM
129798	1FB06	AIS Message 9	VDM
129039	1F80F	AIS Message 18	VDM
129040	1F810	AIS Message 19	VDM
129041	1F811	AIS Message 21	VDM
129802	1FB0A	AIS Message 14	VDM
129809	1FB11	AIS Message 24 (Part A)	VDM
129810	1FB12	AIS Message 24 (Part B)	VDM

\*please note: some of the NMEA 0183 sentences that are received require additional data before being sent.

## 13. Specification

Item	Specification
DC supply	12.0V (+/-10%)
Average supply current	55mA
Maximum supply current	95mA
NMEA data format	ITU/ NMEA 2000 and 0183 format
NMEA 0183 port baud rate	4800bps,38400bps baud
NMEA 2000 port baud rate	250kbps
WiFi mode	Ad-hoc and Station modes on 802.11 b/g/n
Security	WPA/WPA2
Network Protocols	TCP
Cable Length NMEA 2000	1.0m
Cable Length NMEA 0183	0.5m
Operating Temperature	-20°C to +55°C
Storage Temperature	-30°C to +70°C
Recommended Humidity	0 - 93% RH

## 14. Limited Warranty and Notices

Quark-elec warrants this product to be free from defects in materials and manufacture for one year from the date of purchase. Quark-elec will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labour. The customer is, however, responsible for any transportation costs incurred in returning the unit to Quark-elec. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs. A returns number must be given before any unit is sent back for repair. The above does not affect the statutory rights of the consumer.

### Disclaimer

This product is designed to aid navigation and should be used to augment normal navigational procedures and practices. It is the user's responsibility to use this product prudently. Neither Quark-, nor their distributors or dealers accept responsibility or liability either to the products user or their estate for any accident, loss, injury or damage whatsoever arising out of the use or of liability to use this product.

Quark- products may be upgraded from time to time and future versions may therefore not correspond exactly with this manual. The manufacturer of this product disclaims any liability for consequences arising from omissions or inaccuracies in this manual and any other documentation provided with this product.

### Document history

Issue	Date	Changes / Comments
1.0	27-02-2018	Initial release
2.0	25-07-2018	Update to document
3.0	24-10-2018	New 2018 format
4.0	29-01-2019	A032-AIS added
4.1	10-10-2019	Support 129041,129802 PGNs on AIS version

## 15. Glossary

- **Ad-hoc WiFi, also known as 'peer-to-peer'**: devices communicate directly with each other without a router.
- **IP**: internet protocol (ipv4, ipv6)- explains which version
- **IP Address**: is a numerical label assigned to each device connected to a computer network.
- **NMEA 0183**: is a serial data interface operating at 4.8 Kbit/second utilizing standard asynchronous communications. It is an electrical and data standard for communication between marine electronics.
- **NMEA2000 / N2K**: is a serial data network operating at 250 Kbit/second utilizing the Controller Area Network (CAN). The CAN bus was originally developed for the automotive industry but is now used in numerous industrial applications. It is a communications standard used for connecting marine sensors and display units within ships and boats and is generally plug-and-play.
- **NMEA2000 / N2K backbone**: Used with NMEA 2000, the backbone is the main BUS supplying data and power to all the devices on the boat.
- **PGN**: Packet group number – used in the NMEA 2000 protocol instead of sentences

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- **Router:** A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet.
- **Sentences:** Used in NMEA 0183 protocol to transfer data between marine equipment.
- **Station mode WiFi:** devices communicate by going through an Access Point (AP) or router. This allows the user to view data while accessing other router functions such as other devices or internet.
- **USB:** cable for communication and power supply between devices.

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